Site # AIN0030A
Market: Minneapolis

AMENDMENT NO. 1 TO SITE LEASE AGREEMENT BETWEEN BOARD OF WATER COMMISSIONERS OF THE CITY OF SAINT PAUL AND T-MOBILE CENTRAL, LLC

This **AMENDMENT NO. 1 TO SITE LEASE AGREEMENT** ("Amendment") is made this _____ day of _____, 2015, by and between the Board of Water Commissioners of the City of Saint Paul, a Minnesota municipal corporation ("Lessor") and, T-Mobile Central LLC, a Delaware limited liability company, successor in interest to APT Minneapolis, Inc. ("Lessee").

RECITALS

A. Lessor and Lessee are parties to a Site Lease Agreement dated September 25, 1996 ("Agreement") whereby Lessor has leased ground space and water tower space to Lessee at Lessor's McKnight Road Water Tower site, addressed as 393 N McKnight Road, Saint Paul, Minnesota 55119.

B. Lessor and Lessee desire to amend the Agreement to (i) allow for the installation of three (3) additional Antennas; three (3) Remote Radio Units and one (1) Hybrid cable, and to (ii) provide for an increase in the annual rent payable to Lessor under the Agreement.

AGREEMENT

NOW, THEREFORE, in consideration of the facts contained in the Recitals above, the mutual covenants and conditions below, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree as follows:

1. EFFECTIVE DATE.

The effective date of this Amendment shall be the date last signed below ("Effective Date").

2. REVISED INSTALLATION.

a. Lessee shall have the right to modify its Communications Facilities as described and depicted on Exhibit A (Construction Drawings Rev 2 dated March 5, 2015), attached hereto and incorporated herein.

b. Exhibit E of the Agreement is deleted in its entirety and replaced with Exhibit E-1, attached hereto and incorporated herein.

3. REVISED ANNUAL RENT. As consideration for the rights granted herein, commencing on the Effective Date of the Agreement, the annual Base Rent, as described in Section 3 of the Agreement, shall be Thirty-One Thousand Seven Hundred Sixty-Three and

45/100 Dollars ($31,763.45). The resulting increase in rent for 2015 shall be prorated from the Effective Date of this Amendment.

Lessee shall make all payments of rent to Lessor at the following address:

Board of Water Commissioners
Attn: Accounting
1900 Rice Street, Office Building
Saint Paul, Minnesota 55113

4. NOTICE. Each party's notice address in Section 13 of the Agreement is hereby replaced with the following:

LESSOR: Board of Water Commissioners
Attn: Engineering
1900 Rice Street, Office Building
Saint Paul, Minnesota 55113

LESSEE: T-Mobile Central LLC
12920 SE 38th Street
Bellevue, WA 98006
Attn: Lease Compliance A1N0030A

5. RATIFICATION OF THE AGREEMENT.

a. Except as specifically modified by this Amendment, the parties agree that all of the terms and conditions of the Agreement are in full force and effect and remain unmodified, and the parties hereby ratify and reaffirm the terms and conditions of the Agreement and agree to perform and comply with the same.

b. In the event of a conflict between any term or provision of the Agreement and this Amendment, the terms and provisions of this Amendment shall control.

c. Except as otherwise stated in this Amendment, all initially capitalized terms will have the same respective defined meaning stated in the Agreement. All captions are for reference purposes only and shall not be used in the construction or interpretation of this Amendment.

[Remainder of page left intentionally blank.]

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IN WITNESS WHEREOF, Lessor and Lessee have caused this Amendment to be executed by each party's duly authorized representative as of the Effective Date.

Approved:

Stephen P. Schneider, General Manager
Saint Paul Regional Water Services

Approved as to Form:

Assistant City Attorney

BOARD OF WATER COMMISSIONERS OF THE CITY OF SAINT PAUL

Matt Anfang, President

Mollie Gagnelius, Secretary

Todd Hurley, Director
Office of Financial Services

CITY OF SAINT PAUL

Kristin Beckmann, Deputy Mayor

Shari Moore, City Clerk

Date of Execution by Lessor: _____

T-MOBILE CENTRAL LLC

Hossein Sepehr
Area Director, Network Engineering & Ops

Date of Execution by Lessee: 4/21/15

Site # A1N0030A
Market: Minneapolis

ACKNOWLEDGEMENTS

BOARD OF WATER COMMISSIONERS OF THE CITY OF SAINT PAUL

STATE OF MINNESOTA)
) ss.
COUNTY OF RAMSEY)

On _____, 2015, before me, _____, Notary Public, personally appeared Matt Anfang, President, Board of Water Commissioners of the City of Saint Paul, a Minnesota municipal corporation, on behalf of the corporation.

Witness my hand and official seal.

_____
Notary Public

STATE OF MINNESOTA)
) ss.
COUNTY OF RAMSEY)

On _____, 2015, before me, _____, Notary Public, personally appeared Mollie Gagnelius, Secretary, Board of Water Commissioners of the City of Saint Paul, a Minnesota municipal corporation, on behalf of the corporation.

Witness my hand and official seal.

_____
Notary Public

Site # A1N0030A
Market: Minneapolis

CITY OF SAINT PAUL

STATE OF MINNESOTA)
) ss.
COUNTY OF RAMSEY)

On _____, 2015, before me, _____, Notary Public, personally appeared _____, Deputy Mayor of the City of Saint Paul, a Minnesota municipal corporation, on behalf of the corporation.

Witness my hand and official seal.

_____
Notary Public

STATE OF MINNESOTA)
) ss.
COUNTY OF RAMSEY)

On _____, 2015, before me, _____, Notary Public, personally appeared Shari Moore, City Clerk, City of Saint Paul, a Minnesota municipal corporation, on behalf of the corporation.

Witness my hand and official seal.

_____
Notary Public

STATE OF MINNESOTA)
) ss.
COUNTY OF RAMSEY)

On _____, 2015, before me, _____, Notary Public, personally appeared Todd Hurley, Director, Office of Financial Services of the City of Saint Paul, a Minnesota municipal corporation, on behalf of the corporation.

Witness my hand and official seal.

_____
Notary Public

Site # A1N0030A
Market: Minneapolis

T-MOBILE CENTRAL LLC

STATE OF MINNESOTA)
) ss.
COUNTY OF HENNEPIN)

I certify that I know or have satisfactory evidence that Hossein Sepehr is the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the Area Director, Network Engineering & Ops of T-Mobile Central LLC, a Delaware limited liability company, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated: 4/22/2015

Witness my hand and official seal.

JOHN JOSEPH MCDONALD
NOTARY PUBLIC - MINNESOTA
MY COMMISSION EXPIRES 01/31/19

Site # A1N0030A
Market: Minneapolis

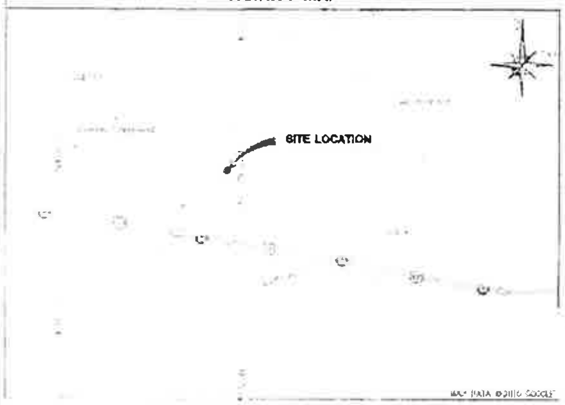
Exhibit A
(Attached CDs Rev 2 dated 3/5/15)

T-Mobile stick together®

SITE NUMBER: A1N0030A
SITE NAME: STPL WT-MCKNIGHT
SITE TYPE: WATER TANK

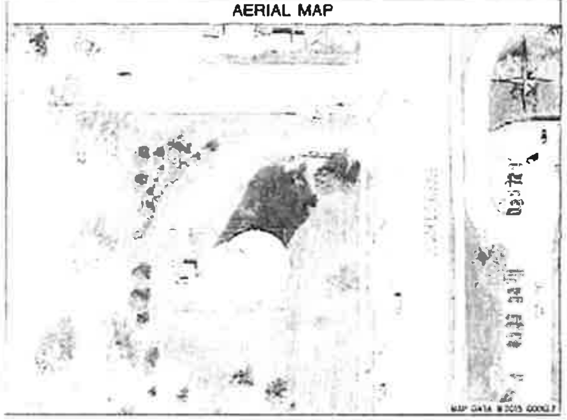
JURISDICTION: CITY OF SAINT PAUL
CITY: SAINT PAUL
COUNTY: RAMSEY COUNTY

VICINITY MAP



MAP DATA ©2015 GOOGLE

AERIAL MAP



MAP DATA ©2015 GOOGLE

PROJECT DESCRIPTION

STRUCTURE HEIGHT: ±105'-0"
STRUCTURE TYPE: WATER TANK
ANTENNA QUANTITY: 8 EXISTING ANTENNAS TO REMAIN, 3 NEW ANTENNAS TO BE INSTALLED
ANTENNA HEIGHT: 108' 0"

PROJECT LOCATION

COORDINATES (NAD83):
LAT: 44.953103
LONG: -93.005604°

SITE ADDRESS:
393 N. MCKNIGHT RD
SAINT PAUL, MN 55119

PROPERTY SUMMARY

PROPERTY ADDRESS:
393 N. MCKNIGHT RD
SAINT PAUL, MN 55119

ASSESSOR'S PARCEL NUMBER (APN):
T.B.D.

ZONING:
TBD

APPLICABLE CODES

BUILDING CODE: INTERNATIONAL BUILDING CODE 2006 (2007 MINNESOTA STATE BUILDING CODE CHAPTER 1305)

ELECTRICAL CODE: NATIONAL ELECTRICAL CODE 2014 (2107 MINNESOTA STATE BUILDING CODE CHAPTER 1315)

NOTES

CONSTRUCTION DRAWINGS WERE COMPLETED BASED ON THE INFORMATION PROVIDED BY T-MOBILE'S RFDS DATED 07/25/2014

CONTACTS

APPLICANT
T-MOBILE USA
8000 WEST 78TH STREET, SUITE 400
EDINA, MINNESOTA 55439
CONTACT: T.B.D
TEL: (612) 701-2669

PROPERTY OWNER CONTACT:
T.B.D

PROJECT TEAM

ARCHITECT
W-T COMMUNICATION DESIGN GROUP, LLC
2675 PRATUM AVENUE
HOFFMAN ESTATES, IL 60192
TEL: (224) 293-6333
FAX: (224) 293-6444

STRUCTURAL ENGINEER
W-T COMMUNICATION DESIGN GROUP, LLC
2675 PRATUM AVENUE
HOFFMAN ESTATES, IL 60192
TEL: (224) 293-6333
FAX: (224) 293-6444

SITE ACQUISITION
LORA, CHANTHADOUANGSY, & CASTELLANOS, LLC
10700 W. HIGGINS, SUITE 240
ROSEMONT, IL 60018
TEL: (847) 608-6300
FAX: (630) 503-7911

811 Know what's below. Call before you dig.

W-T Communication Design Group's Commitment to Quality

Please take a few moments to fill out our online survey

SHEET INDEX

SHEET NUMBER	DESCRIPTION
T-1	TITLE SHEET
T-2	GENERAL NOTES & SPECIFICATIONS
T-3	GENERAL NOTES & SPECIFICATIONS
C-1	OVERALL SITE PLAN
C-2	COMPOUND & EQUIPMENT PLANS
A-1	TOWER ELEVATION
A-2	ANTENNA PLANS & SCHEDULE
A-3	ANTENNA MOUNTING DETAILS
GN-1	GROUNDING DETAILS
SP-1	SOIL REQUIREMENTS & GENERAL GUIDELINES
SE-1	WATER TANK PLAN & ANTENNA MOUNT DETAIL
SE-2	GENERAL NOTES

APPROVALS

PENDING APPROVAL OF THE JURISDICTION, THE FOLLOWING PARTIES HAVE REVIEWED THE DESIGN WITHIN THEIR FUNCTIONAL RESPONSIBILITIES AND HAVE APPROVED THIS PROJECT FOR CONSTRUCTION. CONTRACTORS MAY NOT START CONSTRUCTION WITHOUT A NOTICE TO PROCEED (NTP) FROM T-MOBILE

	PRINT NAME	SIGNATURE	DATE
LANDLORD			
PRECON MGR			
DEVELOP. MGR			
CONST. INSP.			
A&E MGR			
RF ENGINEER			
OPERATIONS			
ZONING REP			
UTILITIES			

T-Mobile stick together
8000 WEST 78TH STREET
SUITE 400
EDINA, MN 55439
OFFICE: (612) 701-2669

PLANS PREPARED BY:
W-T
W-T COMMUNICATION DESIGN GROUP, LLC.
WIRELESS INFRASTRUCTURE

SEAL:

3/5/15

DATE	DESCRIPTION	BY	REV
06/18/14	FOR CLIENT REVIEW	[illegible]	A
10/16/14	FOR CONSTRUCTION	JL	0
02/03/15	REVIEW COMMENTS	SS	1
03/05/15	REVISION	BS	2

SITE INFORMATION:
STPL
WT-MCKNIGHT
A1N0030A
393 N. MCKNIGHT ROAD
SAINT PAUL, MN 55119

SHEET TITLE:
TITLE SHEET

SHEET NUMBER:
T-1

GENERAL REQUIREMENTS:

1.1 INTENT
1. THESE SPECIFICATIONS AND CONSTRUCTION DRAWINGS ACCOMPANYING THEM DESCRIBE THE WORK TO BE DONE AND THE MATERIALS TO BE FURNISHED FOR CONSTRUCTION.
2. THE DRAWINGS AND SPECIFICATIONS ARE INTENDED TO BE FULLY EXPLANATORY AND SUPPLEMENTARY. HOWEVER, SHOULD ANYTHING BE SHOWN, INDICATED OR SPECIFIED ON ONE AND NOT THE OTHER, IT SHALL BE DONE THE SAME AS IF SHOWN, INDICATED OR SPECIFIED IN BOTH.
3. THE INTENTION OF THE DOCUMENTS IS TO INCLUDE ALL LABOR AND MATERIALS REASONABLY NECESSARY FOR THE PROPER EXECUTION AND COMPLETION OF THE WORK AS STIPULATED IN THE CONTRACT.
4. THE PURPOSE OF THE SPECIFICATIONS IS TO INTERPRET THE INTENT OF THE DRAWINGS AND TO DESIGNATE THE METHOD OF THE PROCEDURE, TYPE AND QUALITY OF MATERIALS REQUIRED TO COMPLETE THE WORK.
5. MINOR DEVIATIONS FROM THE DESIGN LAYOUT ARE ANTICIPATED AND SHALL BE CONSIDERED AS PART OF THE WORK. NO CHANGES THAT ALTER THE CHARACTER OF THE WORK WILL BE MADE OR PERMITTED BY THE OWNER WITHOUT ISSUING A CHANGE ORDER.

1.2 CONFLICTS
1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL MEASUREMENTS AT THE SITE BEFORE ORDERING ANY MATERIALS OR DOING ANY WORK. NO EXTRA CHARGE OR COMPENSATION SHALL BE ALLOWED DUE TO DIFFERENCE BETWEEN ACTUAL DIMENSIONS AND DIMENSIONS INDICATED ON THE CONSTRUCTION DRAWINGS. ANY SUCH DISCREPANCY IN DIMENSION WHICH MAY BE FOUND SHALL BE SUBMITTED TO THE OWNER FOR CONSIDERATION BEFORE THE CONTRACTOR PROCEEDS WITH THE WORK IN THE AFFECTED AREAS.
2. THE BIDDER IS AWARDED THE CONTRACT WILL NOT BE ALLOWED ANY EXTRA COMPENSATION BY REASON OF ANY MATTER OR THING CONCERNING WHICH SUCH BIDDER MIGHT HAVE FULLY INFORMED THEMSELVES PRIOR TO THE BIDDING.
3. NO PLEA OF IGNORANCE OF CONDITIONS THAT EXIST, OR OF DIFFICULTIES OR CONDITIONS THAT MAY BE ENCOUNTERED OR OF ANY OTHER RELEVANT MATTER CONCERNING THE WORK TO BE PERFORMED IN THE EXECUTION OF THE WORK WILL BE ACCEPTED AS AN EXCUSE FOR ANY FAILURE OR OMISSION ON THE PART OF THE CONTRACTOR TO FULFILL EVERY DETAIL OF ALL THE REQUIREMENTS OF THE CONTRACT DOCUMENTS GOVERNING THE WORK.

1.3 LICENSES AND BONDS
1. CONTRACTOR IS RESPONSIBLE FOR APPLICATION AND PAYMENT OF CONTRACTOR LICENSES AND BONDS.

1.4 STORAGE
1. ALL MATERIALS MUST BE STORED IN A LEVEL AND DRY FASHION AND IN A MANNER THAT DOES NOT NECESSARILY OBSTRUCT THE FLOW OF OTHER WORK. ANY STORAGE METHOD MUST MEET ALL RECOMMENDATIONS OF THE ASSOCIATED MANUFACTURER.
2. THE BTS MUST BE STORED INSIDE UNTIL THERE IS POWER ON SITE.

