T · ·Mobile·

VIA CERTIFIED U.S. MAIL,
RETURN RECEIPT REQUESTED

October 18, 2016

Fort Bend County
301 Jackson, Suite 719
Richmond, Texas 77469

Attn: Honorable Robert E. Hebert,
County Judge, Fort Bend County, Texas

And to:

Fort Bend County Purchasing Agent
4520 Reading Road, Suite A
Rosenberg, TX 77471

Re: T-Mobile Site #: A3F0194A / William Travis Building
Site Address: 309 South 4th Street, Richmond, TX 77469
Acknowledgment and Consent Letter for Upgrade and Modification of Antenna Facilities

Your Honor and Purchasing Agent,

T-Mobile West LLC, a Delaware limited liability company, successor by conversion or merger to T-Mobile West Corporation., a Delaware corporation and VoiceStream Houston, Inc. a Delaware Corporation ("Licensee"), and Fort Bend County, a body corporate and politic under the laws of the State of Texas ("Licensor") entered into a Lease Agreement ("the Lease") dated April 6, 2004, for site located at 309 South 4th Street, Richmond, TX, upon which T-Mobile operates wireless antenna facilities.

Pursuant to the Lease, specifically **Section 1 USE.** The Leased Premises are hereby leased to Lessee as a site for a communications facility consisting of antennae and associated cabling and equipment as more particularly described below. (the "Antenna Facility") and for any other lawful purpose consistent with related communications applications, for which Lessee may use the Leased Premises. Lessee shall have the right to erect, construct, operate, maintain, repair and replace on the leased Premises a single 10'x20' footprint for its radio equipment on the Leased Premises three all-weather outdoor cabinets and one (1) all-weather battery backup cabinet holding its radios and emergency batteries in the event of a power failure. Lessee agrees and shall be required to light the Antenna Facility in any manner required by the Federal Aviation Agency. Within the confines of each antenna footprint, Lessee shall have the right to erect, construct, operate, maintain, repair and replace a sled mount weighted down with ballast. Two (2) antennae will be mounted on the front of each sled approximately 10' – 12' apart.

By First Amendment to Lease Agreement dated July 24, 2012 the terms of the Lease Agreement were amended to allow additional equipment as reflected by the construction drawings attached thereto and made a part thereof. Specifically, the antenna count was increased to nine (9) antennas and additional hardware added.

T-Mobile needs to upgrade and modify the antenna facilities by removing three (3) antenna and installing the new equipment described in attached Construction Drawings, all pursuant to the terms and conditions contained in the Lease Agreement and First Amendment to the Lease Agreement, during the fourth quarter of 2016. All of the new equipment will be installed within the existing leased premises. Enclosed is a copy of the passing Structural Analysis for your records.

To confirm your approval of the proposed upgrade and modifications to the antenna facilities, please sign and date both counterparts of this letter and the first page of the construction drawings, keeping one for your records and return the other in the enclosed envelope.

If you have any questions, please contact me at (713) 407-3494 or via email at Anthony.Randio@T-Mobile.com.

Thank you for your cooperation and attention to this matter.

Sincerely,

T-Mobile West LLC

Anthony (Tony) Randio
Development Manager

Acknowledged, Accepted and Agreed:

Landlord: Fort Bend County

By: Robert Hebert

Name: Robert Hebert

Title: County Judge

Date: 12-13-2016

L1900 CAPACITY ADDITION

SITE NAME: WILLIAM TRAVIS BUILDING
SITE NUMBER: A3F0194A
STRUCTURE TYPE: ROOFTOP
MARKET: HOUSTON

T-Mobile

CONSTRUCTION DRAWINGS
APPROVED BY: _____
DATE: _____

SIGN HERE

DRAWING INDEX

T1	TITLE SHEET
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APPROVALS

THE FOLLOWING PARTIES HEREBY APPROVE AND ACCEPT THESE DOCUMENTS AND AUTHORIZE THE CONTRACTOR TO PROCEED WITH THE CONSTRUCTION DESCRIBED HEREIN. ALL DOCUMENTS ARE SUBJECT TO REVIEW BY THE LOCAL BUILDING DEPARTMENT AND MAY IMPOSE CHANGES OR MODIFICATIONS.

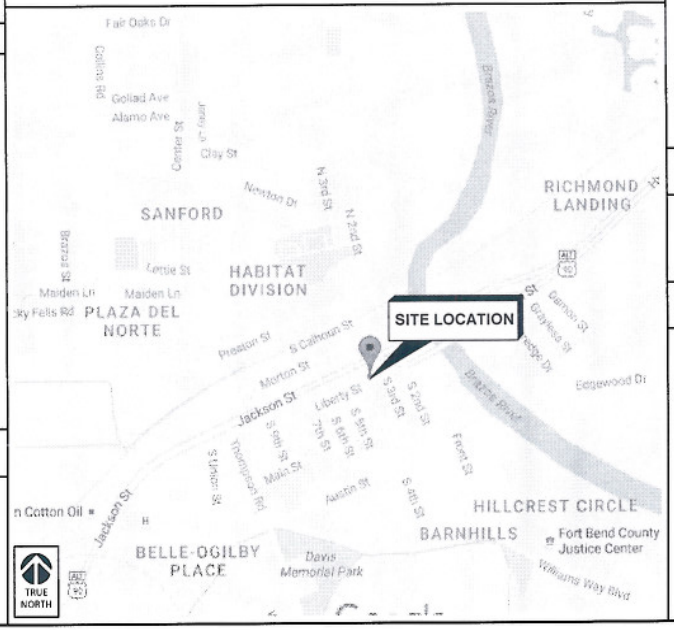
TITLE	SIGNATURE	DATE
T-MOBILE RF ENGINEER		
T-MOBILE REPRESENTATIVE		
CONSTRUCTION MANAGER		
SITE ACQUISITION		
SITE OWNER		
PROJECT MANAGER		

ONE CALL

Texas 811
CALL TEXAS811
ONE CALL - DIAL 811
CALL 3 WORKING DAYS
BEFORE YOU DIG
1-800-344-8377

MAP AND DIRECTIONS

FROM T-MOBILE SWITCH 4660 N SAM HOUSTON E, HEAD EAST ON TEXAS 8 BELTWAY FRONTAGE RD TOWARDS VICKERY DR. SLIGHT RIGHT ONTO TEXAS 8 BELTWAY FRONTAGE RD E. SLIGHT RIGHT ONTO 4TH ST/EASTEX FREEWAY SERVICE RD. USE THE LEFT LANE TO TAKE THE S INTERSTATE 69/S 59 SLIP ROAD. MERGE ONTO HWY 59 S/I-69. TAKE THE WILLIAMS WAY BLVD EXIT. TURN RIGHT ONTO WILLIAMS WAY BLVD. CONTINUE ONTO FRONT ST. TURN LEFT ONTO FRONT ST/MAIN ST. CONTINUE TO FOLLOW MAIN ST. TURN RIGHT AT THE 2ND CROSS STREET ONTO S 3RD ST. TURN LEFT ONTO LIBERTY ST.



PROJECT INFORMATION

SCOPE OF WORK:
1) THE WIRELESS COMMUNICATIONS FACILITY IS NOT INTENDED FOR HUMAN OCCUPANCY
2) THIS FACILITY DOES NOT REQUIRE POTABLE WATER AND WILL NOT PRODUCE ANY SEWAGE.
3) THE SCOPE OF WORK CONSISTS OF MODIFYING THE EXISTING WIRELESS INSTALLATION:
   A. INSTALL (3) NEW FRBG & (3) NEW FHFB
   B. INSTALL (3) NEW FRIJ
   C. REPLOCATED (1) FXFB TO FCOA CABINET
   D. INSTALL (3) NEW ANTENNAS
   E. INSTALL (3) TMA'S
   F. EXISTING (3) ANTENNAS TO BE REMOVED
   G. EXISTING (3) FRIA TO BE REMOVED
   H. EXISTING (2) FXFB TO BE REMOVED
   I. EXISTING (3) FRIG TO BE REMOVED
   F. INSTALL SYSTEM/RADIO MODULES IN EXISTING CABINET
4) THE PROPOSED ELECTRICAL WORK FOR THE SCOPE OF THIS PROJECT IS LOW VOLTAGE DC POWER ONLY

RFDS VERSION: 1.1
LATITUDE (NAD 83): 29.58166666° (29° 34' 54.00" N)
LONGITUDE (NAD 83): -95.7609444° (-95° 45' 39.39" W)
JURISDICTION: CITY OF RICHMOND

CONSULTING TEAM

ENGINEER:	APPLICANT:	PROPERTY OWNER:
ARIA SERVICES, INC. 10006 LYNBROOK DR. HOUSTON, TX 77042 CONTACT: IRSAN TISNABUDI PHONE: 281-797-4387	T-MOBILE USA 2 GREENWAY PLAZA, SUITE 1100 HOUSTON, TX 77046	FORT BEND COUNTY CONTACT: J.C. WHITTEN 281-344-3950

BUILDING CODES

ALL WORK SHALL BE PERFORMED AND MATERIALS INSTALLED IN ACCORDANCE WITH THE CURRENT EDITIONS OF THE FOLLOWING APPLICABLE CODES AS ADOPTED BY THE LOCAL GOVERNING AUTHORITIES.

1. IBC 2012 BUILDING/DWELLING CODE
2. IBC 2012 STRUCTURAL CODE
3. 2012 UPC PLUMBING COVE
4. 2012 UMC MECHANICAL CODE
5. 2014 NEC ELECTRICAL CODE
6. 2012 IFC FIRE CODE
7. 2009 IECC (ENERGY CONSERVATION CODE)

THIS TOWER WAS BUILT PRIOR TO JANUARY 1, 2016. THE SCOPE OF THIS PROJECT DOES NOT INVOLVE EMERGENCY RESPONSE EQUIPMENT.

THE TELECOMMUNICATIONS FACILITY WILL NOT PROVIDE SERVICE TO STRUCTURES AND/OR FACILITIES DESIGNATED IN A RISK CATEGORY HIGHER THAN 2 AND IS NOT CONSIDERED ESSENTIAL TO EMERGENCY RESPONDERS TO COMPLETE THEIR TASK DURING AN EMERGENCY EVENT.

DESIGN WIND SPEED 110mph 3-SECOND GUST (EQUIVALENT TO 142mph ULTIMATE WIND SPEED) FOR THIS SITE LOCATION.

EXPOSURE CATEGORY C, STRUCTURAL CLASS II, TOPOGRAPHIC CATEGORY I.

PLANS PREPARED FOR:

T-Mobile

T-MOBILE USA
2 GREENWAY PLAZA, SUITE 1100
HOUSTON, TX 77046

PLANS PREPARED BY:

ARIA SERVICES, INC.
(281) 797-4387
www.aria-corp.com
TX FIRM REG# F-13104

SITE NAME:
WILLIAM TRAVIS BUILDING

SITE NUMBER:
A3F0194A

SITE ADDRESS:
309 S. 4TH
RICHMOND, TX 77469
FORT BEND COUNTY

REVISION HISTORY

REV	DATE	DESCRIPTION	BY
A	09/05/16	CONSTRUCTION REVIEW	RS

STAMP:

STATE OF TEXAS
MANSOUR SHIRVANI
91997
LICENSED PROFESSIONAL ENGINEER
10/11/16
TEXAS BOARD OF PROFESSIONAL ENGINEER # 91997

SHEET TITLE:
TITLE SHEET

SHEET NUMBER:
T1

SCALE IS BASED ON 22" x 34" "D" SIZE

GENERAL NOTES:

