

DRENNAN AND POWERS

COL02022 10093857



LTE - 3C/4C/4T4R WATER TANK

Approved

By: Gabe Sevigny

Date: 12/05/2017

El Paso County Planning & Community Development



188 INVERNESS DRIVE WEST
SUITE 400
ENGLEWOOD, CO 80112



BLACK & VEATCH

4600 SOUTH SYRACUSE STREET
SUITE 800
DENVER, COLORADO 80237

PROJECT/PHASE NO: 129051/3034

DRAWN BY: BDU

CHECKED BY: NCP

RFDS: 2.00

REV	DATE	DESCRIPTION
0	11/30/17	ISSUED FOR CONSTRUCTION



IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

DRENNAN AND POWERS
COL02022
5275 YUCATAN DRIVE
COLORADO SPRINGS, CO 80911
LTE - 3C/4C/4T4R

SHEET TITLE
TITLE SHEET

SHEET NUMBER
T-1

LEGAL DESCRIPTION

TRACT IN N2 SEC 01-15-66 AS FOLS, COM AT POI OF C/L OF HANCOCK EXPWY WITH C/L OF YUCATAN DR AS PLATTED IN CLEARVIEW ESTATES SUB NO 3, TH N 89°56'53" 300.0 FT, TH ON AN ARC OF A CUR TO R, SD CUR HAVING A C/A OF 16°30' A RAD OF 600.0 FT AN ARC DIST OF 172.79 FT, S 73°33'07" E TANG TO LAST MENT CUR 400.0 FT, TH ON AN ARC OF A CUR TO L SD CUR HAVING A C/A OF 35°26'39" A RAD OF 1320.0 FT AN ARC DIST OF 816.57 FT, N 71°00'14" E TANG TO LAST DES CUR 649.02 FT, S 18°59'46" E 40.0 FT, TO A PT ON SELY R/W LN OF YUCATAN DR FOR POB, N 71°00'14" E ON SD SELY R/W LN 326.70 FT, S 18°59'46" E 200.0 FT, S 70°11' W 150.0 FT, S 19°49' E 200.0 FT, S 71°00'14" W 176.70 FT, TH N 18°59'46" W 400 FT TO POB

ENGINEERING

2009 INTERNATIONAL BLDG. CODE OR LATEST ADOPTED EDITION
2014 NATIONAL ELECTRIC CODE OR LATEST ADOPTED EDITION
TIA/EIA-222-G OR LATEST EDITION
2011 PIKES PEAK REGIONAL BUILDING DEPARTMENT REQUIREMENTS

GENERAL NOTES

THE FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION. A TECHNICIAN WILL VISIT THE SITE AS REQUIRED FOR ROUTINE MAINTENANCE. THE PROJECT WILL NOT RESULT IN ANY SIGNIFICANT DISTURBANCE OR EFFECT ON DRAINAGE. NO SANITARY SEWER SERVICE, POTABLE WATER, OR TRASH DISPOSAL IS REQUIRED AND NO COMMERCIAL SIGNAGE IS PROPOSED.

SITE INFORMATION

PROPERTY OWNER: SECURITY WATER DISTRICT
ADDRESS: 231 SECURITY BOULEVARD
SECURITY, CO 80911

SITE CONTACT: RICHARD DAVIS
(719) 392-3475

PACE ID: MRUTH024868, MRUTH024969
MRUTH024875

COUNTY: EL PASO

LATITUDE (NAD 83): 38° 46' 30.8" N
LONGITUDE (NAD 83): 104° 43' 46.8" W

ZONING JURISDICTION: EL PASO COUNTY
ZONING DISTRICT: RS-6000

PARCEL NUMBER: 6501200004

OCCUPANCY GROUP: U
CONSTRUCTION TYPE: V-B

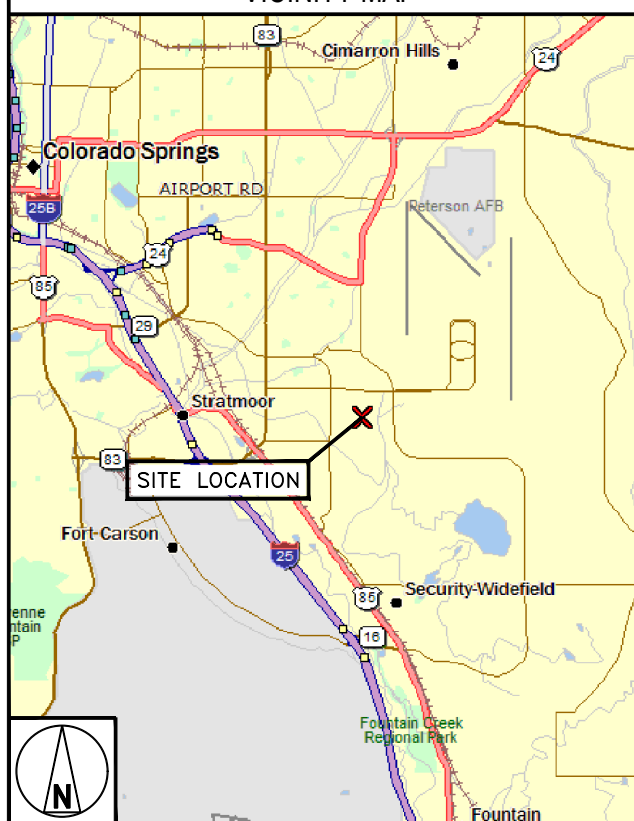
POWER COMPANY: COLORADO SPRINGS UTILITIES
TELEPHONE COMPANY: CENTURYLINK

SITE ACQUISITION MANAGER: MEGHANN MARKEN
(720) 834-4356

CONSTRUCTION MANAGER: JOHN VAUGHAN
(720) 412-4989

RF ENGINEER: DAVID BLACK
(303) 643-3719

VICINITY MAP



LOCAL MAP



PROJECT DESCRIPTION

THE PROJECT CONSISTS OF THE INSTALLATION AND OPERATION OF ANTENNAS AND ASSOCIATED EQUIPMENT CABINETS FOR THE AT&T WIRELESS TELECOMMUNICATIONS NETWORK.

- A. REPLACE (6) EXISTING ANTENNAS WITH (6) PROPOSED 8' ANTENNAS
- B. INSTALL (3) 13.1"x7.87"x21.6" (B14 700MHZ) RRHS
- C. INSTALL (3) 11.97"x7.18"x21.2" (1900MHZ PCS) RRHS
- D. INSTALL (3) 11.8"x7.2"x25.8" (2100MHZ AWS) RRHS
- E. INSTALL (3) 11"x31.25" DC6 SURGE SUPPRESSOR
- F. INSTALL (3) 24"x24"x8.8" DC12 SURGE SUPPRESSORS ON PROPOSED H-FRAME

DRAWING INDEX

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C-3	EXISTING AND PROPOSED SITE ELEVATIONS
C-4	ANTENNA LAYOUTS
C-5	EQUIPMENT DETAILS
C-6	EQUIPMENT DETAILS
S-1	STRUCTURAL DETAILS
E-1	ELECTRICAL DC ONE-LINE DIAGRAM
G-1	EQUIPMENT GROUNDING PLAN
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GN-1	LEGEND AND ABBREVIATIONS
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GN-3	GENERAL SITE WORK AND DRAINAGE NOTES
GN-4	GENERAL CONCRETE WORK NOTES
GN-5	GENERAL STRUCTURAL STEEL NOTES
GN-6	GENERAL ELECTRICAL NOTES

11"x17" PLOT WILL BE HALF SCALE UNLESS OTHERWISE NOTED

CONTRACTOR SHALL VERIFY ALL PLANS, EXISTING DIMENSIONS, AND CONDITIONS ON THE JOB SITE, AND SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK.



UNDERGROUND SERVICE ALERT
UTILITY NOTIFICATION CENTER OF COLORADO
(800) 922-1987
WWW.UNCC.ORG

3 WORKING DAYS UTILITY NOTIFICATION PRIOR TO CONSTRUCTION

CONTACT INFORMATION

ENGINEER: BLACK & VEATCH CORPORATION
4600 SOUTH SYRACUSE STREET, SUITE 800
DENVER, CO 80237

CONTACT: CHRISTINE A. MALONE
PHONE: (720) 834-4420

DRIVING DIRECTIONS

DIRECTIONS FROM AT&T OFFICE:
HEAD SOUTH TOWARD INVERNESS DRIVE WEST, TURN WEST ONTO E DRY CREEK ROAD, TURN SOUTH ONTO I-25 S RAMP, TAKE EXIT 135, KEEP SOUTH SOUTHEAST ONTO SR 83 RAMP, KEEP SOUTH SOUTHEAST ON SR 83 RAMP, TURN EAST NORTHEAST ONTO SR 83, KEEP SOUTH SOUTHEAST ONTO LOCAL ROAD, TURN EAST ONTO BRADLEY ROAD, TURN NORTH ONTO HANCOCK EXPY, TURN EAST ONTO YUCATAN DRIVE, SITE WILL BE ON THE SOUTH.

NOTES

1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.
2. ANTENNAS AND MOUNTS OMITTED FOR CLARITY.



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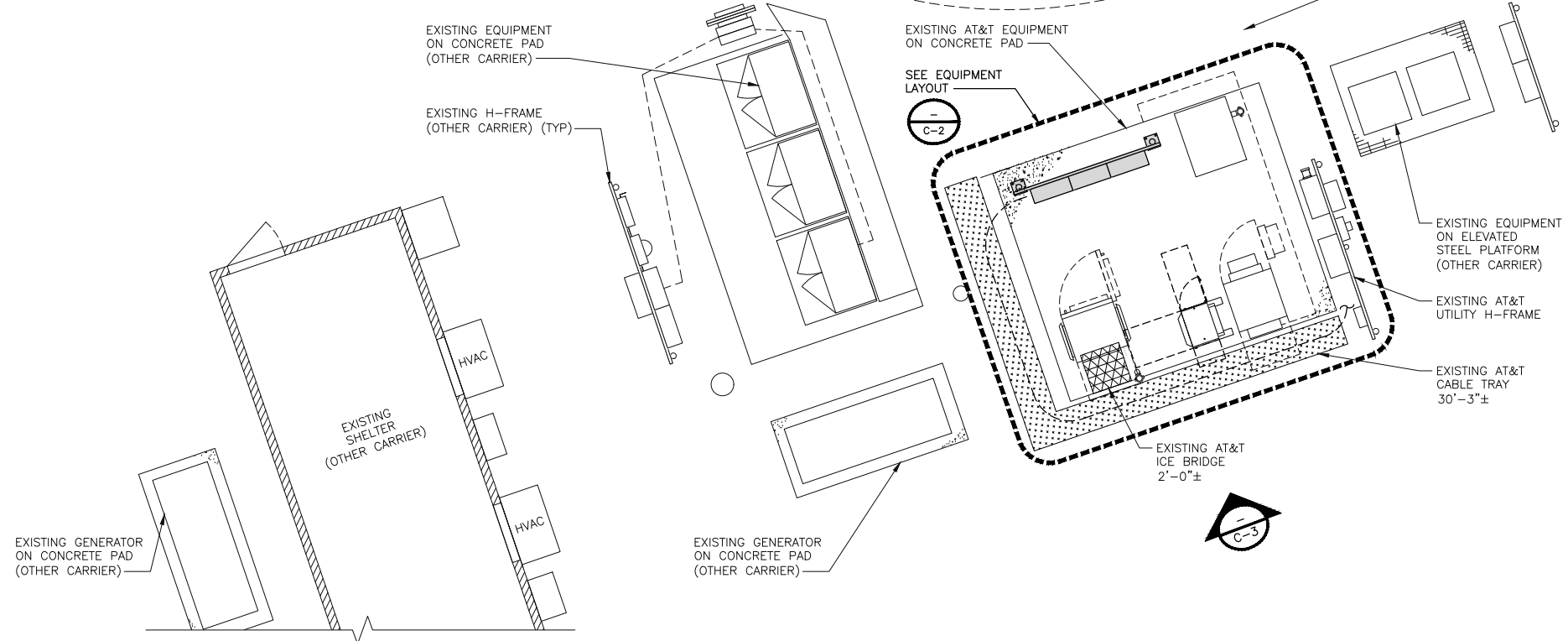
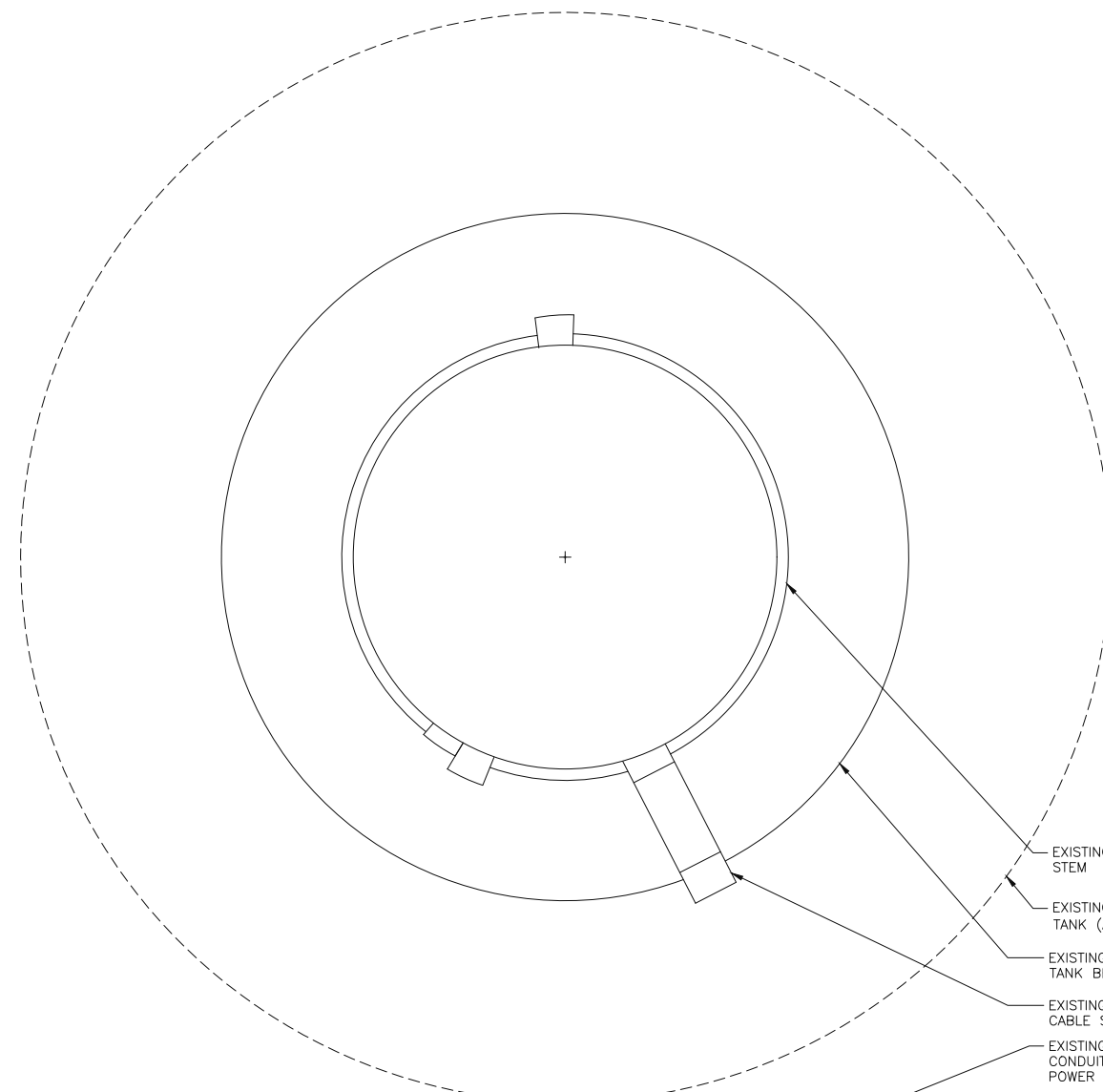


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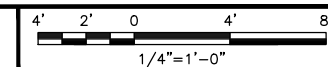
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COL02022
5275 YUCATAN DRIVE
COLORADO SPRINGS, CO 80911
LTE - 3C/4C/4T4R