1.5 CLEAN UP
1. THE CONTRACTORS SHALL AT ALL TIMES KEEP THE SITE FREE FROM ACCUMULATION OF WASTE MATERIALS OR RUBBISH CAUSED BY THEIR EMPLOYEES AT WORK AND AT THE COMPLETION OF THE WORK, THEY SHALL REMOVE ALL RUBBISH FROM AND ABOUT THE BUILDING AREA INCLUDING ALL THEIR TOOLS, SCAFFOLDING AND SURPLUS MATERIALS AND SHALL LEAVE THEIR WORK CLEAN AND READY FOR USE.
2. EXTERIOR: VISUALLY INSPECT EXTERIOR SURFACES AND REMOVE ALL TRACES OF SOIL, WASTE MATERIALS, SMUDGES AND OTHER FOREIGN MATTER.
   a. REMOVE ALL TRACES OF SPLASHED MATERIALS FROM ADJACENT SURFACES.
   b. IF NECESSARY TO ACHIEVE A UNIFORM DEGREE OF CLEANLINESS, HOSE DOWN THE EXTERIOR OF THE STRUCTURE.
3. INTERIOR: VISUALLY INSPECT INTERIOR SURFACE AND REMOVE ALL TRACES OF SOIL, WASTE MATERIALS, SMUDGES AND OTHER FOREIGN MATTER FROM WALLS/FLOOR/CEILING.
   a. REMOVE ALL TRACES OF SPLASHED MATERIAL FROM ADJACENT SURFACES.
   b. REMOVE PAINT DROPPINGS, SPOTS, STAINS AND DIRT FROM FINISHED SURFACES.

1.6 CHANGE ORDER PROCEDURES
1. CHANGE ORDERS MAY BE INITIATED BY THE OWNER AND/OR THE CONTRACTOR INVOLVED. THE CONTRACTOR, UPON NORMAL REQUEST FROM THE OWNER SHALL PREPARE A WRITTEN PROPOSAL DESCRIBING THE CHANGE IN WORK OR MATERIALS AND ANY CHANGES IN THE CONTRACT AMOUNT AND PRESENT TO THE OWNER WITHIN 72 HRS FOR APPROVAL. SUBMIT REQUESTS FOR SUBSTITUTIONS IN THE FORM AND IN ACCORDANCE WITH PROCEDURES REQUIRED FOR CHANGE ORDER PROPOSALS. ANY CHANGES IN SCOPE OF WORK OR MATERIALS WHICH ARE PERFORMED BY THE CONTRACTOR WITHOUT A WRITTEN CHANGE ORDER AS DESCRIBED AND APPROVED BY THE OWNER SHALL PLACE FULL RESPONSIBILITY OF THESE ACTIONS ON THE CONTRACTOR.

1.7 RELATED DOCUMENTS AND COORDINATION
1. GENERAL, CARPENTRY, ELECTRICAL AND ANTENNA DRAWINGS ARE INTERRELATED IN PERFORMANCE OF THE WORK. THE CONTRACTOR MUST REFER TO ALL DRAWINGS. ALL COORDINATION TO BE THE RESPONSIBILITY OF THE CONTRACTOR.

1.8 SHOP DRAWINGS
1. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AS REQUIRED AND LISTED IN THESE SPECIFICATIONS TO THE OWNER FOR APPROVAL.
2. ALL SHOP DRAWINGS SHALL BE REVIEWED, CHECKED AND CORRECTED BY CONTRACTOR PRIOR TO SUBMITTAL TO THE OWNER.

1.9 PRODUCTS AND SUBSTITUTIONS
1. SUBMIT 3 COPIES OF EACH REQUEST FOR SUBSTITUTION. IN EACH REQUEST IDENTIFY THE PRODUCT OR FABRICATION OR INSTALLATION METHOD TO BE REPLACED BY THE SUBSTITUTION. INCLUDE RELATED SPECIFICATION SECTION AND DRAWING NUMBERS AND COMPLETE DOCUMENTATION SHOWING COMPLIANCE WITH THE REQUIREMENTS FOR SUBSTITUTIONS.
2. SUBMIT ALL NECESSARY PRODUCT DATA AND CUT SHEETS WHICH PROPERLY INDICATE AND DESCRIBE THE ITEMS, PRODUCTS AND MATERIALS BEING INSTALLED. THE CONTRACTOR SHALL, IF DEEMED NECESSARY BY THE OWNER, SUBMIT ACTUAL SAMPLES TO THE OWNER FOR APPROVAL IN LIEU OF CUT SHEETS.

1.10 QUALITY ASSURANCE
1. ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS. THESE SHALL INCLUDE BUT NOT BE LIMITED TO THE LATEST VERSION OF THE COOK COUNTY BUILDING CODE.

1.11 ADMINISTRATION
1. BEFORE THE COMMENCEMENT OF ANY WORK, THE CONTRACTOR WILL ASSIGN A PROJECT MANAGER WHO WILL ACT AS A SINGLE POINT OF CONTACT FOR ALL PERSONNEL INVOLVED IN THIS PROJECT. THIS PROJECT MANAGER WILL DEVELOP A MASTER SCHEDULE FOR THE PROJECT WHICH WILL BE SUBMITTED TO THE OWNER PRIOR TO THE COMMENCEMENT OF ANY WORK.
2. SUBMIT A BAR TYPE PROGRESS CHART NOT MORE THAN 3 DAYS AFTER THE DATE ESTABLISHED FOR COMMENCEMENT OF THE WORK ON THE SCHEDULE, INDICATING A TIME BAR FOR EACH MAJOR CATEGORY OR UNIT OF WORK TO BE PERFORMED AT SITE, PROPERLY SEQUENCED AND COORDINATED WITH OTHER ELEMENTS OF WORK AND SHOWING COMPLETION OF THE WORK SUFFICIENTLY IN ADVANCE OF THE DATE ESTABLISHED FOR SUBSTANTIAL COMPLETION OF THE WORK.
3. PRIOR TO COMMENCING CONSTRUCTION, THE OWNER SHALL SCHEDULE AN ON-SITE MEETING WITH ALL MAJOR PARTIES. THIS WOULD INCLUDE (BUT NOT LIMITED TO) THE OWNER PROJECT MANAGER, CONTRACTOR, LAND OWNER REPRESENTATIVE, LOCAL TELEPHONE COMPANY, TOWER ERECTION FOREMAN (IF SUBCONTRACTED).
4. CONTRACTOR SHALL BE EQUIPPED WITH SOME MEANS OF CONSTANT COMMUNICATIONS, SUCH AS A MOBILE PHONE OR A BEEPER. THIS EQUIPMENT WILL NOT BE SUPPLIED BY THE OWNER, NOR WILL WIRELESS SERVICE BE ARRANGED.
5. DURING CONSTRUCTION, CONTRACTOR MUST ENSURE THAT EMPLOYEES AND SUBCONTRACTORS WEAR HARD HATS AT ALL TIMES. CONTRACTOR WILL COMPLY WITH ALL SAFETY REQUIREMENTS IN THEIR AGREEMENT.
6. PROVIDE WRITTEN DAILY UPDATES ON SITE PROGRESS TO THE OWNER.
7. COMPLETE INVENTORY OF CONSTRUCTION MATERIALS AND EQUIPMENT IS REQUIRED PRIOR TO START OF CONSTRUCTION.
8. NOTIFY THE OWNER / PROJECT MANAGER IN WRITING NO LESS THAN 48 HOURS IN ADVANCE OF CONCRETE POURS, TOWER ERECTIONS, AND EQUIPMENT CABINET PLACEMENTS.

1.12 INSURANCE AND BONDS
1. CONTRACTOR SHALL AT THEIR OWN EXPENSE CARRY AND MAINTAIN FOR THE DURATION OF THE PROJECT ALL INSURANCE AS REQUIRED AND LISTED AND SHALL NOT COMMENCE WITH THEIR WORK UNTIL THEY HAVE PRESENTED AN ORIGINAL CERTIFICATE OF INSURANCE STATING ALL COVERAGES TO THE OWNER. REFER TO THE MASTER AGREEMENT FOR REQUIRED INSURANCE LIMITS.
2. THE OWNER SHALL BE NAMED AS AN ADDITIONAL INSURED ON ALL POLICIES.
3. CONTRACTOR MUST PROVIDE PROOF OF INSURANCE.

TOWER & ANTENNA INSTALLATION:

1.1 WORK INCLUDED
1. IF REQUIRED, ERECT FURNISHED TOWER.
2. GROUND TOWER TEMPORARILY DURING ERECTION. GROUNDING SHALL INCLUDE BASE(S) AND ANCHORS.
3. IF REQUIRED, INSTALL THREE (3) SIDE ARMS, CONSISTING OF THREE (3) 6'-0" AS INDICATED ON DRAWINGS - CONFIRM WITH OWNER REPRESENTATIVE.
4. INSTALL ANTENNAS AS INDICATED ON DRAWINGS AND OWNER SPECIFICATIONS.
5. INSTALL GALVANIZED STEEL ANTENNA MOUNTS AS INDICATED ON DRAWINGS.
6. INSTALL FURNISHED GALVANIZED STEEL WAVEGUIDE LADDER.
7. INSTALL WAVEGUIDE BRIDGE AS INDICATED ON DRAWING.
8. SUPPLY AND INSTALL ONE INSULATED GROUND BAR AT EQUIPMENT CABINET.
9. SUPPLY AND INSTALL GROUNDING STRAP KITS WITH LONG BARREL COMPRESSION LUGS (SIM. TO ANDREW-223158 OR APPROVED EQUAL) ATOP TOWER BASE BEFORE ENTERING THE EQUIPMENT. GROUNDING STRAPS TO BE CONNECTED TO INSULATED GROUND BAR.
10. ASSIST OWNER TECHNICIANS IN PERFORMING SWEEP TEST OF INSTALLED COAX.
11. CONCRETE PIERS FOR FOUNDATIONS SHALL BE DRILLED AND POURED ON THE SAME DAY.

1.2 REQUIREMENTS OF REGULATORY AGENCIES
1. FURNISH U.L. LISTED EQUIPMENT WHERE SUCH LABEL IS AVAILABLE. INSTALL IN CONFORMANCE WITH U.L. STANDARDS WHERE APPLICABLE.
2. INSTALL ANTENNA, ANTENNA CABLES, GROUNDING SYSTEM IN ACCORDANCE WITH DRAWINGS AND SPECIFICATION IN EFFECT AT PROJECT LOCATION AND RECOMMENDATIONS OF STATE AND LOCAL BUILDING CODES, SPECIAL CODES HAVING JURISDICTION OVER SPECIFIC PORTIONS OF WORK. THIS INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
   A. TIA - TELECOMMUNICATIONS INDUSTRY ASSOCIATION TIA-222-G STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES.
   B. FAA - FEDERAL AVIATION ADMINISTRATION ADVISORY CIRCULAR AC 70/7460-1K, OBSTRUCTION MARKING AND LIGHTING.
   C. FCC - FEDERAL COMMUNICATIONS COMMISSION RULES AND REGULATIONS FORM 715, OBSTRUCTION MARKING AND LIGHTING SPECIFICATIONS FOR ANTENNA STRUCTURES AND FORM 715A HIGH INTENSITY OBSTRUCTION LIGHTING SPECIFICATIONS FOR ANTENNA STRUCTURES.
   D. AISC - AMERICAN INSTITUTE OF STEEL CONSTRUCTION SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS.
   E. NEC - NATIONAL ELECTRICAL CODE - ON TOWER LIGHTING KITS.
   F. UL - UNDERWRITER'S LABORATORIES APPROVED ELECTRICAL PRODUCTS.
   G. IN ALL CASES, PART 77 OF THE FAA RULES AND PARTS 17 AND 22 OF THE FCC RULES ARE APPLICABLE AND IN THE EVENT OF CONFLICT, SUPERSEDE ANY OTHER STANDARDS OR SPECIFICATIONS.
   H. 2012 LIFE SAFETY CODE NFPA-101.

GENERAL ELECTRIC PROVISION:

1. SUBMITTAL OF BID INDICATES CONTRACTOR IS COGNIZANT OF ALL JOB SITE CONDITIONS AND WORK TO BE PERFORMED UNDER THIS CONTRACT.
2. CONTRACTOR SHALL PERFORM ALL VERIFICATION OBSERVATIONS TEST, AND EXAMINATION WORK PRIOR TO THE ORDERING OF THE ELECTRICAL EQUIPMENT AND THE ACTUAL CONSTRUCTION. CONTRACTOR SHALL ISSUE A WRITTEN NOTICE OF ALL FINDINGS TO THE ARCHITECT LISTING ALL MALFUNCTIONS, FAULTY EQUIPMENT AND DISCREPANCIES.
3. HEIGHTS SHALL BE VERIFIED WITH OWNER PRIOR TO INSTALLATION.
4. THESE PLANS ARE DIAGRAMMATIC ONLY, FOLLOW AS CLOSELY AS POSSIBLE.
5. ELECTRICAL SERVICE 120 / 208 VAC 3-PHASE 4-WIRE 100 AMP SERVICE 120 / 240 VAC SINGLE PHASE 3-WIRE 200 AMP SERVICE.
6. EACH CONDUCTOR OF EVERY SYSTEM SHALL BE PERMANENTLY TAGGED IN EACH PANEL BOARD, PULL BOX, J-BOX, SWITCH BOX, ETC., IN COMPLIANCE WITH OCCUPATIONAL SAFETY AND HEALTH ACT (O.S.H.A.)
7. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION, CONSTRUCTION TOOLS, TRANSPORTATION, ETC., FOR A COMPLETE AND PROPERLY OPERATIVE SYSTEM ENERGIZED THROUGHOUT AND AS INDICATED ON DRAWINGS, AS SPECIFIED HEREIN AND/OR AS OTHERWISE REQUIRED.
8. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND IN PERFECT CONDITION WHEN INSTALLED AND SHALL BE OF THE BEST GRADE AND OF THE SAME MANUFACTURER THROUGHOUT FOR EACH CLASS OR GROUP OF EQUIPMENT. MATERIALS SHALL BE LISTED "U" WHERE SUBJECT TO SUCH APPROVAL. MATERIALS SHALL MEET WITH APPROVAL OF THE DIVISION OF INDUSTRIAL SAFETY AND ALL GOVERNING BODIES HAVING JURISDICTION. MATERIALS SHALL BE MANUFACTURED IN ACCORDANCE WITH APPLICABLE STANDARDS ESTABLISHED BY ANSI, NEMA AND NBFU.
9. ALL CONDUIT INSTALLED SHALL BE SURFACE MOUNTED OR DIRECT BURIAL UNLESS OTHERWISE NOTED.
10. CONTRACTORS SHALL CARRY OUT THEIR WORK IN ACCORDANCE WITH ALL GOVERNING STATE, COUNTY AND LOCAL CODES AND O.S.H.A.
11. CONTRACTOR TO OBTAIN ALL PERMITS, PAY PERMIT FEES, AND BE RESPONSIBLE FOR SCHEDULING INSPECTIONS.
12. COMPLETE JOB SHALL BE GUARANTEED FOR A PERIOD OF ONE (1) YEAR AFTER THE DATE OF JOB ACCEPTANCE BY OWNER. ANY WORK, MATERIAL OR EQUIPMENT FOUND TO BE FAULTY DURING THAT PERIOD SHALL BE CORRECTED AT ONCE, UPON WRITTEN NOTIFICATION, AT THE EXPENSE OF THE CONTRACTOR.
13. ALL CONDUIT SHALL HAVE A PULL WIRE OR ROPE.
14. PROVIDE PROJECT MANAGER WITH ONE SET OF COMPLETE ELECTRICAL "AS INSTALLED" DRAWINGS AT THE COMPLETION OF THE JOB, SHOWING ACTUAL DIMENSIONS, ROUTINGS AND CIRCUITS.
15. ALL BROCHURES, OPERATING MANUALS, CATALOGS, SHOP DRAWINGS, ETC., SHALL BE TURNED OVER TO THE OWNER AT JOB COMPLETION.
16. USE T-TAP CONNECTIONS ON ALL MULTI-CIRCUITS WITH COMMON NEUTRAL CONDUCTOR FOR LIGHTING FIXTURES.
17. ALL CONDUCTORS SHALL BE COPPER.
18. ALL CIRCUIT BREAKERS, FUSES AND ELECTRICAL EQUIPMENT SHALL HAVE AN INTERRUPTING SHORT CIRCUIT CURRENT TO WHICH THEY MAY BE SUBJECTED, AND A MINIMUM OF 10,000 A.I.C.
19. THE ENTIRE ELECTRICAL INSTALLATION SHALL BE GROUNDED AS REQUIRED BY ALL APPLICABLE CODES.
20. PATCH, REPAIR AND PAINT ANY AREA THAT HAS BEEN DAMAGED IN THE COURSE OF THE ELECTRICAL WORK.
21. PENETRATIONS IN FIRE RATED WALLS SHALL BE FIRE STOPPED IN ACCORDANCE WITH APPLICABLE LOCAL BUILDING CODES.
22. WIRE AND CABLE CONDUCTORS SHALL BE COPPER #12 AWG MINIMUM UNLESS SPECIFICALLY NOTED OTHERWISE ON DRAWINGS.
23. GROUNDING CONDUCTORS SHALL BE SOLID TINNED COPPER UNLESS OTHERWISE NOTED.
24. METER SOCKET AMPERES, VOLTAGE, NUMBER OF PHASES SHALL BE AS NOTED ON THE DRAWINGS, MANUFACTURED BY "SQUARE D COMPANY", OR APPROVED EQUAL.
25. ALL MATERIALS SHALL BE U.L. LISTED.
26. CONDUIT:
   A. RIGID CONDUIT SHALL BE U.L. LABEL GALVANIZED ZINC COATED WITH ZINC INTERIOR AND SHALL BE USED WHEN INSTALLED IN OR UNDER CONCRETE SLABS IN CONTACT WITH THE EARTH, UNDER PUBLIC ROADWAYS, IN MASONRY WALLS OR EXPOSED ON BUILDING EXTERIOR. RIGID CONDUIT IN CONTACT WITH EARTH SHALL BE 1/2 LAPPED WRAPPED WITH HUNTS WRAP PROCESS NO. 3.
   B. ELECTRICAL METALLIC TUBING SHALL HAVE U.L. LABEL, FITTING SHALL BE GLAND RING COMPRESSION TYPE. EMT SHALL BE USED ONLY FOR INTERIOR RUNS.
   C. FLEXIBLE METALLIC CONDUIT SHALL HAVE U.L. LISTED LABEL AND MAY BE USED WHERE PERMITTED BY CODE. FITTINGS SHALL BE "JAKE" OR "SQUEEZE" TYPE. SEAL TIGHT FLEXIBLE CONDUIT. ALL CONDUIT SHALL HAVE FULL SIZE EQUIPMENT GROUND WIRE.
   D. CONDUIT RUNS SHALL BE SURFACE MOUNTED IN CEILINGS OR WALLS UNLESS INDICATED OTHERWISE. CONDUIT INDICATED SHALL RUN PARALLEL OR AT RIGHT ANGLES TO CEILING, FLOOR OR BEAMS. VERIFY EXACT ROUTING OF ALL EXPOSED CONDUIT WITH THE OWNER PRIOR TO INSTALLING. NO HORIZONTAL CONDUITS SHALL BE BELOW 7'-0" A.F.F. NO BX OR ROMEX CABLE IS PERMITTED.
   E. PARALLEL UNDERGROUND CONDUIT SHALL BE PVC SCHEDULE 40 (UNLESS NOTED OTHERWISE) AT A MINIMUM DEPTH OF 30" BELOW GRADE - STACKED UNDERGROUND CONDUIT SHALL BE PVC SCHEDULE 40 (UNLESS NOTED OTHERWISE) AT A MINIMUM DEPTH OF 24" BELOW GRADE.
   F. ABOVE GROUND CONDUIT SHALL BE P.V.C. SCHEDULE 80 (UNLESS NOTED OTHERWISE).
27. ALL ELECTRICAL EQUIPMENT SHALL BE LABELED WITH PERMANENT ENGRAVED PLASTIC LABELS.
28. CONTRACTOR TO PROVIDE DAILY UPDATES TO PM UNTIL FINAL ELECTRICAL SERVICE IS EFFECTED.
29. UPON COMPLETION OF WORK, CONDUCT CONTINUITY, SHORT CIRCUIT, AND FALL OF POTENTIAL GROUND TESTS FOR APPROVAL. SUBMIT TEST REPORTS TO PROJECT MANAGER. CLEAN PREMISES OF ALL DEBRIS RESULTING FROM WORK AND LEAVE WORK IN A COMPLETE AND UNDAMAGED CONDITION.
30. CONTRACTOR TO COORDINATE WITH UTILITY COMPANY FOR CONNECTION OF TEMPORARY AND PERMANENT POWER TO THE SITE. THE TEMPORARY POWER AND ALL HOOKUP COSTS TO BE PAID BY CONTRACTOR.