1. THE CONTRACTOR'S SCOPE OF WORK SHALL INCLUDE ALL ITEMS DEFINED IN THE CONTRACT DOCUMENTS. THE CONTRACT DOCUMENTS INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING: THE CONTRACT, SPECIFICATIONS AND CONSTRUCTION DRAWINGS.
2. ALL EQUIPMENT SUPPLIED BY THE OWNER SHALL BE PICKED UP BY THE CONTRACTOR AT THE APPROPRIATE WAREHOUSE.
3. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL WORK.
4. THE CONTRACTOR SHALL PROVIDE ON-SITE SUPERVISION AT ALL TIMES WHILE THE WORK IS BEING PERFORMED AND SHALL DIRECT ALL WORK, USING HIS BEST SKILL AND ATTENTION.
5. HE SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, PROCEDURES AND SEQUENCES FOR COORDINATING ALL PORTIONS OF THE WORK UNDER THE CONTRACT.
6. THE CONTRACTOR SHALL VISIT THE JOB SITE TO REVIEW THE SCOPE OF WORK AND EXISTING JOB SITE CONDITIONS INCLUDING, BUT NOT LIMITED TO, MECHANICAL, ELECTRICAL SERVICE AND OVERALL COORDINATION. THE CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO SUBMITTING HIS BID. ANY DISCREPANCIES, CONFLICTS OR OMISSIONS. ETC., SHALL BE REPORTED TO T-MOBILE CONSTRUCTION SUPERVISOR BEFORE PROCEEDING WITH THE WORK.
7. THE CONTRACTOR SHALL PROTECT ALL AREAS FROM DAMAGE WHICH MAY OCCUR DURING CONSTRUCTION. ANY DAMAGE TO NEW AND EXISTING CONSTRUCTION, STRUCTURE, LANDSCAPING OR EQUIPMENT SHALL BE IMMEDIATELY REPAIRED OR REPLACED TO THE SATISFACTION OF THE TENANT, BUILDING OWNER OR OWNER'S REPRESENTATIVE AT THE EXPENSE OF THE CONTRACTOR.
8. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE ALL EXISTING UTILITIES, WHETHER SHOWN HEREON OR NOT, AND TO PROTECT THEM FROM DAMAGE. THE CONTRACTOR SHALL BEAR ALL EXPENSES FOR REPAIR OR REPLACEMENT OF UTILITIES OR OTHER PROPERTY DAMAGED IN CONJUNCTION WITH THE EXECUTION OF WORK.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COMPLETE SECURITY OF THE SITE WHILE THE JOB IS IN PROGRESS AND UNTIL THE JOB IS COMPLETED.
10. THE CONTRACTOR SHALL PROVIDE TEMPORARY WATER, POWER AND TOILET FACILITIES AS REQUIRED BY THE CITY OR GOVERNING AGENCY.
11. THE CONTRACTOR AND ALL SUBORDINATE CONTRACTORS SHALL COMPLY WITH ALL LOCAL AND STATE REGULATIONS.
12. THE CONTRACTOR SHALL OBTAIN AND PAY FOR PERMITS, LICENSES AND INSPECTIONS NECESSARY FOR PERFORMANCE OF THE WORK AND INCLUDE THOSE IN THE COST OF THE WORK TO T-MOBILE.
13. FIGURED DIMENSIONS HAVE PRECEDENCE OVER DRAWING SCALE, AND DETAIL DRAWINGS HAVE PRECEDENCE OVER SMALL DRAWINGS. CHECK ACCURACY OF ALL DIMENSIONS IN THE FIELD. UNLESS SPECIFICALLY NOTED, DO NOT FABRICATE ANY MATERIALS OFF SITE, NOR DO ANY CONSTRUCTION UNTIL THE ACCURACY OF DRAWING DIMENSIONS HAVE BEEN VERIFIED AGAINST ACTUAL FIELD DIMENSIONS.
14. THE CONTRACTOR SHALL NOTIFY THE T-MOBILE CONSTRUCTION SUPERVISOR OF ANY CONFLICTS OR DISCREPANCIES IN THE CONTRACT DOCUMENTS OR HELD CONDITIONS PRIOR TO EXECUTING THE WORK IN QUESTION.
15. THE CONTRACTOR SHALL NOTIFY THE T-MOBILE CONSTRUCTION SUPERVISOR IF DETAILS ARE CONSIDERED UNSOUND, UNSAFE, NOT WATERPROOF OR NOT WITHIN CUSTOMARY TRADE PRACTICE. IF WORK IS PERFORMED, IT WILL BE ASSUMED THAT THERE IS NO OBJECTION TO THE DETAIL. DETAILS ARE INTENDED TO SHOW THE END RESULT OF THE DESIGN. MINOR MODIFICATIONS MAY BE REQUIRED TO SUIT JOB CONDITIONS, AND SHALL BE INCLUDED AS PART OF THE WORK.
16. EXISTING ELEVATIONS AND LOCATIONS TO BE JOINED SHALL BE VERIFIED BY THE CONTRACTOR BEFORE CONSTRUCTION. IF THEY DIFFER FROM THOSE SHOWN ON THE PLANS, THE CONTRACTOR SHALL NOTIFY THE T-MOBILE CONSTRUCTION SUPERVISOR SO THAT MODIFICATIONS CAN BE MADE BEFORE PROCEEDING WITH THE WORK.
17. ALL SYMBOLS AND ABBREVIATIONS USED ON THE DRAWINGS ARE CONSIDERED CONSTRUCTION STANDARDS. IF THE CONTRACTOR HAS QUESTIONS REGARDING THEIR EXACT MEANING, THE T-MOBILE CONSTRUCTION SUPERVISOR SHALL BE NOTIFIED FOR CLARIFICATION BEFORE PROCEEDING WITH THE WORK.
18. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY BLOCKING, BACKING, FRAMING, HANGERS OR OTHER SUPPORT FOR ALL OTHER ITEMS REQUIRING THE SAME.
19. CITY APPROVED PLANS SHALL BE KEPT IN A PLAN BOX AND SHALL NOT BE USED BY WORKMEN. ALL CONSTRUCTION SETS SHALL REFLECT SAME INFORMATION. AT ALL TIMES THESE ARE TO BE UNDER THE CARE OF THE JOB SUPERINTENDENT.
20. DESIGN DRAWINGS ARE DIAGRAMMATIC ONLY AND SHALL BE FOLLOWED AS CLOSELY AS ACTUAL CONSTRUCTION CONDITIONS WILL PERMIT. ANY ERROR, OMISSION, OR DESIGN DISCREPANCY SHALL BE BROUGHT TO THE ATTENTION OF THE T-MOBILE CONSTRUCTION SUPERVISOR FOR CLARIFICATION OR CORRECTION BEFORE CONSTRUCTION.
21. AS-BUILTS REQUIREMENTS: DO NOT USE RECORD DOCUMENTS FOR CONSTRUCTION PURPOSES. PROTECT RECORD DOCUMENTS FROM DETERIORATION AND LOSS IN A SECURE, FIRE-RESISTANT LOCATION. PROVIDE ACCESS TO RECORD DOCUMENTS FOR THE T-MOBILE CONSTRUCTION SUPERVISOR'S REFERENCE DURING NORMAL WORKING HOURS. MAINTAIN A CLEAN, UNDAMAGED SET OF BLUE OR BLACK LINE PRINTS OF CONTRACT DRAWINGS AND SHOP DRAWINGS. MARK THE SET TO SHOW THE ACTUAL INSTALLATION WHERE THE INSTALLATION VARIES SUBSTANTIALLY FROM THE WORK AS ORIGINALLY SHOWN. MARK WHICH DRAWINGS IS MOST CAPABLE OF SHOWING CONDITIONS FULLY AND ACCURATELY. WHERE SHOP DRAWINGS ARE USED, RECORD A CROSS-REFERENCE AT THE CORRESPONDING LOCATION ON THE CONTRACT DRAWINGS. GIVE PARTICULAR ATTENTION TO CONCEALED ELEMENTS THAT WOULD BE DIFFICULT TO MEASURE AND RECORD AT A LATER DATE. MARK RECORD SETS WITH RED ERASABLE PENCIL USE OTHER COLORS TO DISTINGUISH BETWEEN VARIATIONS IN SEPARATE CATEGORIES OF THE WORK. MARK NEW INFORMATION THAT IS IMPORTANT TO THE OWNER BUT WAS NOT SHOWN ON THE CONTRACT DRAWINGS, DETAILS OR SHOP DRAWINGS. NOTE RELATED CHANGE ORDER NUMBERS WHERE APPLICABLE. NOTE RELATED RECORD DRAWING INFORMATION AND PRODUCT DATA. UPON COMPLETION OF THE WORK. SUBMIT ONE (1) COMPLETE SET OF RECORD DOCUMENTS TO THE T-MOBILE CONSTRUCTION SUPERVISOR FOR THE OWNER'S RECORDS.

SITE WORK & DRAINAGE

PART 1 - GENERAL

1.1 SCOPE: CLEARING, GRUBBING, STRIPPING, EROSION CONTROL, SURVEY, LAYOUT, SUBGRADE PREPARATION AND FINISH GRADING AS REQUIRED TO COMPLETE THE NEW WORK SHOWN IN THESE PLANS.

1.2 REFERENCES:
- A. DEPARTMENT OF TRANSPORTATION CONSTRUCTION AND MATERIAL SPECIFICATIONS FOR THE STATE IN WHICH THE PROJECT IS LOCATED.
- B. ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS).
- C. OSHA (OCCUPATION SAFETY AND HEALTH ADMINISTRATION).

1.3 INSPECTION AND TESTING:
- A. FIELD TESTING OF EARTHWORK COMPACTION AND CONCRETE CYLINDERS SHALL BE PERFORMED BY SUBCONTRACTORS INDEPENDENT TESTING LAB. THIS WORK TO BE COORDINATED BY THE SUBCONTRACTOR.
- B. ALL WORK SHALL BE INSPECTED AND RELEASED BY THE GENERAL CONTRACTOR WHO SHALL CARRY OUT THE GENERAL INSPECTION OF THE WORK WITH SPECIFIC CONCERN TO PROPER PERFORMANCE OF THE WORK AS SPECIFIED AND/OR CALLED FOR ON THE DRAWINGS. IT IS THE SUBCONTRACTOR'S RESPONSIBILITY TO REQUEST TIMELY INSPECTIONS PRIOR TO PROCEEDING WITH FURTHER WORK THAT WOULD MAKE PARTS OF WORK INACCESSIBLE OR DIFFICULT TO INSPECT.

1.4 SITE MAINTENANCE AND PROTECTION:
- A. PROVIDE ALL NECESSARY JOB SITE MAINTENANCE FROM COMMENCEMENT OF WORK UNTIL COMPLETION OF THE SUBCONTRACT.
- B. CONTACT THE ONE-CALL UTILITY LOCATION SERVICE PRIOR TO ANY EXCAVATING ACTIVITIES TO HAVE LOCATIONS OF UNDERGROUND UTILITIES VERIFIED.
- C. AVOID DAMAGE TO THE SITE INCLUDING EXISTING FACILITIES, STRUCTURES, TREES AND SHRUBS DESIGNATED TO REMAIN. TAKE PROTECTIVE MEASURES TO PREVENT EXISTING FACILITIES THAT ARE NOT DESIGNATED FOR REMOVAL FROM BEING DAMAGED BY THE WORK.
- D. KEEP SITE FREE OF ALL PONDING WATER.
- E. PROVIDE EROSION CONTROL MEASURES IN ACCORDANCE WITH THE DEPARTMENT OF TRANSPORTATION CONSTRUCTION AND MATERIAL SPECIFICATIONS FOR THE STATE IN WHICH THE PROJECT IS LOCATED.
- F. PROVIDE AND MAINTAIN ALL TEMPORARY FENCING. BARRICADES. WARNING SIGNALS AND SIMILAR DEVICES NECESSARY TO PROTECT LIFE AND PROPERTY DURING THE ENTIRE PERIOD OF CONSTRUCTION. REMOVE ALL SUCH DEVICES UPON COMPLETION OF THE WORK.

PART 2 - PRODUCTS

2.1 SUITABLE BACKFILL: ASTM D2321 (CLASS I, II, III OR IVA) FREE FROM FROZEN LUMPS, REFUSE, STONES OR ROCKS LARGER THAN 3 INCHES IN ANY DIMENSION OR OTHER MATERIAL THAT MAY MAKE THE INORGANIC MATERIAL UNSUITABLE FOR BACKFILL.

2.2 NON-POROUS GRANULAR EMBANKMENT AND BACKFILL: ASTM D2321 (CLASS III, IVA OR IVB) COARSE AGGREGATE. FREE FROM FROZEN LUMPS, REFUSE, STONES OR ROCKS LARGER THAN 3 INCHES IN ANY DIMENSION OR OTHER MATERIAL THAT MAY MAKE THE INORGANIC MATERIAL UNSUITABLE FOR BACKFILL.

2.3 POROUS GRANULAR EMBANKMENT AND BACKFILL: ASTM D2321 (CLASS IA, IB OR II) COARSE AGGREGATE FREE FROM FROZEN LUMPS, REFUSE, STONES OR ROCKS LARGER THAN 3 INCHES IN ANY DIMENSION OR OTHER MATERIAL THAT MAY MAKE THE INORGANIC MATERIAL UNSUITABLE FOR BACKFILL.

2.4 SELECT STRUCTURAL FILL: GRANULAR FILL MATERIAL MEETING THE REQUIREMENTS OF ASTM E850-95. FOR USE AROUND AND UNDER STRUCTURES WHERE STRUCTURAL FILL MATERIAL ARE REQUIRED.

2.5 GRANULAR BEDDING AND TRENCH BACKFILL: WELL-GRADED SAND MEETING THE GRADATION REQUIREMENTS OF ASTM D2487 (SE OR SW-SM).

2.6 COARSE AGGREGATE FOR ACCESS ROAD SUBBASE COURSE SHALL CONFORM TO ASTM D2940.

2.7 UNSUITABLE MATERIAL: HIGH AND MODERATELY PLASTIC SILTS AND CLAYS (LL>45). MATERIAL CONTAINING REFUSE, FROZEN LUMPS, DEMOLISHED BITUMINOUS MATERIAL, VEGETATIVE MATTER, WOOD, STONES IN EXCESS OF 3 INCHES IN ANY DIMENSION, AND DEBRIS AS DETERMINED BY THE CONSTRUCTION MANAGER. TYPICAL THESE WILL BE SOILS CLASSIFIED BY ASTM AS PT, MH, CH, OH, ML, AND OL.

2.8 GEOTEXTILE FABRIC: MIRAFI 500X OR APPROVED EQUAL.

2.9 PLASTIC MARKING TAPE: SHALL BE ACID AND ALKALI RESISTANT POLYETHYLENE FILM SPECIFICALLY MANUFACTURED FOR MARKING AND LOCATING UNDERGROUND UTILITIES, 6 INCHES WIDE WITH A MINIMUM THICKNESS OF 0.004 INCH. TAPE SHALL HAVE MINIMUM STRENGTH OF 1500 PSI IN BOTH DIRECTIONS AND MANUFACTURED WITH INTEGRAL CONDUCTORS, FOIL BACKING OR OTHER MEANS TO ENABLE DETECTION BY A METAL DETECTOR WHEN BURIED UP TO 3 FEET DEEP. THE METALLIC CORE OF THE TAPE SHALL BE ENCASED IN A PROTECTIVE JACKET OR PROVIDED WITH OTHER MEANS TO PROTECT IT FROM CORROSION. TAPE COLOR SHALL BE RED FOR ELECTRIC UTILITIES AND ORANGE FOR TELECOMMUNICATION UTILITIES.

PART 3 - EXECUTION

3.1 GENERAL:
- A. BEFORE STARTING GENERAL SITE PREPARATION ACTIVITIES, INSTALL EROSION AND SEDIMENT CONTROL MEASURES. THE WORK AREA SHALL BE CONSTRUCTED AND MAINTAINED IN SUCH CONDITION THAT IN THE EVENT OF RAIN THE SITE WILL BE DRAINED AT ALL TIMES.
- B. BEFORE ALL SURVEY, LAYOUT, STAKING, AND MARKING, ESTABLISH AND MAINTAIN ALL LINES, GRADES, ELEVATIONS AND BENCHMARKS NEEDED FOR EXECUTION OF THE WORK.
- C. CLEAR AND GRUB THE AREA WITHIN THE LIMITS OF THE SITE. REMOVE TREES, BRUSH, STUMPS,RUBBISH AND OTHER DEBRIS AND VEGETATION RESTING ON OR PROTRUDING THROUGH THE SURFACE OF THE SITE AREA TO BE CLEARED.
  1. REMOVE THE FOLLOWING MATERIALS TO A DEPTH OF NO LESS THAN 12 INCHES BELOW THE ORIGINAL GROUND SURFACE: ROOTS, STUMPS, AND OTHER DEBRIS, BRUSH, AND REFUSE EMBEDDED IN OR PROTRUDING THROUGH THE GROUND SURFACE, RAKE, DISK OR PLOW THE AREA TO A DEPTH OF NO LESS THAN 6 INCHES, AND REMOVE TO A DEPTH OF 12 INCHES ALL ROOTS AND OTHER DEBRIS THEREBY EXPOSED.
  2. REMOVE TOPSOIL MATERIAL COMPLETELY FROM THE SURFACE UNTIL THE SOIL NO LONGER MEETS THE DEFINITION OF TOPSOIL. AVOID MIXING TOPSOIL WITH SUBSOIL OR OTHER UNDESIRABLE MATERIALS.
  3. EXCEPT WHERE EXCAVATION TO GREATER DEPTH IS INDICATED, FILL DEPRESSIONS RESULTING FROM CLEARING, GRUBBING AND DEMOLITION WORK COMPLETELY WITH SUITABLE FILL.
- D. REMOVE FROM THE SITE AND DISPOSE IN AN AUTHORIZED LANDFILL ALL DEBRIS RESULTING FROM CLEARING AND GRUBBING OPERATIONS. BURNING WILL NOT BE PERMITTED.
- E. PRIOR TO EXCAVATING, THOROUGHLY EXAMINE THE AREA TO BE EXCAVATED AND/OR TRENCHED TO VERIFY THE LOCATIONS OF FEATURES INDICATED ON THE DRAWINGS AND TO ASCERTAIN THE EXISTENCE AND LOCATION OF ANY STRUCTURE, UNDERGROUND STRUCTURE, OR OTHER ITEM NOT SHOWN THAT MIGHT INTERFERE WITH THE NEW CONSTRUCTION. NOTIFY THE CONSTRUCTION MANAGER OF ANY OBSTRUCTIONS THAT WILL PREVENT ACCOMPLISHMENT OF THE WORK AS INDICATED ON THE DRAWINGS.
- F. SEPARATE AND STOCK PILE ALL EXCAVATED MATERIALS SUITABLE FOR BACKFILL. ALL EXCESS EXCAVATED AND UNSUITABLE MATERIALS SHALL BE DISPOSED OF OFF-SITE IN A LEGAL MANNER.