SHEET TITLE
SITE PLAN


SHEET NUMBER
C-1



SITE PLAN



NOTE
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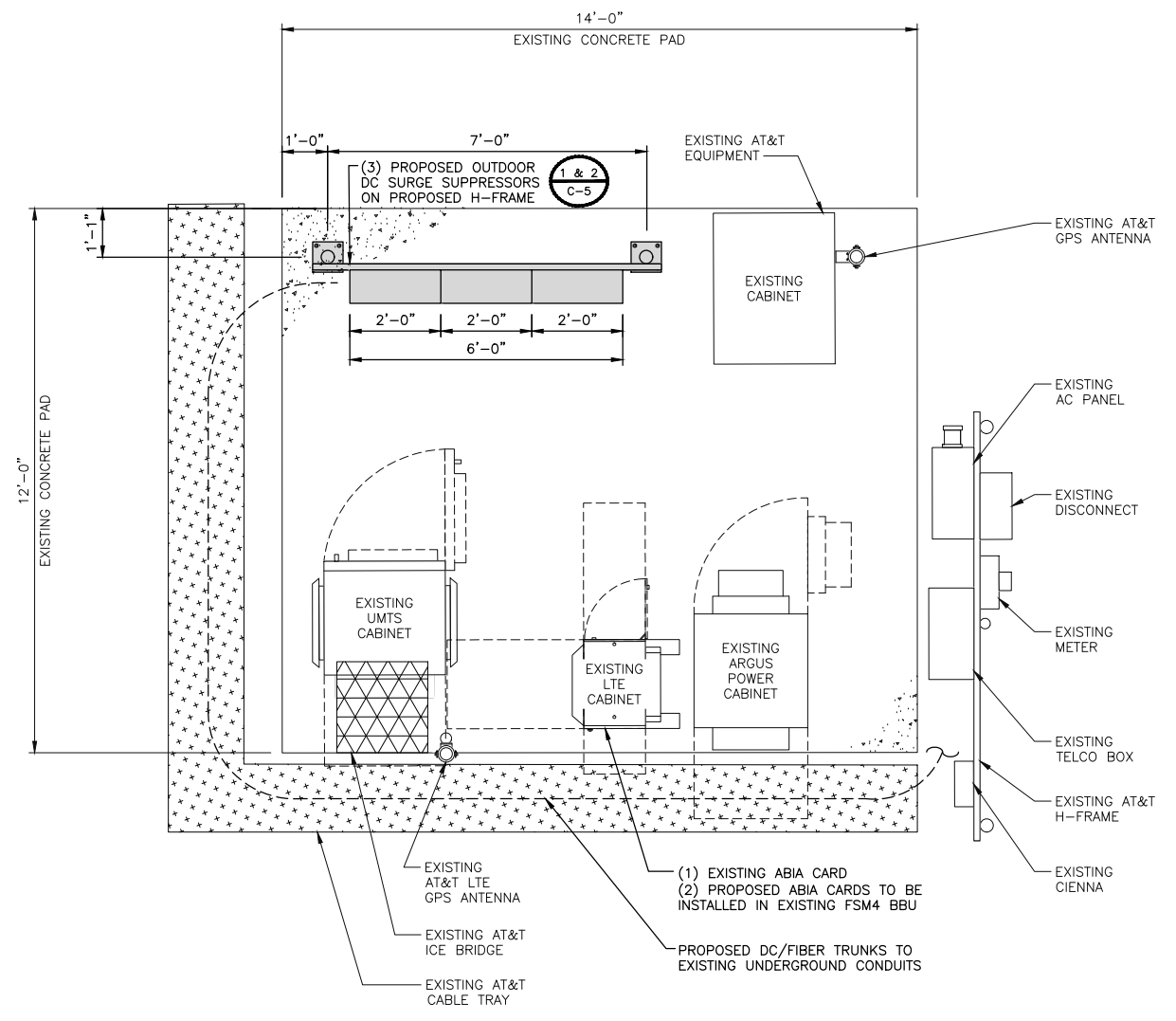
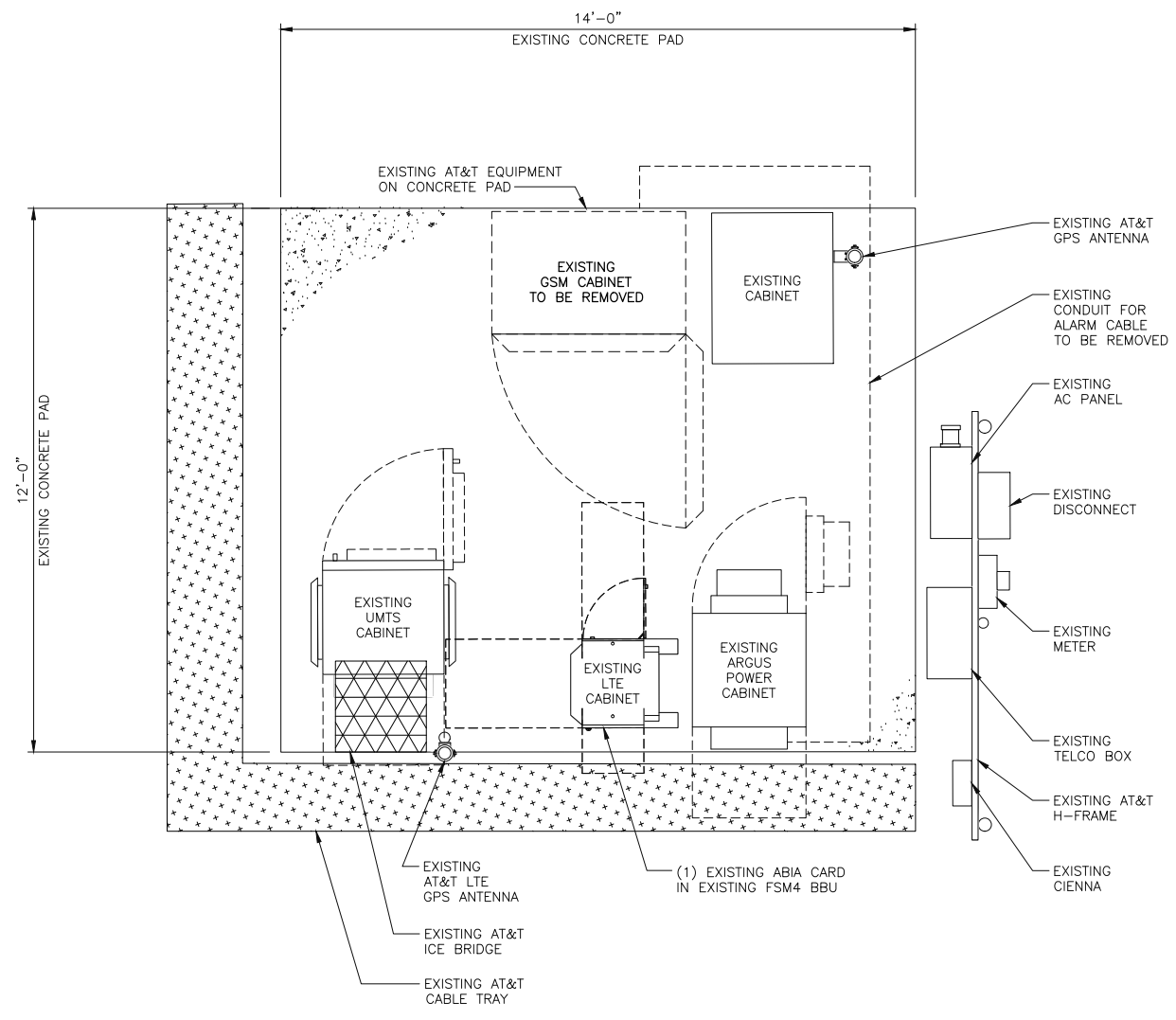


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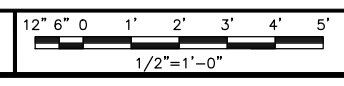
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SHEET TITLE
**EXISTING AND PROPOSED
 EQUIPMENT LAYOUTS**

SHEET NUMBER
C-2



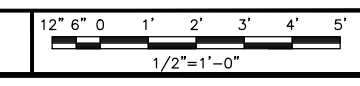
EXISTING EQUIPMENT LAYOUT



1



PROPOSED EQUIPMENT LAYOUT



2

A STRUCTURAL ANALYSIS PERFORMED BY BLACK & VEATCH ON NOVEMBER 02, 2017 DETERMINED THAT THE EXISTING STRUCTURE HAS SUFFICIENT CAPACITY FOR THE PROPOSED IMPROVEMENTS.

NOTE

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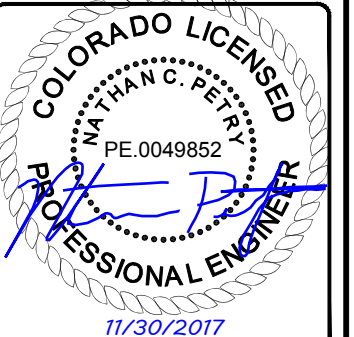


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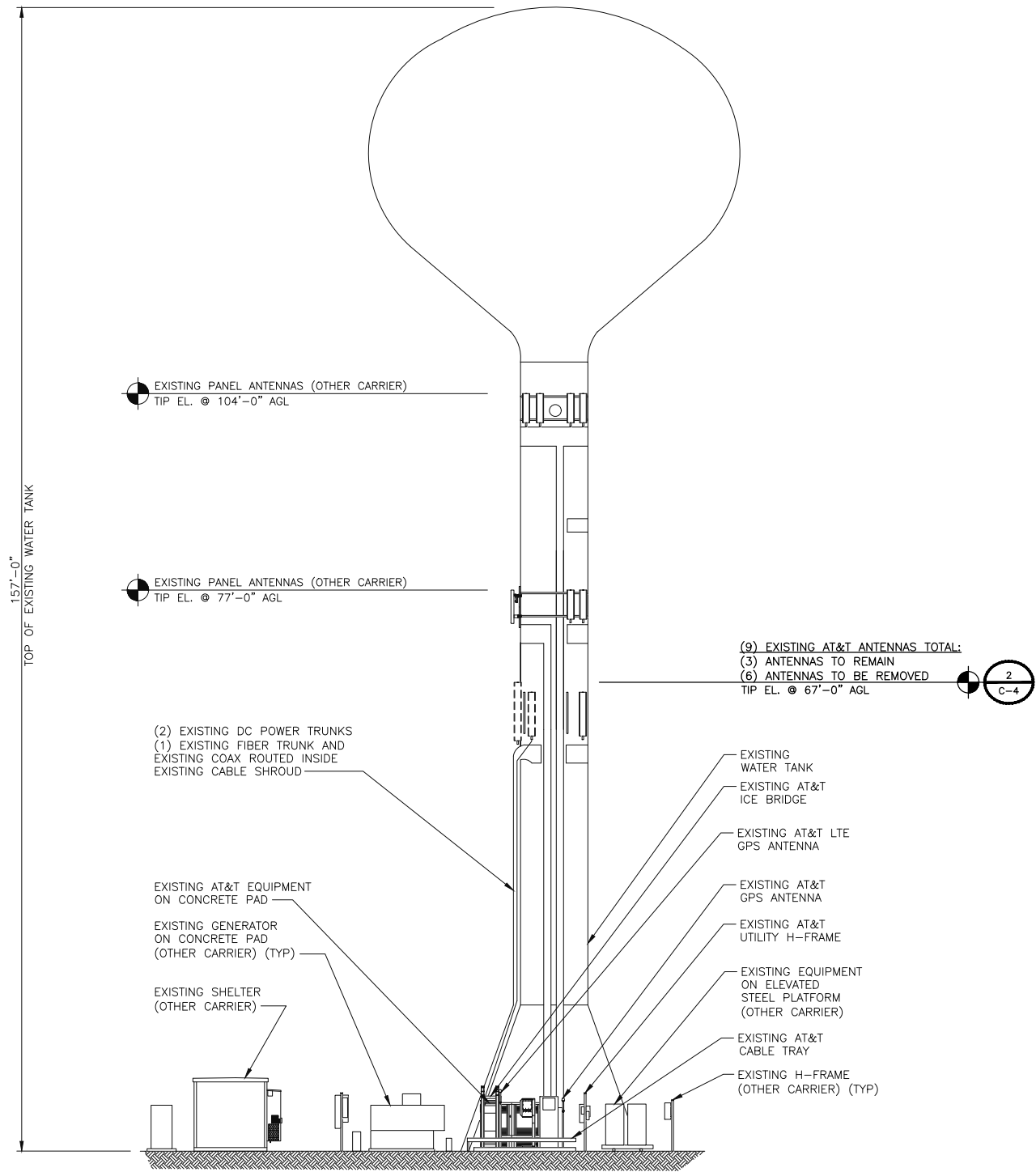


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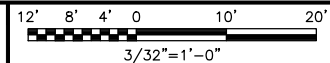
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SHEET TITLE
**EXISTING AND PROPOSED
SITE ELEVATIONS**

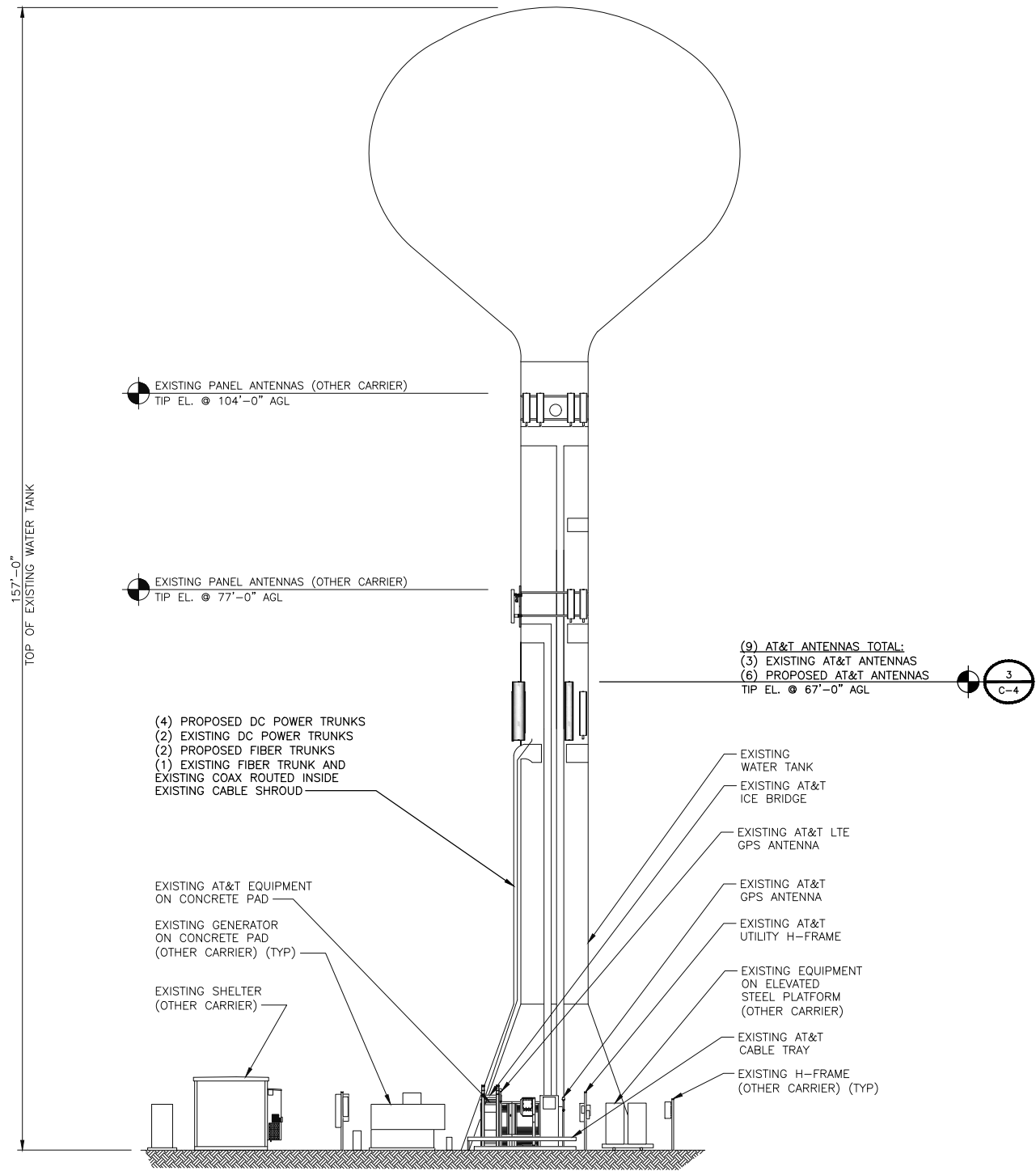
SHEET NUMBER
C-3



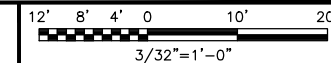
EXISTING SOUTH ELEVATION



1



PROPOSED SOUTH ELEVATION



2

SECTOR	ANTENNA TYPE	TECHNOLOGY	TRANSMISSION CABLE		DC JUMPERS NEEDED	FIBER JUMPERS NEEDED
			QTY.	TYPE		
A1	EXISTING ANTENNA	UMTS 850/1900	-	NO CHANGES	-	-
A2	PROPOSED ANTENNA	LTE 700/AWS	-	*SEE CHANGES BELOW	YES	YES
A3	PROPOSED ANTENNA	LTE 1900/700	-	*SEE CHANGES BELOW	YES	YES
B1	EXISTING ANTENNA	UMTS 850/1900	-	NO CHANGES	-	-
B2	PROPOSED ANTENNA	LTE 700/AWS	-	*SEE CHANGES BELOW	YES	YES
B3	PROPOSED ANTENNA	LTE 1900/700	-	*SEE CHANGES BELOW	YES	YES
C1	EXISTING ANTENNA	UMTS 850/1900	-	NO CHANGES	-	-
C2	PROPOSED ANTENNA	LTE 700/AWS	-	*SEE CHANGES BELOW	YES	YES
C3	PROPOSED ANTENNA	LTE 1900/700	-	*SEE CHANGES BELOW	YES	YES

*(4) PROPOSED DC POWER TRUNKS, (2) EXISTING DC POWER TRUNKS, (2) PROPOSED FIBER TRUNKS AND (1) EXISTING FIBER TRUNK SUPPLY ALL LTE ANTENNAS

NOTES

1. CONTRACTOR TO REFER TO FINAL CONSTRUCTION RFDS FOR ALL RF DETAILS.
2. ANTENNA OR RRH MODELS MAY CHANGE DUE TO EQUIPMENT AVAILABILITY. ALL EQUIPMENT CHANGES MUST BE APPROVED BY AT&T AND REMAIN IN COMPLIANCE WITH THE PROPOSED DESIGN AND STRUCTURAL ANALYSES.



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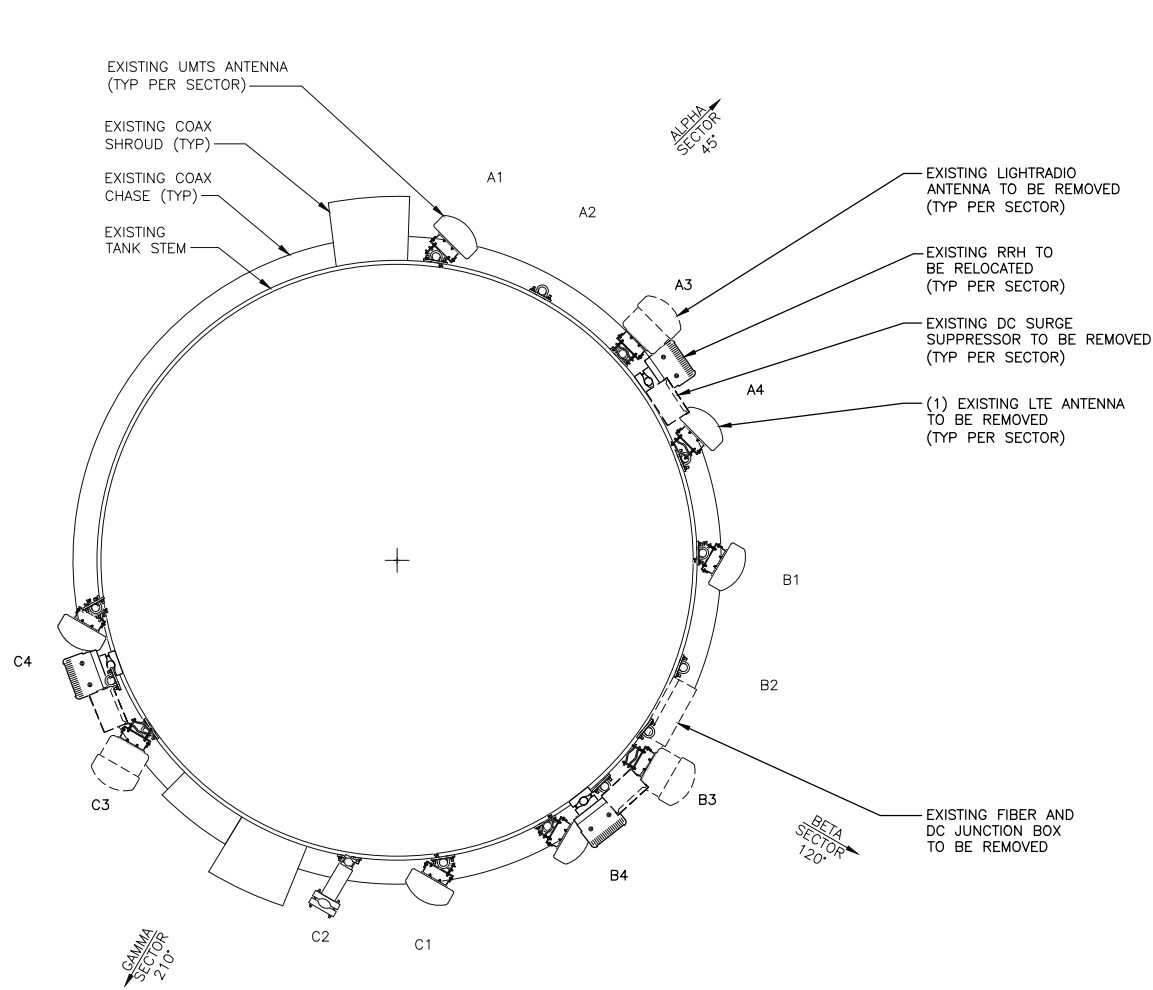
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SHEET TITLE
ANTENNA LAYOUTS