GROUNDING STANDARDS:

1.0 DEFINITIONS

AGB:	ANTENNA GROUND BAR
AWG:	AMERICAN WIRE GAUGE
CADWELDING:	AN EXOTHERMIC WELDING PROCESS WHICH CREATES POSITIVE CONTACT OF POSITIVE CONTACT OF GROUNDING CONDUCTORS
EMT:	ELECTRICAL METAL TUBING (LIGHT GAUGE METALLIC CONDUIT) MGB MASTER GROUND BAR
MGB:	MASTER GROUND BAR
PVC:	POLYVINYL CHLORIDE CONDUIT
RFI:	RADIO FREQUENCY INTERFERENCE
THWN:	LETTER TYPE DESIGNATION FOR CONDUCTOR INSULATION THAT IS A MOISTURE AND HEAT RESISTANT THERMOPLASTIC WITH A MAXIMUM OPERATING TEMPERATURE OF 75 DEGREES CELSIUS OR 167 DEGREES FAHRENHEIT
T/I:	TENANT IMPROVEMENT

2.0 BACKGROUND

2.1 AREAS OF CONCERN: WHEN DESIGNING A GROUNDING SYSTEM FOR A MOBILE RADIO FACILITY THERE ARE FOUR INTERRELATED AREAS OF CONCERN. THE BASIC OBJECTIVE FOR EACH IS:
1. LIGHTNING PROTECTION - TO MAINTAIN ALL EQUIPMENT AT THE SAME POTENTIAL DURING A LIGHTNING IMPULSE.
2. RFI FOR NOISE INDUCTION CONTROL - TO ESTABLISH THE LOWEST POSSIBLE IMPEDANCE AMONG ALL EQUIPMENT.
3. ELECTROSTATIC CONTROL - TO REDUCE ELECTROSTATIC DISCHARGE PROBLEMS.
4. PERSONNEL SAFETY - TO MAINTAIN A MINIMUM VOLTAGE DIFFERENCE BETWEEN ANY TWO METALLIC OBJECTS WHICH PERSONNEL MIGHT CONTACT SIMULTANEOUSLY.

2.2 A/C GROUNDING: IN THIS GROUNDING SYSTEM THE A/C SERVICE GROUND SHALL BE KEPT ISOLATED FROM THE EQUIPMENT FRAME WORK AND LIGHTNING PROTECTION GROUND SYSTEMS EXCEPT FOR ONE SPECIFIC POINT. THIS POINT IS THE MAIN GROUNDING POINT OF THE SYSTEM. THIS WOULD TYPICALLY BE CONNECTING THE A/C SERVICE GROUND AT THE COMMERCIAL POWER RISER POLE GROUNDING/UTILITY BASE TO THE EXTERNAL GROUND RING. ALL GROUNDING CONNECTIONS AT/OR OF CABINETS SHALL BE SCRAPED TO BARE METAL AND COATED WITH NOALOX.

2.3 LIGHTNING CONSIDERATIONS: LIGHTNING DAMAGE OCCURS FROM EITHER INDUCTION OF FROM AN ACTUAL DIRECT STRIKE TO THE BUILDING, USUALLY TAKEN THROUGH THE TOWER AND/OR ANTENNAS. STRIKES TO OTHER NEARBY OBJECTS INDUCE HIGH ENERGY INTO POWER OR TELEPHONE CABLES ENTERING THE BUILDING. THIS TYPE OF EFFECT INSTANTANEOUSLY CAUSES MOST OF THE DAMAGE TO THE BUILDING AND ITS CONTENTS.

3.0 STATION GROUNDING SYSTEM

3.1 MATERIALS
1. #2 AWG, BARE SOLID TINNED COPPER WIRE, FOR ALL EXTERIOR CONDUCTORS AND TOWER GROUND BAR CONDUCTORS OR AS OTHERWISE SPECIFIED. GROUNDS TO THE LNAS SHALL BE NO. 6 STANDARD GREEN INSULATED JUMPERS. THE GROUND WIRE TO THE MGB SHALL BE GREEN JACKETED STRANDED #2 TINNED WIRE ALREADY CONNECTED TO THE BUSS BAR AND CONNECTED TO THE GROUND RING OR A GROUND ROD.
2. #2 AWG, INSULATED STRANDED COPPER CABLE IS ACCEPTABLE FOR INTERIOR GROUND BAR CONDUCTORS ON TENANT IMPROVEMENT SITES.
3. 5/8" X 10' GROUND RODS OF SOLID COPPER, STAINLESS STEEL OR COPPER CLAD HIGH STRENGTH STEEL.
4. ABOVE GRADE CONNECTIONS SHALL BE BURNDY HYGROUND COMPRESSION. BELOW GRADE CONNECTIONS SHALL BE CAD WELD OR OTHER APPROVED EXOTHERMIC WELDING SYSTEM FOR BONDING AS SPECIFIED.
5. XIT OR ADVANCED GROUNDING ELECTRODE (AGE). ALL CHEMICAL GROUND RODS SHALL BE UL APPROVED.
6. SOLID COPPER PLATES OF MINIMUM 3'X3'X1/4" SIZE AS SPECIFIED.
7. NOALOX OR APPROVED EQUAL CONDUCTIVE MEDIUM MATERIAL SHALL BE USED IN ALL MECHANICAL CONNECTIONS.
8. #6 AWG STRANDED INSULATED (GREEN) FOR ALL INTERNAL EQUIPMENT GROUNDING.
9. MECHANICAL FASTENERS (I.E., DOUBLE LUGS, SPLIT BOLTS PARALLEL CONNECTORS) SHALL BE BRONZE, BRASS, COPPER OR STAINLESS STEEL AND HAVE NOALOX BETWEEN CONDUCTOR AND CONNECTION.
10. BOLTS, NUTS AND SCREWS USED TO FASTEN MECHANICAL CONNECTIONS SHALL BE STAINLESS STEEL WITH STAR TYPE STAINLESS STEEL LOCK WASHERS.
11. ALL LUG TUBE FASTENERS SHALL PROVIDE TWO HOLES TO ALLOW A DOUBLE BOLT CONNECTION.

3.2 MASTER GROUND BAR (MGB): THE PURPOSE OF THE MASTER GROUND BAR IS TO GROUND THE BTS AND ANY OTHER METALLIC OBJECTS AROUND THE BTS. IF AN MGB IS NOT PROVIDED WITH THE BTS, THE MGB SHALL BE AS FOLLOWS: THE MGB IS A COPPER BAR MEASURING 4"H X 24"L X 1/4" LOCATED AS CLOSE TO THE BTS AS POSSIBLE. THE MGB SHALL HAVE A MINIMUM NUMBER OF (28) 3/8" HOLES. GROUND BAR SHALL BE SUPPORTED BY MOUNTING BRACKETS WITH INSULATOR STANDOFFS. (2) #2 TINNED SHALL BE MECHANICALLY ATTACHED (2-HOLE COMPRESSION LUG 3/8" HOLES, 1" CENTER TO CENTER SPACING) TO THE MGB AND DOWN LEADS THEN TAKEN THROUGH CONDUIT TO THE GROUND RING. THIS CONDUCTOR SHALL BE KEPT SEPARATE AND ISOLATED UNTIL TERMINATING AT THE MAIN GROUNDING POINT. (I.E. EXTERIOR GROUND RING OR BUILDING STEEL)

3.3 ANTENNA GROUND BAR (AGB): THE PURPOSE OF THE ANTENNA GROUND BAR IS PRIMARILY FOR LIGHTNING PROTECTION. COAXIAL CABLE IS USUALLY THE ONLY ITEM GROUNDED TO THIS BAR. HOWEVER IT IS ACCEPTABLE TO BOND EXTERIOR CABLE TRAY, WAVE GUIDE PORTS AND CANTILEVERED WAVE GUIDE BRIDGES TO THE AGB. THE AGB IS A COPPER BAR MEASURING 4"H X 24"L X 1/4". THERE SHALL BE TWO AGBS, ONE LOCATED AT THE TOP OF THE TOWER AT THE START OF THE VERTICAL RUN OF COAX, THE OTHER AT THE BOTTOM OF THE VERTICAL RUN OF COAX BEFORE IT MAKES ITS BEND. (IF THE TOWER IS OVER 200' THERE SHALL BE A THIRD AGB LOCATED AT THE MIDDLE OF THE TOWER) THE AGB SHALL HAVE A MINIMUM OF (28) 3/8" HOLES. GROUND BARS SHALL BE SUPPORTED BY MOUNTING BRACKETS WITH INSULATOR STANDOFFS. USE #2 AWG SOLID TINNED WIRE W/ 2-HOLE SHORT BARREL COMPRESSION LUGS 3/8" HOLES, 1" CENTER TO CENTER SPACING. THIS CONDUCTOR SHALL BE KEPT SEPARATE AND ISOLATED UNTIL TERMINATING AT THE MAIN GROUNDING POINT (I.E. EXTERIOR GROUND RING OR BUILDING STEEL.)

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W-T COMMUNICATION DESIGN GROUP, LLC

SEAL:

3/5/15

DATE	DESCRIPTION	BY	REV
[illegible]	FOR CLIENT REVIEW	[illegible]	A
10/8/14	FOR CONSTRUCTION	[illegible]	0
02/12/15	REVIEW COMMENTS	[illegible]	1
03/05/15	REVISION	[illegible]	2

SITE INFORMATION:
STPL
WT-MCKNIGHT
A1N0030A
393 N. MCKNIGHT ROAD
SAINT PAUL, MN 55119

SHEET TITLE:
GENERAL NOTES & SPECIFICATIONS

SHEET NUMBER:
T-2

PLOT SCALE: [illegible]

GROUNDING STANDARDS (CONT.):

3.4 SURGE ARRESTOR GROUND BAR: THE PURPOSE OF THE SURGE ARRESTOR GROUND BAR IS FOR LIGHTNING PROTECTION. THE SURGE ARRESTOR GROUND BAR IS A BENT (3" X 3") X 1/4" X 24" COPPER BAR. IT IS LOCATED ON THE WAVEGUIDE BRIDGE SUPPORT CLOSEST TO THE EQUIPMENT. ONE FACE OF THE BAR SHALL HAVE A MINIMUM OF (38) 3/8" DIA. HOLES. HOLES SHALL BE IN PAIRS THAT ARE 1" CENTER TO CENTER. THE OTHER FACE SHALL HAVE 3/8" DIA. HOLES AS REQUIRED TO ATTACH AND GROUND COAXIAL SURGE ARRESTORS. THE GROUND BAR SHALL BE SUPPORTED BY MOUNTING BRACKETS WITH INSULATOR STANDOFFS.

3.5 GROUND ROD AND GROUND RING PLACEMENT: THE OUTSIDE GROUND RING SHALL BE PLACED AROUND THE BTS AT A DISTANCE OF TWO (2) FEET FROM THE BTS AT A DEPTH OF 2'-6" OR 6" BELOW THE FROST LINE, WHICHEVER IS DEEPER. RODS SHALL BE DRIVEN TO A DEPTH SUCH THAT THE TOP OF THE RODS IS AT THE LEVEL OF THE GROUND RING CONDUCTOR. THE RODS SHALL BE PLACED MINIMALLY ALONG THE RING AT THE FOLLOWING LOCATIONS:

- A. BELOW THE AREA OF THE INTERNAL MASTER GROUND BAR FOR CONNECTION TO THE MGB.
- B. BELOW THE UTILITY RACK FOR CONNECTION TO THE MAIN BUILDING COMMERCIAL POWER DISCONNECT.
- C. AT THE CORNERS OF THE BTS.
- D. AS REQUIRED TO ACHIEVE A RECOMMENDED SPACING OF TWENTY (20) FEET BETWEEN GROUND RODS ALONG THE RING PERIMETER.
- E. AS REQUIRED ALONG THE RING PERIMETER TO ACHIEVE 5 OHMS OR LESS RESISTANCE WHEN TESTED.
- F. TWO RODS LOCATED ON OPPOSITE SIDES AT EACH TOWER LEG OR MONOPOLE.
- G. ONE ROD LOCATED BENEATH EACH END OF THE WAVE GUIDE BRIDGE OR CABLE TRAY.
- H. ONE ROD LOCATED ADJACENT TO THE STANDBY GENERATOR, AND IF SEPARATED BY MORE THAN TEN (10) FEET, ONE LOCATED ADJACENT TO THE FUEL TANK.
- I. ONE ROD LOCATED AT THE BASE OF THE TOWER FOR THE AGB.

3.6 TOWER GROUNDING: ALL MONOPOLES SHALL HAVE TWO GROUND RODS (MINIMUM). ALL OTHER TOWERS SHALL HAVE TWO GROUND RODS PLACED AT THE BASE OF EACH TOWER LEG. EACH MONOPOLE OR TOWER LEG SHALL BE BONDED TO THE SYSTEM VIA TWO #2 BARE TINNED SOLID COPPER CONDUCTORS. BURNDY CONNECT THE CONDUCTORS TO ONLY STRUCTURAL BASE PLATES OR LUGS OR EARS AS MAY BE PROVIDED. NO BURNDY CONNECTIONS SHALL BE MADE TO THE VERTICAL WALLS OF THE STRUCTURE. NEVER GROUND TO HOLLOW LEG MEMBERS.

3.7 ANTENNA GROUNDING: EACH ANTENNA COAXIAL CABLE SHALL TYPICALLY BE GROUNDED AT THREE POINTS USING A STANDARD COAXIAL CABLE KIT FROM THE MANUFACTURER OF THE ANTENNA CABLE. A TYPICAL INSTALLATION SHALL BE AS FOLLOWS:

- A. THE FIRST GROUND CONNECTION SHALL OCCUR AS CLOSE TO THE ANTENNA AS POSSIBLE, I.E. AT THE FIRST POINT THE COAX CABLE BEGINS TO RUN VERTICAL DOWN THE TOWER. THIS GROUND SHALL TERMINATE DIRECT TO THE TOP AGB OR A 1/4 GROUND TO THE AGB AT THE ANTENNA MOUNTS.
- B. THE SECOND GROUND SHALL BE MADE AT THE BOTTOM OF THE VERTICAL RUN OF THE COAXIAL CABLE AT IT TURNS OUT AWAY FROM THE TOWER TOWARDS THE BTS. THIS GROUND SHALL BE TERMINATED AT THE AGB. THE AGB SHALL HAVE TWO (2) LEADS OF #2 AWG BARE TINNED SOLID COPPER WIRE, AND SHALL TERMINATE AT THE TOWER GROUND RING. THESE SHALL BE ENCASED IN PVC PIPE.
- C. THE THIRD GROUND SHALL BE ON THE SURGE ARRESTOR GROUND (TO BE ATTACHED TO THE CABLE ON STRAIGHT RUNS (NOT WITHIN BENDS) AND BE WEATHERPROOFED PER THE MANUFACTURER'S SPECIFICATIONS. THE SURGE ARRESTORS SHALL BE GROUNDED TO THE GROUND BAR. THE BAR SHALL HAVE TWO (2) LEADS OF #2 AWG BARE TINNED SOLID COPPER WIRE AND SHALL TERMINATE AT THE TOWER GROUND RING. THESE SHALL BE ENCASED IN PVC PIPE.