3.2 BACKFILL:
- A. AS SOON AS PRACTICAL, AFTER COMPLETING CONSTRUCTION OF THE RELATED STRUCTURE, INCLUDING EXPIRATION OF THE SPECIFIED MINIMUM CURING PERIOD FOR CAST-IN-PLACE CONCRETE, BACKFILL THE EXCAVATION WITH APPROVED MATERIAL TO RESTORE THE REQUIRED FINISHED GRADE.
  1. PRIOR TO PLACING BACKFILL AROUND STRUCTURES, ALL FORMS SHALL BE REMOVED AND THE EXCAVATION CLEANED OF ALL TRASH, DEBRIS, AND UNSUITABLE MATERIALS.
  2. BACKFILL BY PLACING AND COMPACTING SUITABLE BACKFILL MATERIAL OR SELECT GRANULAR BACKFILL MATERIAL WHEN REQUIRED IN UNIFORM HORIZONTAL LAYERS OF NO GREATER THAN 8-INCHES LOOSE THICKNESS AND COMPACTED. WHERE HAND OPERATED COMPACTORS ARE USED, THE FILL MATERIAL SHALL BE PLACED IN LIFTS NOT TO EXCEED 4 INCHES IN LOOSE DEPTH AND COMPACTED.
  3. WHENEVER THE DENSITY TESTING INDICATES THAT THE CONTRACTOR HAS NOT OBTAINED THE SPECIFIED DENSITY, THE SUCCEEDING LAYER SHALL NOT BE PLACED UNTIL THE SPECIFICATION REQUIREMENTS ARE MET UNLESS OTHERWISE AUTHORIZED BY THE GEOTECHNICAL ENGINEER. THE CONTRACTOR SHALL TAKE WHATEVER APPROPRIATE ACTION IS NECESSARY, SUCH AS DISKING AND DRYING, ADDING WATER, OR INCREASING THE COMPACTIVE EFFORT TO MEET THE MINIMUM COMPACTION REQUIREMENTS.
- B. THOROUGHLY COMPACT EACH LAYER OF BACKFILL TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY AS PROVIDED BY THE STANDARD PROCTOR TEST, ASTM D 698.

3.3 TRENCH EXCAVATION:
- A. UTILITY TRENCHES SHALL BE EXCAVATED TO THE LINES AND GRADES SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE GENERAL CONTRACTOR. PROVIDE SHORING, SHEETING AND BRACING AS REQUIRED TO PREVENT CAVING OR SLOUGHING OF THE TRENCH WALLS. EXTEND THE TRENCH WIDTH A MINIMUM OF 6 INCHES BEYOND THE OUTSIDE EDGE OF THE OUTERMOST CONDUIT.
- B. WHEN SOFT YIELDING, OR OTHERWISE UNSTABLE SOIL CONDITIONS ARE ENCOUNTERED, BACKFILL AT THE REQUIRED TRENCH TO A DEPTH OF NO LESS THAN 12 INCHES BELOW THE REQUIRED ELEVATION AND BACKFILL WITH GRANULAR BEDDING MATERIAL.

3.4 TRENCH BACKFILL:
- A. PROVIDE GRANULAR BEDDING MATERIAL IN ACCORDANCE WITH THE DRAWINGS AND THE UTILITY REQUIREMENTS.
- B. NOTIFY THE GENERAL CONTRACTOR 24 HOURS IN ADVANCE OF BACKFILLING.
- C. CONDUCT UTILITY CHECK TESTS BEFORE BACKFILLING. BACKFILL AND COMPACT TRENCH BEFORE ACCEPTANCE TESTING.
- D. PLACE GRANULAR TRENCH BACKFILL UNIFORMLY ON BOTH SIDES OF THE CONDUITS IN 6-INCH UNCOMPACTED LIFTS UNTIL 12 INCHES OVER THE CONDUITS. SOLIDLY RAM AND TAMP BACKFILL INTO SPACE AROUND CONDUITS.
- E. PROTECT CONDUIT FROM LATERAL MOVEMENT, IMPACT DAMAGE, OR UNBALANCED LOADING.
- F. ABOVE THE CONDUIT EMBEDMENT ZONE, PLACE AND COMPACT SATISFACTORY BACKFILL MATERIAL IN 8-INCH MAXIMUM LOOSE THICKNESS LIFTS TO RESTORE THE REQUIRED FINISHED SURFACE GRADE.
- G. COMPACT FINAL TRENCH BACKFILL TO A DENSITY EQUAL TO OR GREATER THAN THAT OF THE EXISTING UNDISTURBED MATERIAL IMMEDIATELY ADJACENT TO THE TRENCH BUT NO LESS THAN A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY AS PROVIDED BY THE STANDARD PROCTOR TEST, ASTM D 698.

3.6 FINISH GRADING:
- A. PERFORM ALL GRADING TO PROVIDE POSITIVE DRAINAGE AWAY FROM STRUCTURES AND SMOOTH, EVEN SURFACE DRAINAGE OF THE ENTIRE AREA WITHIN THE LIMITS OF CONSTRUCTION. GRADING SHALL BE COMPATIBLE WITH ALL SURROUNDING TOPOGRAPHY AND STRUCTURES.
- B. UTILIZE SATISFACTORY FILL MATERIAL RESULTING FROM THE EXCAVATION WORK IN THE CONSTRUCTION OF FILLS, EMBANKMENTS AND FOR REPLACEMENT OF REMOVED UNSUITABLE MATERIALS.
- C. ACHIEVE FINISHED GRADE BY PLACING A MINIMUM OF 4 INCHES OF 1/2" - 3/4" CRUSHED STONE ON TOP SOIL STABILIZER FABRIC.
- D. REPAIR ALL ACCESS ROADS AND SURROUNDING AREAS USED DURING THE COURSE OF THIS WORK TO THEIR ORIGINAL CONDITION.

4.1 WORK SITE SAFETY
SAFETY IS OF PARAMOUNT CONCERN TO BOTH SITE WORKERS AND THE PUBLIC
- A. CONSTRUCTION WORK PRESENTS UNIQUE THREATS TO HEALTH AND SAFETY. THE CONTRACTOR IS RESPONSIBLE TO EDUCATE THEIR WORK FORCE OF THESE DANGERS AND LIMIT THEIR EXPOSURE TO HAZARDS. THIS EDUCATION SHALL INCLUDE BUT NOT BE LIMITED TO APPLICABLE TRAINING COURSES AND CERTIFICATIONS. PROPER PERSONAL PROTECTIVE EQUIPMENT USAGE, DAILY TAILGATE MEETINGS AND ANY OTHER PREVENTATIVE MEASURES WHICH MAY BE REASONABLY EXPECTED. THE CONTRACTOR AND ALL SUB-CONTRACTORS SHALL BE RESPONSIBLE FOR THE SAFETY OF THE WORK AREA, ADJACENT AREAS AND ANY PROPERTY OCCUPANTS WHO MAY BE AFFECTED BY THE WORK UNDER CONTRACT. THE CONTRACTOR SHALL REVIEW ALL LANDOWNER, PRIME CONTRACTOR, CARRIER, OSHA, AND LOCAL SAFETY GUIDELINES AND AT ALL TIMES SHALL CONFORM TO THE MOST RESTRICTIVE OF THESE STANDARDS TO ENSURE A SAFE WORKPLACE.
- B. TOWER WORK PRESENTS ADDITIONAL THREATS TO HEALTH AND SAFETY. ALL TOWER WORKERS WORKING ON A TOWER MUST BE ADEQUATELY TRAINED AND MONITORED TO ENSURE THAT SAFE WORK PRACTICES ARE LEARNED AND FOLLOWED. AS REQUIRED BY OSHA, WHEN WORKING ON EXISTING COMMUNICATION TOWERS, EMPLOYEES MUST BE PROVIDED WITH APPROPRIATE FALL PROTECTION, TRAINED TO USE THIS FALL PROTECTION PROPERLY, AND THE USE OF FALL PROTECTION MUST BE CONSISTENTLY SUPERVISED AND ENFORCED BY THE CONTRACTOR.
- C. ALL SAFETY EQUIPMENT SHALL BE INSPECTED ACCORDING TO ALL OSHA AND INDUSTRY SCHEDULED INTERVALS AND ALL INSPECTIONS SHALL BE DOCUMENTED PER APPLICABLE CODES AND STANDARDS.

PLANS PREPARED FOR:

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T-MOBILE USA
2 GREENWAY PLAZA, SUITE 1100
HOUSTON, TX 77046

PLANS PREPARED BY:

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(281) 797-4387
www.aria-corp.com
TX FIRM REG# F-13104

SITE NAME:

WILLIAM TRAVIS BUILDING

SITE NUMBER:

A3F0194A

SITE ADDRESS:

309 S. 4TH
RICHMOND, TX 77469
FORT BEND COUNTY

REVISION HISTORY

REV	DATE	DESCRIPTION	BY
A	09/05/16	CONSTRUCTION REVIEW	RS

STAMP:

STATE OF TEXAS
MANSOUR SHIRVANI
91997
LICENSED PROFESSIONAL ENGINEER
10/11/16
TEXAS BOARD OF PROFESSIONAL ENGINEER # 91997

SHEET TITLE:

GENERAL NOTES

SHEET NUMBER:

T2

SCALE IS BASED ON 22" x 34" "D" SIZE

PROJECT SPECIFICATION 16000 (ELECTRICAL)

PART 1 – GENERAL

1.1 SCOPE: THIS SPECIFICATION DESCRIBES THE MINIMUM REQUIREMENT FOR INSTALLATION OF ALL ELECTRICAL SYSTEMS.

1.2 REFERENCES: THE PUBLICATIONS LISTED BELOW FORM PART OF THIS SPECIFICATION. EACH PUBLICATION SHALL BE THE LATEST REVISION AND ADDENDUM IN EFFECT ON THE DATE THIS SPECIFICATION IS ISSUED FOR CONSTRUCTION, UNLESS NOTED OTHERWISE. EXCEPT AS MODIFIED BY THE REQUIREMENTS SPECIFIED HEREIN, OR THE DETAILS OF THE DRAWINGS, WORK INCLUDED IN THIS SPECIFICATION SHALL CONFORM TO THE APPLICABLE PROVISIONS OF THESE PUBLICATIONS.
- A. ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE)
- B. NESC (NATIONAL ELECTRICAL SAFETY CODE). LATEST EDITION
- C. NEC (NATIONAL ELECTRICAL CODE). LATEST EDITION
- D. NFPA 70 (NATIONAL FIRE PROTECTION ASSOCIATION)
- E. OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION), INCLUDING ALL APPLICABLE AMENDMENTS
- F. U.L (UNDERWRITERS LABORATORIES)

1.3 SYSTEM DESCRIPTION
- A. DESIGN REQUIREMENTS: THE CONTRACTOR SHALL INSTALL UNDERGROUND ELECTRICAL AND TELEPHONE CONDUITS AND CABLE AS SPECIFIED HEREIN AND AS SHOWN ON THE DRAWINGS.
- B. PERFORMANCE REQUIREMENTS: WHEN FINISHED, WORK SHALL BE IN A COMPLETE AND UNDAMAGED STATE, AS REQUIRED IN THE CONTRACT DOCUMENTS.

PART 2 – PRODUCTS

2.1 GENERAL
- A. ITEMS SHALL BE NEW AND SHALL BE INSTALLED ONLY IF IN FIRST-CLASS CONDITION.
- B. SUBSTITUTIONS FOR MATERIAL WILL BE PERMITTED ONLY BY WRITTEN APPROVAL OF THE T-MOBILE CONSTRUCTION SUPERVISOR.

2.2 MATERIALS: THE CONTRACTOR SHALL PROVIDE ALL MATERIAL EXCEPT AS SPECIFIED IN THE CONTRACT DOCUMENTS. ALL MATERIAL SHALL BE APPROVED AND LISTED BY OR BEAR THE U.L LABEL, AND WILL COMPLY WITH ANSI, IEEE AND NEMA STANDARDS WHERE APPLICABLE.
- A. CONDUITS:
  1. ALL UNDERGROUND CONDUIT SHALL BE SCHEDULE 40 PVC, SIZED AS SHOWN ON THE CONSTRUCTION DRAWINGS.
  2. ALL EXTERIOR ABOVEGROUND CONDUIT SHALL BE PER LOCAL CODE REQUIREMENTS.
  3. ALL INTERIOR CONDUIT SHALL BE EMT WITH COMPRESSION-TYPE FITTINGS.
  4. LIQUID-TIGHT FLEXIBLE METALLIC CONDUIT SHALL BE USED FOR OUTDOOR LOCATIONS WHERE FLEXIBLE CONNECTION IS REQUIRED.
- B. CABLES: CONDUCTORS FOR GENERAL WIRING SHALL BE NEC STANDARD ANNEALED COPPER WIRE WITH NEC 600 VOLT INSULATION.
  1. #8 AND LARGER-STRANDED TYPE. THHN OR THWN
  2. #10 AND SMALLER-SOLID TYPE THHN OR THWN
  3. CONDUCTORS IN CONDUIT IN OR ADJACENT TO HIGH HEAT SOURCE SHALL BE TYPE XHHW
  4. CONDUCTORS IN CONDUITS ABOVE ROOF. ON TOP OF ROOF OR INSIDE BUILT-UP ROOFING MATERIAL SHALL BE TYPE XHHW
- C. CONVENIENCE OUTLET: UNLESS NOTED OTHERWISE, SURFACE-MOUNTED OUTLETS FOR EXTERIOR LOCATIONS SHALL BE FERALOY, CAD/ZINC ELECTROPLATED WITH THREADED HUBS OR CONDUIT ENTRANCES DRILLED AND TAPPED. ALL COVERS SHALL BE SELF-CLOSING AND GASKETED. SURFACE MOUNTED OUTLETS FOR INTERIOR LOCATIONS SHALL BE GALVANIZED, PRESSED STEEL WITH COVER PLATE, SIERRA PLASTIC STYLE, IVORY COLOR.
- D. COAXIAL CABLE SUPPORTS
  1. ALL WAVE GUIDE SUPPORTS SHALL BE MANUFACTURED TO MEET ALL COAX MINIMUM BENDING REQUIREMENTS WAVE GUIDES, AND B1587 FOR 6 WAVE GUIDES. SUPPORTS SHALL BE PROVIDED 3-0" ON CENTERS.

PART 3 – EXECUTION

3.1 PREPARATION
- A. BEFORE LAYING OUT WORK. EXERCISE PROPER PRECAUTION TO VERIFY EACH MEASUREMENT.
- B. USE EXTREME CAUTION BEFORE EXCAVATING IN EXISTING AREAS TO LOCATE EXISTING UNDERGROUND SERVICES.