SHEET NUMBER
C-4

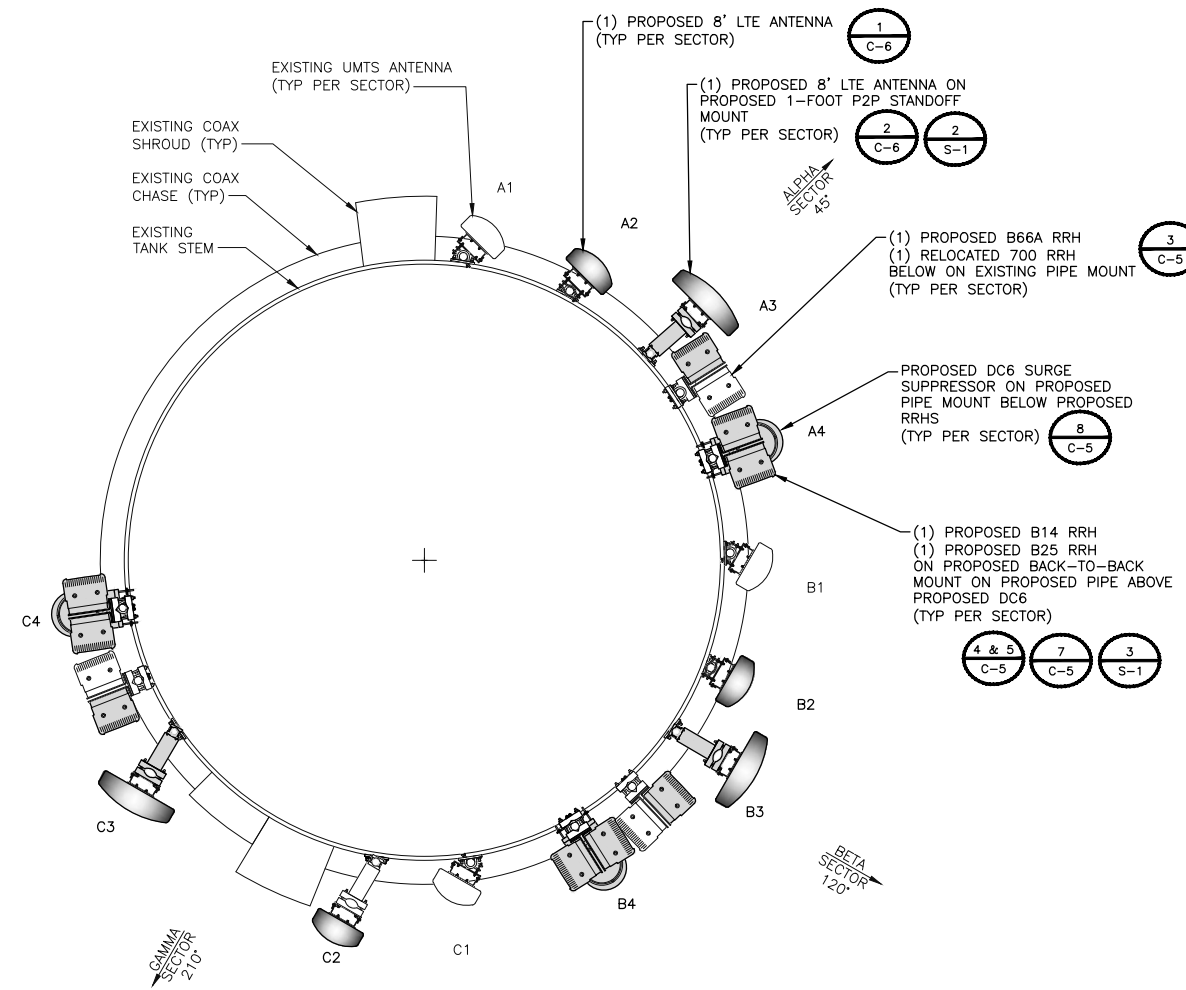
PROPOSED ANTENNA AND TRANSMISSION CABLE REQUIREMENT

NO SCALE 1



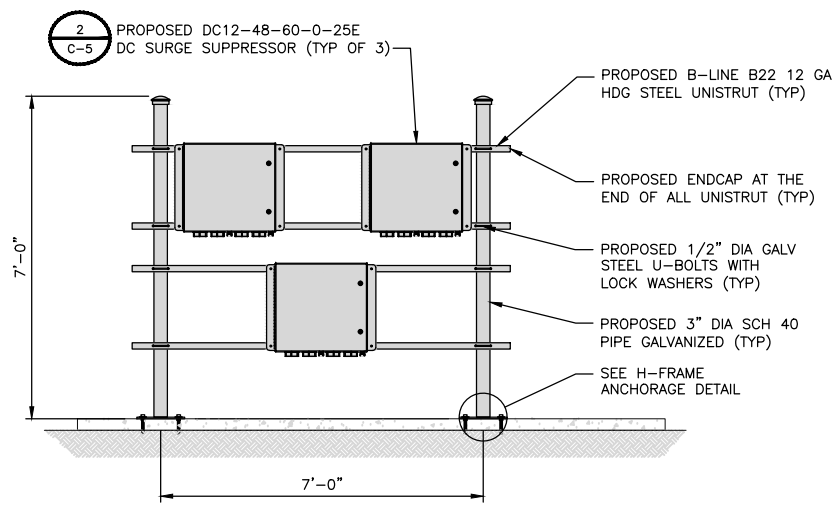
EXISTING ANTENNA LAYOUT

NO SCALE 2



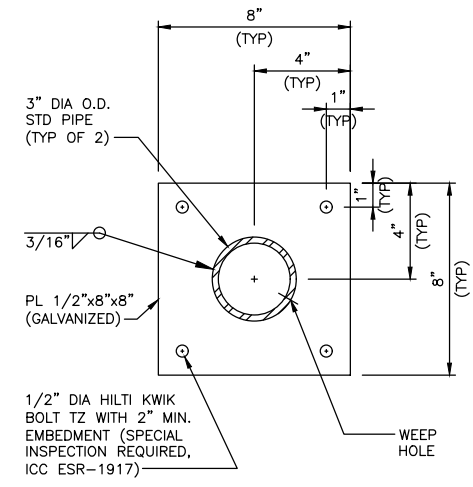
PROPOSED ANTENNA LAYOUT

NO SCALE 3



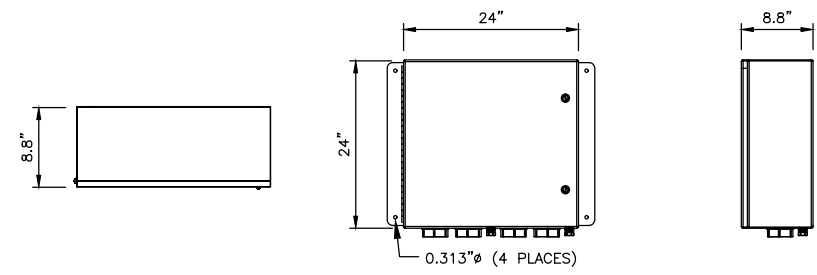
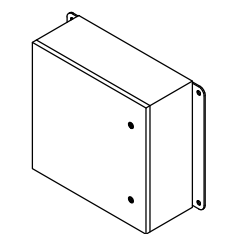
PROPOSED H-FRAME

NO SCALE 1



H-FRAME ANCHORAGE DETAIL

RAYCAP DC12-48-60-0-25E	
DIMENSIONS, WxDxH:	24"x24"x8.8"
TOTAL WEIGHT:	56.3 LBS
INPUT SIZE QUANTITY & SIZE:	(4) 2"
ENCLOSURE TYPE:	NEMA 4



DC SURGE SUPPRESSOR DETAIL

NO SCALE 2

ALCATEL-LUCENT B66A RRH4x45W+4T4R or RRH2x90W+2T4R	
WIDTH	11.8" (299 mm)
DEPTH	7.2" (182 mm)
HEIGHT	25.8" (655 mm)
WEIGHT	56.8 LBS (26 Kg)



NOKIA FLEXI 4T4R B14 RRH4X40W+4T4R or RRH2X60W+2T2R FRBI	
WIDTH	13.1" (320mm)
DEPTH	7.87" (160mm)
HEIGHT	21.6" (583mm)
WEIGHT	53 LBS (26kg)



ALCATEL-LUCENT B25 RRH4x30W+4T4R or RRH2x60W+2T4R	
WIDTH	11.97" (304 mm)
DEPTH	7.18" (182 mm)
HEIGHT	21.2" (538 mm)
WEIGHT	52.8 LBS (24 Kg)

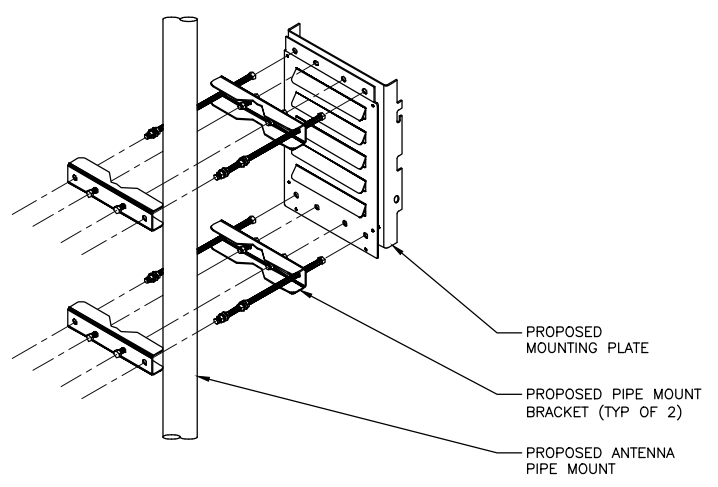


RRH SPECIFICATIONS (700 MHz)

NO SCALE 4

RRH SPECIFICATIONS (1900 MHz)

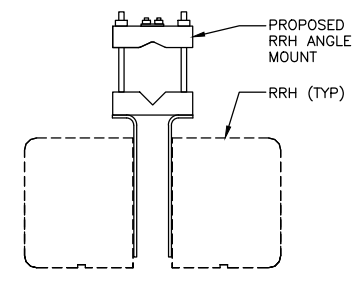
NO SCALE 5



RRH MOUNTING PLATE

NO SCALE 6

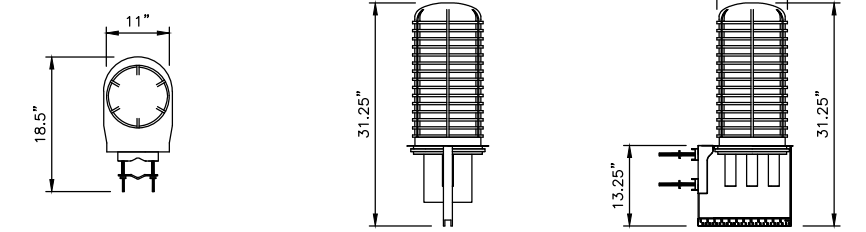
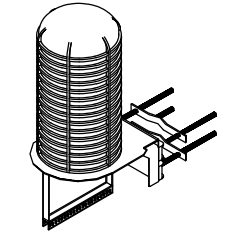
COMMSCOPE RRU MOUNT RR-FA2	
TOTAL WEIGHT (UNFINISHED)	35.88 LBS
ROUND LEGS	UP TO 5.5" DIA
60 DEGREE ANGLE LEGS	UP TO 6.0" DIA
90 DEGREE ANGLE LEGS	UP TO 4.5" DIA



FAST ACCESS DUAL RRH MOUNT

NO SCALE 7

RAYCAP DC6-48-60-18-8C	
DIMENSIONS, WxDxH	11"x31.25"
NOMINAL OPERATING VOLTAGE	48 VDC
NOMINAL DISCHARGE CURRENT	20 kA 8/20 μs
MAXIMUM DISCHARGE CURRENT	60 kA 8/20 μs
MAXIMUM CONTINUOUS OPERATING VOLTAGE	75 VDC
VOLTAGE PROTECTION RATING	600 V
WIND LOADING	150 MPH SUSTAINED (105.7 LBS) 195 MPH GUST (213.6 LBS)
TOTAL WEIGHT	32.8 LBS



CONTRACTOR TO USE "THREAD LUBRICANT" ON MOUNTING BOLTS DURING INSTALLATION

DC SURGE SUPPRESSOR DETAIL

NO SCALE 8

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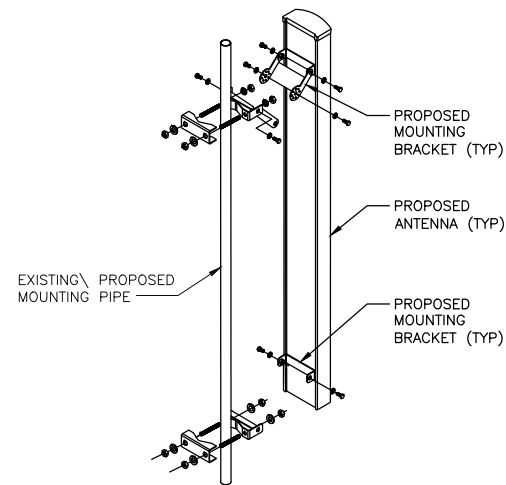
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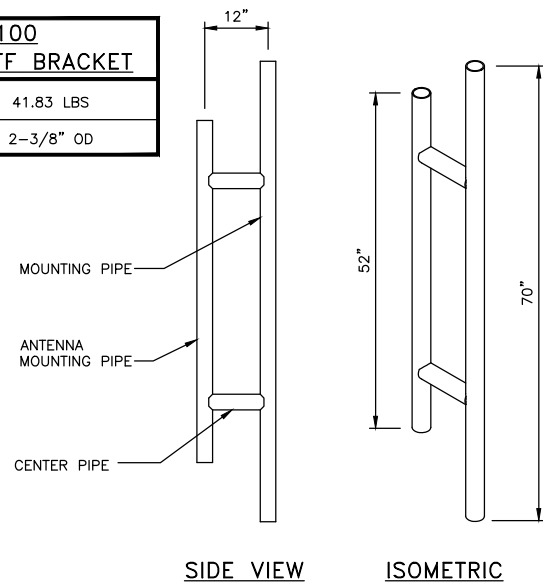
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COMMSCOPE P-100 12" ANTENNA STAND-OFF BRACKET	
TOTAL WEIGHT	41.83 LBS
MAXIMUM LEG OUTSIDE DIAMETER	2-3/8" OD



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C-6

ANTENNA MOUNTING DETAIL

NO SCALE

1

ANTENNA STAND-OFF BRACKET

NO SCALE

2

NOT USED

NO SCALE

3

NOT USED

NO SCALE

4

NOT USED

NO SCALE

5

NOT USED

NO SCALE

6

NOT USED

NO SCALE

7

NOT USED

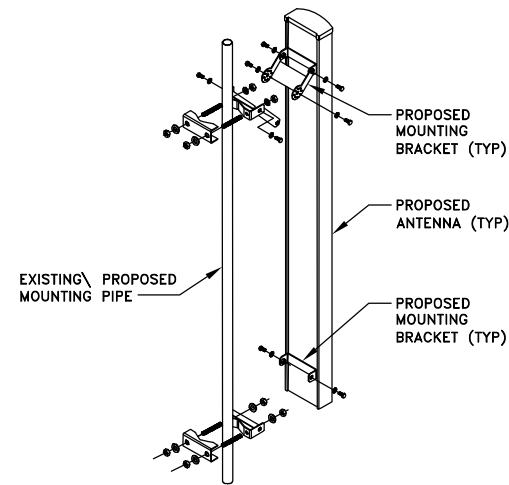
NO SCALE

8

NOT USED

NO SCALE

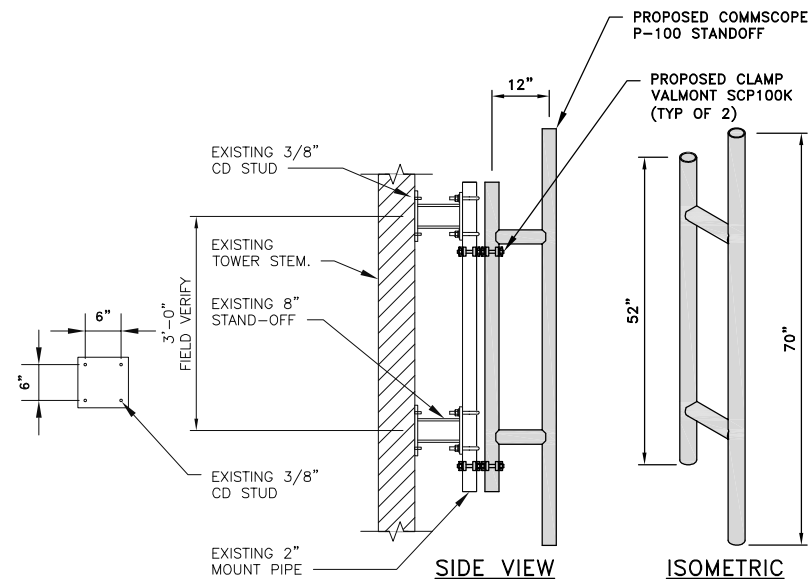
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ANTENNA MOUNTING DETAIL

NO SCALE

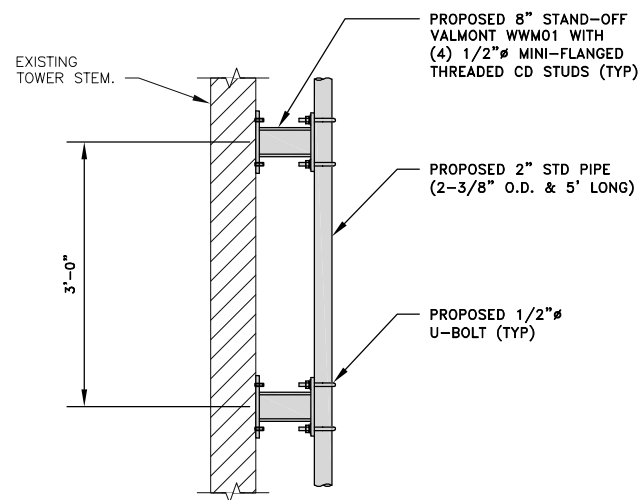
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ANTENNA MOUNT DETAIL @ A3,B3,C3

NO SCALE

2



RRH MOUNT DETAIL @ A4,B4,C4

NO SCALE

3

NOT USED

NO SCALE

4

NOTES

CONTRACTOR SHALL FIELD VERIFY AND MEASURE DIMENSIONS OF THE SITE STRUCTURE BEFORE FABRICATION OF MATERIALS FOR ALL MODIFICATIONS.