3.8 PERIMETER FENCE GROUNDING:

- A. ALL FENCE CORNER AND END POSTS (MINIMUM OF TWO) SHALL HAVE ONE #2 SOLID TINNED COPPER GROUND WIRE CONNECTED TO A 5/8" X 10' SOLID COPPER CLAD GROUND ROD NEAR TO THE POST. THESE POSTS SHALL BE CONNECTED TO THE GROUND RING WITH A #2 SOLID TINNED COPPER GROUND WIRE AND INTERMEDIATE GROUND RODS IF THE DISTANCE FROM THE POST TO THE GROUND RING EXCEEDS 10 FEET. IN NO CASE SHALL ANY PORTION OF THE SAME FENCE REMAIN DISCONNECTED FROM THE GROUND RING.
- B. GATE POSTS SHALL BE GROUNDED TO EACH OTHER TO ENSURE THE ENTIRE FENCE HAS ELECTRICAL CONTINUITY. CONNECTIONS SHALL BE DRILL AND TAP WITH BURNDY TYPE KC22 TO THE POST WITH A #2 AWG BARE SOLID TINNED COPPER WIRE.
- C. GATES SHALL BE BONDED TO GATE POSTS WITH A 16" BRAIDED STRAP TYPE BDH692. THE CONNECTIONS SHALL BE BURNDY 2-HOLE LUGS (3/8" HOLES, 1" CENTER TO CENTER) BOLTED THROUGH EACH POST.
- D. ALL DOWN LEADS TO EARTH WILL BE ENCASED IN 3/4 INCH PVC NON-METALLIC AND SEALED WITH SILICONE.

3.9 GENERATOR FUEL TANK GROUNDING: THE GENERATOR FUEL TANK, IF REQUIRED, SHALL BE CONNECTED IN AT LEAST ONE PLACE TO THE MAIN EXTERIOR GROUND RING. #2 AWG BARE SOLID TINNED COPPER WIRE SHALL BE BURNDY CONNECTED TO ONE SUPPORT LEG OF THE FUEL TANK AND CAD WELD TO THE NEAREST EXTERIOR GROUND RING/GROUND ROD.

3.10 EQUIPMENT ROOM GROUNDING: THE MASTER GROUND BAR (MGB) SERVES AS THE COLLECTION POINT FOR THE BTS AS WELL AS ALL INTERIOR NON-ELECTRICAL EXPOSED METAL MATERIALS (HVAC UNITS, DOOR FRAMES/DOORS, TELCO BOARD, UNISTRUTS, CABLE TRAYS, ALARM JUNCTION BOX, ETC.) SHALL BE GROUNDED WITH #6 AWG STRANDED (GREEN) GROUND WIRES WITH INDIVIDUAL RUNS BACK TO THE MGB. (THE CABLE TRAY, DOOR/FRAME AND UNISTRUT MAY BE JUMPERED TOGETHER AND HAVE A SINGLE GROUND WIRE CONNECTION TO THE MGB.)

3.11 WALL PENETRATIONS SLEEVES: INSTALL PER CONSTRUCTION DRAWINGS.

3.12 A/C COMMERCIAL POWER GROUNDING CONNECTIONS: AT THE ON SITE RISER POLE LOCATION OR UNDERGROUND SERVICE ENTRANCE LOCATION, THE A/C SERVICE SHALL BE MECHANICALLY BONDED TO THE A/C SERVICE ENTRANCE GROUND AS SPECIFIED BY THE NATIONAL ELECTRIC CODE, ARTICLE 250, AND/OR APPROPRIATE LOCAL CODES. A SEPARATE GROUND ROD SHALL BE PROVIDED AT THIS POINT, AND SHALL BE CONNECTED TO THE EXTERIOR GROUND RING. A SEPARATE A/C SERVICE GROUND AND NEUTRAL SHALL THEN BE ROUTED TO AND CONNECTED TO THE MAIN DISCONNECT INSIDE THE BUILDING OR AS REQUIRED BY LOCAL AUTHORITY.

3.13 GENERATOR RECEPTACLE GROUNDING: THE GENERATOR RECEPTACLE (HUBBLE PLUG) SHALL BE GROUNDED TO THE EGR.

3.14 COAX BRIDGE / CABLE TRAY GROUNDING: BOND THE COAX BRIDGE OR CABLE TRAY TO THE MGB WITH #2 SOLID TINNED GROUND WIRE. THESE CONNECTIONS SHALL BE DOUBLE LUG BOLTED / SCREWED MECHANICAL CONNECTIONS WITH STAR LOCK WASHERS AND NOALOX. ALL BRIDGE SPLICES SHALL HAVE JUMPERS OF #2 SOLID WITH COMPRESSION LUGS.

3.15 CAD WELD & BURNDY CONNECTION:
CAD WELDS (EXOTHERMIC WELDS) AND BURNDY CONNECTIONS SHALL BOND ALL UNDERGROUND AND DAMP LOCATION CONNECTIONS, SHELTER SKID GROUNDS, TOWER OR MONOPOLE GROUNDS, FENCING CORNER AND GATE POSTS, ANTENNA GROUND BARS, (AGB) SURGE ARRESTER GROUND BAR, AND THE MASTER GROUND BAR (MGB). MECHANICAL CONNECTIONS SHALL BE TYPICALLY USED TO BOND ALL INTERIOR EQUIPMENT, WAVE CABLE BRIDGES AND COAXIAL CABLE GROUND KITS. ALL LUG TYPE MECHANICAL CONNECTIONS TO THE MGB OR AGB SHALL BE TWO HOLE TYPE CONNECTORS WITH STAINLESS STEEL BOLTS AND NUTS WITH STAINLESS STEEL LOCK WASHERS AND NOALOX ON EITHER SIDE OF THE BUSS BAR.

3.16 CHEMICAL GROUND RODS: CHEMICAL GROUND RODS SHALL NOT BE INSTALLED ON GROUND RING INSTALLATIONS WITH NORMAL SOIL. CHEMICAL GROUND RODS SHALL BE INSTALLED ONLY FOR SPECIAL DESIGN APPLICATIONS THAT REQUIRE SINGLE POINT GROUNDING DUE TO SPECIFIC SITE CONDITIONS.

3.17 TENANT IMPROVEMENT SITE GROUNDING: FOR ROOF TOP ANTENNA INSTALLATIONS ADDITIONAL ANTENNA GROUND BARS MAY HAVE TO BE INSTALLED AT EACH ANTENNA MOUNT LOCATION. ALL ANTENNA MOUNTS SHALL BE GROUNDED WITH A #2 AWG CONDUCTOR CONNECTED TO THE NEAREST BUILDING STEEL OR THE AGB INSTALLED AT THE MOUNT. ALL BUSS BARS, BOTH MGB AND AGB(S), SHALL BE INDEPENDENTLY TIED TO THE NEAREST BUILDING STEEL OR DESIGNATED GROUNDING SYSTEM. NO GROUND WIRE IS TO CONNECT THE BUSS BARS TOGETHER. AGB(S) MAY BE HOME RUN BACK TO THE MGB WHERE NO BUILDING STEEL IS AVAILABLE.

3.18 LIMITS OF BEND RADIUS: IT IS IMPORTANT THAT THE GROUNDING CONDUCTOR CONNECTING THE INSIDE AND OUTSIDE GROUND SYSTEMS BE AS STRAIGHT AS POSSIBLE, WITH NO TURN OR BEND SHORTER THAN ONE FOOT RADIUS WITH A THREE FOOT RADIUS PREFERRED. NO RIGHT ANGLE OR SHARP BENDS SHALL BE ALLOWED.

3.19 BONDING PREPARATION & FINISH: ALL SURFACES REQUIRE PREPARATION PRIOR TO BONDING OF EITHER CAD WELD OR BURNDY FASTENERS. GALVANIZED SURFACES SHALL BE GROUND OR SANDED TO THE POINT OF EXPOSING THE STEEL SURFACE BELOW, PRIOR TO BONDING THE GROUND CONDUCTOR. FOR OTHER SURFACES INCLUDING COPPER BUSS BARS ALL PAINT, RUST, TARNISH AND GREASE SHALL BE REMOVED PRIOR TO BONDING THE GROUND CONDUCTOR. CAD WELD TYPE BONDS SHALL BE FINISHED WITH THE APPLICATION OF COLD GALVANIZATION AND WHEN APPLICABLE, THEN PAINTED WITH AN APPROPRIATE COLOR AS REQUIRED. MECHANICAL TYPE BONDS ON BUSS BARS SHALL BE FINISHED WITH THE APPLICATION OF NOALOX OR OTHER APPROVED CONDUCTIVE MEDIUM MATERIAL BETWEEN CONNECTOR AND BUSS BAR. MECHANICAL TYPE BONDS ON ALL OTHER SURFACES SHALL BE FINISHED WITH THE APPLICATION OF COLD GALVANIZATION AND/OR THE APPROPRIATE PAINT TO MATCH AS REQUIRED.

3.20 TESTING: THE OUTSIDE GROUND RING SHALL BE TESTED AFTER INSTALLATION BUT PRIOR TO BACKFILLING THE GROUND RING TRENCH. THE GROUND FIELD RESISTANCE SHALL MEASURE 5 OHMS OR LESS TO GROUND. ANY DIFFICULTY IN ACHIEVING THIS LEVEL OF RESISTANCE MUST BE BROUGHT TO THE ATTENTION OF THE PROJECT MANAGER. THE RESISTANCE TO GROUND SHALL BE MEASURED USING THE FALL OF POTENTIAL METHOD. TESTING SHALL BE PERFORMED BY AN OWNER PROVIDED INDEPENDENT TESTING LABORATORY FROM WHICH A WRITTEN REPORT SHALL BE PROVIDED FOR REVIEW BY THE PROJECT MANAGER.

3.21 SPECIAL CONDITIONS: WHEN SOIL CONDITIONS EXIST (I.E., NON-COMPACTABLE ROCK, GRAVEL, SHALE, ETC.) THAT PREVENTS THE INSTALLATION OF THE STANDARD GROUNDING SYSTEM AND PROCEDURES, THEN SPECIAL PROCEDURES SHALL BE REQUESTED BY THE PM.

3.22 EXTERNAL GROUND RING: THE EXTERNAL GROUND RING SHALL EXTEND TO THE MAXIMUM ALLOWABLE DEPTH IN 95% COMPACTED SOIL.

3.23 GROUND RODS (REPLACEMENT): WHEN GROUND RODS CANNOT BE DRIVEN INTO THE SOIL VERTICALLY TO A DEPTH DESCRIBED IN PARAGRAPH 3.5, AND REMAIN IN 95% COMPACTED SOIL, THEN THE FOLLOWING METHODS OF SUBSTITUTION MAY BE USED. THESE ARE SUGGESTED METHODS ONLY, AND EACH CASE SHOULD BE REVIEWED BY THE T-MOBILE PROJECT MANAGER. THE PURPOSE IS TO ACHIEVE THE LOWEST IMPEDANCE TO GROUND IN ANY CASE, EQUAL TO OR LESS THAN 5 OHMS.

3.24 ROCK WITH SOME OR NO SOIL COVER: FOR SITES WHICH HAVE SOIL CONDITIONS WHICH CONSIST OF SOLID OR SEMI SOLID ROCK BELOW ABOUT THREE FEET OF COMPACTABLE SOIL, A COMBINATION OF METHODS MAY BE USED:

- A. A COMBINATION OF SHORT GROUND RODS MAY BE USED WITH 3' SQUARE 1/4" COPPER PLATES. A MINIMUM OF TWO PLATES SHOULD BE USED AND SHOULD REPLACE GROUND RODS ON AN EQUIVALENCY OF TWO GROUND ROD LENGTHS PER COPPER PLATE. THE COPPER PLATE SHOULD BE PLACED IN A MINIMUM 3" BENTONITE BASE AND COVERED WITH 3" OF BENTONITE FILL PRIOR TO BACKFILL.
- B. AN ACTIVE TYPE CHEMICAL ROD SYSTEM MAY BE USED. THIS IS AN ENGINEERING JUDGMENT AND SHOULD BE USED ONLY WHERE NECESSARY DUE TO EXPENSE. IN ALL CASES, THE STANDARD PRACTICES OUTLINED IN THIS DOCUMENT SHOULD BE FOLLOWED TO THE EXTENT THAT IS APPLICABLE, AND SHOULD BE MODIFIED AS TO THE QUANTITY OF GROUND RODS AND CONDUCTOR SIZE ONLY AS RECOMMENDED BY THE MANUFACTURER OF THE GROUND ROD SYSTEM.
- C. A SYSTEM UTILIZING CORED SHAFTS, STANDARD GROUND RODS ON A TYPICAL LAYOUT, WITH A BENTONITE (CLAY) BACKFILL. IN THIS CASE EACH GROUND ROD SHOULD BE TESTED INDIVIDUALLY, AND EACH ROD SHOULD HAVE AN ACCESS BOX PLACED FOR FUTURE TESTING.

3.25 HIGH RISE BUILDING:

- A. HIGH RISE BUILDINGS PRESENT A UNIQUE PROBLEM IN GROUNDING. A FACILITY INVESTIGATION SHOULD BE MADE INTO THE STRUCTURE OF THE BUILDING, AND AS TO THE POSSIBLE PRESENCE OF AN EXISTING LIGHTNING PROTECTION SYSTEM. IF ONE IS IN PLACE AND APPEARS ADEQUATE IN DESIGN, IT WILL BE NECESSARY TO CONNECT THE ANTENNA SYSTEM TO THE EXISTING SYSTEM, WITH A TEST TO THE SYSTEM AFTER INSTALLATION TO ENSURE THAT IT HAS NOT CAUSED THE SYSTEM TO EXCEED 5 OHMS.
- B. STRUCTURAL STEEL BUILDINGS. IF THE BUILDING IS BUILT OF STRUCTURAL STEEL, IT MAY BE POSSIBLE TO GROUND THE ANTENNAS TO THE BUILDING SITE. IT IS PREFERABLE TO GROUND THE ANTENNAS AND THE SITE TO A DIRECT EARTH CONNECTION, BY USE OF SEPARATE DOWN LEADS OF CONSIDERABLE SIZE (250 MCM OR LARGER) COMING FROM GROUND BUSS BARS TO COLLECT THE GROUND INPUT, AND RUN DOWN A VERTICAL SHAFT OR STAIRWELL TO A PATTERN OF NO LESS THAN FOUR GROUND RODS. WHERE PRACTICAL, THE BUILDING STEEL SHOULD BE BONDED TO THE GROUND RING WITH A SEPARATE LEAD TO THE GROUND ROD FIELD.
- C. A SYSTEM STRUCTURAL CONCRETE BUILDINGS ARE MORE DIFFICULT TO GROUND PROPERLY. THE ANTENNAS SHOULD BE GROUNDED TO A SEPARATE BUSS BAR AND DOWN LEAD WHERE THE COAXIAL CABLES ENTER THE BUILDING. THE DOWN LEAD SHOULD BE RUN IN A SIMILAR FASHION AS IN THE STRUCTURAL STEEL EQUIPMENT ROOM. THE DOWN LEADS SHOULD BE PROTECTED IN CONDUIT AND SHOULD BE INSTALLED AS FAR APART AS IS PRACTICAL FROM EACH OTHER. THE SEPARATE DOWN LEADS SHOULD NOT CONTACT EACH OTHER UNTIL CONNECTION WITH THE FIRST GROUND ROD.

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PLANS PREPARED BY:

W-T
W-T COMMUNICATION DESIGN GROUP, LLC.

SEAL:

DATE	DESCRIPTION	BY
09/18/14	FOR CLIENT REVIEW	[illegible]
10/08/14	[illegible]	[illegible]
02/13/15	REVIEW COMMENTS	[illegible]
03/05/15	REVISION	[illegible]

SITE INFORMATION:

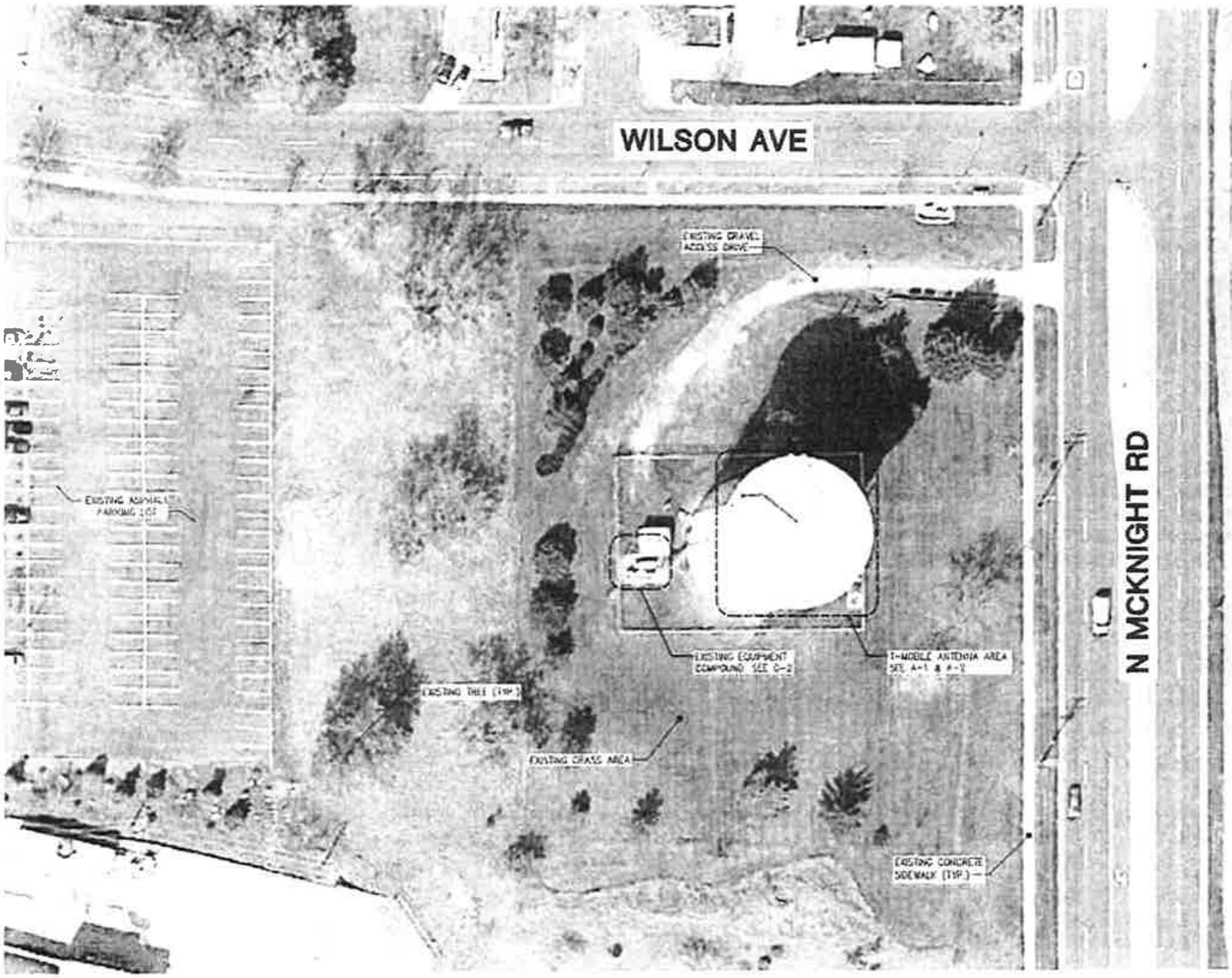
STPL
WT-MCKNIGHT
A1N0030A
393 N. MCKNIGHT ROAD
SAINT PAUL, MN 55119