3.2 INSPECTION
- A. A VISUAL CHECK OF ELECTRICAL AND TELEPHONE CABLES. CONDUITS AND OTHER ITEMS SHALL BE MADE BY AN T-MOBILE CONSTRUCTION SUPERVISOR BEFORE THESE ITEMS ARE PERMANENTLY INSTALLED.
- B. THE CONTRACTOR SHALL NOTIFY THE T-MOBILE CONSTRUCTION SUPERVISOR 24 HOURS PRIOR TO TRENCH BACK FILL

3.3 INSTALLATION
- A. TRENCHING, BACK FILLING, BEDDING AND COMPACTING SHALL COMPLY WITH SITE WORK SPECIFICATIONS.
- B. DIG TRENCHES TO THE REQUIRED DEPTH AS SHOWN ON THE DRAWINGS WITHOUT POCKETS OR DIPS. REMOVE LARGE STONES FROM THE BOTTOM OF THE TRENCH AND FIRMLY TAMP LOOSE FILL IN THE BOTTOM BEFORE CONDUIT IS LAID.
- C. INSTALL UNDERGROUND CONDUIT WITH A MINIMUM 3-INCH TO 100-FOOT SLOPE OR TO A SLOPE SHOWN ON THE DRAWINGS.
- D. UNLESS SHOWN OTHERWISE ON THE DRAWINGS, TERMINATE AND CAP ALL STUB-UPS 12 INCHES ABOVE FINISHED GRADE ELEVATION.
- E. WHEREVER CONDUITS CROSS UNDER ROADWAYS, USE GALVANIZED RIGID STEEL CONDUITS IN ALL CASES, EXTENDING 5 FEET BEYOND THE EDGE OF THE ROAD BED. MINIMUM DEPTH FOR CONDUIT SHALL BE 4 FEET BELOW ROADWAY GRADE.
- F. MARK UNDERGROUND CONDUITS WITH A 6-INCH WIDE RED POLYETHYLENE TAPE BURIED 6 INCHES UNDER THE SURFACE DIRECTLY OVER THE CONDUITS. MARK THE TAPE THUS: CAUTION-BURIED ELECTRICAL CABLE.
- G. FOR SEALING CONDUITS, USE ONLY NONTHERMOPLASTIC COMPOUNDS SUCH AS J.M. DUXSEAU OR AN APPROVED SUBSTITUTE. THE COMPOUND SHALL HAVE NO EFFECT ON RUBBER OR RUBBER-UKE INSULATIONS, LEAD. ALUMINUM OR FERROUS ALLOYS; IT SHALL BE INSOLUBLE IN WATER AND WITHSTAND MAXIMUM TEMPERATURE RANGES OF THE LOCALITY.
- H. COAXIAL – REFER TO NOKIA ANTENNA AND COAXIAL CABLE INSULATION PROCEDURES.
- I. ANTENNA – REFER TO NOKIA ANTENNA AND COAXIAL CABLE INSULATION PROCEDURES.
- J. LNA/MHA – REFER TO NOKIA ANTENNA AND COAXIAL CABLE INSULATION PROCEDURES.

3.4 SAFETY IS OF PARAMOUNT CONCERN TO BOTH SITE WORKERS AND THE PUBLIC.
- A. ELECTRICAL WORK PRESENTS SPECIFIC THREATS TO THE HEALTH AND SAFETY OF WORKERS ON SITE. SPECIFICALLY ELECTROCUTIONS ARE THE FOURTH LEADING CAUSE OF DEATH ON CONSTRUCTION SITES. ALL ELECTRICAL WORKERS SHALL HAVE CURRENT CERTIFICATIONS WHICH SATISFY ALL TRAINING REQUIREMENTS FOR THE ELECTRICAL WORK THEY ARE PERFORMING PER OSHA STANDARDS. ALL ELECTRICAL WORKERS SHALL ADHERE TO ALL SAFETY RULES AND REGULATIONS FOR WORKER AND PUBLIC SAFETY. ALL WORK SHALL BE PERFORMED BY QUALIFIED ELECTRICIANS TRAINED FOR THE TYPE OF WORK AND THE VOLTAGES PRESENT FOR EACH TASK. THE CONTRACTOR SHALL REVIEW ALL LANDOWNER, PRIME CONTRACTOR, CARRIER, OSHA, NFPA 70, AND LOCAL SAFETY GUIDELINES AND AT ALL TIMES SHALL CONFORM TO THE MOST RESTRICTIVE OF THESE STANDARDS TO ENSURE A SAFE WORKPLACE.

PROJECT SPECIFICATION 16670 (GROUNDING)

PART 1 – GENERAL

1.1 SCOPE
- A. THIS SPECIFICATION PRESCRIBES THE REQUIREMENTS FOR FURNISHING, INSTALLATION AND TESTING OF THE GROUNDING CABLE, CONNECTORS AND ASSOCIATED COMPONENTS AS INDICATED ON THE DRAWINGS.
- B. APPLICATIONS OF ELECTRICAL GROUNDING AND BONDING WORK SPECIFIED IN THIS SPECIFICATION INCLUDE THE FOLLOWING:
  1. FENCE AND GATE POSTS
  2. ELECTRICAL POWER SYSTEMS
  3. GROUNDING ELECTRODES
  4. GROUND BUS BAR
  5. SERVICE EQUIPMENT
  6. ENCLOSURES
  7. MONOPOLE/LATTICE TOWER
  8. ICE BRIDGE

1.2 REFERENCES: THE PUBLICATIONS LISTED BELOW FORM PART OF THIS SPECIFICATION. EACH PUBLICATION SHALL BE THE LATEST REVISION AND ADDENDUM IN EFFECT ON THE DATE THIS SPECIFICATION IS ISSUED FOR CONSTRUCTION. UNLESS NOTED OTHERWISE. EXCEPT AS MODIFIED BY THE REQUIREMENTS SPECIFIED HEREIN. OR THE DETAILS OF THE DRAWINGS. WORK INCLUDED IN THIS SPECIFICATION SHALL CONFORM TO THE APPLICABLE PROVISIONS OF THESE PUBLICATIONS.
- A. ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE)
- B. IEEE (INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS)
- C. NEC (NATIONAL ELECTRICAL CODE), LATEST EDmON
- D. NEMA (NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION)
- E. NESC (NATIONAL ELECTRICAL SAFETY CODE). LATEST EDITION
- F. OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION)
- G. U.L (UNDERWRITERS LABORATORIES)
- H. APPLICABLE LOCAL CODES AND ORDINANCES

PART 2 – PRODUCTS

2.1 MATERIALS: EXCEPT AS OTHERWISE INDICATED, PROVIDE ELECTRICAL GROUNDING AND BONDING SYSTEMS INDICATED: WITH ASSEMBLY OF MATERIAL. INCLUDING, BUT NOT LIMITED TO, GROUNDING ELECTRODES, BONDING JUMPER AND ADDITIONAL ACCESSORIES NEEDED FOR A COMPLETE INSTALLATION. WHERE MORE THAN ONE TYPE COMPONENT PRODUCT MEETS INDICATED REQUIREMENTS. SELECTION IS INSTALLER'S OPTION. WHERE MATERIALS OR COMPONENTS ARE NOT INDICATED, PROVIDE PRODUCTS WHICH COMPLY WITH NEC. U.L AND IEEE REQUIREMENTS AND WITH ESTABLISHED INDUSTRY STANDARDS FOR THOSE APPLICATIONS INDICATED.

A. GROUNDING
1. THE EQUIPMENT SHALL BE GROUNDED AS FOLLOWS, AS SHOWN ON THE DRAWINGS AND IN COMPLIANCE WITH NEC ARTICLE 250 AND STATE AND LOCAL CODES.
2. GROUND RODS AND QUANTITY SHOWN ON THE DRAWINGS ARE DIAGRAMMATIC. THE CONTRACTOR SHALL PERFORM A GROUND-RESISTANCE-TO-EARTH TEST. SHOULD THE INSTALLATION HAVE A RESISTANCE OF 5 OHMS OR MORE, CONTRACTOR SHALL INSTALL MORE GROUND RODS AS NECESSARY SO THAT THE OVERALL GROUND-TO-EARTH RESISTANCE IS LESS THAN 5 OHMS.
3. INSTALL ELECTRICAL GROUNDING AND BONDING SYSTEMS AS INDICATED. IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, NEC'S "STANDARD OF INSTALLATION." AND IN ACCORDANCE WITH RECOGNIZED INDUSTRY PRACTICES TO ENSURE THAT PRODUCTS COMPLY WITH REQUIREMENTS.
4. COORDINATE WITH OTHER ELECTRICAL WORK AS NECESSARY TO INTERFACE INSTALLATION OF ELECTRICAL GROUNDING AND BONDING SYSTEMS.
5. INSTALL GROUND CONDUCTORS A MINIMUM OF 36 INCHES BELOW FINISHED GRADE WHICH ENCIRCLES THE TOWER AND EQUIPMENT AND ARE CONNECTED TO EACH DRIVEN GROUND ROD. GROUND TRENCH SHALL BE AT LEAST 24 INCHES AWAY FROM FOUNDATIONS.
6. TIGHTEN GROUNDING AND BONDING CONNECTORS, INCLUDING SCREWS AND BOLTS. IN ACCORDANCE WITH MANUFACTURER'S PUBLISHED TORQUE TIGHTENING VALUE FOR CONNECTORS AND BOLTS. WHERE MANUFACTURER'S TORQUING REQUIREMENTS ARE NOT INDICATED. TIGHTEN CONNECTIONS TO COMPLY WITH TIGHTENING TORQUE VALUE SPECIFIED IN U.L 466A TO ASSURE PERMANENT AND EFFECTIVE GROUNDING.
7. APPLY CORROSION-RESISTANT FINISH (NO-OX) TO FIELD-CONNECTIONS. AT COPPER GROUND BARS AND PLACES WHERE FACTORY APPLIED PROTECTIVE COATING HAVE BEEN DESTROYED. WHICH ARE SUBJECTED TO CORROSIVE AND/OR OXIDATION PROCESS.
8. ON EXISTING LATTICE TOWERS, WATER TOWERS AND ROOF TOPS WHEN A NEW GROUNDING SYSTEM IS INSTALLED. THE CONTRACTOR SHALL TIE THE NEW GROUND SYSTEM TO THE EXISTING WATER TOWER, LATTICE TOWER STRUCTURAL STEEL OR BUILDING STRUCTURAL STEEL AS THE CASE MAY BE AT LEAST AT ONE LOCATION SO THAT THEY ARE AT THE SAME POTENTIAL

B. GROUND RODS
1. GROUND RODS SHALL BE 5/8" DIAMETER 10'-0" LONG, COPPER CLAD DRIVEN ROD(S).
2. GROUND ROD(S) SHALL BE LOCATED AT THE PERIMETER OF EQUIPMENT AS TO CREATE A GROUND RING AS SHOWN ON THE DRAWINGS.
3. GROUND ROD(S) SHALL BE SPACED AT A MINIMUM SPACING OF 8'-0" AND A MAXIMUM SPACING OF 10'-0".
4. GROUND RODS SHELL BE BURIED BELOW THE FROSTLINE. AT NO TIME SHALL THIS DEPTH BE LESS THAN 18" BELOW FINISHED GRADE.
5. GROUND RODS WHICH CANNOT BE DRIVEN STRAIGHT DOWN THE ENTIRE (10) FEET, SHALL BE DRIVEN AT AN ANGLE NOT GRATER THAN 45 DEGREES (NEC 250-83 AND 250-84).
6. GROUND ROD LOCATIONS SHALL BE NOTED ON THE AS-BUILT DRAWING COMPLETE WITH DIMENSIONS.
7. PROVIDE GROUND TEST WELLS AS SHOWN ON THE CONSTRUCTION DRAWINGS.

C. GROUND CONDUCTOR
1. ALL DIRECT BURIED GROUND CONDUCTORS SHALL BE TINNED SOLID COPPER (#2 AWG) WIRE. BURIED GROUND CONDUCTOR SHALL BE INSTALLED AT MINIMUM DEPTH OF 36" BELOW GRADE.
2. ALL SUB GRADE GROUND CONNECTIONS SHALL BE MADE THROUGH THE USE OF EXOTHERMIC WELD PROCESS. CONNECTIONS SHALL INCLUDE ALL CABLE TO CABLE SPLICES, TEES AND ALL GROUND ROD CONNECTIONS. MOLD. WELD KITS, ETC..
SHALL BE MANUFACTURED BY CADWELD AND SHALL BE INSTALLED AS PER THE MANUFACTURER'S INSTRUCTIONS.
3. GROUND CONDUCTORS SHALL BE ROUTED IN THE SHORTEST AND STRAIGHTEST DISTANCES POSSIBLE TO MINIMIZE TRANSIENT VOLTAGE RISES. CONDUCTORS SHALL BE INSTALLED AS FOLLOWS:
- A. ALL GROUND CONDUCTORS SHALL FOLLOW A CONTINUOUS DOWNWARD PATTERN TO THE GROUND SOURCE. (NEVER RUN GROUND CONDUCTOR IN AN UPWARD DIRECTION.)
- B. CONDUCTORS SHALL BE INSTALLED WITH A MINIMUM OF 12 INCH MINIMUM BENDING RADIUS.
- C. WHEN THE MINIMUM BENDING RADIUS CANNOT BE ACHIEVED, GROUND CABLES SHALL BE ROUTED AT 90 DEGREE BENDS WITH THE USE OF EXOTHERMIC CONNECTIONS AT 90 DEGREES. THE INTENT IS TO ELIMINATE THE CABLE BEND RADIUS AND REPLACE THE RADIUS WITH AN EXOTHERMIC CONNECTION.

PART 3 – EXECUTION

3.1 PREPARATION
- A. ALL SURFACES TO WHICH GROUND CONNECTIONS WILL BE MADE SHALL BE FREE OF PAINT, GALVANIZING DIRECT CORROSION ETC..
- B. ALL METAL SURFACES EXPOSED ON GROUNDING SHALL BE EITHER COLD GALVANIZE, OR PAINTED TO MATCH ORIGINAL SURFACE.

3.2 EXAMINATION.
- A. EXAMINE AREAS AND CONDITIONS UNDER WHICH ELECTRICAL GROUNDING AND BONDING CONNECTIONS ARE TO BE MADE AND NOTIFY T-MOBILE CONSTRUCTION SUPERVISOR IN WRITING OF CONDITIONS DETRIMENTAL TO PROPER COMPLETION OF WORK. DO NOT PROCEED WITH WORK UNTIL UNSATISFACTORY CONDITIONS HAVE
- B. THE CONTRACTOR SHALL NOTIFY THE T-MOBILE CONSTRUCTION SUPERVISOR 24 HOURS PRIOR TO TRENCH BACK FILL ALL WORK DONE BELOW FINISHED GRADE SHALL BE INSPECTED BY THE AERIAL CONSTRUCTION SUPERVISOR DURING THAT PERIOD OR THE CONTRACTOR SHALL PROCEED.