- CONTRACTOR SHALL FIELD VERIFY EXISTING ANTENNA MOUNT STRUCTURE, AND EXISTING BUILDING STRUCTURE, AS APPLICABLE, PRIOR TO START OF WORK. CONTRACTOR SHALL FIELD VERIFY AND MEASURE DIMENSIONS OF THE SITE STRUCTURE BEFORE FABRICATION OF MATERIALS FOR ALL PROPOSED INSTALLATIONS AND/OR MODIFICATIONS.
- ALL EXPOSED STRUCTURAL STEEL ROLLED SHAPES, PLATES, SUPPORT BRACKETS, AND MOUNT PIPES SHALL BE HOT-DIP GALVANIZED PER ASTM A123.
- U-BOLTS, THREADED RODS, BOLTS, AND HARDWARE SHALL BE HOT-DIP GALVANIZED PER ASTM A153, UNLESS NOTED OTHERWISE.
- U-BOLTS SHALL BE A307, UNLESS NOTED OTHERWISE.
- CONTRACTOR SHALL SUPPLY ALL NECESSARY CONNECTION HARDWARE.
- MAINTAIN MINIMUM 1-1/8" EDGE DISTANCE FROM THE CENTER OF ANY HOLE TO NEAREST EDGE OF ANY PLATE OR ANGLE, UNLESS NOTED OTHERWISE.
- ALL STEEL WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE AISC MANUAL OF STEEL CONSTRUCTION, UNLESS NOTED OTHERWISE. ALL PROPOSED STRUCTURAL STEEL MATERIAL SHALL CONFORM TO THE FOLLOWING PROPERTIES:
 W SHAPES: ASTM A992, 50 KSI
 ANGLES, PLATES, CHANNELS: ASTM A36, 36 KSI
 HSS SHAPES: ASTM A500, GR. B, 46 KSI
 HSS ROUND: ASTM A500, GR. B, 42 KSI
 PIPE SECTIONS: ASTM A53, GR. B, 35 KSI
- CONTRACTOR SHALL TOUCH UP ANY DAMAGED PAINT AREAS WITH ZINC RICH PAINT. ALL AREAS OF FIELD DRILLING, WELDING, OR CUTTING SHALL BE TOUCHED UP WITH ZINC RICH PAINT.
- ALL WELDING, IF INDICATED ON DRAWING(S), SHALL BE PERFORMED USING E70XX ELECTRODES. WELDING SHALL CONFORM TO AWS D1.1.
- CONSTRUCTION SHALL BE IN ACCORDANCE WITH APPLICABLE OSHA REGULATIONS. THESE DRAWINGS DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION METHODS, MEANS, TECHNIQUES, SEQUENCES, AND PROCEDURES.
- CONTRACTOR SHALL PROVIDE ADEQUATE TEMPORARY SUPPORT AS REQUIRED TO COMPLETE THE WORK.
- ALL CHANGES/ALTERNATES/REVISIONS TO THESE DRAWINGS SHALL BE DOCUMENTED BY REQUEST FOR INFORMATION (RFI) FORM APPROVED BY ENGINEER OF RECORD. FINAL WORK AUTHORIZATION AND ALL CHANGE ORDERS SHALL BE APPROVED BY CLIENT AND/OR CLIENT REPRESENTATIVE PRIOR TO PROCEEDING WITH ANY WORK THAT DEVIATES FROM THE ORIGINAL DESIGN, SCOPE, PRICE AND/OR SCHEDULE.
- ADHESIVE ANCHORS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND WITH A MINIMUM OF 12" FROM EDGE OF WALL.
- THREADED RODS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND WITH MINIMUM 8" SPACING FROM EDGE OF MASONRY WALL.



188 INVERNESS DRIVE WEST
SUITE #400
ENGLEWOOD, CO 80112



BLACK & VEATCH

304 INVERNESS WAY SOUTH
SUITE #400
ENGLEWOOD, CO 80112

PROJECT NO:	129051
DRAWN BY:	SAN
CHECKED BY:	YU

REV	DATE	DESCRIPTION
0	11/01/17	ISSUED FOR CONSTRUCTION



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DN2022
DRENNAN AND POWERS
5275 YUCATAN DRIVE
COLORADO SPRINGS, CO 80911

SHEET TITLE
STRUCTURAL DETAILS

SHEET NUMBER
S-1

NOT USED

NO SCALE

5

NOT USED

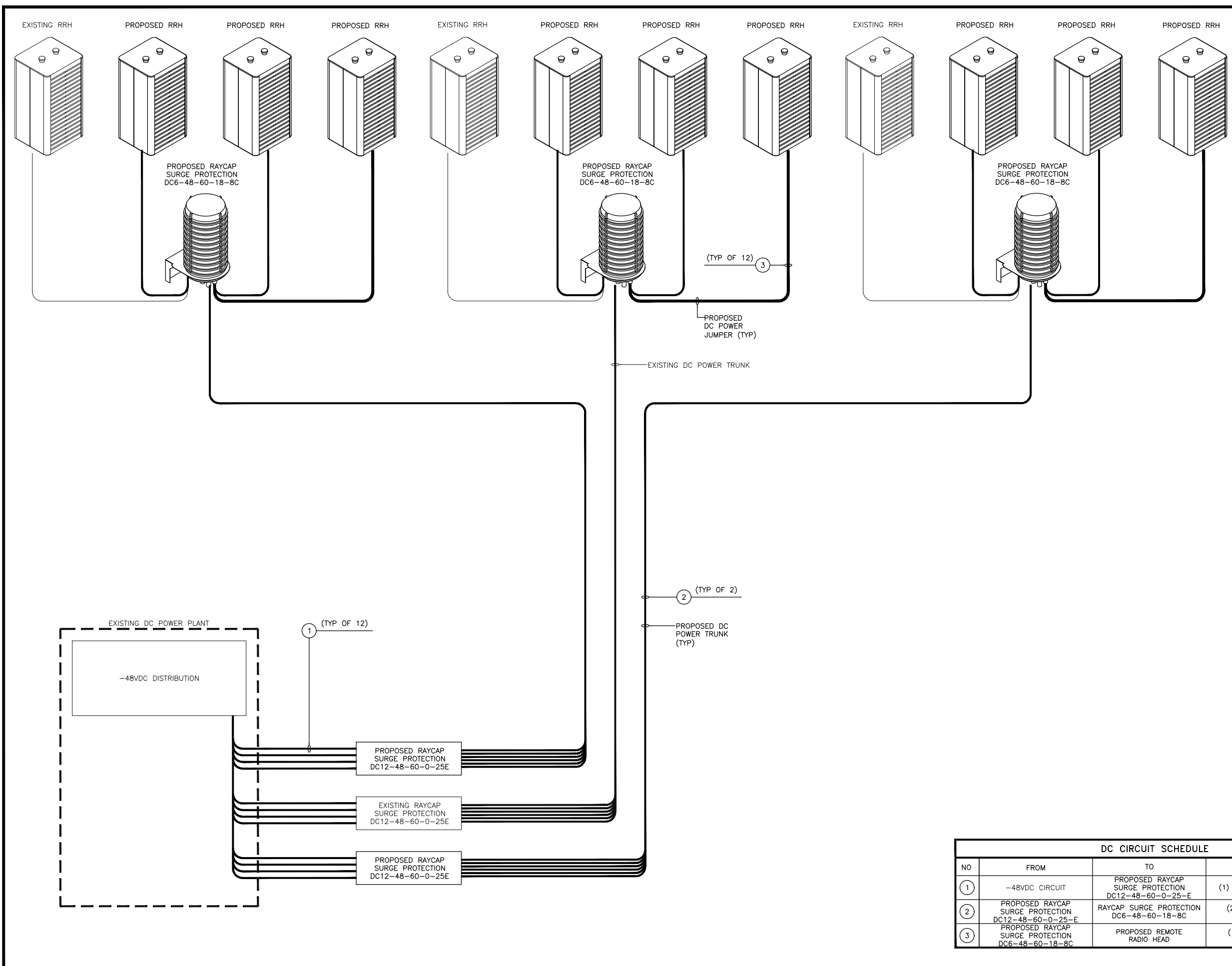
NO SCALE

6

NOT USED

NO SCALE

7

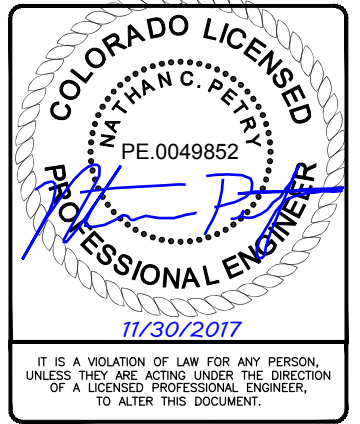


- NOTES**
- DC POWER WIRING SHALL BE COLOR CODED AT EACH END FOR IDENTIFYING +24V AND -48V CONDUCTORS. RED MARKINGS SHALL IDENTIFY +24V AND BLUE MARKINGS SHALL IDENTIFY -48V. REFER TO ATT-002-290-701.
 - LTE DC POWER WIRING SIZE 14 AWG TO 10 AWG SHALL BE TELCOFLEX III. DC POWER WIRING 8 AWG AND LARGER SHALL BE TELCOFLEX IV.
 - LTE POWER WIRING SHALL BE IN ACCORDANCE WITH ATT-002-290-701.
 - GROUND CONDUCTOR MINIMUM SIZE SHALL BE 750 KCMIL FOR POWER PLANT CAPACITY GREATER THAN OR EQUAL TO 1,200 AMP.
 - DC ELECTRICAL LOAD DEMAND FOR PROPOSED ADDITIONS WERE INCLUDED IN AC LOAD CALCULATION.



PROJECT/PHASE NO:	129051/3034
DRAWN BY:	BDJ
CHECKED BY:	NCP
RFDS:	2.00

REV	DATE	DESCRIPTION
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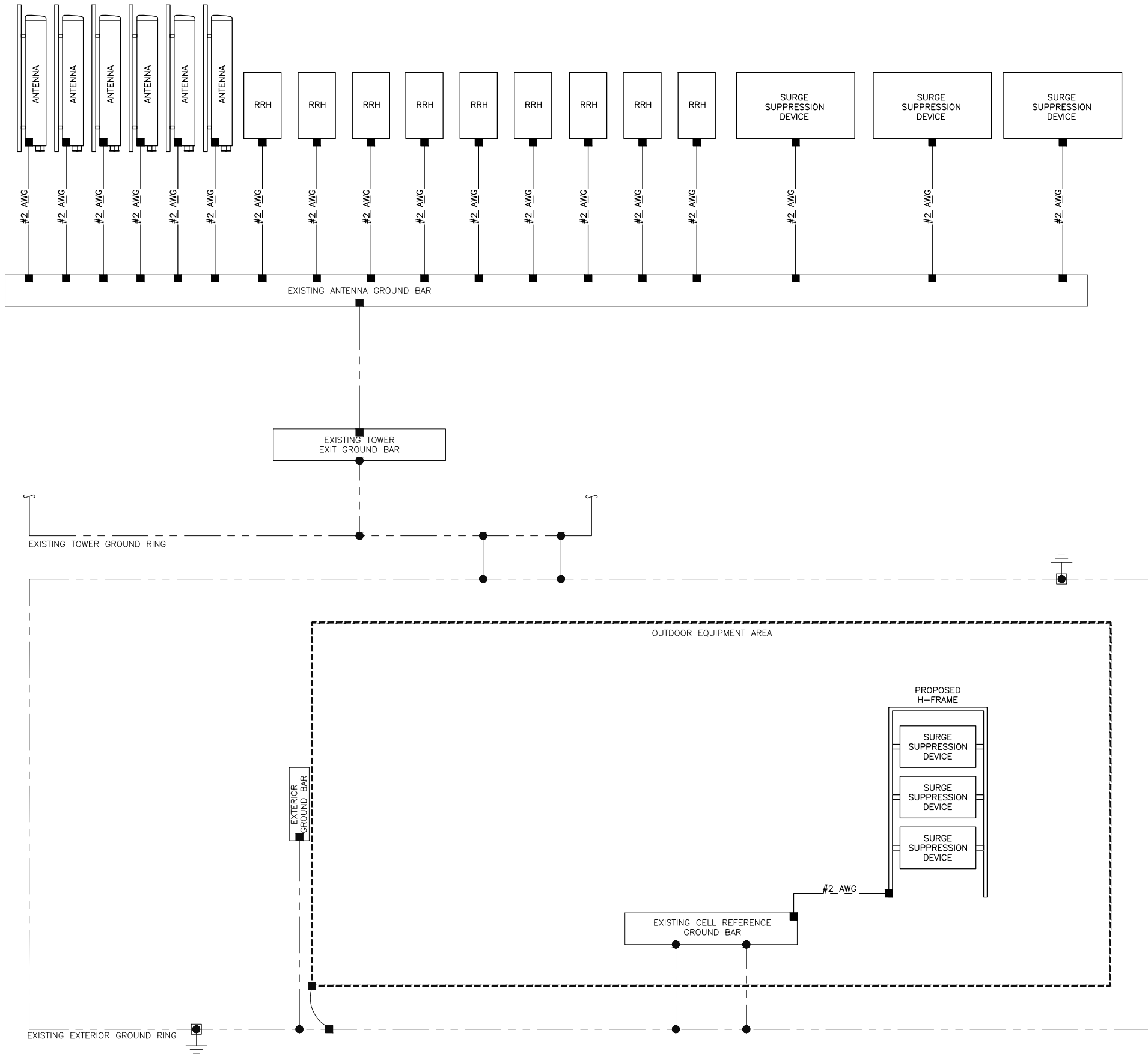
DRENNAN AND POWERS
 COL02022
 5275 YUCATAN DRIVE
 COLORADO SPRINGS, CO 80911
 LTE - 3C/4C/4T4R

SHEET TITLE
ELECTRICAL DC ONE-LINE DIAGRAM

SHEET NUMBER
E-1

NO	FROM	TO	CONFIGURATION
①	-48VDC CIRCUIT	PROPOSED RAYCAP SURGE PROTECTION DC12-48-60-0-25-E	(1) 2-#8 TELCOFLEX III DC CABLE
②	PROPOSED RAYCAP SURGE PROTECTION DC12-48-60-0-25-E	RAYCAP SURGE PROTECTION DC6-48-60-18-8C	(2) 6- #8 THHN/THWN-VW1 TYPE TC-ER DC CABLE
③	PROPOSED RAYCAP SURGE PROTECTION DC6-48-60-18-8C	PROPOSED REMOTE RADIO HEAD	(1) 2- #10 THHN/THWN-VW1 TYPE TC-ER DC CABLE

ELECTRICAL DC ONE-LINE DIAGRAM



- EXOTHERMIC CONNECTION
- MECHANICAL CONNECTION
- ⊕ GROUND ROD
- ⊕ T TEST GROUND ROD WITH INSPECTION SLEEVE

LEGEND

1. GROUNDING IS SHOWN DIAGRAMMATICALLY ONLY.
2. CONTRACTOR SHALL GROUND ALL EQUIPMENT AS A COMPLETE SYSTEM. GROUNDING SHALL BE IN COMPLIANCE WITH NEC SECTION 250 AND AT&T GROUNDING AND BONDING REQUIREMENTS (ATT-TP-76416) AND MANUFACTURER'S SPECIFICATIONS.
3. ALL GROUND CONDUCTORS SHALL BE COPPER; NO ALUMINUM CONDUCTORS SHALL BE USED.

NOTES

- (A) **EXTERIOR GROUND RING:** #2 AWG SOLID COPPER, BURIED AT A DEPTH OF AT LEAST 30 INCHES BELOW GRADE, OR 6 INCHES BELOW THE FROST LINE AND APPROXIMATELY 24 INCHES FROM THE EXTERIOR WALL OR FOOTING. (ATT-TP-76416 2.2.3.5 / 7.5.1)
- (B) **TOWER GROUND RING:** THE GROUND RING SYSTEM SHALL BE INSTALLED AROUND AN ANTENNA TOWER'S LEGS, AND/OR GUY ANCHORS. WHERE SEPARATE SYSTEMS HAVE BEEN PROVIDED FOR THE TOWER AND THE BUILDING, AT LEAST TWO BONDS SHALL BE MADE BETWEEN THE TOWER RING GROUND SYSTEM AND THE BUILDING RING GROUND SYSTEM USING MINIMUM #2 AWG SOLID COPPER CONDUCTORS. (ATT-TP-76416 / 7.5.1)
- (C) **GROUND ROD:** UL LISTED COPPER CLAD STEEL. MINIMUM 5/8" DIAMETER BY EIGHT FEET LONG. GROUND RODS SHALL BE INSTALLED WITH INSPECTION SLEEVES. GROUND RODS SHALL BE DRIVEN TO THE DEPTH OF GROUND RING CONDUCTOR. (ATT-TP-76416)
- (D) **CELL REFERENCE GROUND BAR:** POINT OF GROUND REFERENCE FOR ALL COMMUNICATIONS EQUIPMENT FRAMES. ALL BONDS ARE MADE WITH #2 AWG STRANDED GREEN INSULATED COPPER CONDUCTORS. BOND TO GROUND RING WITH (2) #2 SOLID TINNED COPPER CONDUCTORS. (ATT-TP-76416 / 7.6.7)
- (E) **TOWER EXIT GROUND BAR:** #2 AWG SOLID TINNED COPPER BOND TO THE TOWER GROUND RING. (ATT-TP-76416 / 7.4.2.6)
- (F) **FRAME BONDING:** THE BONDING POINT FOR TELECOM EQUIPMENT FRAMES SHALL BE THE GROUND BUS THAT IS NOT ISOLATED FROM THE EQUIPMENTS METAL FRAMEWORK. BOND THE FRAME GROUND TO THE "I" SECTION OF THE CELL REFERENCE GROUND BAR OR SUPPLEMENTARY CONDUCTOR. (ATT-TP-76416 6.5.3 AND 7.8)
- (G) **FENCE AND GATE GROUNDING:** METAL FENCES WITHIN 7 FEET OF THE EXTERIOR GROUND RING OR OBJECTS BONDED TO THE EXTERIOR GROUND RING SHALL BE BONDED TO THE GROUND RING WITH A #2 AWG SOLID TINNED COPPER CONDUCTOR AT AN INTERVAL NOT EXCEEDING 25 FEET. BONDS SHALL BE MADE AT EACH GATE POST AND ACROSS GATE OPENINGS. (ATT-TP-76416 / 7.12.2.2)
- (H) **EXTERIOR UNIT BONDS:** METALLIC OBJECTS SHALL BE BONDED TO THE EXTERIOR GROUND RING. (ATT-TP-76416 / 7.12.6)
- (J) **ICE BRIDGE SUPPORTS:** EACH ICE BRIDGE LEG SHALL BE BONDED TO THE GROUND RING WITH #2 AWG BARE TINNED COPPER CONDUCTOR. PROVIDE EXOTHERMIC WELDS AT BOTH THE ICE BRIDGE LEG AND BURIED GROUND RING. (ATT-TP-76416 / 7.4.2.6)
- (K) **OUTDOOR GROUNDING CONDUCTORS:** GROUNDING CONDUCTORS INSTALLED OUTDOORS AND RUN ENTIRELY ABOVE GRADE SHALL BE TINNED STRANDED COPPER AND BE SUNLIGHT RESISTANT.