SHEET TITLE:

GENERAL NOTES & SPECIFICATIONS

SHEET NUMBER:

T-3



IMPORTANT SITE NOTES:

1. GENERAL CONTRACTOR WILL NOT START CONSTRUCTION UNTIL AFTER THEY HAVE RECEIVED THE PRE-CON PACKAGE AND HAVE A PRE-CON WALK WITH THE PROJECT MANAGER
2. GENERAL CONTRACTOR TO HIRE PUBLIC (811) AND PRIVATE LOCATING SERVICE IN ORDER TO LOCATE AND PROTECT ALL SURFACE UTILITIES. DO NOT SCALE OFF THESE PLANS FOR ANY BELOW GRADE UTILITIES.
3. CONTRACTOR SHALL VERIFY ALL EXISTING BURIED AND OVERHEAD UTILITIES PRIOR TO EXCAVATION. CONTRACTOR SHALL REPAIR ALL DAMAGED UTILITIES AT HIS OWN COST AND COORDINATE ANY REPAIRS WITH RESPECTIVE UTILITY COMPANY.
4. CONTRACTOR TO VERIFY ALL HEIGHTS AND AZIMUTHS IN FIELD PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY T-MOBILE AND ENGINEERING FIRM OF ANY DISCREPANCIES BEFORE PROCEEDING.
5. CONTRACTOR SHALL RESTORE AND REPAIR ANY DAMAGED AREAS CAUSED BY CONSTRUCTION

OVERALL SITE PLAN 1

SCALE: 1"=60'-0"

T-Mobile stick together

PLANS PREPARED BY:

W-T COMMUNICATION DESIGN GROUP, LLC
WIRELESS INFRASTRUCTURE

SEAL:

LICENSED ARCHITECT

DATE:	DESCRIPTION:	BY:	REV
08/18/14	90% CLIENT REVIEW		A
10/16/14	FOR CONSTRUCTION		0
02/13/15	REVIEW COMMENTS		1
03/05/15	REVISION		2

SITE INFORMATION:

STPL
WT-MCKNIGHT
A1N0030A

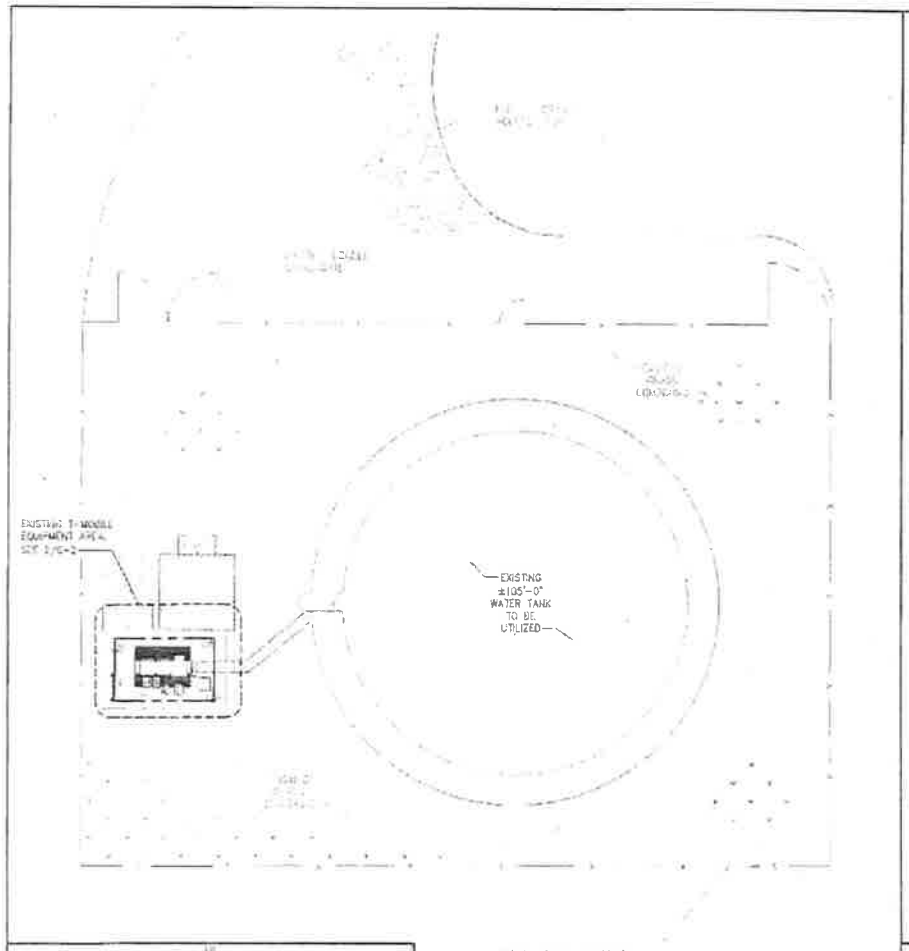
393 N. MCKNIGHT ROAD
SAINT PAUL, MN 55119

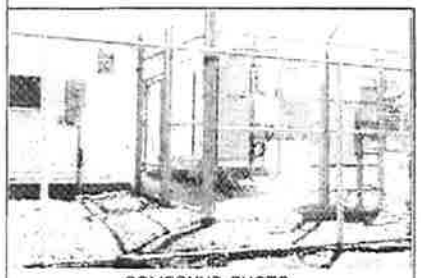
SHEET TITLE:

OVERALL SITE PLAN

SHEET NUMBER:

C-1



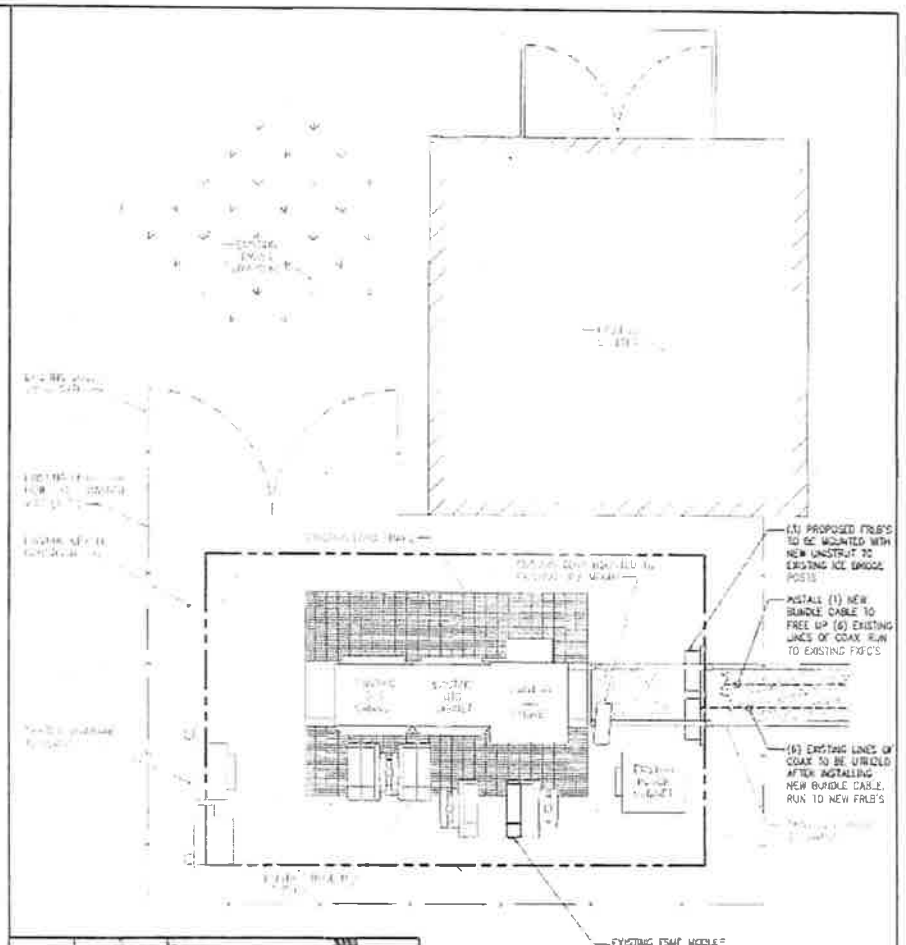


COMPOUND PHOTO

COMPOUND PLAN

SCALE: 1"=20'-0"

1



EQUIPMENT PHOTO

EQUIPMENT PLAN

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

2

T · · Mobile · ·
stick together

PLANS PREPARED BY:

W-T COMMUNICATION DESIGN GROUP, LLC.
WIRELESS INFRASTRUCTURE

SEAL:

DATE	DESCRIPTION	BY	REV
06/18/14	95% CLIENT REVIEW	KSL	A
10/13/14	FOR CONSTRUCTION	JS	0
02/13/15	REVIEW COMMENTS	BS	1
03/05/15	REVISION	BS	2

SITE INFORMATION

STPL
WT-MCKNIGHT
A1N0030A

292 N. MCKNIGHT ROAD
SAINT PAUL, MN 55119

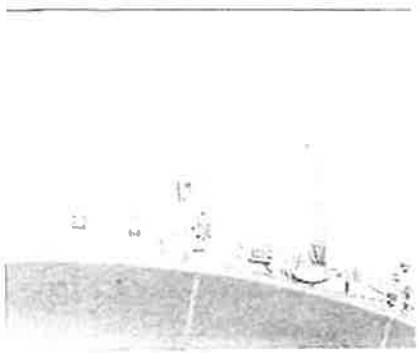
SHEET TITLE

COMPOUND & EQUIPMENT PLANS

SHEET NUMBER

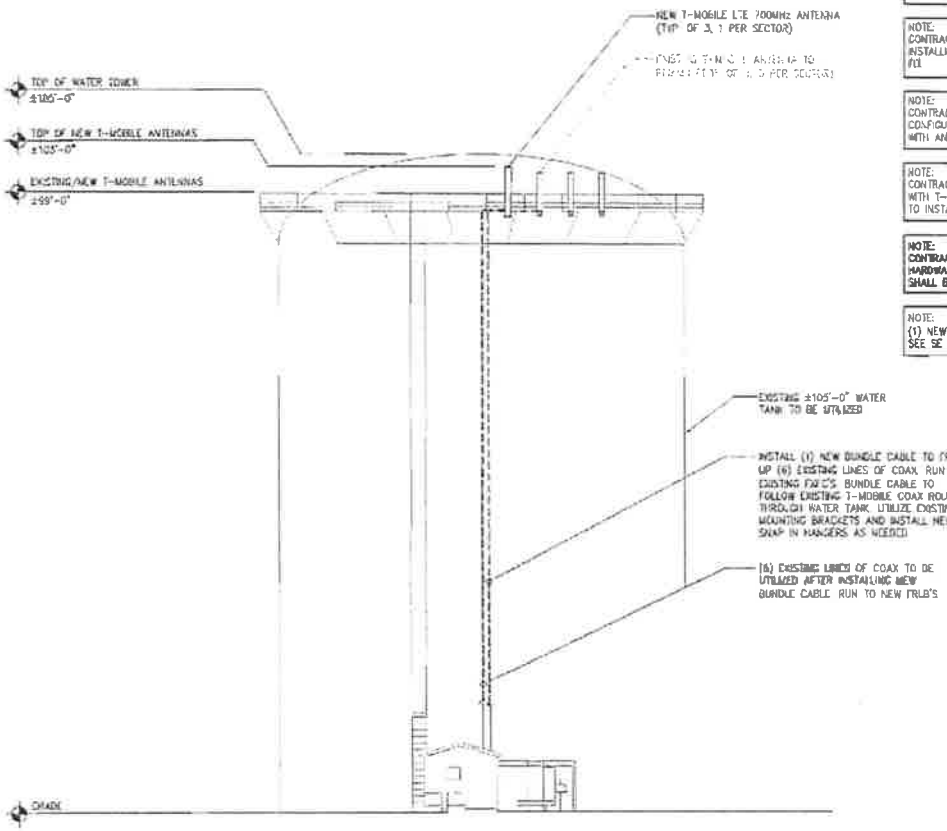
C-2

PLOT SCALE: 1:1 @ 11"x17"



EXISTING ANTENNA PHOTO

TOWER PHOTO



NOTE:
AN ANTENNA MOUNT ANALYSIS HAS BEEN COMPLETED BY W-T COMMUNICATION DESIGN GROUP, LLC ON FEBRUARY 11, 2014. SEE SE SHEETS.

NOTE:
AN TOWER STRUCTURAL EVALUATION HAS BEEN COMPLETED BY TAC, INC ON FEBRUARY 12, 2014. THE LOCATION SHOWN IN THE STRUCTURAL ANALYSIS SHOULD SUPERSEDE THESE DRAWINGS.

NOTE:
CONTRACTOR TO VERIFY ALL HEIGHTS AND AZIMUTHS IN FIELD PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY T-MOBILE AND ENGINEERING FIRM OF ANY DISCREPANCIES BEFORE PROCEEDING.

NOTE:
CONTRACTOR TO USE PROPER TORQUE WRENCH WHEN INSTALLING AND TIGHTENING CONNECTORS TO INSURE PROPER PCI.

NOTE:
CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING FINAL RF CONFIGURATION AND NOTIFY T-MOBILE AND ENGINEERING FIRM WITH ANY DISCREPANCIES.

NOTE:
CONTRACTOR SHALL VERIFY ALL FINAL CONNECTION LOCATIONS WITH T-MOBILE ENGINEER, RF ENGINEER, AND NET-OPS PRIOR TO INSTALLATION.

NOTE:
CONTRACTOR SHALL PAINT ALL NEW COAX AND MOUNTING HARDWARE TO MATCH EXISTING TANK. ALL NEW ANTENNAS SHALL BE SHOP PAINTED TO MATCH EXISTING TANK.

NOTE:
(1) NEW PIPE MOUNT TO BE INSTALLED (TYP PER SECTOR). SEE SE SHEETS.

TOWER ELEVATION

SCALE: 1"=20'-0"

1

T-Mobile
stick together

PLANS PREPARED BY:

W-T
W-T COMMUNICATION DESIGN GROUP, LLC
WIRELESS INFRASTRUCTURE

SEAL:

LICENSED ARCHITECT

DATE	DESCRIPTION	BY	REV
09/18/14	SUB-CONT REVIEW	RTC	A
10/16/14	FOR CONSTRUCTION	JK	0
02/13/15	REVIEW COMMENTS	BS	1
03/05/15	REVISION	BS	2

SITE INFORMATION:

STPL
WT-MCKNIGHT
A1N0030A

393 N. MCKNIGHT ROAD
SAINT PAUL, MN 55119

SHEET TITLE:

TOWER ELEVATION

SHEET NUMBER:

A-1

CABLE SCHEDULE			
STATUS	CABLE TYPE	SIZE	QUANTITY
EXISTING	[illegible]	1-5/8	13
EXISTING	[illegible]	[illegible]	[illegible]
PROPOSED	LMU BUNDLE	1.2"	1
FINAL CABLE QUANTITY			15

ANTENNA SCHEDULE

SECTOR	STATUS	ANTENNA MANUFACTURER	ANTENNA MODEL	ANTENNA DIMENSIONS (HxWxD)	RAD CENTER	AZIMUTH	TMA/RRU QUANTITY & MODEL
A1	PROPOSED	ANDREW	LNX-6515DS-A1M	95.4"x11.9"x7.1"	99'	0	
A2	EXISTING	ANDREW	TMBXX-6517-A2M	74.5"x12"x6.5"	[illegible]	0	EX. ETW200VS12UB TMA
A3	EXISTING	ANDREW	TMBXX-6517-A2M	74.5"x12"x6.5"	99'	0	-
A4	EXISTING	ANDREW	TMBXX-6517-A2M	74.5"x12"x6.5"	99'	0	-
B1	PROPOSED	ANDREW	LNX-6515DS-A1M	96.4"x11.9"x7.1"	99'	120'	
B2	EXISTING	ANDREW	TMBXX-6517-A2M	74.5"x12"x6.5"	99'	120'	EX. ETW200VS12UB TMA
B3	EXISTING	ANDREW	TMBXX-6517-A2M	74.5"x12"x6.5"	99'	120'	
B4	EXISTING	ANDREW	TMBXX-6517-A2M	74.5"x12"x6.5"	99'	120	
C1	PROPOSED	ANDREW	LNX-6515DS-A1M	96.4"x11.9"x7.1"	99'	240'	
C2	EXISTING	ANDREW	TMBXX-6517-A2M	74.5"x12"x6.5"	99'	240	EX. ETW200VS12UB TMA
C3	EXISTING	ANDREW	TMBXX-6517-A2M	74.5"x12"x6.5"	99'	240	
C4	EXISTING	ANDREW	TMBXX-6517-A2M	74.5"x12"x6.5"	99'	240	-