3.3 GROUND TESTING
- A. THE CONTRACTOR SHALL TEST THE GROUND ELECTRODE ROD RESISTANCE IN ACCORDANCE WITH THE METHODS OF MEASUREMENT SHOWN IN THE FALL OF POTENTIAL METHOD.
- B. TEST INSTRUMENTS SHALL OPERATE AT A FREQUENCY OTHER THAN 60 HERTZ AND SHALL CONTAIN STRAY CURRENT AND DC FILTERS, FAULT CURRENT PROTECTION AND HAVE SENSITIVITY TO OPERATE A LOW SIGNAL STRENGTH.
- C. PRIOR TO TESTING, THE CONTRACTOR SHALL DE-ENERGIZE ALL POWER SOURCES, DISCONNECT THE ELECTRODE CONDUCTOR FROM THE GROUND ROD. WEAR HIGH VOLTAGE RUBBER SAFETY GLOVES AND WILL NOT HANDLE TEST INSTRUMENTS IF AT ALL POSSIBLE.
- D. GROUND TESTS ARE TO BE PERFORMED BY QUALIFIED PERSONS FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THE EQUIPMENT AND THE HAZARDS INVOLVED.
- E. AN INDEPENDENT, APPROVED OUTSIDE FIRM SHALL PERFORM THE GROUND TEST AS OUTLINED. ALL TEST RESULTS SHALL BE FORWARDED TO THE T-MOBILE CONSTRUCTION SUPERVISOR FOR APPROVAL.

CLOSE OUT DOCUMENTATION

CLOSEOUT BOOK CONTAINING THE FOLLOWING:
- A. AS BUILT DESIGN DRAWINGS
- B. SWEEP TEST RESULTS
- C. RESISTIVELY TEST
- D. PHOTO DOCUMENTATION OF:
  1. UNDERGROUND CONDUITS AND GROUND RING
  2. ANTENNA, COAXIAL JUMPER ATTACHMENTS AND GROUND KIT ATTACHMENTS
  3. ANTENNA DOWN TILT MEASUREMENT USING AN INCLINOMETER ON THE BACK PLANE OF THE ANTENNA
  4. GROUND BAR ATTACHMENTS
- E. SIGNED OFF PERMIT CARDS
- F. CERTIFICATE OF OCCUPANCY
- G. RETURN OF KEYS AND/OR ACCESS AUTHORIZATION
- H. ORIGINAL BUILDING PERMIT

NOTE:
NO NEW ELECTRICAL AC CIRCUITS REQUIRED FOR THIS PROJECT. NO NEW LOADING ON AC PANEL OR FEEDERS.

ELECTRICAL SCOPE OF WORK:
GROUNDING OF NEW EQUIPMENT PER T-MOBILE STANDARDS AND NEW DC CIRCUITS FROM EXISTING DC EQUIPMENT TO NEW EQUIPMENT PER MANUFACTURER REQUIREMENTS. MATCH EXISTING CONDUIT TYPES AND ROUTING IN FIELD. LOW VOLTAGE CABLES (+24, -48 V DC) FROM RADIOS TO ANTENNAS

PLANS PREPARED FOR:

T-Mobile

T-MOBILE USA
2 GREENWAY PLAZA, SUITE 1100
HOUSTON, TX 77046

PLANS PREPARED BY:

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TX FIRM REG# F-13104

SITE NAME:

WILLIAM TRAVIS BUILDING

SITE NUMBER:

A3F0194A

SITE ADDRESS:

309 S. 4TH
RICHMOND, TX 77469
FORT BEND COUNTY

REVISION HISTORY

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A	09/05/16	CONSTRUCTION REVIEW	RS

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10/11/16

TEXAS BOARD OF PROFESSIONAL ENGINEER # 91997

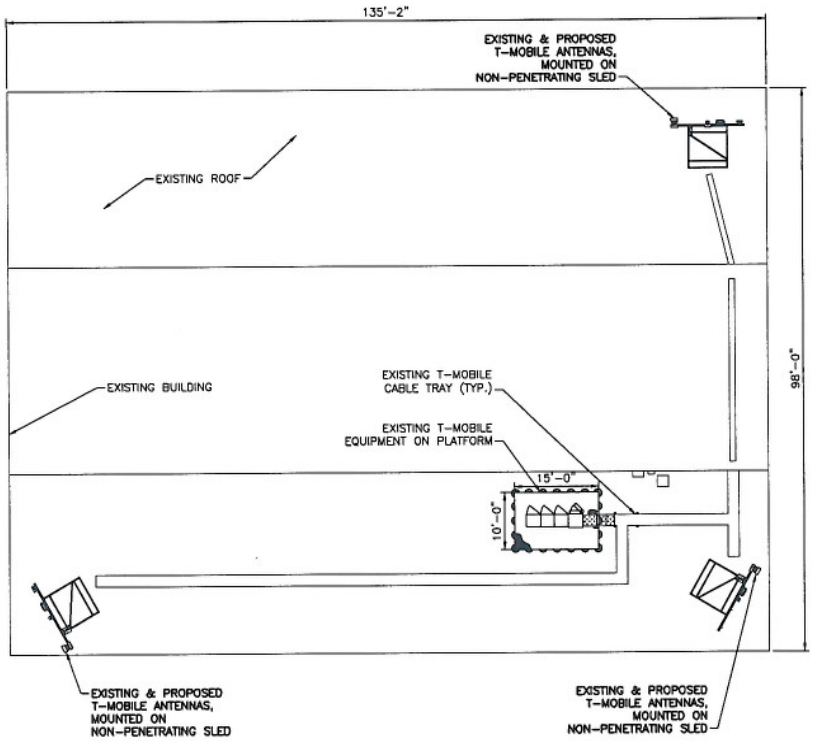
SHEET TITLE:

GENERAL NOTES

SHEET NUMBER:

T3

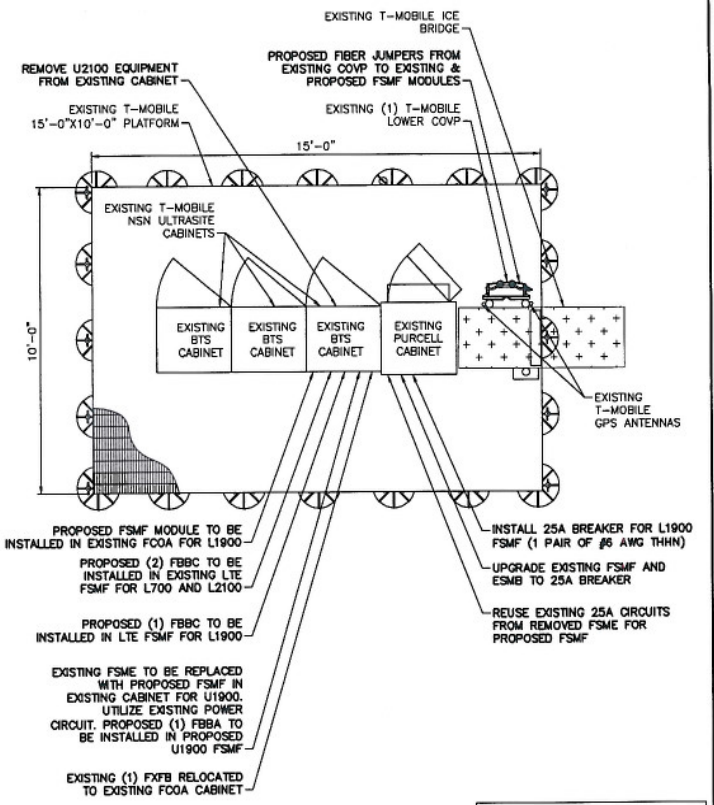
SCALE IS BASED ON 22" x 34" "D" SIZE



1 **SITE PLAN**
SCALE: 3/32" = 1'-0"

TRUE NORTH

SITE PLAN LAYOUT OBTAINED FROM A 07/29/16 SITE VISIT



2 **EQUIPMENT LAYOUT**
SCALE: 1/2" = 1'-0"

TRUE NORTH

LEGEND

- EXIST. EQUIPMENT
- NEW EQUIPMENT
- NEW DC POWER CABLE
- NEW FIBER CABLE

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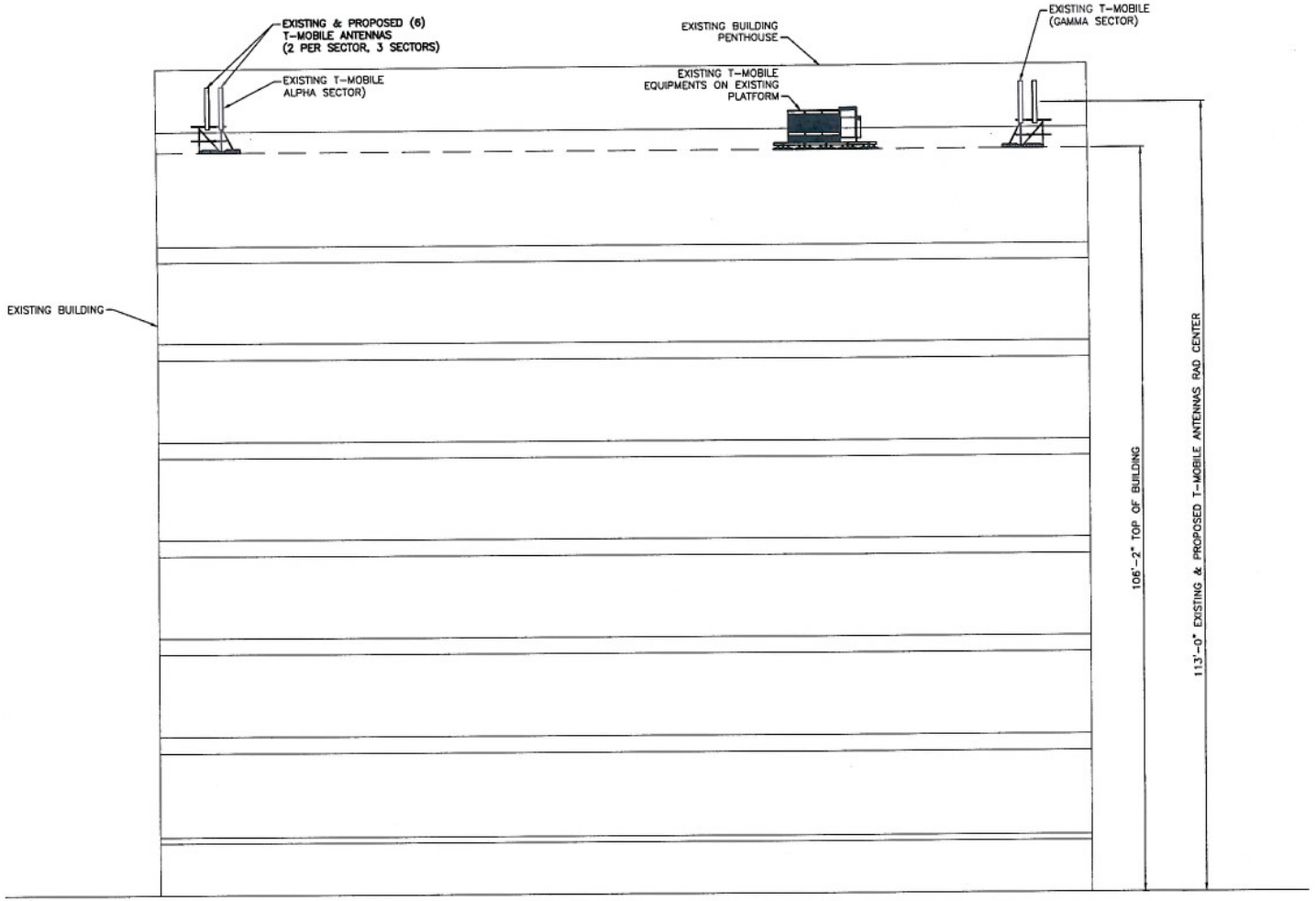
SHEET TITLE:
SITE PLAN & EQUIPMENT LAYOUT

SHEET NUMBER:
C1

SCALE IS BASED ON 22" x 34" "D" SIZE



1 **TOWER ELEVATION**
SCALE: NOT TO SCALE

FOR STRUCTURAL INTEGRITY OF THE TOWER, REFER TO STRUCTURAL ANALYSIS REPORT, DONE BY ARIA SERVICES, INC, DATED 08/25/16.

CONTRACTOR TO REFER TO LATEST RFDS PRIOR TO CONSTRUCTION.

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PROFESSIONAL ENGINEER

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TEXAS BOARD OF PROFESSIONAL ENGINEER # 91997

SHEET TITLE:
BUILDING ELEVATION

SHEET NUMBER:
C2

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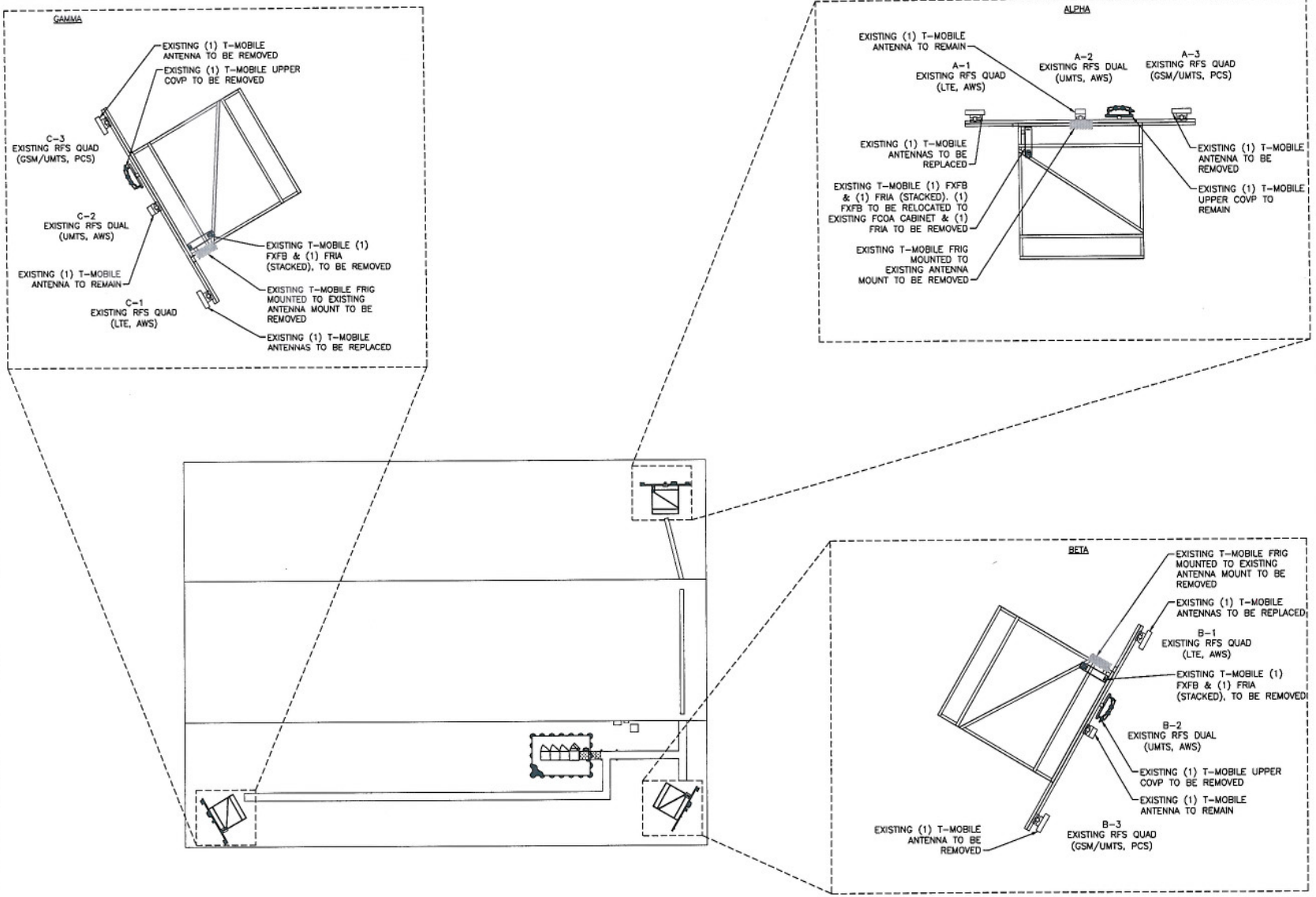