188 INVERNESS DRIVE WEST
SUITE 400
ENGLEWOOD, CO 80112



BLACK & VEATCH

4600 SOUTH SYRACUSE STREET
SUITE 800
DENVER, COLORADO 80237

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DRAWN BY:	BDJ
CHECKED BY:	NCP
RFDS:	2.00

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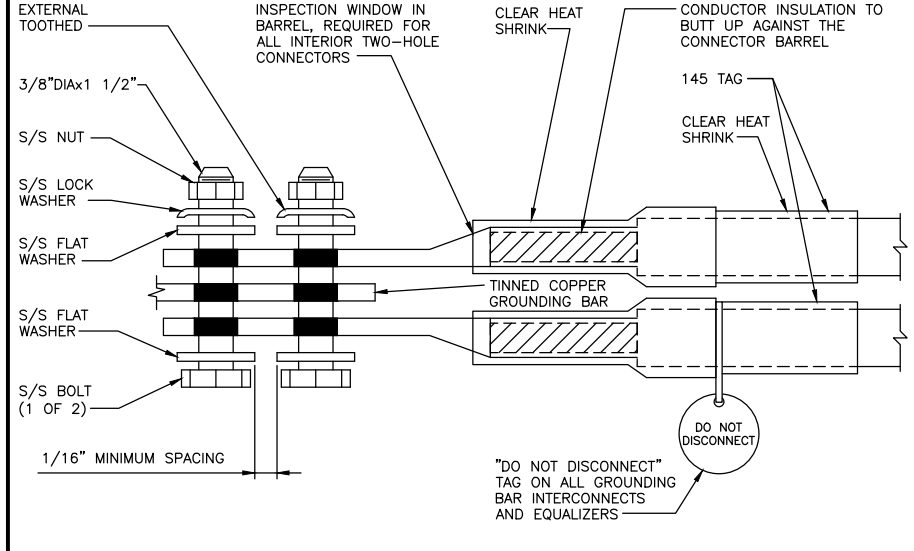
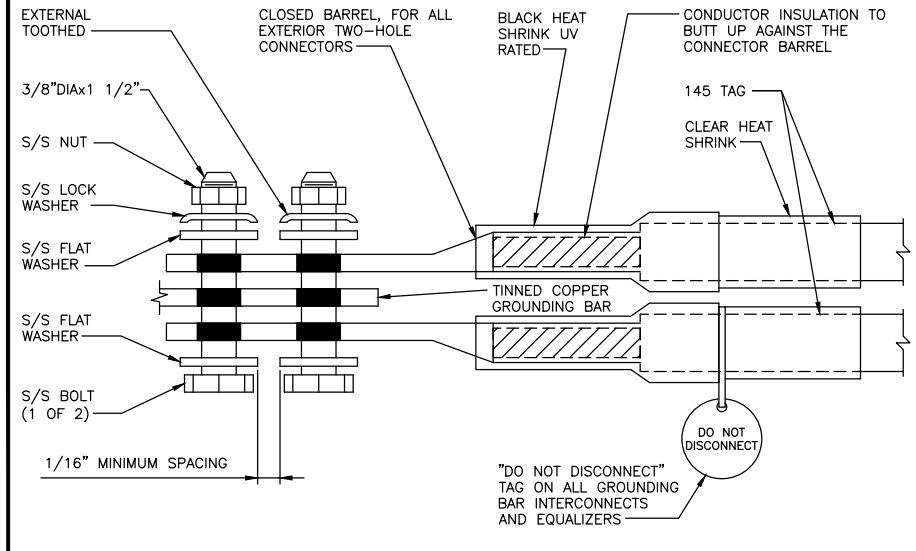
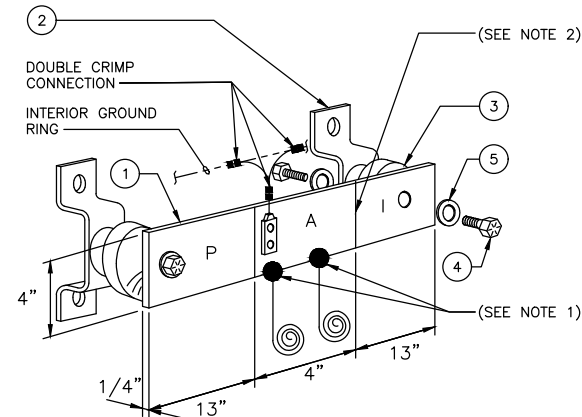
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DRENNAN AND POWERS
COL02022
5275 YUCATAN DRIVE
COLORADO SPRINGS, CO 80911
LTE - 3C/4C/4T4R

SHEET TITLE
EQUIPMENT GROUNDING PLAN

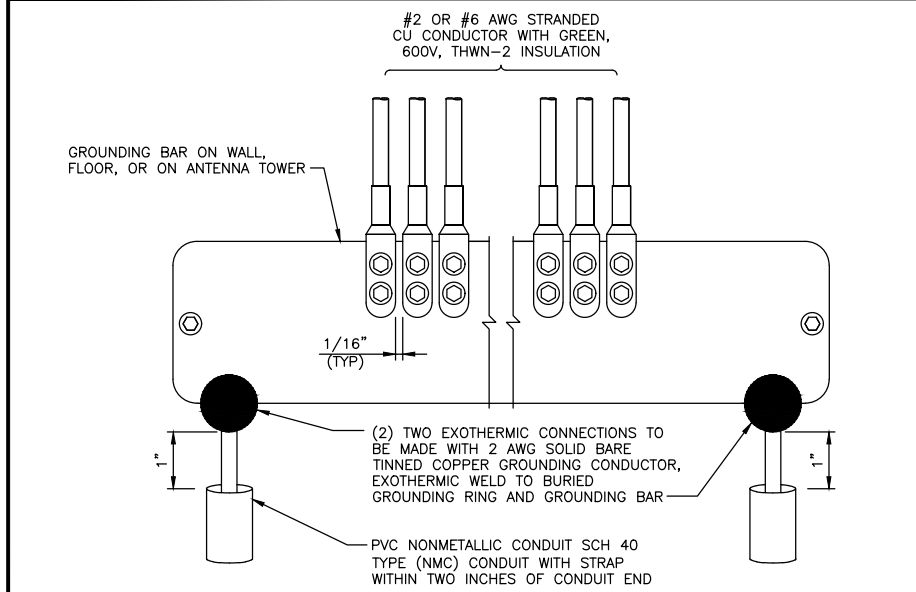
SHEET NUMBER
G-1

NEWTON INSTRUMENT COMPANY, INC. BUTNER, N.C.			
NO	REQUIRED	PART NUMBER	DESCRIPTION
①	1	1/4"x4"x30"	SOLID GROUND BAR
②	2	A-6056	WALL MOUNTING BRACKET
③	2	3061-4	INSULATORS
④	4	3012-1	5/8"-11x1" H.H.C.S.
⑤	4	3015-8	5/8" LOCKWASHER



EXTERIOR TWO HOLE LUG NO SCALE 2

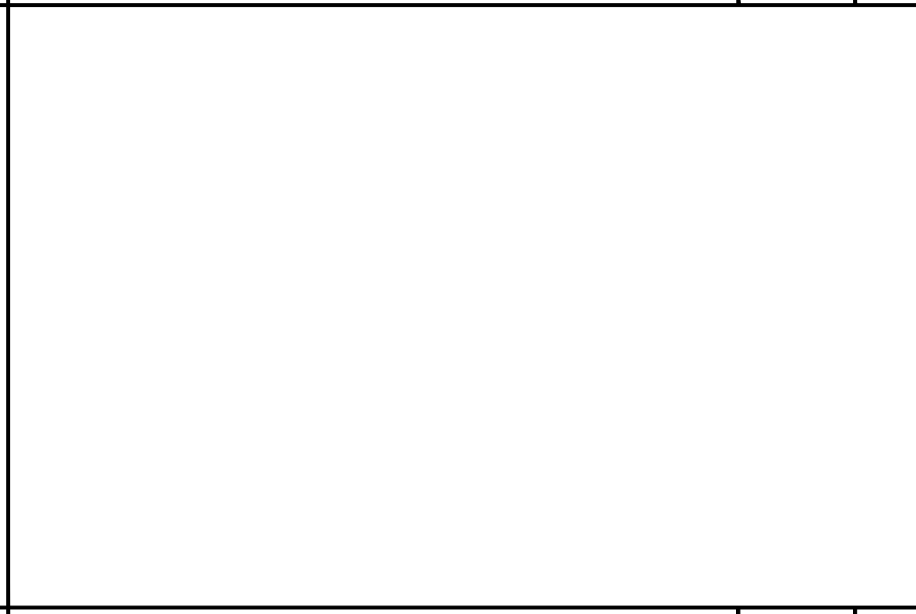
INTERIOR TWO HOLE LUG NO SCALE 3



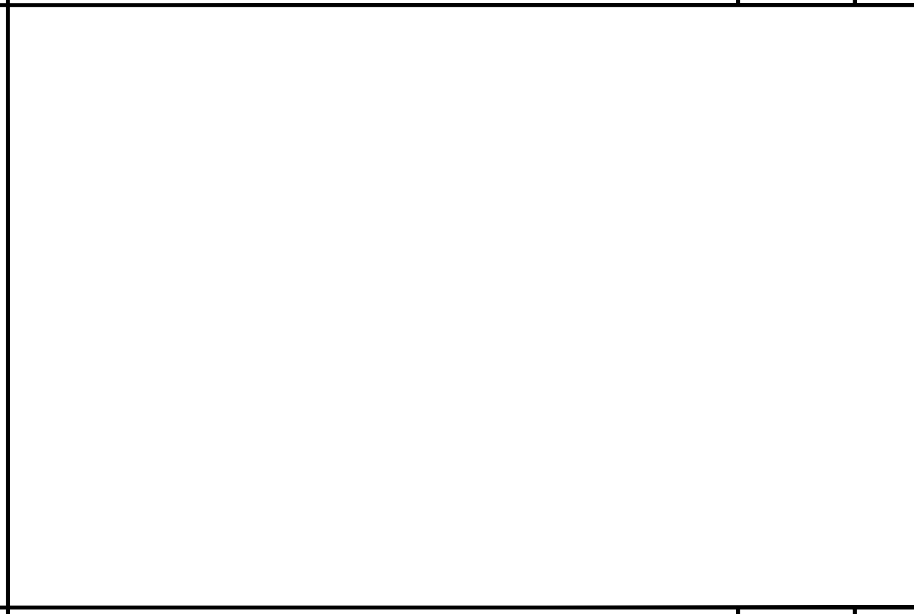
INSTALLATION OF GROUNDING CONDUCTOR TO GROUNDING BAR NO SCALE 4

- EXOTHERMIC WELD (2) TWO, #2 AWG BARE TINNED SOLID COPPER CONDUCTORS TO GROUND BAR. ROUTE CONDUCTORS TO BURIED GROUND RING AND PROVIDE PARALLEL EXOTHERMIC WELD.
- ALL GROUND BARS SHALL BE STAMPED IN TO THE METAL "IF STOLEN DO NOT RECYCLE." THE CONTRACTOR SHALL USE PERMANENT MARKER TO DRAW THE LINES BETWEEN EACH SECTION AND LABEL EACH SECTION ("P", "A", "I") WITH 1" HIGH LETTERS.
- ALL HARDWARE SHALL BE STAINLESS STEEL 3/8" DIAMETER OR LARGER. ALL HARDWARE 18-8 STAINLESS STEEL INCLUDING LOCK WASHERS, COAT ALL SURFACES WITH AN ANTI-OXIDANT COMPOUND BEFORE MATING.
- FOR GROUND BOND TO STEEL ONLY: INSERT A CADMIUM FLAT WASHER BETWEEN LUG AND STEEL, COAT ALL SURFACES WITH AN ANTI-OXIDANT COMPOUND BEFORE MATING.
- DO NOT INSTALL CABLE GROUNDING KIT AT A BEND AND ALWAYS DIRECT GROUND CONDUCTOR DOWN TO GROUNDING BUS.
- NUT & WASHER SHALL BE PLACED ON THE FRONT SIDE OF THE GROUND BAR AND BOLTED ON THE BACK SIDE. INSTALL BLACK HEAT-SHRINKING TUBE, 600 VOLT INSULATION, ON ALL GROUNDING TERMINATIONS. THE INTENT IS TO WEATHERPROOF THE COMPRESSION CONNECTION.
- ALL GROUNDING PARTS AND EQUIPMENT TO BE SUPPLIED AND INSTALLED BY CONTRACTOR.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING ADDITIONAL GROUND BAR AS REQUIRED, PROVIDING 50% SPARE CONNECTION POINTS.
- ENSURE THE WIRE INSULATION TERMINATION IS WITHIN 1/8" OF THE BARREL (NO SHINERS).

GROUNDING NOTES NO SCALE 5



PROPOSED H-FRAME GROUNDING NO SCALE 6



NOT USED NO SCALE 7

NOT USED NO SCALE 8

188 INVERNESS DRIVE WEST
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





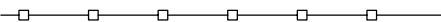
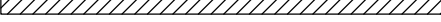




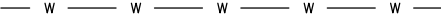
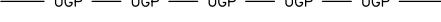











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DRENNAN AND POWERS
COL02022
5275 YUCATAN DRIVE
COLORADO SPRINGS, CO 80911
LTE - 3C/4C/4T4R

SHEET TITLE
GROUNDING DETAILS

SHEET NUMBER
G-2

- EXOTHERMIC CONNECTION 
- MECHANICAL CONNECTION 
- CHEMICAL ELECTROLYTIC GROUNDING SYSTEM 
- TEST CHEMICAL ELECTROLYTIC GROUNDING SYSTEM 
- EXOTHERMIC WITH INSPECTION SLEEVE 
- GROUNDING BAR 
- GROUND ROD 
- TEST GROUND ROD WITH INSPECTION SLEEVE 
- SINGLE POLE SWITCH 
- DUPLEX RECEPTACLE 
- DUPLEX GFCI RECEPTACLE 
- FLUORESCENT LIGHTING FIXTURE (2) TWO LAMPS 48-T8 
- SMOKE DETECTION (DC) 
- EMERGENCY LIGHTING (DC) 
- SECURITY LIGHT W/PHOTOCELL LITHONIA ALXW LED-1-25A400/51K-SR4-120-PE-DBTDX 
- CHAIN LINK FENCE 
- WOOD/WROUGHT IRON FENCE 
- WALL STRUCTURE 
- LEASE AREA 
- PROPERTY LINE (PL) 
- SETBACKS 
- ICE BRIDGE 
- CABLE TRAY 
- WATER LINE 
- UNDERGROUND POWER 
- UNDERGROUND TELCO 
- OVERHEAD POWER 
- OVERHEAD TELCO 
- UNDERGROUND TELCO/POWER 
- ABOVE GROUND POWER 
- ABOVE GROUND TELCO 
- ABOVE GROUND TELCO/POWER 
- WORKPOINT 
- SECTION REFERENCE 
- DETAIL REFERENCE 

- AB ANCHOR BOLT
- ABV ABOVE
- AC ALTERNATING CURRENT
- ADDL ADDITIONAL
- AFF ABOVE FINISHED FLOOR
- AFG ABOVE FINISHED GRADE
- AGL ABOVE GROUND LEVEL
- AIC AMPERAGE INTERRUPTION CAPACITY
- ALUM ALUMINUM
- ALT ALTERNATE
- ANT ANTENNA
- APPROX APPROXIMATE
- ARCH ARCHITECTURAL
- ATS AUTOMATIC TRANSFER SWITCH
- AWG AMERICAN WIRE GAUGE
- BATT BATTERY
- BLDG BUILDING
- BLK BLOCK
- BLKG BLOCKING
- BM BEAM
- BTC BARE TINNED COPPER CONDUCTOR
- BOF BOTTOM OF FOOTING
- CAB CABINET
- CANT CANTILEVERED
- CHG CHARGING
- CLG CEILING
- CLR CLEAR
- COL COLUMN
- COMM COMMON
- CONC CONCRETE
- CONSTR CONSTRUCTION
- DBL DOUBLE
- DC DIRECT CURRENT
- DEPT DEPARTMENT
- DF DOUGLAS FIR
- DIA DIAMETER
- DIAG DIAGONAL
- DIM DIMENSION
- DWG DRAWING
- DWL DOWEL
- EA EACH
- EC ELECTRICAL CONDUCTOR
- EL ELEVATION
- ELEC ELECTRICAL
- EMT ELECTRICAL METALLIC TUBING
- ENG ENGINEER
- EQ EQUAL
- EXP EXPANSION
- EXT EXTERIOR
- EW EACH WAY
- FAB FABRICATION
- FF FINISH FLOOR
- FG FINISH GRADE
- FIF FACILITY INTERFACE FRAME
- FIN FINISH(ED)
- FLR FLOOR
- FDN FOUNDATION
- FOC FACE OF CONCRETE
- FOM FACE OF MASONRY
- FOS FACE OF STUD
- FOW FACE OF WALL
- FS FINISH SURFACE
- FT FOOT
- FTG FOOTING
- GA GAUGE
- GEN GENERATOR
- GFCI GROUND FAULT CIRCUIT INTERRUPTER
- GLB GLUE LAMINATED BEAM
- GLV GALVANIZED
- GPS GLOBAL POSITIONING SYSTEM
- GND GROUND
- GSM GLOBAL SYSTEM FOR MOBILE
- HDG HOT DIPPED GALVANIZED
- HDR HEADER
- HGR HANGER
- HVAC HEAT/VENTILATION/AIR CONDITIONING
- HT HEIGHT
- IGR INTERIOR GROUND RING
- IN INCH
- INT INTERIOR
- LB(S) POUND(S)
- LF LINEAR FEET
- LTE LONG TERM EVOLUTION
- MAS MASONRY
- MAX MAXIMUM
- MB MACHINE BOLT
- MECH MECHANICAL
- MFR MANUFACTURER
- MGB MASTER GROUND BAR
- MIN MINIMUM
- MISC MISCELLANEOUS
- MTL METAL
- MTS MANUAL TRANSFER SWITCH
- MW MICROWAVE
- NEC NATIONAL ELECTRIC CODE
- NM NEWTON METERS
- NO. NUMBER
- # NUMBER
- NTS NOT TO SCALE
- OC ON-CENTER
- OSHA OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
- OPNG OPENING
- P/C PRECAST CONCRETE
- PCS PERSONAL COMMUNICATION SERVICES
- PCU PRIMARY CONTROL UNIT
- PRC PRIMARY RADIO CABINET
- PP POLARIZING PRESERVING
- PSF POUNDS PER SQUARE FOOT
- PSI POUNDS PER SQUARE INCH
- PT PRESSURE TREATED
- PWR POWER CABINET
- QTY QUANTITY
- RAD RADIUS
- RECT RECTIFIER
- REF REFERENCE
- REINF REINFORCEMENT
- REQ'D REQUIRED
- RET REMOTE ELECTRIC TILT
- RF RADIO FREQUENCY
- RMC RIGID METALLIC CONDUIT
- RRH REMOTE RADIO HEAD
- RRU REMOTE RADIO UNIT
- RWY RACEWAY
- SCH SCHEDULE
- SHT SHEET
- SIAD SMART INTEGRATED ACCESS DEVICE
- SIM SIMILAR
- SPEC SPECIFICATION
- SQ SQUARE
- SS STAINLESS STEEL
- STD STANDARD
- STL STEEL
- TEMP TEMPORARY
- THK THICKNESS
- TMA TOWER MOUNTED AMPLIFIER
- TN TOE NAIL
- TOA TOP OF ANTENNA
- TOC TOP OF CURB
- TOF TOP OF FOUNDATION
- TOP TOP OF PLATE (PARAPET)
- TOS TOP OF STEEL
- TOW TOP OF WALL
- TVSS TRANSIENT VOLTAGE SURGE SUPPRESSION
- TYP TYPICAL
- UG UNDERGROUND
- UL UNDERWRITERS LABORATORY
- UNO UNLESS NOTED OTHERWISE
- UMTS UNIVERSAL MOBILE TELECOMMUNICATIONS SYSTEM
- UPS UNINTERRUPTIBLE POWER SYSTEM (DC POWER PLANT)
- VIF VERIFIED IN FIELD
- W WIDE
- W/ WITH
- WD WOOD
- WP WEATHERPROOF
- WT WEIGHT



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COLORADO SPRINGS, CO 80911
LTE - 3C/4C/4T4R