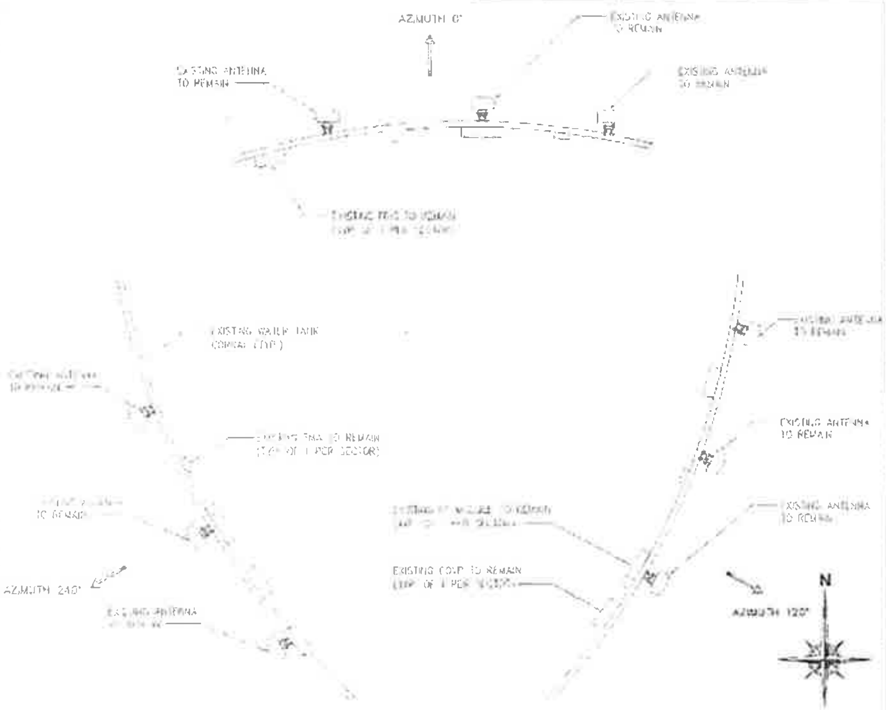
NOTE:
AN ANTENNA MOUNT ANALYSIS HAS BEEN COMPLETED BY W-T COMMUNICATION DESIGN GROUP, LLC ON FEBRUARY 11, 2014. SEE SE SHEETS

NOTE:
AN TOWER STRUCTURAL EVALUATION HAS BEEN COMPLETED BY TAE, INC ON FEBRUARY 12, 2014. THE LOCATION SHOWN IN THE STRUCTURAL ANALYSIS SHOULD SUPERSEDE THESE DRAWINGS

NOTE:
ANTENNA INFORMATION OBTAINED FROM T-MOBILE RF DATA CONFIGURATION SHEET DATED 07/25/14

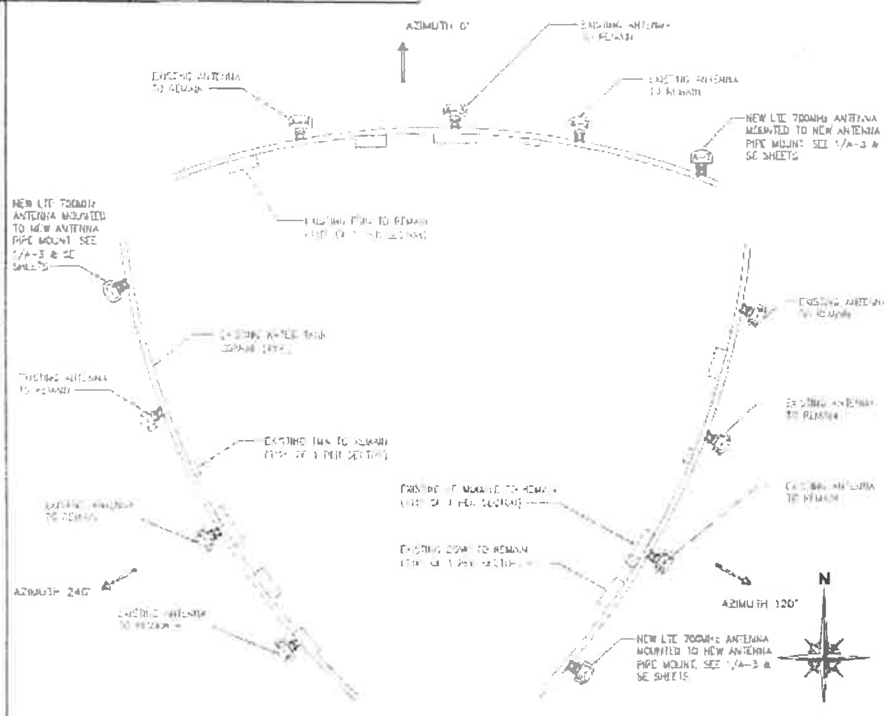
NOTE:
(1) NEW PIPE MOUNT TO BE INSTALLED (TYP PER SECTOR). SEE SE SHEETS

NOTE:
CONTRACTOR SHALL PAINT ALL NEW COAX AND MOUNTING HARDWARE TO MATCH EXISTING TANK. ALL NEW ANTENNAS SHALL BE SHOP PAINTED TO MATCH EXISTING TANK.



EXISTING ANTENNA PLAN 1

SCALE: 3/16"=1'-0"



PROPOSED ANTENNA PLAN 2

SCALE: 3/16"=1'-0"

T-Mobile
stick together

PLANS PREPARED BY:
W-T
W-T COMMUNICATION DESIGN GROUP, LLC
WIRELESS INFRASTRUCTURE

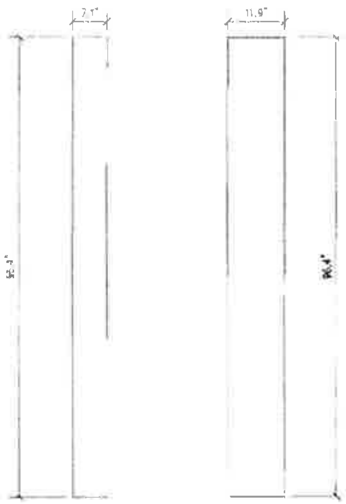
SEAL:

DATE	DESCRIPTION	BY	REV
05/19/14	90% CLIENT REVIEW	[illegible]	[illegible]
06/10/14	FOR CONSTRUCTION	[illegible]	0
02/13/15	REVIEW COMMENTS	[illegible]	1
03/05/15	REVISION	[illegible]	2

SITE INFORMATION:
STPL
WT-MCKNIGHT
A1N0030A
393 N. MCKNIGHT ROAD
SAINT PAUL, MN 55119

SHEET TITLE:
ANTENNA PLANS & SCHEDULE

SHEET NUMBER:
A-2



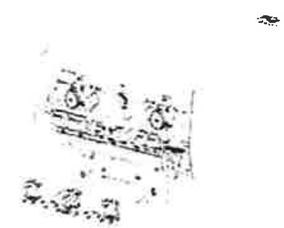
ANDREW ANTENNA LNX-6515DS-A1M

DIMENSIONS, HxWxD: 86.4"x11.9"x7.1"
ANTENNA WEIGHT: 50.3 lbs

ANTENNA DETAIL
SCALE: NONE
1

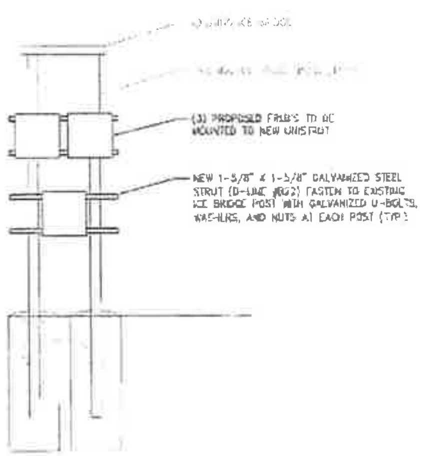
Characteristic	FRLB Capability
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Power	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Support	Software Support
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]



Dimension	Value
Height	15.75 inches
[illegible]	15.75 inches
Depth	5.5 inches
Weight	59.5 lbs

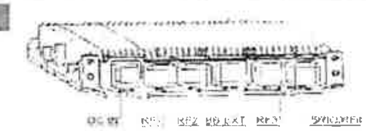
FRLB DETAIL
SCALE: NONE
2

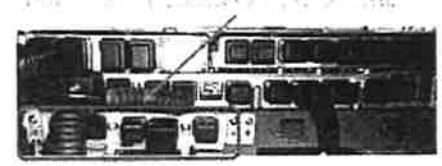


FRLB ATTACHMENT DETAIL
SCALE: NONE
3

New baseband sub-module FBBC

Capability	FBBC
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]





FBBC SUB-MODULE DETAIL
SCALE: NONE
4

T-Mobile stick together

PLANS PREPARED BY:

W-T COMMUNICATION DESIGN GROUP, LLC
WIRELESS INFRASTRUCTURE

SEAL:
LICENSED ARCHITECT

3/5/15

DATE	DESCRIPTION	BY	REV
08/18/14	90% CLIENT REVIEW	[illegible]	A
10/16/14	FOR CONSTRUCTION	[illegible]	0
02/11/15	REVIEW COMMENTS	[illegible]	1
03/05/15	REVISION	[illegible]	2

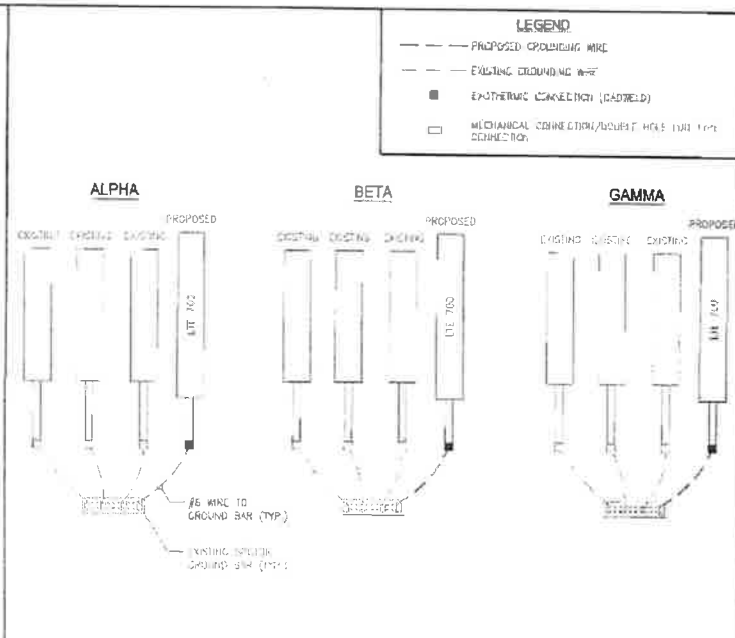
SITE INFORMATION:
STPL
WT-MCKNIGHT
A1N0030A
393 N. MCKNIGHT ROAD
SAINT PAUL, MN 55119

SHEET TITLE:
ANTENNA MOUNTING DETAILS

SHEET NUMBER:
A-3

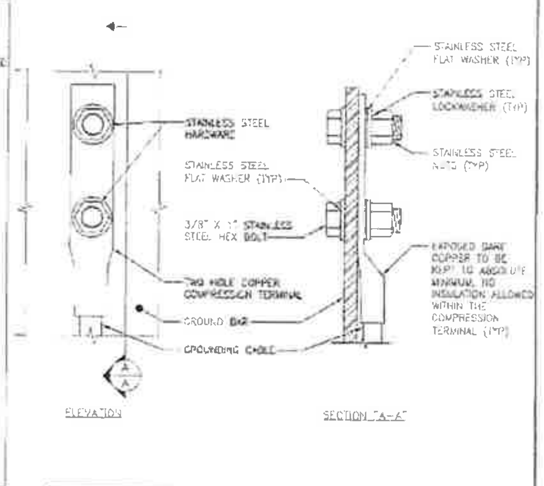
NOTES:

1. ALL ELECTRICAL WORK SHALL CONFORM TO THE NATIONAL ELECTRICAL CODE (EDITION ADOPTED BY LOCAL JURISDICTION) AND APPLICABLE LOCAL CODES
2. GROUNDING SHALL COMPLY WITH ARTICLE 250 OF THE NATIONAL ELECTRICAL CODE
3. ALL ELECTRICAL ITEMS SHALL BE UL APPROVED OR LISTED
4. WIRES AND CABLES FOR POWER AND LIGHTING SHALL BE COPPER WITH TYPE XHHW, THWN OR THHN INSULATION. SOLID CONDUCTORS FOR #10 AWG AND SMALLER, STRANDED FOR LARGER THAN #10 AWG. MINIMUM SIZE #12 AWG.
5. WIRES AND CABLES FOR POWER SHALL BE INSTALLED IN GALVANIZED RIGID STEEL CONDUIT OR FLEXIBLE LIQUID TIGHT CONDUIT AS INDICATED ON DRAWING
6. CONTRACTOR TO OBTAIN ALL PERMITS, PAY PERMIT FEES, AND BE RESPONSIBLE FOR SCHEDULING INSPECTIONS
7. COORDINATE WITH UTILITY COMPANIES SERVICE ENTRANCE REQUIREMENTS
8. PROVIDE ALL LABOR AND MATERIAL DESCRIBED ON THIS DRAWING, AND ALL ITEMS INCIDENTAL TO COMPLETING AND PRESENTING THIS PROJECT AS FULLY OPERATIONAL
9. GROUNDING CONNECTIONS SHALL BE EXOTHERMIC TYPE ("CADWELD") TO ANTENNA MASTS, AND THE GROUND BARS. REMAINING GROUNDING CONNECTIONS SHALL BE COMPRESSION FITTINGS
10. GROUND COAXIAL CABLE SHIELDS AT BOTH ENDS WITH COAX CABLE GROUNDING KITS & INSTALL WEATHER PROOFING KIT AT EACH CONNECTION
11. ROUTE GROUNDING CONDUCTORS ALONG THE SHORTEST AND STRAIGHTEST PATH POSSIBLE, EXCEPT AS OTHERWISE INDICATED. GROUNDING LEADS SHOULD NEVER BE BENT AT RIGHT ANGLE, ALWAYS MAKE AT LEAST 12" RADIUS BENDS. #6 WIRE CAN BE BENT AT 6" RADIUS WHEN NECESSARY
12. CONTRACTOR TO PROVIDE GROUND RING AS SHOWN ON GROUNDING SITE PLAN AND GROUNDING RISER DIAGRAM. CONTRACTOR SHALL TEST AND VERIFY THAT THE IMPEDANCE DOES NOT EXCEED 5 OHMS TO GROUND BY MEANS OF A BIDDLE-MEGGER TESTER. GROUNDING AND OTHER OPERATIONAL TESTING SHALL SHALL BE WITNESSED BY THE OWNER'S REPRESENTATIVE
13. ALL EQUIPMENT FURNISHED BY OTHERS SHALL BE PROVIDED WITH PROPER MOTOR STARTERS, DISCONNECTS, CONTROLS, ETC. BY THE ELECTRICAL CONTRACTOR UNLESS SPECIFICALLY NOTED OTHERWISE. THE ELECTRICAL CONTRACTOR SHALL INSTALL AND COMPLETELY WIRE ALL ASSOCIATED EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S WIRE DIAGRAMS AND AS REQUIRED FOR A COMPLETE OPERATING INSTALLATION. ELECTRICAL CONTRACTOR SHALL VERIFY AND COORDINATE ELECTRICAL CHARACTERISTICS AND REQUIREMENTS OF EQUIPMENT PRIOR TO ROUGH-IN OF CONDUIT AND WIRING TO AVOID CONFLICTS WHERE APPLICABLE
14. GROUNDING CONDUCTORS SHALL BE COPPER OR SOLID TINNED COPPER. ALL CONNECTIONS MADE BELOW GRADE SHALL BE SOLID TINNED COPPER. ALL CONNECTIONS ABOVE GRADE STRANDED IS PERMITTED
15. ALL CADWELDS ABOVE FINISHED GRADE SHALL BE PAINTED WITH CO-GALVANIZED ZINC ENRICHED PAINT TO MATCH COLOR OBJECT BONDED TO
16. CONNECT COAX GROUND KITS TO MASTER GROUND BAR AT BASE OF TOWER
17. CONNECT COAX GROUND KITS TO GROUND BUS AT TOP OF TOWER
18. CONNECT LNA GROUND TO GROUND BUS AT TOP OF TOWER
19. ALL GROUNDING CONNECTIONS TO BE MADE USING EXOTHERMIC WELD PROCESS UNLESS OTHERWISE APPROVED BY DESIGNER
20. ELECTRICAL CONTRACTOR TO PULL BONDING JUMPER @ PURCELL ONLY IF DISCONNECT GROUND IS TIED TO GROUND FIELD INSTEAD OF SEPARATE GROUND ROD
21. PLAN DRAWINGS SHOWN HEREIN DO NOT NECESSARILY DEPICT ELECTRICAL REQUIREMENTS OF INDIVIDUAL EQUIPMENT AND DEVICES SUCH AS THE EQUIPMENT GROUNDING REQUIREMENTS, POWER REQUIREMENTS AND TELCO RACEWAY REQUIREMENTS
22. PLAN DRAWINGS SHOWN HEREIN ARE DIAGRAMMATIC AND DO NOT NECESSARILY DEPICT THE EXACT EQUIPMENT QUANTITIES, LOCATION, LAYOUT AND CONFIGURATION. REFER TO ARCHITECTURAL PLANS FOR EXACT EQUIPMENT LOCATION, LAYOUT AND CONFIGURATION
23. NUMBER OF ANTENNAS REPRESENTED IN THIS DETAIL ARE FOR SHOWING CLARITY OF GROUND SYSTEM REQUIREMENTS ONLY. SEE RF INFO FOR ANTENNA QUANTITY
24. CONTRACTOR TO 'NOALOX' ALL CONNECTIONS TO GROUND BARS
25. ALL GROUND WIRES ENTERING GROUND SHALL HAVE PVC SLEEVE



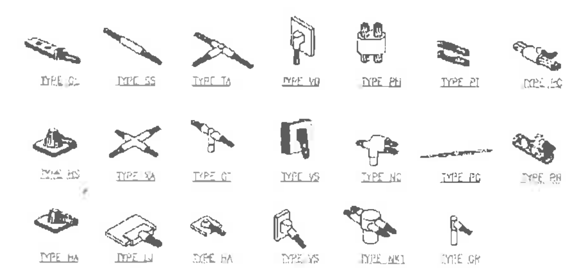
ANTENNA GROUNDING DIAGRAM 1

SCALE: NONE



ANTENNA GROUNDING DIAGRAM 2

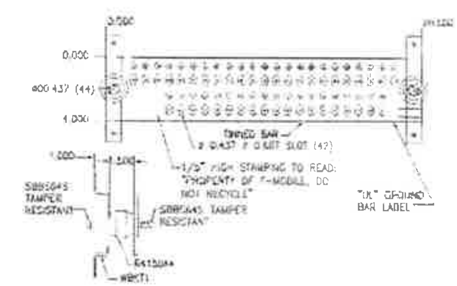
SCALE: NONE



NOTE:
CADWELD "TYPES" SHOWN ABOVE ARE EXAMPLES. CONSULT WITH PROJECT MANAGER FOR SPECIFIC TYPES OF CADWELDS TO BE USED FOR THIS PROJECT.