RAD CENTER
SECTOR 1 – 113'-0"
SECTOR 2 – 113'-0"
SECTOR 3 – 113'-0"

TRUE NORTH

1 EXISTING ANTENNA PLAN
SCALE: NOT TO SCALE

EXISTING AZIMUTHS:	
GSM/UMTS:	0°, 120°, 240°
LTE:	0°, 120°, 240°

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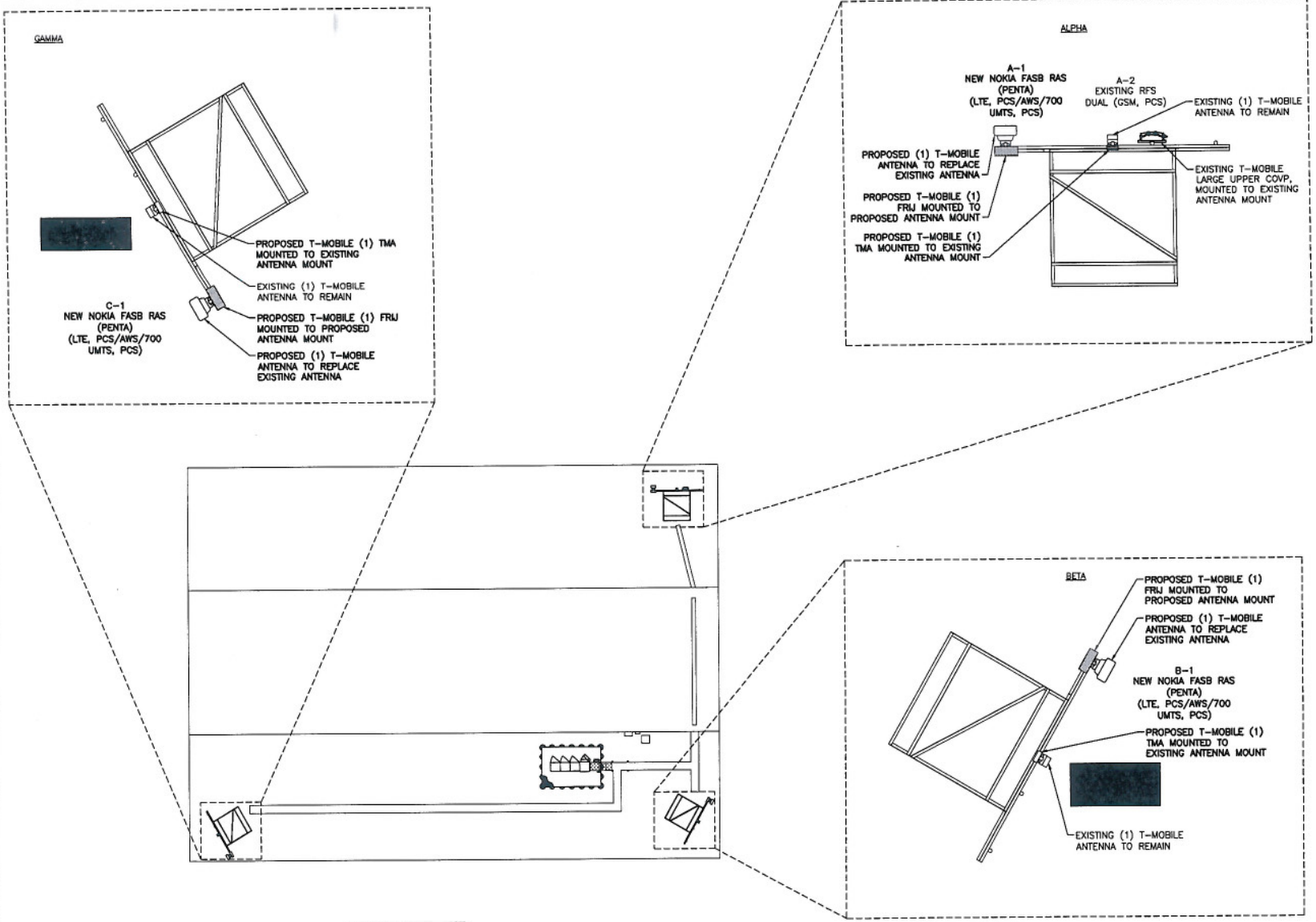
SHEET TITLE:

ANTENNA LAYOUT

SHEET NUMBER:

C2.1

SCALE IS BASED ON 22" x 34" "D" SIZE



RAD CENTER
SECTOR 1 – 113'-0"
SECTOR 2 – 113'-0"
SECTOR 3 – 113'-0"

TRUE NORTH

1 PROPOSED ANTENNA PLAN

SCALE: NOT TO SCALE

EXISTING AZIMUTHS:	
GSM/UMTS:	0°, 120°, 240°
LTE:	0°, 120°, 240°

PLANS PREPARED FOR:

T-Mobile

T-MOBILE USA
2 GREENWAY PLAZA, SUITE 1100
HOUSTON, TX 77046

PLANS PREPARED BY:

ARIA SERVICES, INC.
(281) 797-4387
www.aria-corp.com
TX FIRM REG# F-13104

SITE NAME:

WILLIAM TRAVIS BUILDING

SITE NUMBER:

A3F0194A

SITE ADDRESS:

309 S. 4TH
RICHMOND, TX 77469
FORT BEND COUNTY

REVISION HISTORY

REV	DATE	DESCRIPTION	BY
A	09/05/16	CONSTRUCTION REVIEW	RS

STAMP:

STATE OF TEXAS
MANSOUR SHIRVANI
91997
LICENSED PROFESSIONAL ENGINEER

10/11/16

TEXAS BOARD OF PROFESSIONAL ENGINEER # 91997

SHEET TITLE:

ANTENNA LAYOUT

SHEET NUMBER:

C2.2

SCALE IS BASED ON 22" x 34" "D" SIZE

TOWER TOP EQUIPMENT SCHEDULE

SECTOR	ANTENNA NUMBER	TECHNOLOGY	ANTENNA MODEL	ANTENNA AZIMUTH	RAD CENTER	TRANSMISSION CABLE		RRU MODEL	TMA/DIPLEXER MODEL	TOWER TOP COVP MODEL
						LENGTH	TYPE			
ALPHA	A1	(LTE, PCS/AWS/700 UMTS, PCS)	(P) NOKIA FASB RAS (PENTA)	0°	113'-0"	130'	(E) (1) 7/8" LOW CAP HYBRID CABLE	(P) (1) FRIJ	–	(1) (E) NSN LARGE COVP RAYCAP RNSDC-7771-PF-48
	A2	GSM PCS	(E) RFS (DUAL) APXV18-206517S-A20	0°	113'-0"	–	–	–	(P) (1) TMA RFS STYLE 1A- ATM1900D-1A20	
BETA	B1	(LTE, PCS/AWS/700 UMTS, PCS)	(P) NOKIA FASB RAS (PENTA)	120°	113'-0"	75'	(E) (1) 7/8" LOW CAP HYBRID CABLE	(P) (1) FRIJ	–	
	B2	GSM PCS	(E) RFS (DUAL) APXV18-206517S-A20	120°	113'-0"	–	–	–	(P) (1) TMA RFS STYLE 1A- ATM1900D-1A20	
GAMMA	C1	(LTE, PCS/AWS/700 UMTS, PCS)	(P) NOKIA FASB RAS (PENTA)	240°	113'-0"	155'	(E) (1) 7/8" LOW CAP HYBRID CABLE	(P) (1) FRIJ	–	
	C2	GSM PCS	(E) RFS (DUAL) APXV18-206517S-A20	240°	113'-0"	–	–	–	(P) (1) TMA RFS STYLE 1A- ATM1900D-1A20	

NOTE: (P) DENOTES PROPOSED EQUIPMENT, (E) DENOTES EXISTING EQUIPMENT

1 EQUIPMENT SCHEDULE
SCALE: NOT TO SCALE

2 NOT USED
SCALE: NOT TO SCALE

3 NOT USED
SCALE: NOT TO SCALE

PLANS PREPARED FOR:

T-Mobile

T-MOBILE USA
2 GREENWAY PLAZA, SUITE 1100
HOUSTON, TX 77046

PLANS PREPARED BY:

ARIA SERVICES, INC.
(281) 797-4387
www.aria-corp.com
TX FIRM REG# F-13104

SITE NAME:
WILLIAM TRAVIS BUILDING

SITE NUMBER:
A3F0194A

SITE ADDRESS:
309 S. 4TH
RICHMOND, TX 77469
FORT BEND COUNTY

REVISION HISTORY

REV	DATE	DESCRIPTION	BY
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91997
LICENSED PROFESSIONAL ENGINEER

10/11/16
TEXAS BOARD OF PROFESSIONAL ENGINEER # 91997

SHEET TITLE:
EQUIPMENT SCHEDULE & DETAILS

SHEET NUMBER:
C2.3

SCALE IS BASED ON 22" x 34" "D" SIZE

NOKIA

Nokia Networks

Preliminary Datasheet

Nokia FASB Antenna Specifications

Three Cross Polarized Column Antenna (2 x High Band, 1 x Low Band)

- 10-port antenna using 4.3-10 connectors for all antenna ports
- Independent electrical tilt for high and low bands.

General Specifications

Antenna type	XXXpol, Multiband
Operating Frequency bands	698 - 894 MHz (Xpol) | 1695 - 2690 MHz (XXpol)

Electrical Specifications

Frequency Band, MHz	Low Band		High Band 1			High Band 2	
	694-791	791-894	1695-1780	2095-2180	2300-2690	1850-1920	1930-2000
Gain, average [dBi]	16.0	16.2	17.3	18.0	18.1	17.4	17.6
Gain, Over All Tilts [dBi]	16.0 ± 0.4	16.2 ± 0.4	17.3 ± 0.4	18.0 ± 0.4	18.1 ± 0.4	17.4 ± 0.4	17.6 ± 0.4
Azimuth Beamwidth [°]	69 ± 4	67 ± 3	65 ± 4	63 ± 3	60 ± 4	63 ± 3	63 ± 3
Elevation Beamwidth [°]	10 ± 1	9 ± 1	6.0 ± 0.7	5.6 ± 0.5	5.5 ± 0.6	5.7 ± 0.5	5.7 ± 0.5
Electrical Downtilt [°]	2...12		2...12			2...12	
USLS [dB]	> 17		> 16			> 17	
Front-to-Back Ratio, at 180°±30° [dB]	> 25		> 25			> 25	
Cross Polar Isolation [dB]	> 30		> 30			> 30	
Isolation, Intersystem [dB]	> 30		> 30			> 30	
VSWR / Return Loss [dB]	< 1.5 | > 14		< 1.5 | > 14			< 1.5 | > 14	
Passive Intermodulation @(2x43dBm) [dBc]	< -150		< -150			< -150	
Input Power per Port, max [W] (CF= 8dB)	300		200			200	
Polarization [°]	± 45						
Impedance [Ohm]	50						

Mechanical Specifications

Radome Material	Fiberclass, UV resistant
Colour	RAL 7047
RF Connector Interface	4.3-10 Female, 10 pcs
RF Connector Location	Bottom
Lightning Protection	DC Ground

NOKIA

Nokia Networks

Dimensions

Depth	13.4 in (340 mm)
Height	96 in (2440 mm)
Width	14.9 in (380 mm)
Weight, antenna assembly	108 lb (49 kg)

Remote Electrical Tilt (RET) Information

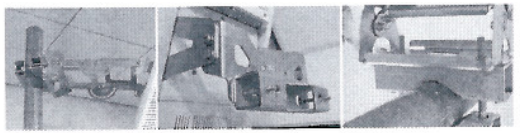
Protocol and RET interfaces	according to 3GPP/AISG 2.0 standards
RET Interface connectors	8-pin DIN Female / 8-pin DIN Male
RET Interface, quantity	Four DIN connectors, (1 pair for HB and one pair for LB)

Environmental Specifications

Environmental conditions for operation	ETSI EN 300 019-1-4 Class 4.1E
Environmental conditions for transportation	ETSI EN 300 019-1-2 Class 2.3
Environmental conditions for storage	ETSI EN 300 019-1-1 Class 1.2
Operational air temperature range	-40°C ...+50°C (with solar load 1120W/m²)
Earthquake	GR-63-CORE, Zone 4
Wind Loading, maximum at 200km/h wind,	Front: 1170N, Back: 950N, Side: 1230N
Wind Speed, maximum	200km/h steady wind, 67m/s wind gusts

Product Items Included

Full antenna, tilt brackets (upper and lower), jumper cables and related accessories



Confidential
Preliminary Datasheet
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1 ANTENNA SPECIFICATIONS
SCALE: NOT TO SCALE

PLANS PREPARED FOR:

T-Mobile

T-MOBILE USA
2 GREENWAY PLAZA, SUITE 1100
HOUSTON, TX 77046

PLANS PREPARED BY:

ARIA SERVICES, INC.
(281) 797-4387
www.aria-corp.com
TX FIRM REG# F-13104

SITE NAME:
WILLIAM TRAVIS BUILDING

SITE NUMBER:
A3F0194A

SITE ADDRESS:
309 S. 4TH
RICHMOND, TX 77469
FORT BEND COUNTY

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STATE OF TEXAS
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PROFESSIONAL ENGINEER

10/11/16
TEXAS BOARD OF PROFESSIONAL ENGINEER # 91997

SHEET TITLE:
EQUIPMENT DETAILS

SHEET NUMBER:
C3

SCALE IS BASED ON 22" x 34" "D" SIZE

ARIA SERVICES, INC.
6602 Harbor Town, Unit #101
Houston, TX 77036-4033
(281) 797-4387 – info@aria-corp.com
www.aria-corp.com TX Firm Reg# F-13104

May 05, 2012

Mr. Anthony J. Randio
T-Mobile
2 Greenway Plaza, Suite 1100
Houston, TX 77046

Subject:	**Structural Analysis Report**
Site Information:	**A3F0194A, William Travis Building, T-Mobile** **309 S. 4th, Richmond, TX 77469** **Jurisdiction: City of Richmond, TX** **Latitude: 29.5816666 / Longitude: -95.7609444**
Structure Type:	**Rooftop, Antenna @ 113'-0" Rad Center**

Mr. Randio,

Aria Services, Inc. is pleased to submit this report to determine the structural integrity of the existing standard non-penetrating antenna mount sled on rooftop to support the following load (per sector):

- Two (2) RFS model # APX17DWV_DWVS panel antenna (75.2" L x 13" W x 3.15" D, 55 lbs.)
- One (1) RFS model # APXV18-206517S_C panel antenna (72" L x 6.65" W x 3.15" D, 32.5 lbs.)
- One (1) FXFB radio module (19.4" W x 5.2" H x 16.6" D, 55.1 lbs.)
- One (1) FRIA radio module (17.6" W x 5.2" H x 15.6" D, 55.1 lbs.)
- One (1) FRIG behind APX17 antenna, (18.9" L x 15.24" W x 5.98" D, 57.3 lbs.)