SHEET TITLE

LEGEND AND ABBREVIATIONS

SHEET NUMBER

GN-1

LEGEND

ABBREVIATIONS

GENERAL CONSTRUCTION NOTES

GENERAL CONSTRUCTION

1. FOR THE PURPOSE OF CONSTRUCTION DRAWINGS, THE FOLLOWING DEFINITIONS SHALL APPLY:
GENERAL CONTRACTOR: OVERLAND CONTRACTING INC. (B&V)
CONTRACTOR: (CONSTRUCTION)
OWNER: AT&T
2. ALL SITE WORK SHALL BE COMPLETED AS INDICATED ON THE DRAWINGS AND AT&T PROJECT SPECIFICATIONS.
3. GENERAL CONTRACTOR SHALL VISIT THE SITE AND SHALL FAMILIARIZE HIMSELF WITH ALL CONDITIONS AFFECTING THE PROPOSED WORK AND SHALL MAKE NECESSARY PROVISIONS. PRIOR TO PROCEEDING WITH CONSTRUCTION, GENERAL CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH ALL CONTRACT DOCUMENTS, SITE CONDITIONS, DIMENSIONS, AND CONFIRMING THAT THE WORK CAN BE ACCOMPLISHED AS SHOWN ON PLAN. ANY DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF WORK.
4. MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES. GENERAL CONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS, AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF WORK.
5. ALL WORK CARRIED OUT SHALL COMPLY WITH APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS IN ADDITION TO LOCAL JURISDICTIONAL CODES, ORDINANCES, AND APPLICABLE REGULATIONS.
6. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS SHOWN ON THE DRAWINGS.
7. PLANS SHALL NOT BE SCALED. THESE PLANS ARE INTENDED TO BE A DIAGRAMMATIC OUTLINE ONLY, UNLESS OTHERWISE NOTED. DIMENSIONS SHOWN ARE TO FINISH SURFACES, UNLESS OTHERWISE NOTED. SPACING BETWEEN EQUIPMENT IS THE MINIMUM REQUIRED CLEARANCE. IT IS CRITICAL TO FIELD VERIFY ALL DIMENSIONS. SHOULD THERE BE ANY QUESTIONS REGARDING THE PLAN, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING A CLARIFICATION FROM THE ENGINEER PRIOR TO PROCEEDING WITH THE WORK. DETAILS ARE INTENDED TO SHOW DESIGN INTENT. MODIFICATIONS MAY BE REQUIRED TO SUIT JOB DIMENSIONS OR CONDITIONS. SUCH MODIFICATIONS SHALL BE INCLUDED AS PART OF WORK AND APPROVED BY THE ENGINEER PRIOR TO PROCEEDING WITH WORK.
8. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.
9. IF THE SPECIFIED EQUIPMENT CANNOT BE INSTALLED AS SHOWN ON THE PLAN, THE CONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION SPACE FOR APPROVAL BY THE ENGINEER PRIOR TO PROCEEDING.
10. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY OF WORK AREA, ADJACENT AREAS, AND BUILDING OCCUPANTS THAT ARE LIKELY TO BE AFFECTED BY THE WORK UNDER THIS CONTRACT. WORK SHALL CONFORM TO ALL OSHA REQUIREMENTS AND THE LOCAL JURISDICTION.
11. GENERAL CONTRACTOR SHALL COORDINATE AND SCHEDULE WORK ACTIVITIES WITH OTHER DISCIPLINES.
12. ERECTION SHALL BE DONE IN A WORKMANLIKE MANNER BY COMPETENT, EXPERIENCED WORKMEN IN ACCORDANCE WITH APPLICABLE CODES AND THE BEST ACCEPTED PRACTICE. ALL MEMBERS SHALL BE LAID PLUMB AND TRUE AS INDICATED ON THE DRAWINGS.
13. SEAL PENETRATIONS THROUGH FIRE RATED AREAS, SHALL BE MADE WITH UL LISTED MATERIALS, APPROVED BY THE LOCAL JURISDICTION. CONTRACTOR SHALL KEEP AREA CLEAN AND HAZARD FREE, AND DISPOSE OF ALL DEBRIS DAILY.
14. AS-BUILT CONDITIONS ARE REPRESENTED BY LIGHT SHADED LINES AND NOTES. THE SCOPE OF WORK FOR THIS PROJECT IS REPRESENTED BY DARK SHADED LINES AND NOTES. CONTRACTOR SHALL NOTIFY THE GENERAL CONTRACTOR OF ANY EXISTING CONDITIONS THAT DEVIATE FROM THE DRAWINGS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
15. CONTRACTOR SHALL PROVIDE WRITTEN NOTICE TO THE CONSTRUCTION MANAGER, 48 HOURS PRIOR TO COMMENCEMENT OF WORK.
16. THE CONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, LANDSCAPING, AND STRUCTURES DURING CONSTRUCTION OPERATIONS. ANY DAMAGED AREAS/ SITE ELEMENTS SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE OWNER.
17. THE CONTRACTOR SHALL CONTACT UTILITY LOCATING SERVICES PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR IS ALSO RESPONSIBLE FOR THE NOTIFICATION OF TIER-TWO FACILITY/UTILITY OWNERS.
18. GENERAL CONTRACTOR SHALL COORDINATE AND MAINTAIN ACCESS FOR ALL TRADES AND CONTRACTORS TO THE SITE AND/OR BUILDING.
19. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR SECURITY OF THE SITE FOR THE DURATION OF CONSTRUCTION UNTIL JOB COMPLETION.
20. THE GENERAL CONTRACTOR SHALL MAINTAIN IN GOOD CONDITION ONE COMPLETE SET OF PLANS WITH ALL REVISIONS, ADDENDA, AND CHANGE ORDERS, ON THE PREMISES, AT ALL TIMES.
21. THE CONTRACTOR SHALL PROVIDE PORTABLE FIRE EXTINGUISHERS WITH A RATING OF NOT LESS THAN 2-A OR 2-A:10-B:C LOCATED WITHIN 25 FEET OF TRAVEL DISTANCE TO WORK ALL AREAS OR WHERE WORK IS BEING PERFORMED DURING CONSTRUCTION.
22. ALL EXISTING ACTIVE SEWER, WATER, GAS, ELECTRIC, AND OTHER UTILITIES SHALL BE PROTECTED AT ALL TIMES, AND WHERE REQUIRED FOR THE PROPER EXECUTION OF THE WORK, SHALL BE RELOCATED AS DIRECTED BY THE ENGINEER. EXTREME CAUTION SHOULD BE USED BY THE CONTRACTOR WHEN EXCAVATING OR DRILLING PIERS AROUND OR NEAR UTILITIES. CONTRACTOR SHALL PROVIDE SAFETY TRAINING FOR THE WORKING CREW. TRAINING SHALL INCLUDE BUT NOT BE LIMITED TO A) FALL PROTECTION, B) CONFINED SPACE, C) ELECTRICAL SAFETY, AND D) TRENCHING & EXCAVATION.
23. ALL EXISTING INACTIVE SEWER, WATER, GAS, ELECTRIC, AND OTHER UTILITIES, WHICH INTERFERE WITH THE EXECUTION OF THE WORK, SHALL BE REMOVED, CAPPED, PLUGGED, OR OTHERWISE DISCONNECTED AT POINTS WHICH WILL NOT INTERFERE WITH THE EXECUTION OF THE WORK, AS DIRECTED BY THE RESPONSIBLE ENGINEER, AND SUBJECT TO THE APPROVAL OF THE OWNER AND/OR LOCAL UTILITIES.
24. THE AREAS OF THE OWNER'S PROPERTY DISTURBED BY THE WORK AND NOT COVERED BY THE TOWER, EQUIPMENT, OR DRIVEWAY, SHALL BE GRADED TO A UNIFORM SLOPE AND PROPERLY STABILIZED TO PREVENT EROSION.
25. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO THE SITE DURING CONSTRUCTION. EROSION CONTROL AND SEDIMENT CONTROL MEASURES, IF REQUIRED DURING CONSTRUCTION, SHALL BE IN CONFORMANCE WITH FEDERAL AND/OR LOCAL JURISDICTIONS.
26. FILL OR EMBANKMENT MATERIAL SHALL NOT BE PLACED ON FROZEN GROUND. FROZEN MATERIALS, SNOW, OR ICE SHALL NOT BE PLACED IN ANY FILL OR EMBANKMENT.
27. THE SUBGRADE SHALL BE BROUGHT TO A SMOOTH UNIFORM GRADE AND COMPACTED TO 95 PERCENT STANDARD PROCTOR UNDER PAVEMENT AND STRUCTURES AND 80 PERCENT STANDARD PROCTOR IN OPEN SPACE. ALL TRENCHES IN THE PUBLIC RIGHT-OF-WAY SHALL BE BACKFILLED WITH FLOWABLE FILL OR OTHER MATERIAL, PRE-APPROVED BY THE LOCAL JURISDICTION.
28. ALL NECESSARY RUBBISH, STUMPS, DEBRIS, STICKS, STONES, AND OTHER REFUSE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN A LAWFUL MANNER.
29. ALL BROCHURES, OPERATION MANUALS, MAINTENANCE MANUALS, CATALOGS, SHOP DRAWINGS, AND OTHER DOCUMENTS SHALL BE TURNED OVER TO THE GENERAL CONTRACTOR AT COMPLETION OF CONSTRUCTION AND PRIOR TO PAYMENT.

30. CONTRACTOR SHALL SUBMIT A COMPLETE SET OF AS-BUILT REDLINES TO THE GENERAL CONTRACTOR UPON COMPLETION OF PROJECT AND PRIOR TO FINAL PAYMENT.
31. THE PROPOSED FACILITY WILL BE UNMANNED, DOES NOT REQUIRE POTABLE WATER OR SEWER SERVICE, AND IS NOT FOR HUMAN HABITAT (NO HANDICAP ACCESS REQUIRED).
32. OCCUPANCY IS LIMITED TO PERIODIC MAINTENANCE AND INSPECTION OF APPROXIMATELY TWO TIMES PER MONTH BY AT&T TECHNICIANS.
33. NO OUTDOOR STORAGE OR SOLID WASTE CONTAINERS ARE PROPOSED.
34. ALL MATERIAL SHALL BE FURNISHED AND WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE LATEST REVISION AT&T MOBILITY GROUNDING STANDARD "TECHNICAL SPECIFICATION FOR CONSTRUCTION OF GSM WIRELESS SITES" AND "TECHNICAL SPECIFICATION FOR FACILITY GROUNDING". IN CASE OF A CONFLICT BETWEEN THE CONSTRUCTION SPECIFICATIONS AND THE DRAWINGS, THE DRAWINGS SHALL GOVERN.
35. CONTRACTORS SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS AND INSPECTIONS REQUIRED FOR CONSTRUCTION. IF CONTRACTOR CANNOT OBTAIN A PERMIT, THEY MUST NOTIFY THE GENERAL CONTRACTOR IMMEDIATELY.
36. CONTRACTOR SHALL REMOVE ALL TRASH AND DEBRIS FROM THE SITE ON A DAILY BASIS.
37. CONTRACTOR SHALL LEAVE PREMISES IN A CLEAN CONDITION.
38. INFORMATION SHOWN ON THESE DRAWINGS WAS OBTAINED FROM SITE OBSERVATIONS AND/OR DRAWINGS PROVIDED BY THE SITE OWNER. CONTRACTORS SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIAL OR PROCEEDING WITH CONSTRUCTION.
39. WHITE STROBE LIGHTS ARE NOT PERMITTED. IF LIGHTING IS REQUIRED, IT SHALL MEET FAA STANDARDS AND REQUIREMENTS.
40. ALL COAXIAL CABLE CONTRACTOR SHALL INSTALL PER MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS.

ANTENNA MOUNTING

41. DESIGN AND CONSTRUCTION OF ANTENNA SUPPORTS SHALL CONFORM TO CURRENT ANSI/TIA-222 OR APPLICABLE LOCAL CODES.
42. ALL STEEL MATERIALS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT-DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS", UNLESS NOTED OTHERWISE.
43. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC-COATING (HOT-DIP) ON IRON AND STEEL HARDWARE", UNLESS NOTED OTHERWISE.
44. DAMAGED GALVANIZED SURFACES SHALL BE REPAIRED BY COLD GALVANIZING IN ACCORDANCE WITH ASTM A780.
45. ALL ANTENNA MOUNTS SHALL BE INSTALLED WITH LOCK WASHERS AND/OR DOUBLE NUTS, AND SHALL BE TORQUED TO MANUFACTURER'S RECOMMENDATIONS.
46. CONTRACTOR SHALL INSTALL ANTENNA AND ASSOCIATED GROUNDING PER MANUFACTURER'S RECOMMENDATIONS.
47. ALL UNUSED PORTS ON ANY ANTENNA OR TMA, SHALL BE COVERED BY CONCEALOR CAP WITH PROPER WEATHER PROOFING OR BE TERMINATED WITH A 50 Ω LOAD.
48. PRIOR TO SETTING ANTENNA AZIMUTHS AND DOWNTILTS, ANTENNA CONTRACTOR SHALL CHECK THE ANTENNA MOUNT FOR TIGHTNESS AND ENSURE THAT THEY ARE PLUMB. ANTENNA AZIMUTHS SHALL BE SET FROM TRUE NORTH AND BE ORIENTED WITHIN +/- 3 DEGREES AS DEFINED BY THE RFDS. ANTENNA DOWNTILTS SHALL BE WITHIN +/- 0.5 DEGREES AS DEFINED BY THE RFDS. REFER TO ATT-002-290-210.
49. JUMPERS FROM THE TOWER MOUNTED AMPLIFIERS MUST TERMINATE TO OPPOSITE POLARIZATIONS IN EACH SECTOR.
50. CONTRACTOR SHALL RECORD THE SERIAL NUMBER, SECTOR, AND POSITION OF EACH ACTUATOR INSTALLED AT THE ANTENNAS AND PROVIDE THE INFORMATION TO AT&T.
51. TOWER MOUNTED AMPLIFIERS SHALL BE MOUNTED ON PIPE DIRECTLY BEHIND ANTENNAS AS CLOSE TO ANTENNA AS FEASIBLE IN A VERTICAL POSITION.
52. ANTENNAS SHALL HAVE A 4'-0" MINIMUM CENTER-TO-CENTER HORIZONTAL SEPARATION.

TORQUE REQUIREMENTS

53. ALL RF CONNECTIONS SHALL BE TIGHTENED BY A TORQUE WRENCH.
54. A TORQUE MARK FORMING A CONTINUOUS STRAIGHT LINE IS TO BE MADE IN THE FOLLOWING APPLICATIONS:
 - A. RF CONNECTIONS - MARK BOTH SIDES OF THE CONNECTOR
 - B. GROUNDING AND ANTENNA HARDWARE - MARK ON THE NUT SIDE OF THE BOLT, STARTING FROM THE THREADS TO THE SOLID SURFACE. SOLID SURFACE EXAMPLES INCLUDE A GROUND BAR OR ANTENNA BRACKET METAL.
55. ALL 8M ANTENNA HARDWARE SHALL BE TIGHTENED TO 9 LB-FT (12 NM).
56. ALL 12M ANTENNA HARDWARE SHALL BE TIGHTENED TO 43 LB-FT (58 NM).
57. ALL GROUNDING HARDWARE SHALL BE TIGHTENED UNTIL THE LOCK WASHER COLLAPSES AND THE GROUNDING HARDWARE IS NO LONGER LOOSE.
58. ALL DIN TYPE CONNECTIONS SHALL BE TIGHTENED TO 18-22 LB-FT (24.4 - 29.8 NM).
59. ALL N TYPE CONNECTIONS SHALL BE TIGHTENED TO 15-20 LB-IN (1.7 - 2.3 NM).

FIBER & POWER CABLE MOUNTING

60. THE FIBER OPTIC TRUNK CABLES SHALL BE INSTALLED IN CONDUITS OR INNERDUCT. WHEN UTILIZING A CABLE TRAY SYSTEM, PLACE FIBER OPTIC TRUNK CABLE INTO AN INTER-DUCT. A PARTITION BARRIER SHALL BE INSTALLED BETWEEN THE 600 VOLT CABLES AND THE INTER-DUCT IN ORDER TO SEGREGATE CABLE TYPES. OPTIC FIBER TRUNK CABLES SHALL HAVE APPROVED CABLE RESTRAINTS EVERY (6) SIX FEET AND SHALL BE SECURELY FASTENED TO THE CABLE TRAY SYSTEM. NFPA 70 (NEC) ARTICLE 770 RULES SHALL APPLY.
61. TYPE TC-ER CABLES SHALL BE INSTALLED INTO CONDUITS OR CABLE TRAYS, AND SHALL BE SECURED AT INTERVALS NOT EXCEEDING (6) FEET. WHERE TYPE TC-ER CABLES ARE NOT SUBJECT TO PHYSICAL DAMAGE, CABLES SHALL BE PERMITTED TO MAKE A TRANSITION BETWEEN CONDUITS OR CABLE TRAYS THAT ARE SERVICING UTILIZATION EQUIPMENT OR DEVICES. A TRANSITION DISTANCE EXCEEDING (6) FEET REQUIRES CONTINUOUS SUPPORTING. NFPA 70 (NEC) ARTICLES 336 AND 392 RULES SHALL APPLY.
62. WHEN INSTALLING OPTIC FIBER TRUNK CABLES OR TYPE TC-ER CABLES INTO CONDUITS, NFPA 70 (NEC) ARTICLE 300 RULES SHALL APPLY.

COAXIAL CABLE NOTES

63. TYPES AND SIZES OF THE ANTENNA CABLES ARE BASED ON ESTIMATED LENGTHS. PRIOR TO ORDERING CABLE, CONTRACTOR SHALL VERIFY ACTUAL LENGTH BASED ON CONSTRUCTION LAYOUT AND NOTIFY THE PROJECT MANAGER IF ACTUAL LENGTHS EXCEED ESTIMATED LENGTHS.
64. CONTRACTOR SHALL VERIFY THAT THE DOWNTILT OF EACH ANTENNA IS WITHIN +/- 0.5 DEGREES OF SPECIFICATION WITH AN OCI APPROVED DIGITAL LEVEL.
65. CONTRACTOR SHALL CONFIRM COAX COLOR CODING PRIOR TO CONSTRUCTION. REFER TO LATEST REVISION OF THE "ANTENNA SYSTEM LABELING STANDARD."
66. ALL COAXIAL CABLE SHALL BE SECURED TO THE DESIGNED SUPPORT STRUCTURE IN AN APPROVED MANNER, NOT TO EXCEED MANUFACTURER'S RECOMMENDATIONS.
67. COAXIAL CABLE SHALL BE SECURED TO THE DESIGNATED SUPPORT STRUCTURE(S) PER MANUFACTURER'S SPECIFICATIONS.

GENERAL CABLE AND EQUIPMENT NOTES

68. CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY ANTENNA, TMAS, DIPLEXERS, COAX CONFIGURATION, MAKES, AND MODELS PRIOR TO INSTALLATION.
69. ALL CONNECTIONS FOR HANGERS, SUPPORTS, BRACING, ETC. SHALL BE INSTALLED PER TOWER MANUFACTURER'S RECOMMENDATIONS.
70. CONTRACTOR SHALL REFERENCE THE TOWER STRUCTURAL ANALYSIS/DESIGN DRAWINGS FOR DIRECTIONS ON CABLE DISTRIBUTION/ROUTING.
71. AFTER INSTALLATION AND FINAL CONNECTIONS ARE MADE, ALL OUTDOOR RF CONNECTORS/CONNECTIONS SHALL BE WEATHERPROOFED, EXCEPT THE RET CONNECTORS, USING BUTYL TAPE. BUTYL TAPE SHALL HAVE A MINIMUM OF ONE-HALF TAPE WIDTH OVERLAP ON EACH TURN AND EACH LAYER SHALL BE WRAPPED THREE TIMES. WEATHERPROOFING SHALL BE SMOOTH WITHOUT BUCKLING. BUTYL BLEEDING IS NOT ALLOWED. SELF BONDING TAPE AND PLASTIC ENCLOSURES ARE PERMITTED PER ATT-002-290-041, SECTION 7.
72. IF REQUIRED TO PAINT ANTENNAS AND/OR COAX:
 - A. TEMPERATURE SHALL BE ABOVE 50 DEGREES FAHRENHEIT.
 - B. PAINT COLOR MUST BE APPROVED BY BUILDING OWNER/LANDLORD.
 - C. FOR REGULATED TOWERS, FAA/FCC APPROVED PAINT IS REQUIRED.
 - D. DO NOT PAINT OVER COLOR CODING OR ON EQUIPMENT MODEL NUMBERS.
73. ALL CABLES SHALL BE GROUNDED WITH COAXIAL CABLE GROUND KITS. AT THE FOLLOWING LOCATIONS PER MANUFACTURER'S RECOMMENDATIONS:
 - A. THE ANTENNA LEVEL.
 - B. THE MID LEVEL, TOWERS WHICH ARE OVER 200'-0", ADDITIONAL CABLE GROUNDING REQUIRED.
 - C. BASE OF TOWER PRIOR TO TURNING HORIZONTAL.
 - D. OUTSIDE THE EQUIPMENT SHELTER AT ENTRY PORT.
74. ANTENNA CONTRACTOR SHALL FURNISH AND INSTALL A 12'-0" T-BOOM SECTOR ANTENNA MOUNT INCLUDING ALL HARDWARE, IF APPLICABLE.