CADWELD CONNECTIONS 3

SCALE: NONE



GROUND BAR 4

SCALE: NONE

T-Mobile stick together

PLANS PREPARED BY:

W-T COMMUNICATION DESIGN GROUP, LLC.

SEAL:

DATE	DESCRIPTION	BY	REV
08/18/14	[illegible]	[illegible]	A
[illegible]	FOR CONSTRUCTION	[illegible]	[illegible]
[illegible]	REVIEW COMMENTS	[illegible]	[illegible]
01/05/15	REVISION	[illegible]	[illegible]

SITE INFORMATION

STPL

WT-MCKNIGHT

A1N0030A

393 N. MCKNIGHT ROAD
SAINT PAUL, MN 55119

SHEET TITLE:

GROUNDING DETAILS

SHEET NUMBER:

GR-1

SEH WATER TANK CLEANING AND PAINTING REQUIRMENTS

PART 1 GENERAL

1.01 SUMMARY

A. SECTION INCLUDES PAINTING AND PAINTING REPAIR WORK ASSOCIATED WITH THE INSTALLATION OF ANTENNAS, COAXIAL CABLES, AND OTHER COMMON COMPONENTS WITH DIRECT ATTACHMENT TO WATER TANK FACILITIES.

1.02 REFERENCES

A. SOCIETY FOR PROTECTIVE COATINGS (SSPC), WWW.SSPC.ORG

1. VOLUME 1: GOOD PAINTING PRACTICE
2. VOLUME 2: SYSTEMS AND SPECIFICATIONS

1.03 SUBMITTALS

A. PRODUCT DATA

1. SUBMIT DATA SHEET FOR EACH COATING SYSTEM

PART 2 PRODUCTS

2.01 MATERIALS

A. MANUFACTURERS

1. SHERWIN WILLIAMS COMPANY [illegible]
2. TNEMEC COMPANY WWW.TNEMEC.COM
3. X - I - M PRODUCTS WWW.XIMBONDER.COM

PART 3 EXECUTION

3.01 EXAMINATION

A. VISUALLY EVALUATE SURFACE PREPARATION BY COMPARISON WITH PICTORIAL STANDARDS OF SSPC-VIS-1-89

3.02 PREPARATION

A. REMOVE ALL SURFACE CONTAMINANTS IN ACCORDANCE WITH SSPC-SP1 SOLVENT CLEANING

1. DO NOT USE HYDROCARBON SOLVENTS ON SURFACES TO BE COATED WITH WATER-BASED COATINGS

B. CLEAN AND REMOVE ALL RUST, SLAG, WELD SPLATTER, WELD SCABS, MILL SCALE, AND LOOSE PAINT.

C. PROTECT AREAS ADJACENT TO WELDING AND/OR GRINDING OPERATIONS TO PREVENT DAMAGE OF SURROUNDING INTACT PAINT SYSTEM

D. FERROUS METAL: SSPC-SP6 COMMERCIAL BLAST CLEANING

E. GALVANIZED STEEL: SSPC-SP7 BRUSH OFF BLAST

F. ANTENNA COVERS, COAXIAL CABLE, NON-METALLIC SUBSTRATES AND PREVIOUSLY PAINTED SURFACES: SCARIFY TO DE-GLOSS SSPC-SP1 WITH A NON-HYDROCARBON SOLVENT

G. SURFACE PROFILE SHALL BE IN ACCORDANCE WITH MANUFACTURE'S PRODUCT RECOMMENDATION

H. RE-BLAST ALL SURFACES

1. WHERE RUSTING HAS RECURRED
2. THAT DO NOT MEET THE REQUIREMENTS OF THESE SPECIFICATIONS

3.03 APPLICATION

A. COATINGS SHALL BE APPLIED IN ACCORDANCE WITH MANUFACTURER'S PRINTED INSTRUCTIONS

B. SURFACES TO BE COATED SHALL BE CLEAN, DRY, AND FREE OF AIRBORNE DUST AND CONTAMINANTS AT THE TIME OF APPLICATION AND WHILE FILM IS FORMING

C. FINISH COAT SHALL BE UNIFORM IN COLOR AND SHEEN WITHOUT STREAKS, LAPS, RUNS, SAGS OR MISSED AREAS

D. SHOP PAINTING: TAPE-OFF (TWO-INCH MINIMUM) SURFACES THAT WILL BE IN THE HEAT-AFFECTED-ZONE DURING FIELD WELDING

E. COMPONENT PAINTING

1. INTERIOR EXPOSED FERROUS METAL AND GALVANIZED STEEL

A. PRIMER: SHERWIN WILLIAMS MACROPOXY 646 OR TNEMEC SERIES 161

1. NUMBER OF COATS: TWO
2. DRY FILM THICKNESS: 4.0-8.0 MILS (PER COAT)
3. COLOR: BY OWNER

2. EXTERIOR EXPOSED FERROUS METAL AND GALVANIZED STEEL:

A. PRIMER: SHERWIN WILLIAMS MACROPOXY 646 OR TNEMEC SERIES 161 OR N69

1. NUMBER OF COATS: ONE
2. DRY FILM THICKNESS: 4.0-8.0 MILS
3. COLOR: BY OWNER

B. FINISH: SHERWIN WILLIAMS ACROLON 218 OR TNEMEC SERIES 1074U/1075U

1. NUMBER OF COATS: ONE
2. DRY FILM THICKNESS: 2.0-3.0 MILS
3. COLOR: BY OWNER

3. ANTENNA COVERS

A. PRIMER: SHERWIN WILLIAMS PRO-CRYL PRIMER

1. NUMBER OF COATS: ONE
2. DRY FILM THICKNESS: 2.0-4.0 MILS

B. FINISH: SHERWIN WILLIAMS SHER-CRYL HPA

1. NUMBER OF COATS: ONE
2. DRY FILM THICKNESS: 2.5-4.0 MILS
3. COLOR: BY OWNER

4. COAXIAL CABLE

A. PRIMER: X-I-M 1136

1. NUMBER OF COATS: ONE
2. DRY FILM THICKNESS: 2.0-3.0 MILS

B. FINISH: SHERWIN WILLIAMS SHER-CRYL HPA

1. NUMBER OF COATS: ONE
2. DRY FILM THICKNESS: 3.0-4.0 MILS
3. COLOR: BY OWNER

3.04 REPAIR OF AREAS DAMAGED BY WELDING

A. PREPARE THE DAMAGE BY ONE OF THE FOLLOWING METHODS AS DIRECTED BY THE ENGINEER

1. ABRASIVE-BLAST TO SSPC-SP6
2. MECHANICALLY CLEAN TO SSPC-SP6

B. FEATHER EDGES TO PROVIDE SMOOTH COVERING TRANSITION

C. APPLY PRIME COAT TO BARE METAL SURFACE

D. MASK OFF RECTANGULAR AREA AROUND PRIME COAT

E. APPLY FINISH COAT

3.05 QUALITY CONTROL

A. MEASURE DRY FILM THICKNESS WITH A MAGNETIC FILM THICKNESS GAGE IN ACCORDANCE WITH SSPC-PA2

B. VISUALLY INSPECT DRIED FILM FOR RUNS, SAGS, DRY SPRAY, OVERSPRAY, EMBEDDED PARTICLES AND MISSED AREAS

C. REPAIR DEFECTIVE OR DAMAGED AREAS IN ACCORDANCE WITH ARTICLES 3.02, 3.03, AND 3.04

SEH GENERAL GUIDELINES

WELDING:
DUE TO THE POTENTIAL FOR DAMAGE TO THE COATING SYSTEM WELDING SHOULD ONLY BE CONSIDERED AFTER ALL OTHER OPTIONS HAVE BEEN EXHAUSTED. PRIOR TO SUBMITTING PLANS WITH WELDING A CALL SHOULD BE MADE TO SEH TO DISCUSS THE REASONS FOR CHOOSING THIS OPTION AND POSSIBLE ACCEPTABLE ALTERNATIVES

GALVANIZED PIPES:
GALVANIZED MOUNTING PIPES ARE STANDARD FOR ALL INTERIOR AND EXTERIOR INSTALLATIONS. PLANS MUST NOTE GALVANIZED PIPES/HARDWARE

RUBBER CAPS:
FLEXIBLE WHITE RUBBER CAPS ARE REQUIRED ON ALL MOUNTING PIPES BOTH INTERIOR AND EXTERIOR. TOP CAP MUST BE ATTACHED WITH SILICONE OR WITH A GALVANIZED HOSE CLAMP. BOTTOM CAP ONLY, MUST HAVE A HOLE DRILLED IN THE CENTER. FOLLOW SAME ATTACHMENT PROCEDURE AS TOP CAP. WHITE RUBBER CAPS MUST ALSO BE PLACED ON THE ENDS OF ANY UNISTRUT FRAMES PLACED ON THE STRUCTURE

NEOPRENE/METAL SHIMS:
NEOPRENE IS REQUIRED FOR ALL METAL/METAL CONTACT POINTS. THIS PREVENTS DAMAGE TO THE COATING SYSTEM. METAL SHIMS ARE REQUIRED IN SITUATIONS WHERE TIGHTENING A CLAMP MAY CAUSE THE NEOPRENE TO TEAR CAUSING METAL/METAL CONTACT. WHENEVER POSSIBLE EXPOSED NEOPRENE SHOULD BE WRAPPED WITH WHITE TAPE

HANDRAILS: GENERAL RULES FOR HANDRAILS INCLUDE:
A. EQUIPMENT SHOULD BE PLACED IN SUCH A WAY SO AS NOT TO BLOCK ACCESS AROUND THE HANDRAIL. EQUIPMENT AND ASSOCIATED MOUNTS SHOULD NOT BE ATTACHED TO THE TOP HANDRAIL
B. DRILLING THROUGH HANDRAILS, SUPPORT POSTS, RAILS AND TOE KICK IS PROHIBITED
C. CUTTING OF HANDRAILS, SUPPORT POSTS, RAILS AND TOE KICK IS PROHIBITED

ROUTING FOR POWER/TELCO/RF-FIBER CABLES SUFFICIENT DETAIL MUST BE SUPPLIED TO ANSWER THE FOLLOWING QUESTIONS:
A. WHAT IS THE ITEM
B. WHERE IS IT GOING
C. HOW WILL IT GET FROM POINT A TO POINT B

ATTACHMENTS:
ANYTHING ATTACHED TO THE STRUCTURE REQUIRES A SEPARATE DETAIL IDENTIFYING— THE METHOD OF ATTACHMENT, COMPONENTS TO BE USED, AND LOCATION OF ATTACHMENT

CONFIGURATION:
COMPONENT IDENTIFICATION, NUMBER OF EACH COMPONENT, AZIMUTH FOR EACH SECTOR/COMPONENT, LOCATION OF COMPONENTS

PENETRATIONS:
SIMILAR TO WELDING, PENETRATIONS MUST BE GIVEN CAREFUL CONSIDERATION DUE TO THEIR IMPACT ON THE COATING SYSTEM AND THE OVERALL STRUCTURE. EXISTING PENETRATION SHOULD BE USED WHENEVER POSSIBLE

PREFERRED METHOD FOR JUMPER PENETRATIONS ARE DRILLED HOLES. SIZE, LOCATION, NUMBER OF HOLES, AND SPACING MUST BE SHOWN ON CONSTRUCTION DRAWINGS AS A SEPARATE DETAIL. DETAIL MUST INCLUDE NOTATIONS FOR DEBURRING, COLD GALV AND TOUCH, AS WELL AS SEALING WITH FIREWALL GROMMETS

ACCESS:
TENANT AND TENANT CONTRACTORS MUST PROVIDE A MINIMUM OF 24 HR. ADVANCE NOTICE PRIOR TO ARRIVING ON SITE. THIS NOTICE APPLIES TO ALL SITE VISITS PRIOR TO THE START OF CONSTRUCTION, AS DEFINED BY THE CONTRACTOR'S SUPPLIED WRITTEN SCHEDULE

AFTER APPROPRIATE WRITTEN NOTICE OF CONSTRUCTION, CONTRACTOR/TENANT SHALL NOTIFY SEH DAILY WITH CURRENT STATUS OF ACTIVITY THROUGHOUT THE COURSE OF THE PROJECT

FIREWALL GROMMETS- SILICONE:
DRILLED HOLES THAT ARE NOT COVERED WITH A MOUNT REQUIRE FIREWALL GROMMETS. SPACE BETWEEN THE JUMPERS AND FIREWALL GROMMET MUST BE NEATLY SEALED WITH SILICONE TO FORM A WEATHER TIGHT SEAL

REST ROOM FACILITIES:
SEH ADVISES ALL CLIENTS TO REQUIRE PORTABLE TOILET FACILITIES ON SITE. THIS IS AN OWNER REQUIREMENT BASED ON THE PROXIMITY OF CITY STRUCTURES TO PUBLIC AREAS SUCH AS PARKS, TRAILS, AND SCHOOLS

IDENTIFICATION OF CONDUIT/LINES/EQUIPMENT:
ALL EXPOSED CONDUIT, CABLES, AND EQUIPMENT SHOULD BE CLEARLY MARKED WITH THE NAME OF THE TENANT. PROPER IDENTIFICATION OF TENANT INSTALLATIONS PROVIDES A MEANS FOR RESOLUTION OF ISSUES ON SITE FOR THE OWNER, TENANTS, AND CONTRACTORS

T-Mobile stick together
8000 WEST 78TH STREET
SUITE 400
EDINA, MN 55439
OFFICE: (952) [illegible]

PLANS PREPARED BY:
W-T
W-T COMMUNICATION DESIGN GROUP, LLC.
WIRELESS INFRASTRUCTURE

SEAL:

Signed: 3/5/15

DATE:	DESCRIPTION:	BY:	REV:
08/18/14	90% CLIENT REVIEW	[illegible]	[illegible]
10/16/14	FOR CONSTRUCTION	[illegible]	[illegible]
02/13/15	REVIEW COMMENTS	[illegible]	1
03/05/15	REVISION	[illegible]	2

SITE INFORMATION:
STPL
WT-MCKNIGHT
A1N0030A
393 N. MCKNIGHT ROAD
SAINT PAUL, MN 55119

SHEET TITLE:
SEH REQUIREMENTS & GENERAL GUIDELINES

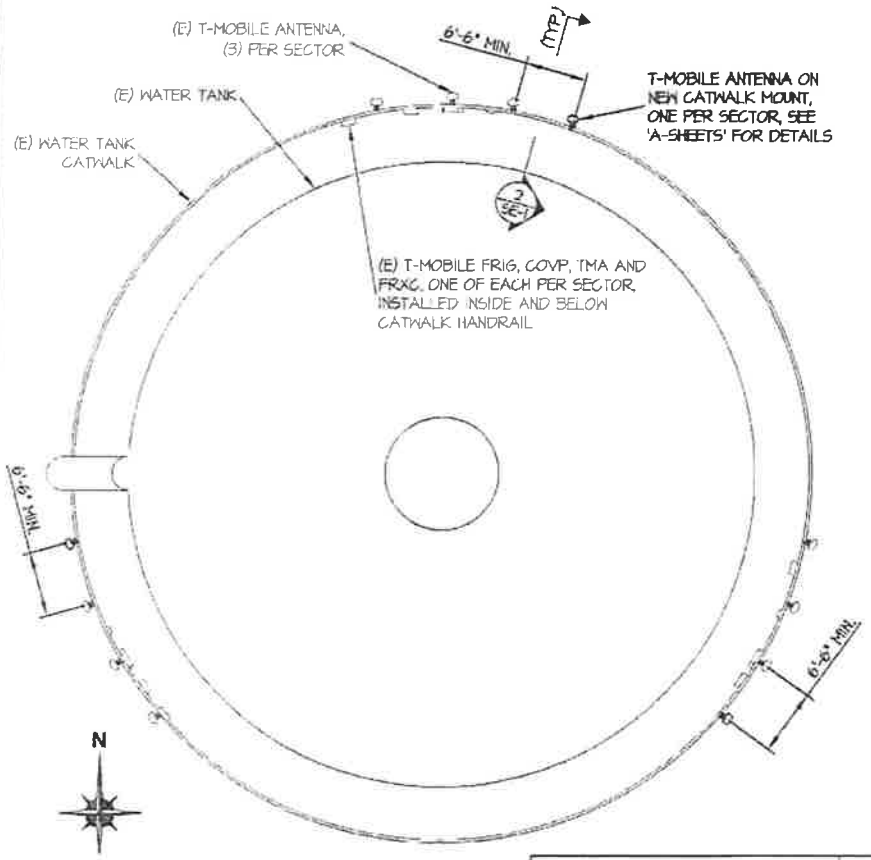
SHEET NUMBER:
SP-1

NOTES:

1. ALL EXISTING DIMENSIONS AND CONDITIONS SHALL BE FIELD VERIFIED PRIOR TO FABRICATION AND INSTALLATION. IF SIGNIFICANT DEVIATIONS OR DETERIORATION ARE ENCOUNTERED AT THE TIME OF CONSTRUCTION, A REPAIR PERMIT WILL BE OBTAINED AND CONTRACTOR SHALL NOTIFY STRUCTURAL ENGINEER IMMEDIATELY.