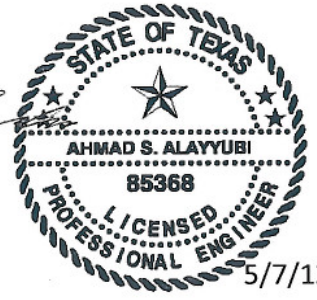
The enclosed calculation for the above condition has been executed in accordance with:

- 1996 TIA/EIA-222-F standard, 2006 International Building Code, and local code.
- Design wind speed 95 mph fastest mile wind/90 mph basic wind speed (equivalent to 110 mph, 3-second gust wind) for Richmond, Fort Bend County, TX.

Per the enclosed calculation, the existing antenna mount sleds on roof deck at rad center 113'-0" have been determined to be **structurally adequate** to support the loading listed above at the location shown on construction drawings.

Please refer to Appendices for analysis results, for loading, and mounting method to the structure. Should you need any further assistance, please do not hesitate to contact us.

Sincerely,



Ahmad Al-Ayyubi, P.E.
Engineering Supervisor

5/7/12

APPENDIX – A

Structural Calculations

Wind Force Calculations:

Code: TIA/EIA-222-F

Antenna rad. center: 145'-0" AGL

$q_{wind} = 0.00256 K_z \bar{V}^2 \times G_H \times C_F$

$K_z = \left(\frac{h}{33}\right)^{2/7} = \left(\frac{113}{33}\right)^{2/7}$ = 1.421

$V = 95$ mph (Fastest Mile) $= 110$ mph (3 − Second Gust)

$G_H = \frac{0.65}{\left(\frac{113}{33}\right)^{1/7}} + 0.60$ = 1.145

$q_{wind} = 0.00256\ x1.421 \times \overline{95^2} \times 1.145 \times 1 = 37.6\ psf$

New Antennas, with one (1) FRIG, negligible behind one APX17 antenna:

$A_F = \frac{2x\ 75.8" \times 13"}{144} + \frac{72" \times 6.65"}{144} = 17.01\ ft^2\ per\ sector$

Total Antennas Area = 17.01 ft^2 per sector

Radio Modules, (1) FXFB and (1) FRIA, mounted 2'-0" above sled base:

$A_F = \frac{19.4" \times 5.2"}{144} + \frac{17.6" \times 5.2"}{144} = 1.34\ ft^2\ per\ sector$

$F_{WIND1} = 37.6\ psf \times 17.01\ ft^2 = 639.74\#\ per\ sector$

$F_{WIND2} = 37.6\ psf \times 1.34\ ft^2 = 50.4\#\ per\ sector$

Average Height of Antennas above Roof =7'-0" +/-

Overturning moment = (639.74# x 7' + 50.4# x 2') = 4579$^{\#\text{-ft}}$

Factor of safety = 1.50

5/7/12

STATE OF TEXAS
AHMAD S. ALAYYUBI
85368
LICENSED PROFESSIONAL ENGINEER

Let W = Weight of total ballast per side

Sled weight & (3) 7', 2-3/8" mount pipes = $475^{\#}$
Appurtenances weight (3 RFS antennas & 3 Radio Modules)

$= 2 \times 55^{\#} + 1 \times 32.5^{\#} + 2 \times 55.1^{\#} \; 1 \times 57.3^{\#} +$ $= 310^{\#}$
Total sled & appurtenances weight $= 785^{\#}$
Stability Equation:

$$(1.5)(4579) = W\left(8.5 - \frac{1.0}{2}\right) + 785\,x\left(\frac{8.5}{2}\right)$$

$$W_{REQ'D} = 442^{\#}\ /side$$

For 4" x 8" x 16" Concrete Block

Weight / Block = $\frac{4" \times 8" \times 16"}{12^3} \times 120^{\#}/\,ft^3$ = 36# per block

Number of Blocks required = $\frac{442}{36}$ $= 12.5\ blocks\ per\ side$

Total Blocks Required per Sector 12.5 x 2 = 25 Blocks

Total Existing Blocks Weight 36x 36# +1x72# per sled = 1368 #
Total Required Blocks Weight per sled = 882 # < 1368#, **O.K**

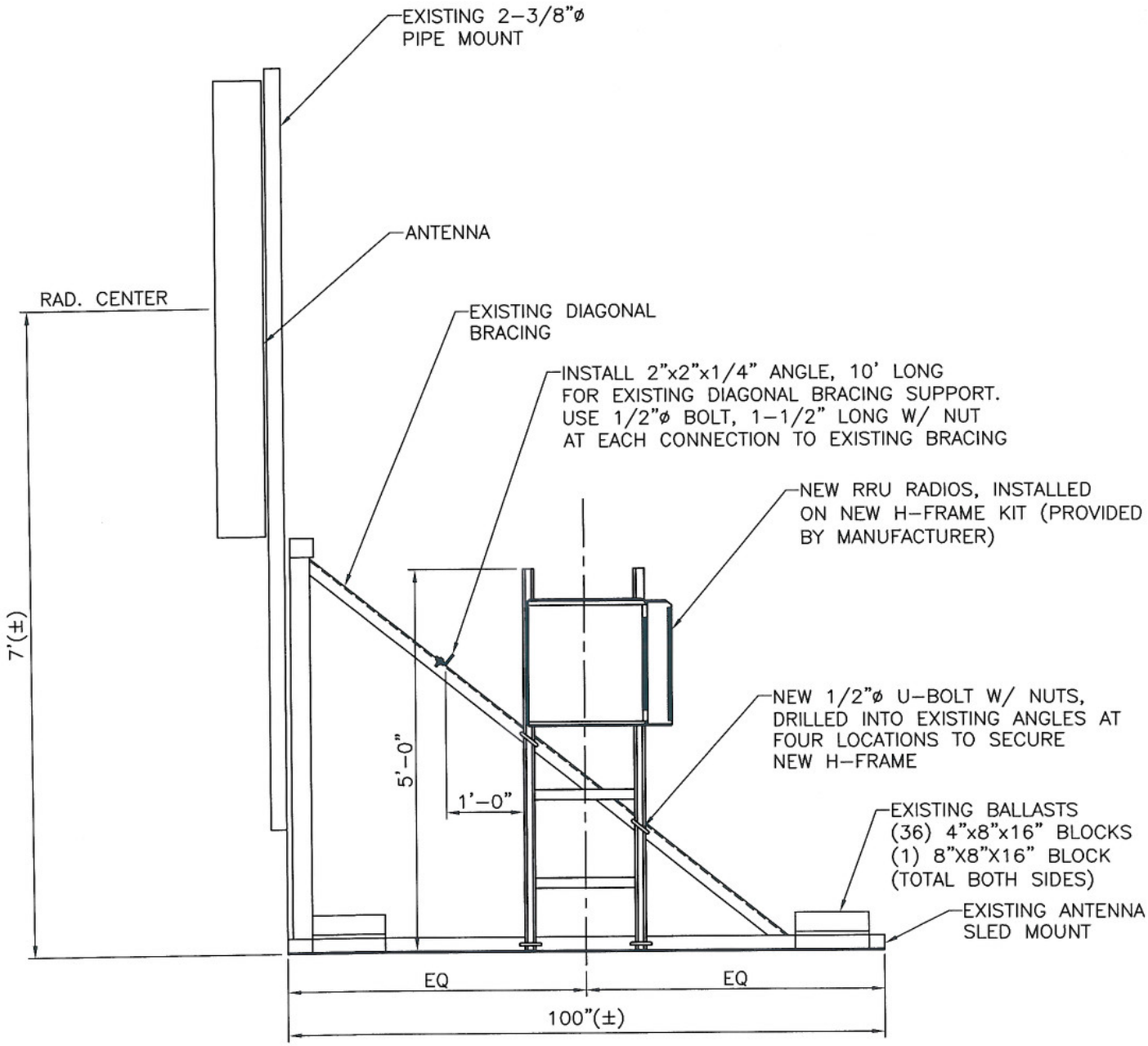
Conclusion:

Existing sleds and roof are sufficient to support the new load.

5/7/12

APPENDIX – B

Reference Drawings



SLED DETAIL
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T-Mobile®
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2 GREENWAY PLAZA
11TH FLOOR
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ARIA SERVICES, INC.
(281) 797-4387
WWW.ARIA-CORP.COM
TX FIRM REG# F-13104

SITE NAME: WILLIAM TRAVIS BLDG
SITE ADDRESS:
309 S. 4th (E911)
RICHMOND, TX 77469

DATE: 05–05–12

APPROVED _____

APPROVED _____

APPENDIX – C

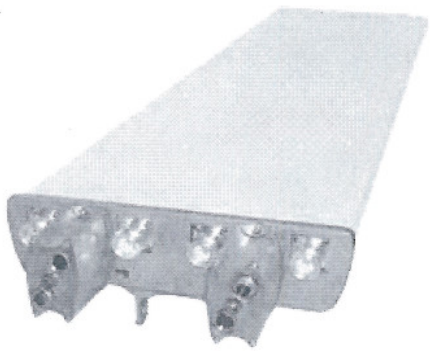
Equipment Cut Sheets

Product Data Sheet **APX17DWV-17DWVS-E-A20**

Optimizer® Side-by-Side Dual Polarized Antenna, 1710-2200, 65deg, 18.8dBi, 1.9m, VET, 0-10deg RET

Product Description

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

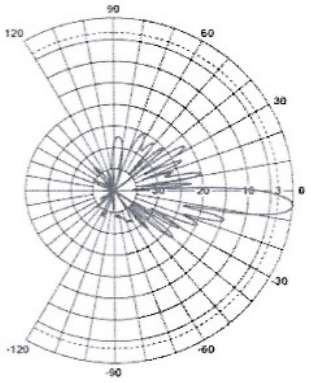


Features/Benefits

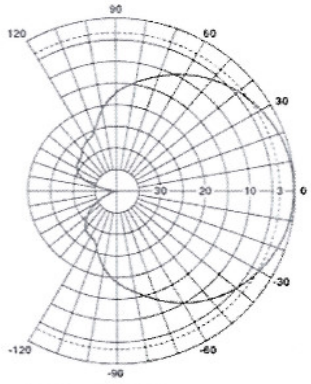
- **Variable electrical downtilt - provides enhanced precision in controlling intercell interference. The tilt is infield adjustable 0-10 deg.**
- **High Suppression of all Upper Sidelobes (Typically <-20dB).**
- **Gain difference between UL and DL <1dB.**
- **Two X-Polarised panels in a single radome.**
- **Azimuth horizontal beamwidth difference <5deg between UL and DL (1710-1755 & 2110-2155).**
- **Low profile for low visual impact.**
- **Dual polarization; Broadband design.**
- **Includes (2) AISG 2.0 Compatible ACU-A20-N antenna control units**

Technical Specifications

Electrical Specifications	
Frequency Range, MHz	1710-2200
Horizontal Beamwidth, deg	65 ±5 (64.8 average across band)
Vertical Beamwidth, deg	4.3 to 5.6
Electrical Downtilt, deg	0-10
Gain, dBi (dBd)	18.8 (16.7) Avg. across band
Upper Sidelobe Suppression, dB	Typically > 20
Front-To-Back Ratio, dB	> 25 (Typically 28)
Polarization	Dual pol +/-45°
VSWR	< 1.5:1
Isolation between Ports, dB	> 30
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (155 Typical)
7th Order IMP @ 2 x 38 dBm, dBc	> 170
Impedance, Ohms	50
Maximum Power Input, W	300
Lightning Protection	Direct Ground
Connector Type	(4) 7-16 Long Neck Female
Mechanical Specifications	
Dimensions - HxWxD, mm (in)	1925 x 331 x 80 (75.8 x 13 x 3.15)
Weight w/o Mtg Hardware, kg (lb)	25.0 (55)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	160 (100)
Max Wind Loading Area, m² (ft²)	0.64 (6.85)
Front Thrust @ Rated Wind, N (lbf)	1026 (230)
Maximum Thrust @ Rated Wind, N (lbf)	1026 (230)
Wind Load - Side @ Rated Wind, N (lbf)	314 (70)
Wind Load - Rear @ Rated Wind, N (lbf)	554 (124)
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Mounting Hardware Material	Diecasted Aluminum
Shipping Weight, kg (lb)	31 (68.2)
Packing Dimensions, HxWxD, mm (in)	2015 x 380 x 197 (79.3 x 15 x 7.8)
Ordering Information	
Mounting Hardware	APM40-2 + APM40-E2
Mounting Pipe Diameter, mm (in)	60-120 (2.36-4.72)



Vertical Pattern



Horizontal Pattern

Other Documentation

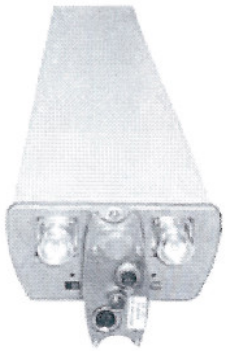
APM40 Series Datasheet
APM40 Series Installation Instructions

Product Data Sheet **APXV18-206517S-C-A20**

Optimizer® Dual Polarized Antenna, 1710-2200, 65deg, 18.8dBi, 1.8m, VET, 0-10deg RET

Product Description

This X-Polarized variable tilt antenna provides exceptional suppression of all upper sidelobes at all downtilt angles. It also features null fill and a wide downtilt range with optional remote tilt. This antenna is optimized for performance across the entire frequency band (1710-2200 MHz). The antenna comes pre-connected with the antenna control unit (ACU).