188 INVERNESS DRIVE WEST
SUITE 400
ENGLEWOOD, CO 80112



4600 SOUTH SYRACUSE STREET
SUITE 800
DENVER, COLORADO 80237

PROJECT/PHASE NO:	129051/3034
DRAWN BY:	BDJ
CHECKED BY:	NCP
RFDS:	2.00

REV	DATE	DESCRIPTION
0	11/30/17	ISSUED FOR CONSTRUCTION



IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

DRENNAN AND POWERS
COL02022
5275 YUCATAN DRIVE
COLORADO SPRINGS, CO 80911
LTE - 3C/4C/4T4R

SHEET TITLE
GENERAL CONSTRUCTION NOTES

SHEET NUMBER
GN-2

GENERAL SITE WORK AND DRAINAGE NOTES

PART 1 – GENERAL

CONTRACTOR SHALL PROVIDE CLEARING, GRUBBING, STRIPPING, EROSION CONTROL, SURVEY, LAYOUT, SUBGRADE PREPARATION, AND FINISH GRADING AS REQUIRED TO COMPLETE THE PROPOSED WORK SHOWN IN THESE PLANS.

1.1 REFERENCES:

- A. DOT (STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, CURRENT EDITION)
- B. ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)
- C. OSHA (OCCUPATION SAFETY AND HEALTH ADMINISTRATION)

1.2 INSPECTION AND TESTING:

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

1.3 SITE MAINTENANCE AND PROTECTION:

- A. PROVIDE ALL NECESSARY JOB SITE MAINTENANCE FROM COMMENCEMENT OF WORK UNTIL COMPLETION OF THE SUBCONTRACT.
- B. AVOID DAMAGE TO THE SITE AND TO EXISTING FACILITIES, STRUCTURES, TREES, AND SHRUBS DESIGNATED TO REMAIN. TAKE PROTECTIVE MEASURES TO PREVENT DAMAGED TO EXISTING FACILITIES THAT ARE NOT DESIGNATED FOR MODIFICATION OR REMOVAL.
- C. KEEP SITE FREE OF PONDING WATER.
- D. PROVIDE EROSION CONTROL MEASURES IN ACCORDANCE WITH STATE DOT AND EPA REQUIREMENTS.
- E. PROVIDE AND MAINTAIN ALL TEMPORARY FENCING, BARRICADES, WARNING SIGNS, AND SIMILAR DEVICES NECESSARY TO PROTECT AGAINST THEFT FROM PROPERTY DURING THE ENTIRE DURATION OF CONSTRUCTION. REMOVE ALL SUCH DEVICES UPON COMPLETION OF THE WORK.
- F. DO NOT INTERRUPT EXISTING UTILITIES SERVING FACILITIES OCCUPIED BY THE OWNER OR OTHERS, EXCEPT WHEN PERMITTED IN WRITING BY THE ENGINEER AND THEN ONLY AFTER ACCEPTABLE TEMPORARY UTILITY SERVICES HAVE BEEN PROVIDED.
 - 1. NOTICE TO ENGINEER SHALL BE PROVIDED A MINIMUM OF 48 HOURS PRIOR TO OUTAGE.

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 THREE (3) INCHES IN ANY DIMENSION.
- 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 THREE (3) INCHES IN ANY DIMENSION.
- 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 THREE (3) INCHES IN DIAMETER, 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 IS REQUIRED.
- 2.5 GRANULAR BEDDING AND TRENCH BACKFILL: WELL-GRADED SAND MEETING THE GRADATION REQUIREMENTS OF ASTM D2487 (CLASSIFIED AS SE OR SW-SM SOILS).
- 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 DIAMETER, AND DEBRIS. THESE WILL BE SOILS CLASSIFIED BY ASTM AS PT, MH, CH, OH, ML, AND OL.
- 2.8 GEOTEXTILE FABRIC: MIRAFI 500X OR APPROVED EQUIVALENT.
- 2.9 PLASTIC MARKING TAPE SHALL BE ACID AND ALKALI RESISTANT POLYETHYLENE FILM SPECIFICALLY MANUFACTURED FOR MARKING AND LOCATING UNDERGROUND UTILITIES, SIX (6) INCHES WIDE WITH A MINIMUM THICKNESS OF 0.004" TAPE SHALL HAVE MINIMUM STRENGTH OF 1,500 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 A RAIN EVENT, THE SITE CAN PROPERLY DRAIN AT ANY TIME.
- B. PRIOR TO 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, OTHER DEBRIS, AND VEGETATION RESTING ON OR PROTRUDING THROUGH THE GROUND SURFACE.
 - 1. REMOVE THE FOLLOWING MATERIALS TO A DEPTH OF NO LESS THAN 12 INCHES BELOW THE ORIGINAL GROUND SURFACE: ROOTS, STUMPS, BRUSH, REFUSE, AND OTHER DEBRIS 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 MATERIAL TO A DEPTH OF 12 INCHES BELOW THE BOTTOM DEPTH OF ROOTS AND OTHER DEBRIS.
 - 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. ALL DEBRIS RESULTING FROM CLEARING AND GRUBBING OPERATIONS SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN AN AUTHORIZED LANDFILL. BURNING OF DEBRIS 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 PROPOSED CONSTRUCTION. NOTIFY THE CONSTRUCTION MANAGER OF ANY OBSTRUCTIONS THAT WILL PREVENT ACCOMPLISHMENT OF THE WORK AS INDICATED ON THE PLANS.
- F. SEPARATE AND STOCKPILE 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. AFTER COMPLETING CONSTRUCTION OF A 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 IN UNIFORM HORIZONTAL LAYERS OF NO GREATER THAN 8-INCHES LOOSE THICKNESS. WHERE HAND OPERATED COMPACTORS ARE USED, THE FILL MATERIAL SHALL BE PLACED IN LIFTS NOT TO EXCEED 4 INCHES IN LOOSE DEPTH.
 - 3. IF 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 PERCENT OF THE MAXIMUM DRY DENSITY AS PROVIDED BY THE STANDARD PROCTOR TEST, ASTM D698.

3.3 TRENCH EXCAVATION:

- A. UTILITY TRENCHES SHALL BE EXCAVATED AT LOCATIONS, DEPTHS, AND WIDTHS SHOWN ON PLAN, OR AS DIRECTED BY THE GENERAL CONTRACTOR. EXCAVATION CONTRACTOR SHALL PROVIDE SHORING, SHEETING, AND BRACING AS REQUIRED TO PREVENT CAVING OR SLOUGHING OF THE TRENCH WALLS.
- B. THE TRENCH WIDTH SHALL EXTEND A MINIMUM OF 6 INCHES BEYOND THE OUTSIDE EDGE OF THE OUTERMOST CONDUIT.

3.4 TRENCH BACKFILL:

- A. NOTIFY THE GENERAL CONTRACTOR 24 HOURS IN ADVANCE OF BACKFILLING.
- B. PROVIDE GRANULAR BEDDING MATERIAL IN ACCORDANCE WITH THE PLAN AND THE UTILITY REQUIREMENTS.
- 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 AND TO 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 THE BACKFILL MATERIAL IN MAXIMUM 8-INCH THICK LOOSE LIFTS TO RESTORE THE REQUIRED FINISHED SURFACE GRADE.
- G. COMPACT THE TRENCH BACKFILL A MINIMUM OF 95 PERCENT OF THE MAXIMUM DRY DENSITY AS PROVIDED BY THE STANDARD PROCTOR TEST, ASTM D698.

3.5 AGGREGATE ACCESS ROAD:

- A. CLEAR, GRUB, STRIP, AND EXCAVATE FOR THE ACCESS ROAD AS SHOWN ON PLAN. SCARIFY TO A DEPTH OF 6 INCHES AND PROOF-ROLL. ALL HOLES, RUTS, SOFT PLACES, AND OTHER DEFECTS SHALL BE CORRECTED.
- B. THE SUBGRADE OF THE DISTURBED AREA SHALL BE COMPACTED TO NOT LESS THAN 95 PERCENT OF THE MAXIMUM DRY DENSITY AS PROVIDED BY THE MODIFIED PROCTOR TEST, ASTM D1557.
- C. AFTER PREPARATION OF THE ROAD SUBGRADE IS COMPLETE, INSTALL THE GEOTEXTILE FABRIC (MIRAFI 500X) AT LOCATIONS INDICATED ON THE PLAN BY ROLLING THE FABRIC OUT LONGITUDINALLY ALONG THE ROADWAY. THE FABRIC SHALL NOT BE DRAGGED ACROSS THE SUBGRADE. PLACE THE ENTIRE ROLL IN A SINGLE OPERATION AND ROLL IT OUT AS SMOOTHLY AS POSSIBLE.
 - 1. GEOTEXTILE FABRIC OVERLAPS THAT ARE PARALLEL TO THE ROADWAY WILL BE PERMITTED ALONG THE CENTERLINE OF THE ROAD AND AT LOCATIONS BEYOND THE ROADWAY SURFACE WIDTH (I.E. WITHIN THE SHOULDER WIDTH) ONLY. NO LONGITUDINAL OVERLAPS SHALL BE LOCATED BETWEEN THE CENTERLINE AND THE SHOULDER. PARALLEL OVERLAPS SHALL BE A MINIMUM OF 3 FEET WIDE.
 - 2. TRANSVERSE (PERPENDICULAR TO THE ROADWAY) GEOTEXTILE FABRIC OVERLAPS AT THE END OF A ROLL SHALL OVERLAP IN THE DIRECTION OF THE AGGREGATE PLACEMENT WITH THE PREVIOUS ROLL ON TOP OF THE NEW ROLL, AND SHALL HAVE A MINIMUM LENGTH OF 3 FEET.
 - 3. ALL GEOTEXTILE FABRIC OVERLAPS SHALL BE PINNED WITH STAPLES OR NAILS A MINIMUM OF 10 INCHES LONG TO INSURE PROPER POSITIONING DURING PLACEMENT OF AGGREGATE. PIN LONGITUDINAL SEAMS AT A MINIMUM OF 25-FOOT INTERVALS AND TRANSVERSE SEAMS AT A MINIMUM OF 5-FOOT INTERVALS.
- D. THE AGGREGATE BASE AND SURFACE AGGREGATE SHALL BE CONSTRUCTED IN LAYERS NOT MORE THAN 4 INCHES (COMPACTED) IN THICKNESS. AGGREGATE TO BE PLACED ON GEOTEXTILE FABRIC SHALL BE END-DUMPED ON THE FABRIC FROM THE FREE END OF THE FABRIC OR OVER PREVIOUSLY PLACED AGGREGATE. THE FIRST LIFT SHALL BE BLADED DOWN TO A THICKNESS OF 8 INCHES PRIOR TO COMPACTION. AT NO TIME SHALL EQUIPMENT, EITHER TRANSPORTING THE AGGREGATE OR GRADING THE AGGREGATE, BE PERMITTED ON THE ROADWAY WITH LESS THAN 4 INCHES OF MATERIAL COVERING THE GEOTEXTILE FABRIC.
- E. THE AGGREGATE SHALL BE IMMEDIATELY COMPACTED TO NOT LESS THAN 95 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR TEST, ASTM D1557. A TAMPING ROLLER, PNEUMATIC-TIRED ROLLER, OR VIBRATORY MACHINE, OR ANY COMBINATION THEREOF MAY BE USED FOR COMPACTION PROCEDURES. THE TOP LAYER SHALL BE GIVEN A FINAL ROLLING WITH A THREE-WHEEL OR TANDEM ROLLER.

3.6 FINISH GRADING:

- A. PERFORM ALL GRADING TO PROVIDE POSITIVE DRAINAGE AWAY FROM STRUCTURES AND SMOOTH SURFACE DRAINAGE OF THE ENTIRE AREA WITHIN THE LIMITS OF CONSTRUCTION. GRADING SHALL PROPERLY BLEND WITH SURROUNDING TOPOGRAPHY AND STRUCTURES.
- B. IF DEEMED SUITABLE PER GEOTECHNICAL ENGINEER, UTILIZE FILL MATERIAL RESULTING FROM EXCAVATION FOR 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 IF APPLICABLE, TOP OF SOIL STABILIZER FABRIC.
- D. REPAIR ALL ACCESS ROADS AND SURROUNDING AREAS DISTURBED DURING THE COURSE OF THIS WORK TO THEIR ORIGINAL CONDITION.

3.7 ASPHALT PAVING: SHALL BE PERFORMED PER COLORADO DEPARTMENT OF TRANSPORTATION (CDOT), DIVISION 400 – CDOT PAVEMENT STANDARDS AND SPECIFICATIONS.



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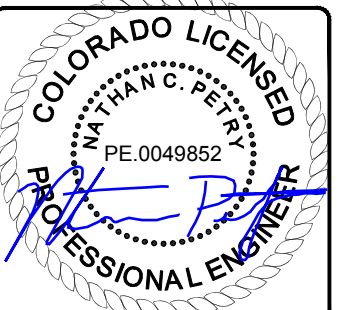


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COLORADO SPRINGS, CO 80911
LTE – 3C/4C/4T4R

SHEET TITLE
GENERAL SITE WORK AND DRAINAGE NOTES

SHEET NUMBER
GN-3

GENERAL CONCRETE WORK NOTES

PART 1 – GENERAL

1.1 SCOPE:

- A. FORM WORK, REINFORCING STEEL, ACCESSORIES, CAST-IN PLACE CONCRETE, FINISHING, CURING, AND TESTING FOR STRUCTURAL CONCRETE FOUNDATIONS.

1.2 REFERENCES:

- A. ACI (AMERICAN CONCRETE INSTITUTE)
 - 1. ACI 301 SPECIFICATION FOR STRUCTURAL CONCRETE FOR BUILDINGS.
 - 2. ACI 304 RECOMMENDED PRACTICE FOR MEASURING, MIXING, TRANSPORTING AND PLACING CONCRETE.
 - 3. ACI 305 RECOMMENDED PRACTICE FOR HOT WEATHER CONCRETING.
 - 4. ACI 306 RECOMMENDED PRACTICE FOR COLD WEATHER CONCRETING.
 - 5. ACI 308 STANDARD PRACTICE FOR CURING CONCRETING.
 - 6. ACI 309 STANDARD PRACTICE FOR CONSOLIDATION OF CONCRETE.
 - 7. ACI 318 BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE.
 - 8. ACI 347 RECOMMENDED PRACTICE FOR CONCRETE FORMWORK.
- B. THE APPLICABLE STANDARDS OF THE AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) ARE REFERENCED IN THE ACI STANDARDS AND ARE A PART OF THIS SPECIFICATION.

PART 2 – PRODUCTS

2.1 REINFORCING MATERIALS:

- B. REINFORCING BARS: ASTM A615, GRADE 60, PROPOSED DEFORMED BILLET-STEEL BARS, PLAIN FINISH.
- C. CONTRACTOR SHALL FURNISH CHAIRS, BOLSTERS, BAR SUPPORTS, SPACERS AS REQUIRED FOR SUPPORT OF REINFORCING STEEL AND WIRE FABRIC.

2.2 CONCRETE MATERIALS:

- A. PORTLAND CEMENT SHALL BE TYPE II, CONFORMING TO ASTM C-150.
- B. AGGREGATE SHALL CONFORM TO ASTM C-33.
 - 1. FINE AGGREGATE SHALL BE UNIFORMLY GRADED, CLEAN, SHARP, AND WASHED NATURAL OR CRUSHED SAND, FREE FROM ORGANIC IMPURITIES.
 - 2. COARSE AGGREGATE SHALL BE NATURAL WASHED GRAVEL OR CRUSHED ROCK CONSISTING HARD, STRONG, DURABLE PIECES, FREE FROM ADHERENT COATINGS.
 - 3. MAXIMUM SIZE OF COARSE AGGREGATE SHALL BE 3/4 INCH IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM C-33 GRADATION SIZE NO. 67.
- C. WATER USED IN CONCRETE MIX SHALL BE POTABLE, CLEAN, AND FREE FROM OILS, ACIDS, SALTS, CHLORIDES, ALKALI, SUGAR, VEGETABLE, OR OTHER DELETARIOUS SUBSTANCES.
- D. THE CONCRETE SHALL CONTAIN AN AIR-ENTRAINING ADMIXTURE COMPLYING WITH THE REQUIREMENTS OF ASTM C-260 AND ACI 212.1R AND A WATER-REDUCING ADMIXTURE COMPLYING WITH THE REQUIREMENTS OF ASTM C-494 AND ACI 212.1R. ADMIXTURES SHALL BE PURCHASED AND BATCHED IN LIQUID SOLUTION. THE USE OF CALCIUM CHLORIDE OR AN ADMIXTURE CONTAINING CALCIUM CHLORIDE IS PROHIBITED. ADMIXTURES SHALL BE OF THE SAME MANUFACTURER TO ASSURE COMPATIBILITY. ACCEPTABLE MANUFACTURERS ARE:
 - 1. W.R. GRACE
 - 2. SIKA CORPORATION
 - 3. MASTER BUILDERS
 - 4. EUCLID CHEMICAL COMPANY
- E. CURING COMPOUND SHALL CONFORM TO ASTM C309, TYPE I, ID, CLASS A AND B, AND ASTM C171 AS APPLICABLE.

2.3 CONCRETE MIX:

- A. PROPORTION CONCRETE MIX IN ACCORDANCE WITH REQUIREMENTS OF ACI 301. THE STRENGTH OF CONCRETE SHALL BE AS INDICATED ON THE DRAWINGS. WHERE STRENGTH IS NOT CLEARLY INDICATED, CONCRETE OF MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4,000 PSI SHALL BE USED.
- B. THE CONCRETE MIX SHALL BE DESIGNED FOR A MAXIMUM SLUMP OF THREE INCHES AT THE POINT OF DISCHARGE. MIXES OF THE STIFFEST CONSISTENCY THAT CAN BE EFFICIENTLY PLACED SHALL BE USED.
- C. ALL CONCRETE SHALL HAVE THREE (3) TO FIVE (5) PERCENT ENTRAINED AIR.
- D. ALL STRUCTURAL CONCRETE SHALL CONTAIN A WATER-REDUCING AGENT.

PART 3 – EXECUTION

3.1 GENERAL:

- A. CONSTRUCT AND ERECT THE FORM WORK IN ACCORDANCE WITH ACI 301 AND ACI 347.
- B. COLD-WEATHER CONCRETING SHALL BE IN ACCORDANCE WITH ACI 306.
- C. HOT-WEATHER CONCRETING SHALL BE IN ACCORDANCE WITH ACI 305.

3.2 INSERTS, EMBEDDED COMPONENTS, AND OPENINGS:

- A. CONTRACTOR SHALL CHECK ALL CIVIL, ARCHITECTURAL, STRUCTURAL, AND ELECTRICAL DRAWINGS FOR OPENINGS, SLEEVES, ANCHOR BOLTS, INSERTS, AND OTHER ITEMS TO BE INCORPORATED INTO THE CONCRETE WORK.
- B. COORDINATE THE WORK OF OTHER SECTION IN FORMING AND SETTING OPENINGS, RECESSES, SLOTS, CHASES, ANCHORS, INSERTS, AND OTHER ITEMS TO BE EMBEDDED.
- C. EMBEDDED ITEMS SHALL BE SET ACCURATELY IN LOCATION, ALIGNMENT, ELEVATION AND PLUMBNESS, LOCATED AND MEASURED FROM ESTABLISHED SURVEYED REFERENCE BENCHMARKS.