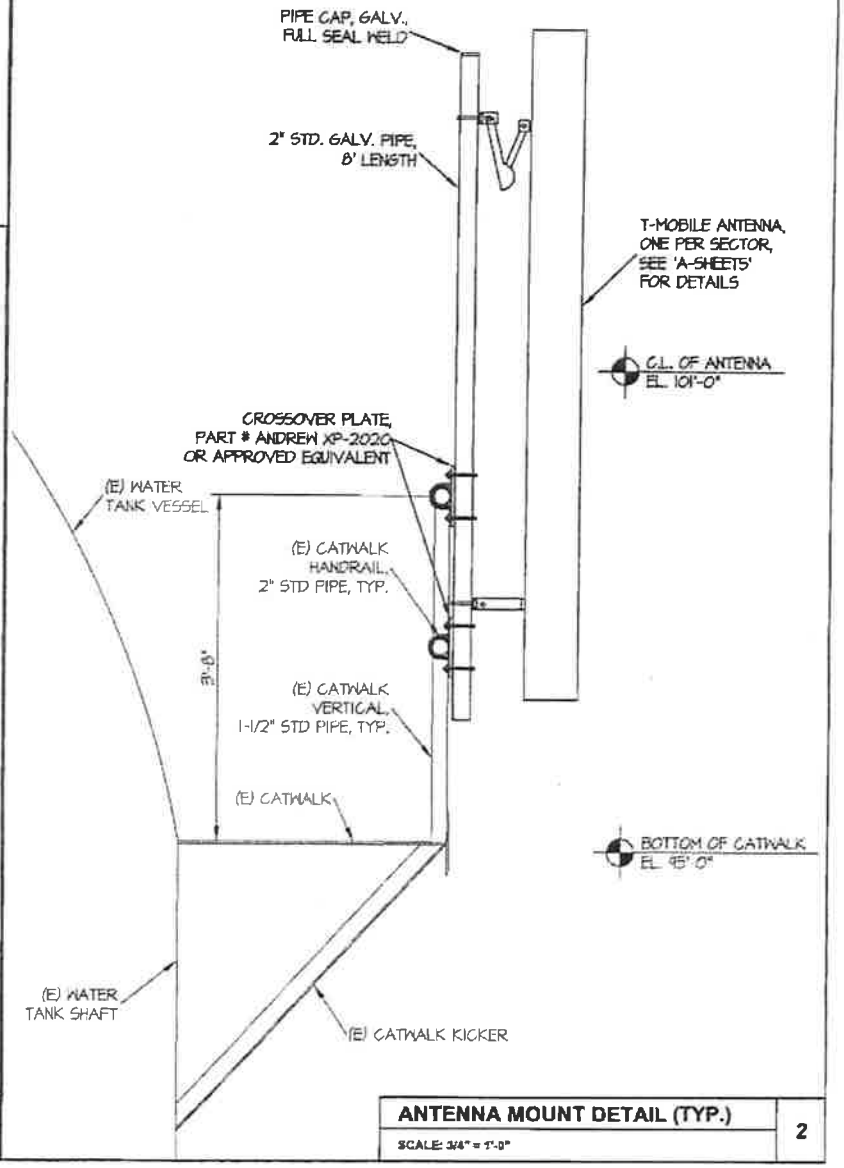
2. 'W-T COMMUNICATION DESIGN GROUP, LLC' PERFORMED A WATER TANK MAPPING ON 9-23-2014. IT WAS PROPOSED TO ADD THE ANTENNAS ON THE EXISTING WATER TANK SHAFT. THE WATER TANK APPEARED TO BE IN GOOD CONDITION.

3. DO NOT SCALE DRAWINGS



WATER TANK PLAN | 1

SCALE: 1/8" = 1'-0"



ANTENNA MOUNT DETAIL (TYP.) | 2

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

T-Mobile
stick together

PLANS PREPARED BY:

W-T COMMUNICATION DESIGN GROUP, LLC.
WIRELESS INFRASTRUCTURE

SEAL:

DATE:	DESCRIPTION:	BY:	REV.
10/14/14	REVISE/REWRITE	[illegible]	A
02/02/15	REV. PER RDI	[illegible]	B
02/11/15	REV. PER RDI	[illegible]	C

SITE INFORMATION:

STPL
WT-MCKNIGHT
A1N0030A

383 N. MCKNIGHT RD
SAINT PAUL, MN 55119

SHEET TITLE:

WATER TANK PLAN & ANTENNA MOUNT DETAIL

SHEET NUMBER:

SE-1

GENERAL STRUCTURAL NOTES

1.0 GENERAL CONDITIONS

1.1 DESIGN AND CONSTRUCTION OF WORK SHALL CONFORM TO MINNESOTA STATE BUILDING CODE 2007 (INTERNATIONAL BUILDING CODE 2006), ACI 318-08, AISC/ASD 13TH EDITION, ASCE 7-05, TIA/EIA-222-F, AWWA D100-05 STANDARDS. IN CASE OF CONFLICT BETWEEN THE CODES, STANDARDS, REGULATIONS, SPECIFICATIONS, GENERAL NOTES AND/OR MANUFACTURER'S REQUIREMENTS USE THE MOST STRINGENT PROVISION.

1.2 IT IS THE EXPRESS INTENT OF THE PARTIES INVOLVED IN THIS PROJECT THAT THE CONTRACTOR OR SUBCONTRACTOR OR INDEPENDENT CONTRACTOR OR THEIR RESPECTIVE EMPLOYEES SHALL EXCULPATE THE ARCHITECT, THE ENGINEER, THE CONSTRUCTION MANAGER, THE OWNER, AND THEIR AGENTS, FROM ANY LIABILITY WHATSOEVER AND HOLD THEM HARMLESS AGAINST LOSS, DAMAGES, LIABILITY OR ANY EXPENSE ARISING IN ANY MATTER FROM THE WRONGFUL OR NEGLIGENT ACT, OR FAILURE TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, OR THE CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES OR FAILURE TO CONFORM TO THE STATE SCAFFOLDING ACT IN CONNECTION WITH THE WORK.

1.3 CONTRACTOR SHALL AT ALL TIMES PROTECT EXISTING BUILDING STRUCTURE, EQUIPMENT, FURNISHINGS AND ETC., WHILE PERFORMING THE WORK.

1.4 CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL AT ALL TIMES BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTIONAL MEANS, METHODS, TECHNIQUES, SEQUENCES, PROCEDURES AND SAFETY (INCLUDING OSHA REGULATIONS).

1.5 ALL NEW STEEL MEMBERS & COMPONENTS SHALL BE HOT DIPPED GALVANIZED PER ASTM 123, UNLESS SPECIFIED OTHERWISE.

1.6 DO NOT SCALE DRAWINGS.

1.7 VERIFY ALL EQUIPMENT MOUNTING DIMENSIONS PER MANUFACTURER DRAWINGS.

1.8 SUBMIT ONE COPY OF ALL STRUCTURAL SHOP DRAWINGS FOR REVIEW.

1.9 DESIGN LOADS ARE:

A. ANTENNA LOAD

- (3) PROPOSED ANDREW LNX-6515DS-A1M (96.4"Hx11.9"Wx7.1"D)............ 50.3 LBS
- (4) EXISTING ANDREW TMBXX-6517-A2M (74.9"Hx12.0"Wx6.5"D) .... 43.4 LBS
- (3) EXISTING FRIG (20.0"Hx15.23"Wx5.98"D) .... 57.2 LBS
- (3) EXISTING FXFC (22.0"Hx19.3"Wx5.25"D) .... 55.0 LBS
- (3) EXISTING COVP (20.22"Hx18.86"Wx7.0"D) .... 20.0 LBS
- (3) EXISTING ANDREW ETW200VS12UB TMA (6.3"Hx7.7"Wx3.1"D)............ 11.0 LBS

B. WIND LOAD

- WIND LOAD ON ANTENNA MOUNTS PER TIA/EIA-222-F: 80 MPH (FASTEST-MILE)
- WIND LOAD ON ANTENNA MOUNTS PER TIA/EIA-222-F W/ 0.75" ICE: 37.62 MPH (FASTEST-MILE)

2.0 EXISTING CONDITIONS

2.0 CONTRACTOR SHALL FIELD VERIFY THAT THE EXISTING CONSTRUCTION ADJACENT TO THIS CONSTRUCTION, OR TO WHICH THIS CONSTRUCTION SHALL BE CONNECTED, IS AS INDICATED ON THIS DRAWING.

2.1 EXISTING CONDITIONS WILL BE CHECKED AND VERIFIED IN FIELD. IF SIGNIFICANT DEVIATIONS OR DETERIORATION ARE ENCOUNTERED AT THE TIME OF CONSTRUCTION A REPAIR PERMIT WILL BE OBTAINED AND CONTRACTOR SHALL NOTIFY STRUCTURAL ENGINEER IMMEDIATELY.

3.0 STEEL NOTES

3.1 MEET OR EXCEED THE FOLLOWING CODES & STANDARDS EXCEPT AS NOTED.

A. STRUCTURAL STEEL............ AISC SPECIFICATION ALLOWABLE STRESS DESIGN, 13TH EDITION
- -W SHAPES............ ASTM A992 - 50KSI
- -SHAPES AND PLATES............ ASTM A36
- -PLATES BENT OR COLD FORMED............ ASTM A 283, GRADE C
- -PIPES............ ASTM A 53, Fy = 35 KSI
- -TUBES............ ASTM A 500, Fy= 46 KSI
- -STRUCTURAL SHEETS, HOT ROLLED............ ASTM A 570
- -COLD-FORMED STEEL TUBING............ ASTM A 500, GRADE B
- -BOLTS, NUTS & WASHERS FOR FRAMING MEMBERS AND BRACINGS............ ASTM A 325-X
- -BOLTS, NUTS & WASHERS FOR ANCHOR BOLTS AND SECONDARY CONNECTIONS............ ASTM A 307

B. WELDS............ AWS E 70XX

EXCEPTION IS TAKEN TO AISC CODE OF STANDARD PRACTICE PARAGRAPH

3.2 REGARDING OWNERS AND FABRICATOR'S RESPONSIBILITY FOR CONNECTION DESIGN AND ADEQUACY OF SHOP DRAWINGS. COMPLIANCE WITH THE REQUIREMENTS SHOWN ON DRAWINGS AND/OR SPECIFICATIONS, CONNECTION DESIGN AND DETAILING IS THE CONTRACTOR'S RESPONSIBILITY. ENGINEER'S REVIEW OF SHOP DRAWINGS IS FOR GENERAL CONSIDERATIONS ONLY AND DOES NOT CONSTITUTE AN ACCEPTANCE OF THESE RESPONSIBILITY BY THE OWNER AND/OR ENGINEER.

3.3 PAINT NEW STEEL MEMBERS TO MATCH COLOR OF EXISTING WATER TANK.

3.4 EXISTING STEEL SHAPES: Fy = 36KSI

4.0 SEH NOTES:

4.1 ALL ATTACHMENTS TO PAINTED SURFACES ARE TO INCLUDE THE PLACEMENT OF NEOPRENE STRIPS BETWEEN HARDWARE AND POINTS OF CONTACT TO REDUCE/ELIMINATE DAMAGE TO THE PAINTED SURFACE. METAL SHIMS ARE REQUIRED IN SITUATIONS WHERE TIGHTENING A CLAMP MAY CAUSE THE NEOPRENE TO TEAR CAUSING METAL TO METAL CONTACT. WHERE POSSIBLE EXPOSED NEOPRENE SHOULD BE WRAPPED WITH WHITE TAPE. FASTENING SEQUENCE SHOULD INCLUDE NYLON WASHERS BETWEEN THE PAINTED SURFACE AND THE GALVANIZED WASHER.

4.2 PROPOSED ANTENNAS AND NEW ANTENNA MOUNTING PIPES INSTALLED ON THE EXTERIOR OF THE WATER TOWER SHALL BE SHOP PAINTED TO MATCH THE COLOR OF THE WATER TOWER (VERIFY COLOR).

4.3 NEW PIPE MASTS ARE TO HAVE WELDED END CAPS, EXISTING PIPE MASTS (IF NOT CAPPED) ARE TO BE CAPPED AT BOTH ENDS WITH WHITE RUBBER CAPS.

4.4 CONTRACTOR TO TOUCH UP PAINTING ON EXISTING ANTENNAS, SPOT REPAIRS MADE WITH BRUSH AND W/O FEATHERING, SHOULD BE COMPLETELY ROLLED FOR UNIFORMITY.

4.5 CONTRACTOR TO TOUCH UP EXISTING ANTENNA PIPE MASTS, DEPENDING UPON THEIR CONDITION (DAMAGED/FAILED) THE SPRWS MAY REQUEST REPLACEMENT.

4.6 ALL EXPOSED JUMPERS AND CABLES ARE TO BE PROVIDED WITH MANUFACTURED WHITE JACKETING OR TAPED WHITE.

4.7 ANY JUMPERS THAT ARE DISCONNECTED DURING THE INSTALLATION WILL NEED TO TAPED WHITE.

4.8 ALL MOUNTING HARDWARE IS TO BE GALVANIZED AND/OR PROVIDED IN A NON-CORRODING MATERIAL.

4.9 ALL T-MOBILE RF EQUIPMENT IS TO BE TAGGED AND/OR LABELED.

W-T Communication Design Group's Commitment to Quality

Please take a few moments to fill out our online survey.

T-Mobile stick together

PLANS PREPARED BY:

W-T COMMUNICATION DESIGN GROUP, LLC.

SEAL:

DATE:	DESCRIPTION:	BY:	REV
10/14/14	[illegible]	[illegible]	A
[illegible]	REV. PER SEH	[illegible]	B
[illegible]	REV. PER SEH	[illegible]	C

SITE INFORMATION:

STPL

WT-MCKNIGHT

A1N0030A

SHEET TITLE:

GENERAL NOTES

SHEET NUMBER:

SE-2

Site # A1N0030A
Market: Minneapolis

EXHIBIT "E-1"

T-Mobile
A1N0030A
393 McKnight Road N
STPL WT-McKnight

Antenna Facilities and Frequencies

1. **Shelter and Shelter Components**
   Shelter: Fenced Gravel Compound, 20' x 12'
   Power plant (DC current): 1 cabinet, 240V / 100A / 12 kW
   Battery supply back up: (2) batteries, 880 lbs./513 lbs.
   T-1 switch equipment:
   Commercial switch gear equipment:
   Radio transmitters: (3) Nokia FXFB, (3) Nokia FRIA, (3) FRLB
   Air conditioner: none

2. **Generators:** none

3. **Antennas**
   Quantity: (12) Total; (4) per Sector
   Type: Manufacturer: Andrew/Commscope
   Azimuths: 0° / 120° / 240°
   Model: (9) TMBXX-6517-A2M / (3) LNX-6515DS-A1M
   Dimensions: 84" x 12" x 6.5" 96.4" x 11.9" x 7.1"
   Weight: 44.4 lbs. ea. 50.3 lbs. ea.
   Mount Type: Pipe
   Centerline of the antenna: 99' AGL

4. **Coax Cable**
   Number of lines: (13) Total (2) Hybrid – See Below
   Type: (13) Andrew LDF7-50A
   Size: 1-5/8"

5. **Tower Mounted Amplifiers (TMAs)**
   Quantity: (3) Total; (1) per Sector
   Manufacturer: Andrew
   Model: ETW200VS12UB
   Dimensions: 7.7" x 6.3" x 3.1"
   Weight: 11 lbs. ea.
   Mounting: Pipe

6. **Diplexers**
   Quantity: none
   Manufacturer:
   Model:
   Dimensions:
   Weight:
   Mounting:

7. **Remote Radio Heads (RRHs)**
   Quantity: (6)
   Manufacturer: Nokia
   Model: (3) FRIG; (3) FXFC
   Dimensions: 16.4" x 6" x 20.1" 22" x 19.3" x 5.2"
   Weight: 57.3 lbs. 55 lbs.
   Mounting: Pipe
   Hybrid Jumper:

8. **Distribution Box (COVP)**
   Quantity: (4) Total; (1) Shelter plus (1) per Sector
   Manufacturer: RayCap
   Model: DC4-48-60-8-20F
   Dimensions: 16.1" x 5.8" x 20.4"
   Weight: 17 lbs. ea.

9. **Sector Box**
   Quantity: none
   Manufacturer:
   Model:
   Dimensions:
   Weight:

10. **Hybrid Cable**
    Type: (1) Nokia Hybrid (1.584" dia.), (1) Commscope; Bundled LMU H (1.3" dia.)
    Number of Lines: (2)
    - From main cabinet to tower-mounted equipment

11. Frequencies

Svc	Technology	EIRP (Watts)	Std Frequency	Freq Tx/Start	Freq Tx/Stop	Freq Rx/Start	Freq Rx/Stop
1	GSM	1600		1865	1885	1945	1965
2	UMTS/AWS	1600		1735	1755	2135	2155
3	LTE	1600		1735	1755	2135	2155
4	LTE 700	1600		698	704	728	734

12. Proposed Scope of Work

Remove: NA

Replace: NA

Add: (3) Antennas
(3) RRUs
(1) Hybrid cables