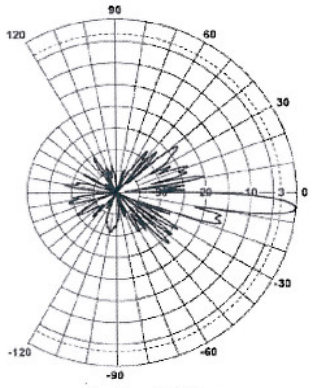


Features/Benefits

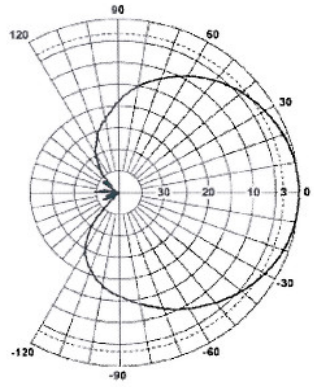
- **Variable electrical downtilt - provides enhanced precision in controlling intercell interference. The tilt is infield adjustable 0-10 deg.**
- **High Suppression of all Upper Sidelobes (Typically <-20dB).**
- **Gain difference between UL and DL <1dB.**
- **Azimuth horizontal beamwidth difference <7deg between UL and DL (1710-1755 & 2110-2155).**
- **Low profile for low visual impact.**
- **Dual polarization; Broadband design.**
- **Includes AISG 2.0 Compatible ACU-A20-N antenna control unit**

Technical Specifications

Electrical Specifications	
Frequency Range, MHz	1710-2200
Horizontal Beamwidth, deg	65 ±5 (65.1 average across band)
Vertical Beamwidth, deg	4.5 to 5.5
Electrical Downtilt, deg	0-10
Gain, dBi (dBd)	18.8 (16.7) Avg. across band
Upper Sidelobe Suppression, dB	Typically >20
Front-To-Back Ratio, dB	> 26 (Typically 29)
Polarization	Dual pol +/-45°
VSWR	< 1.5:1
Isolation between Ports, dB	> 30
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (155 Typical)
7th Order IMP @ 2 x 38 dBm, dBc	> 170
Impedance, Ohms	50
Maximum Power Input, W	300
Lightning Protection	Direct Ground
Connector Type	(2) 7-16 Long Neck Female
Mechanical Specifications	
Dimensions - HxWxD, mm (in)	1850 x 169 x 80 (72.0 x 6.65 x 3.15)
Weight w/o Mtg Hardware, kg (lb)	11.5 (25.3)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	160 (100)
Max Wind Loading Area, m² (ft²)	0.31 (3.3)
Front Thrust @ Rated Wind, N (lbf)	557 (125)
Maximum Thrust @ Rated Wind, N (lbf)	557 (125)
Wind Load - Side @ Rated Wind, N (lbf)	325 (73)
Wind Load - Rear @ Rated Wind, N (lbf)	269 (60)
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Mounting Hardware Material	Diecasted Aluminum
Shipping Weight, kg (lb)	20 (44)
Packing Dimensions, HxWxD, mm (in)	1950 x 230 x 189 (76.77 x 9.06 x 7.44)
Ordering Information	
Mounting Hardware	APM40-2
Mounting Hardware Weight, kg (lb)	3.4 (7.5)



Vertical Pattern



Horizontal Pattern

4 RF Module and Remote Radio Head dimensions and weights

RF Module dimensions and weights

The tables below list the dimensions and weights of the RF Module and the Remote Radio Head.

Property	3-sector RF Module	Dual RF Module	Single RF Module
Height	133 mm/3U (5.2 in)	133 mm/3U (5.2 in)	133 mm/3U (5.2 in)
Width Width (with covers)	447 mm (17.6 in) 490 mm (19.3 in)	447 mm (17.6 in) 490 mm (19.3 in)	447 mm (17.6 in) 490 mm (19.3 in)
Depth (for rack assemblies) Depth (with covers)	395 mm (15.6 in) 560 mm (22 in)	395 mm (15.6 in) 560 mm (22 in)	395 mm (15.6 in) 560 mm (22 in)
Weight (including the core, fans and casing)	Max. 25 kg (55.1 lb)	21.8 kg (48.1 lb)	18.7 kg (41.2 lb)

Table 11 Dimensions and weight of the RF Module

The module is heavy. Take care when lifting the module.

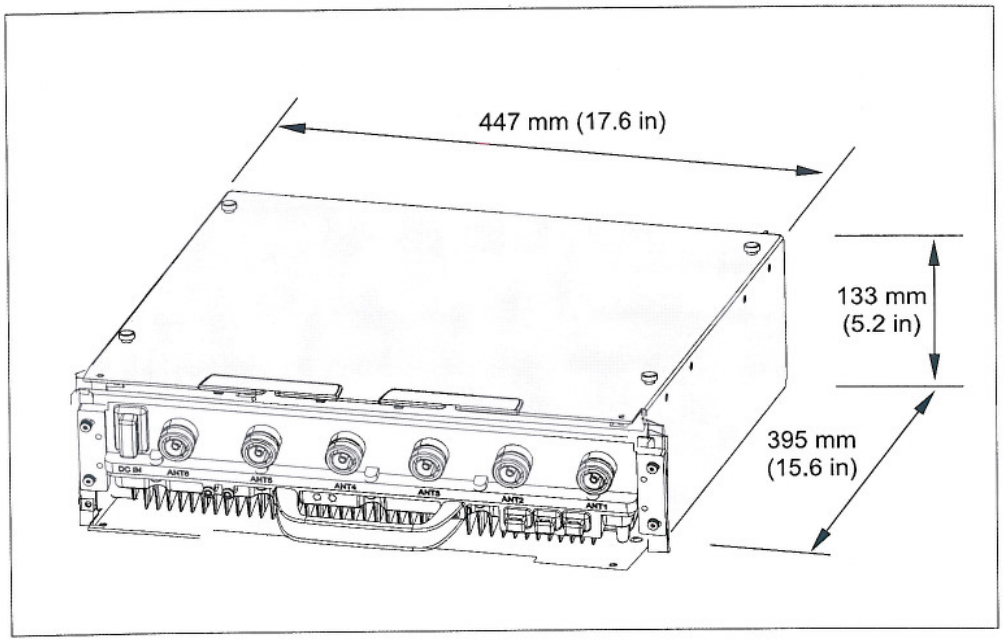


Figure 11 3U module dimensions for rack assembly

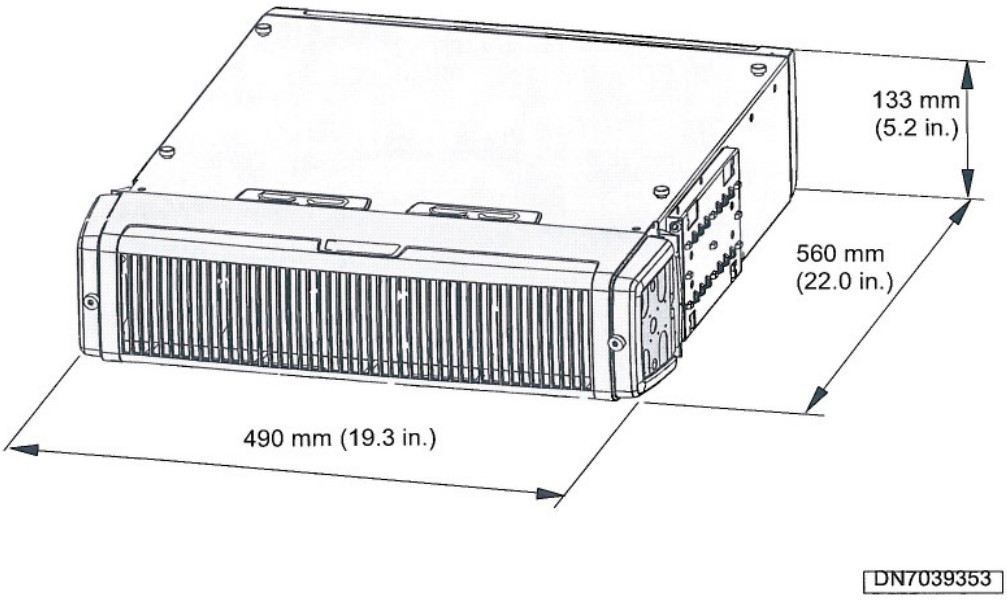


Figure 12 3U module dimensions with covers

6 Radio Frequency Module (FXxx) and Remote Radio Head Module (FHxx) dimensions and weight

Radio Frequency Module (FXxx) Dimensions and weight

The dimensions of the Radio Frequency Module are presented in the table below.

Property	Value
Width 1)	447/492 mm (17.6/19.4 in.)
Height	133 mm/ 3U (5.2 in.)
Depth 2)	422/560 mm (16.6/22.1 in.)
Weight	25 kg (55.1 lbs)

Table 11 FXxx dimensions and weight

1) Width of the casing without front covers/with front covers

2) Depth of the casing without front covers/with front covers

Remote Radio Head Module (FHxx) dimensions and weight

The dimensions of the Remote Radio Head Module are presented in the table below.

Property	Value
Width	358 mm (14.1 in.)
Height	579 mm (22.7 in.) - (as delivered, cable tie point recessed) 733 mm (28.8 in.) - (as installed, cable tie point released due to brackets and solar shields)
Depth	215 mm (8.4 in.)
Weight	FHxA - 20 kg (44 lbs)

Table 12 FHxx dimensions and weight

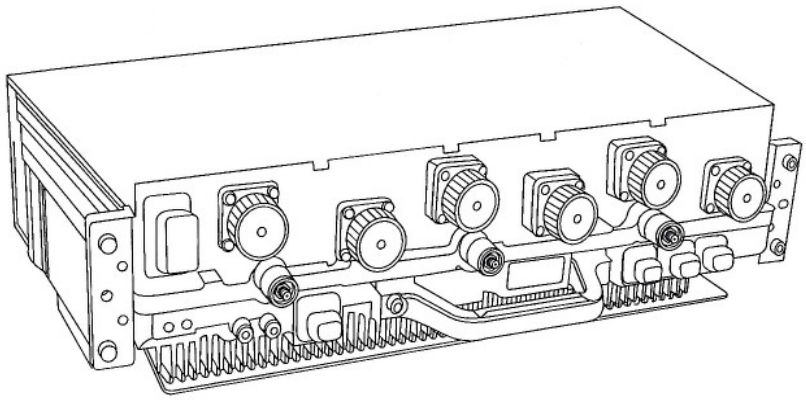


Figure 1 Isometric view of RF Module (FXDA, FXDJ, and FXEA)

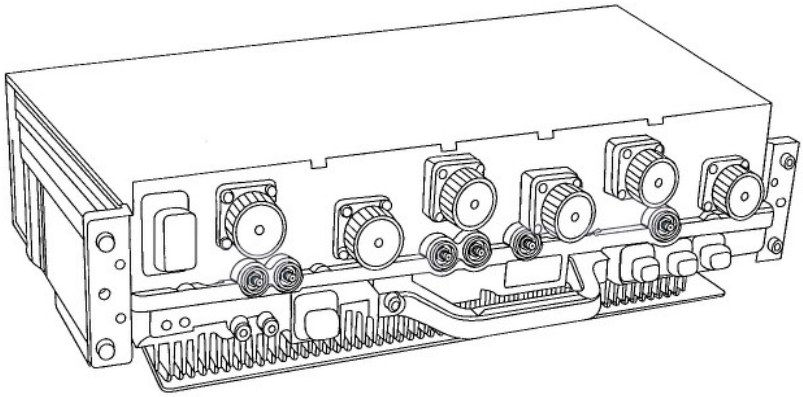


Figure 2 Isometric view of RF Module (FXFA and FXCA)

2.1.1 Software tunable filters (STuF)

STuF is a mechanical filter which is tuned with a small step motor, controlled automatically by the BTS software. There is one STuF on each branch of the RF Module. STuF has specific bandwidth on both RX and TX bands. The STuF tuning range covers the whole band, therefore a tuning window can be allocated anywhere within the band. When STuF is tuned, both RX and TX are tuned at the same time as RX and TX sides are mechanically coupled together. STuF is tuned only when the carrier allocation requires this. STuF center frequency is determined from TX & RX main frequency requests and also from diversity frequency requests when diversity sharing is used between the branches.

2.1.2 Digital predistortion (DAPD)

The reference signal for digital predistortion and RF power control is provided by predistortion RX path (PDRX). The power amplifier delivers the coupled and attenuated TX signal to the PDRX. For digital pre-distortion and RF power control, this signal is atten-

FRIG Dimensions (estimated)

Sub-section	Width (mm)	Height (mm)			Depth (mm)			
		Filter	PA	Total	Filter	PA	Qty	Volume (L)
Overall w/o bosses (3-way)	387	324.5	155	479.5	132.9	151.85	1	26

Note: Dimensions do not include flange, screw boss and connectors. Stepping fin height was used separately for volume calculation.

Installation options:

- RRH can be installed in vertical position (some tilt form vertical can be done , e.g. +/10 deg depending on how final design will work)
- No horizontal installation
- Wall mounting possible

Please note that final dimensions may vary depending upon the final optimization after actual hardware is available and matched to the simulations.

Final dimensions:

Final dimensions are expected to be available by June 2012.

DRAFT:

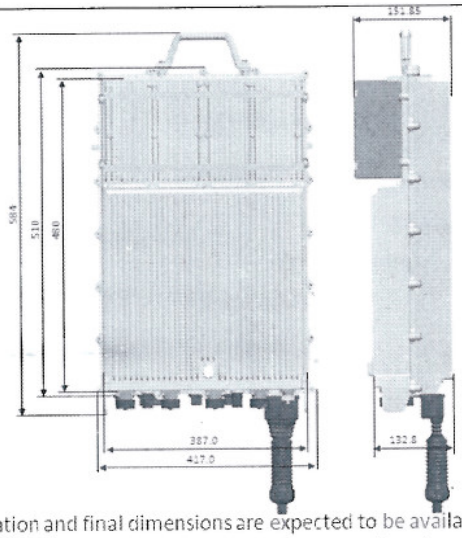
Status of Mechanical Parameters

Overall Dimensions

Sub-section	Width (mm)	Height (mm)			Depth (mm)		Qty	Volume (L)
		Filter	PA	Total	Filter	PA		
Overall w/o bosses (3-way)	387	324.5	155	479.5	132.9	151.85	1	26

Note:
1. All the dimensions do not include Flange, Screw Boss & Connectors. Stepping fin height was used separately for Volume calculate.

- 26 liters
- 26 Kg
- IP65
- -35 to +55 °C*
- 4*30W or 2*60W



Draft

Note:
These dimensions are based on thermal simulation and final dimensions are expected to be available by June 2012. Final dimensions may vary depending upon the final optimization after actual hardware is available.

Nokia Siemens Networks

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

OFFICE USE ONLY
CERTIFICATION OF FILING

Certificate Number:
2016-141700

Date Filed:
12/01/2016

Date Acknowledged:

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.
T-Mobile West LLC
Houston, TX United States

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.
Fort Bend County, Texas

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.
A3F0194A
Upgrade telecommunications equipment at existing cell site

4 Name of Interested Party	City, State, Country (place of business)	Nature of interest (check applicable)	
		Controlling	Intermediary
Deutsche Telekom Holding B.V.	Düsseldorf Berlin Germany	X	
T-Mobile US, Inc	Bellevue, WA United States		X
T-Mobile USA Inc.	Bellevue, WA United States		X

5 Check only if there is NO Interested Party. ☐

6 AFFIDAVIT

I swear, or affirm, under penalty of perjury, that the above disclosure is true and correct.

SOPHIA O'NEIL
Notary Public
STATE OF TEXAS
My Comm. Exp. March 1, 2018

Signature of authorized agent of contracting business entity

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said Keith Haydon-Director, this the 2nd day of December 20 16, to certify which, witness my hand and seal of office.

Signature of officer administering oath	Printed name of officer administering oath	Title of officer administering oath
Sophia O'Neil	Sophia O'Neil	Project Manager

CERTIFICATE OF INTERESTED PARTIES

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T-Mobile US, Inc	Bellevue, WA United States		X
T-Mobile USA Inc.	Bellevue, WA United States		X

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6 AFFIDAVIT

I swear, or affirm, under penalty of perjury, that the above disclosure is true and correct.

_____
Signature of authorized agent of contracting business entity

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said _____, this the _____ day of _____, 20_____, to certify which, witness my hand and seal of office.

_____
Signature of officer administering oath | Printed name of officer administering oath | Title of officer administering oath