- D. EMBEDDED ITEMS SHALL BE ANCHORED INTO PLACE IN A MANNER TO PREVENT MOVEMENT DURING CONCRETE PLACEMENT AND CONSOLIDATION. COMPONENTS FORMING A PART OF A COMPLETE ASSEMBLY SHALL BE ALIGNED BEFORE ANCHORING INTO PLACE. PROVIDE TEMPORARY BRACING, ANCHORAGE, AND TEMPLATES AS REQUIRED TO MAINTAIN THE SETTING AND ALIGNMENT.

3.3 REINFORCEMENT PLACEMENT:

- A. PLACE REINFORCEMENT ACCORDING TO CONSTRUCTION PLAN SET DRAWINGS AND IN ACCORDANCE WITH ACI 301 AND ACI 318.
- B. ACCURATELY POSITION, SUPPORT, AND SECURE REINFORCEMENT AGAINST DISPLACEMENT FROM FORM WORK CONSTRUCTION OR CONCRETE PLACEMENT AND CONSOLIDATION. SUPPORT REINFORCING ON METAL CHAIRS, RUNNERS, BOLSTERS, SPACERS AND HANGERS.
- C. SPLICES OF REINFORCING BARS SHALL BE CLASS B UNLESS SPECIFIED OTHERWISE ON THE DRAWINGS. SPLICES SHALL BE STAGGERED AND FULL DEVELOPMENT LENGTH SHALL BE PROVIDED ACROSS JOINTS.
- D. LOCATE REINFORCING TO PROVIDE CONCRETE COVER AND SPACING SHOWN ON THE DRAWINGS. MINIMUM COVER SHALL BE AS REQUIRED BY ACI 318.
- E. WELDING OF AND TO ANY REINFORCING MATERIALS, INCLUDING TACK WELDING OF CROSSING BARS, IS STRICTLY PROHIBITED.

3.4 CONCRETE PLACEMENT:

- A. PRIOR TO PLACING CONCRETE, THE FORMS AND REINFORCEMENT SHALL BE THOROUGHLY INSPECTED; ALL TEMPORARY BRACING, TIES, AND CLEATS REMOVED; ALL OPENINGS FOR UTILITIES PROPERLY BOXED; ALL FORMS PROPERLY SECURED IN THEIR CORRECT POSITION AND MADE TIGHT. ALL REINFORCEMENT AND EMBEDDED ITEMS SHALL BE SECURED IN THEIR PROPER LOCATIONS. ALL OLD AND DRY CONCRETE AND DIRT SHALL BE CLEANED OFF AND ALL STANDING WATER AND OTHER FOREIGN MATERIAL REMOVED.
- B. CONCRETE SHALL BE IN ACCORDANCE WITH ACI 301 AND ACI 304 AND SHALL BE PLACED AT SUCH A RATE THAT THE CONCRETE PREVIOUSLY PLACED IS STILL PLASTIC AND INTEGRATED WITH THE FRESH CONCRETE. CONCRETE PLACEMENT, ONCE STARTED, SHALL BE CARRIED ON AS A CONTINUOUS OPERATION UNTIL THE SECTION IS COMPLETED. COLD JOINTS ARE NOT ALLOWED UNLESS PRE-APPROVED BY ENGINEER.
- C. ALL CONCRETE SHALL BE THOROUGHLY CONSOLIDATED AND COMPACTED BY VIBRATION SPACING, RODDING, OR FORKING DURING THE OPERATION OF PLACING IN ACCORDANCE WITH ACI 309. THE CONCRETE SHALL BE THOROUGHLY WORKED AROUND REINFORCEMENT, EMBEDDED ITEMS, AND INTO THE CORNER OF THE FORMS SO AS TO ELIMINATE ALL AIR POCKETS AND VOIDS.

3.5 FINISHING:

- A. FINISHING OF THE FLOOR SLABS SHALL BE IN ACCORDANCE WITH ACI 302.1 SECTION 7.2 AND SHALL INCLUDE A MINIMUM OF THREE TROWELINGS. IN ACCORDANCE WITH ASTM E 1155 THE SLAB FINISH TOLERANCE AS MEASURED SHALL HAVE AN OVERALL TEST NUMBER FOR FLATNESS OF Ff= 20 AND F1 = 15. THE MINIMUM LOCAL NUMBER FOR FLATNESS, Ff= 15 AND F1=10.
- B. SURFACE OF FLOOR SLAB SHALL RECEIVE TWO COATS OF CLEAR SEALER/HARDNER.
- C. ABOVE GRADE WALL SURFACES SHALL HAVE A SMOOTH FORM FINISH AS DEFINED IN CHAPTER 10 OF ACI 301.

3.6 CURING:

- A. FRESHLY DEPOSITED CONCRETE SHALL BE PROTECTED FROM PREMATURE DRYING AND EXCESSIVELY HOT AND COLD TEMPERATURES, AND SHALL BE MAINTAINED WITH MINIMUM MOISTURE LOSS AT A RELATIVELY CONSTANT TEMPERATURE FOR A PERIOD OF TIME NECESSARY FOR THE HYDRATION OF THE CEMENT AND PROPER CURING OF THE CONCRETE.
- B. CONCRETE SHALL BE KEPT CONTINUOUSLY MOIST AT LEAST OVERNIGHT, IMMEDIATELY FOLLOWING THE INITIAL CURING. BEFORE THE CONCRETE HAS DRIED. ADDITIONAL CURING SHALL BE ACCOMPLISHED BY ONE OF THE FOLLOWING MATERIALS OR METHODS:
 - 1. PONDING OR CONTINUOUS SPRINKLING.
 - 2. ABSORPTIVE MAT OR FABRIC KEPT CONTINUOUSLY WET.
 - 3. NON-ABSORPTIVE FILM (POLYETHYLENE) OVER PREVIOUSLY SPRINKLED SURFACE.
 - 4. SAND OR OTHER COVERING KEPT CONTINUOUSLY WET.
 - 5. CONTINUOUS STEAM (NOT EXCEEDING 150 DEGREES FAHRENHEIT OR VAPOR MIST BATH.
 - 6. CURING COMPOUND APPLIED IN TWO COATS, SPRAYED IN PERPENDICULAR DIRECTION
- C. THE FINAL CURING SHALL CONTINUE UNTIL THE CUMULATIVE NUMBER OF DAYS OR FRACTION THEREOF, NOT NECESSARILY CONSECUTIVE, DURING WHICH TEMPERATURE OF THE AIR IN CONTACT WITH CONCRETE IS ABOVE 50 DEGREES FAHRENHEIT HAS TOTALED SEVEN (7) DAYS. CONCRETE SHALL NOT BE PERMITTED TO FREEZE DURING THE CURING PERIOD. RAPID DRYING AT THE END OF THE CURING PERIOD SHALL BE PREVENTED.



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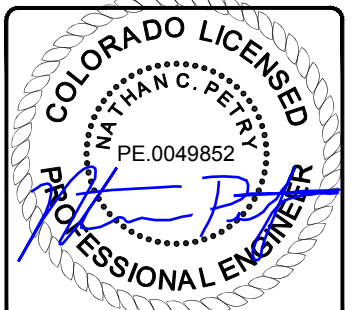
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LTE – 3C/4C/4T4R

SHEET TITLE

GENERAL CONCRETE
WORK NOTES

SHEET NUMBER

GN-4

GENERAL ELECTRICAL NOTES

PART 1 – GENERAL

1.1 GENERAL CONDITIONS:

- A. CONTRACTOR SHALL INSPECT THE EXISTING SITE CONDITIONS PRIOR TO PERFORMING WORK. ANY QUESTIONS ARISING DURING THE BID PERIOD REGARDING THE CONTRACTORS FUNCTIONS, THE SCOPE OF WORK, OR ANY OTHER ISSUE RELATED TO THIS PROJECT SHALL BE BROUGHT UP DURING THE BID PERIOD WITH THE PROJECT MANAGER FOR CLARIFICATION, PRIOR TO THE AWARD OF THE CONTRACT.
- B. THE CONTRACTOR SHALL OBTAIN PERMITS, LICENSES, MAKE ALL DEPOSITS, AND PAY ALL FEES REQUIRED FOR THE CONSTRUCTION PERFORMANCE OF THE WORK UNDER THIS SECTION.
- C. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS. DRAWING SHALL NOT BE SCALED TO DETERMINE DIMENSIONS. DRAWINGS SHOW THE GENERAL ARRANGEMENT OF ALL SYSTEMS AND COMPONENTS COVERED UNDER THIS SECTION.

1.2 LAWS, REGULATIONS, ORDINANCES, STATUTES, AND CODES:

- A. ALL WORK SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE, AND ALL APPLICABLE LOCAL LAWS, REGULATIONS, ORDINANCES, STATUTES, AND CODES. CONDUIT BENDS SHALL BE THE RADIUS BEND FOR THE TRADE SIZE OF CONDUIT IN COMPLIANCE WITH THE LATEST EDITIONS OF NEC.

1.3 REFERENCES:

- A. THE PUBLICATIONS LISTED BELOW ARE PART OF THIS SPECIFICATION. EACH PUBLICATION SHALL BE THE LATEST REVISION AND ADDENDUM IN EFFECT ON THE DATE OF CONSTRUCTION. EXCEPT AS MODIFIED BY THE REQUIREMENT SPECIFIED HEREIN OR THE DETAILS OF THE DRAWINGS, WORK INCLUDED IN THIS SPECIFICATION SHALL CONFORM TO THE APPLICABLE PROVISION OF THESE PUBLICATIONS.
 - 1. ANSI/IEEE (AMERICAN NATIONAL STANDARDS INSTITUTE)
 - 2. ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)
 - 3. ICE (INSULATED CABLE ENGINEERS ASSOCIATION)
 - 4. NEMA (NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION)
 - 5. NFPA (NATIONAL FIRE PROTECTION ASSOCIATION)
 - 6. OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION)
 - 7. UL (UNDERWRITERS LABORATORIES. INC.)
 - 8. AT&T GROUNDING AND BONDING STANDARDS TP-76416

1.4 SCOPE OF WORK:

- A. WORK UNDER THIS SECTION SHALL CONSIST OF FURNISHING ALL LABOR, MATERIAL, AND ASSOCIATED SERVICES REQUIRED TO COMPLETE REQUIRED CONSTRUCTION AND TO ACHIEVE OPERATIONAL STATUS.
- B. ALL ELECTRICAL EQUIPMENT UNDER THIS CONTRACT SHALL BE PROPERLY TESTED, ADJUSTED, AND ALIGNED BY THE CONTRACTOR.
- C. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EXCAVATING, DRAINING, TRENCHING, BACKFILLING, AND REMOVAL OF EXCESS SOIL, FILL, AND DEBRIS.
- D. THE CONTRACTOR SHALL FURNISH THE OWNER WITH CERTIFICATES OF A FINAL INSPECTION AND APPROVAL FROM THE JURISDICTIONAL AUTHORITIES.
- E. IF APPLICABLE, THE CONTRACTOR SHALL PREPARE A COMPLETE SET OF AS-BUILT DRAWINGS TO DOCUMENT ALL WIRING EQUIPMENT CONDITIONS AND CHANGES WHILE COMPLETING THIS CONTRACT. THE AS-BUILT DRAWINGS SHALL BE SUBMITTED AT COMPLETION OF THE PROJECT TO THE APPROPRIATE PARTY.

PART 2 – PRODUCTS

2.1 GENERAL:

- A. ALL MATERIALS AND EQUIPMENT SHALL BE NEW, UL LISTED, AND FREE FROM DEFECTS.
- B. ALL EQUIPMENT SHALL BEAR THE UNDERWRITERS LABORATORIES (UL) LABEL OF APPROVAL AND SHALL CONFORM TO REQUIREMENT OF THE NATIONAL ELECTRICAL CODE.
- C. ALL ITEMS, MATERIALS, AND EQUIPMENT SHALL BE ACCEPTABLE TO THE JURISDICTIONAL AUTHORITY AND SUITABLE FOR THE USE INTENDED.
- D. ALL OVERCURRENT DEVICES SHALL HAVE AN INTERRUPTING CURRENT RATING OF GREATER THAN THE SHORT CIRCUIT CURRENT TO WHICH THEY ARE SUBJECTED (10,000 AIC MINIMUM). CONTRACTOR SHALL VERIFY THAT AVAILABLE SHORT CIRCUIT CURRENT DOES NOT EXCEED THE RATING OF ELECTRICAL EQUIPMENT IN ACCORDANCE WITH ARTICLE 110.24 NEC OR THE MOST CURRENT ADOPTED CODE PER THE GOVERNING JURISDICTION.

2.2 MATERIALS AND EQUIPMENT:

- A. CONDUIT:
 - 1. RIGID METAL CONDUIT (RMC) SHALL BE HOT-DIPPED GALVANIZED INSIDE AND OUTSIDE INCLUDING ENDS AND THREADS, AND ENAMELED OR LACQUERED INSIDE IN ADDITION TO GALVANIZING.
 - 2. LIQUIDTIGHT FLEXIBLE METAL CONDUIT SHALL BE UL LISTED.
 - 3. CONDUIT CLAMPS, STRAPS, AND SUPPORTS SHALL BE STEEL OR MALLEABLE IRON. ALL FITTINGS SHALL BE COMPRESSION AND CONCRETE-TIGHT TYPE. GROUNDING BUSHINGS WITH INSULATED THROATS SHALL BE INSTALLED ON ALL CONDUIT TERMINATIONS.
 - 4. NONMETALLIC CONDUIT AND FITTINGS SHALL BE SCHEDULE 40 PVC AND INSTALLED USING SOLVENT-CEMENT-TYPE JOINTS AS RECOMMENDED BY THE MANUFACTURER.
- B. CONDUCTORS AND CABLE:
 - 1. CONDUCTORS AND CABLE SHALL BE FLAME-RETARDANT, MOISTURE AND HEAT RESISTANT THERMOPLASTIC, SINGLE CONDUCTOR, COPPER, TYPE THHN/THWN-2, 600 VOLT, SIZE AS INDICATED, ON PLANS THE MINIMUM SIZE CONDUCTOR USED SHALL BE #12 AWG.
 - 2. #10 AWG AND SMALLER CONDUCTOR SHALL BE SOLID OR STRANDED. #8 AWG AND LARGER CONDUCTORS SHALL BE STRANDED.
 - 3. SOLDERLESS COMPRESSION TYPE CONNECTORS SHALL BE USED FOR TERMINATION OF ALL STRANDED CONDUCTORS.
 - 4. STRAIN-RELIEF SUPPORTS GRIPS SHALL BE HUBBELL KELLEMS OR APPROVED EQUAL. CABLES SHALL BE SUPPORTED IN ACCORDANCE WITH THE NEC AND CABLE MANUFACTURER'S RECOMMENDATIONS.
 - 5. ALL CONDUCTORS SHALL BE TAGGED AT BOTH ENDS OF THE CONDUCTOR, AT ALL PULL BOXES, J-BOXES, EQUIPMENT. CABINETS SHALL BE IDENTIFIED WITH APPROVED PLASTIC TAGS (ACTION CRAFT, BRADY, OR APPROVED EQUAL).
- C. DISCONNECT SWITCHES:
 - 1. DISCONNECT SWITCHES SHALL BE HEAVY DUTY, DEAD-FRONT, QUICK-MAKE, QUICK-BREAK, EXTERNALLY OPERABLE, HANDLE LOCKABLE, INTERLOCK WITH COVER IN CLOSED POSITION, RATING AS INDICATED, UL LABELED, FURNISHED IN NEMA 3R ENCLOSURE, SQUARE-D, OR ENGINEERED APPROVED EQUAL.

D. CHEMICAL ELECTROLYTIC GROUNDING SYSTEM:

- 1. INSTALL CHEMICAL GROUNDING AS REQUIRED. THE SYSTEM SHALL BE ELECTROLYTIC MAINTENANCE FREE ELECTRODE CONSISTING OF RODS WITH A MINIMUM #2 AWG CU EXOTHERMALLY WELDED PITGAL, PROTECTIVE BOXES, AND BACKFILL MATERIAL. MANUFACTURER SHALL BE LYNCOLE XIT GROUNDING ROD TYPES K2-(*)CS OR K2L-(*)CS (*) LENGTH AS REQUIRED.
 - 2. GROUND ACCESS BOX SHALL BE A POLYPLASTIC BOX FOR NON-TRAFFIC APPLICATIONS, INCLUDING BOLT DOWN FLUSH COVER WITH "BREATHER" HOLES, XIT MODEL #XB-22. ALL DISCONNECT SWITCHES AND CONTROLLING DEVICES SHALL BE PROVIDED WITH ENGRAVED LAMICOID NAMEPLATES INDICATING EQUIPMENT CONTROLLED, BRANCH CIRCUITS IDENTIFICATION NUMBERING, AND THE ELECTRICAL POWER SOURCE.
 - 3. BACKFILL MATERIAL SHALL BE LYNCONITE AND LYNCOLE GROUNDING GRAVEL.
- E. SYSTEM GROUNDING:**
- 1. ALL GROUNDING COMPONENTS SHALL BE TINNED AND GROUNDING CONDUCTOR SHALL BE #2 AWG BARE, SOLID, TINNED COPPER. ABOVE-GRADE GROUNDING CONDUCTORS SHALL BE INSULATED WHERE NOTED.
 - 2. GROUNDING BUSES SHALL BE BARE, TINNED, ANNEALED COPPER BARS OF RECTANGULAR CROSS SECTION. STANDARD BUS BARS MGB SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR AND THEY SHALL NOT BE FABRICATED OR MODIFIED IN THE FIELD. ALL GROUNDING BUSES SHALL BE IDENTIFIED WITH MINIMUM 3/4" LETTERS BY STENCILING OR DESIGNATION PLATE.
 - 3. CONNECTORS SHALL BE HIGH CONDUCTIVITY, HEAVY DUTY, LISTED AND LABELED AS GROUNDING CONNECTORS FOR THE MATERIALS USED. USE TWO-HOLE COMPRESSION LUGS WITH CLEAR HEAT SHRINK FOR MECHANICAL CONNECTIONS. USE TWO-HOLE COMPRESSION LUGS WITH INSPECTION WINDOW AND CLEAR HEAT SHRINK FOR INTERIOR AND BLACK HEAT SHRINK FOR EXTERIOR.
 - 4. EXOTHERMIC WELDED CONNECTIONS SHALL BE PROVIDED IN KIT FORM AND SELECTED FOR THE SPECIFIC TYPES, SIZES, AND COMBINATIONS OF CONDUCTORS AND OTHER ITEMS TO BE CONNECTED.
 - 5. GROUND RODS SHALL BE ERICO #615800, COPPER-CLAD STEEL WITH HIGH STRENGTH STEEL CORE AND ELECTROLYTIC GRADE COPPER OUTER SHEATH, MOLTEN WELDED TO CORE, AND 5/8"x10'-0". ALL GROUNDING RODS SHALL BE INSTALLED WITH INSPECTION SLEEVES AS SHOWN ON DRAWINGS.
 - 6. INSTALL AN EQUIPMENT GROUNDING CONDUCTOR IN ALL CONDUITS IN COMPLIANCE WITH THE AT&T SPECIFICATIONS AND NEC. THE EQUIPMENT GROUNDING CONDUCTORS SHALL BE BONDED AT ALL JUNCTION BOXES, PULLBOXES, DISCONNECT SWITCHES, STARTERS, AND EQUIPMENT CABINETS.

F. OTHER MATERIALS:

- 1. THE CONTRACTOR SHALL PROVIDE OTHER MATERIALS, THOUGH NOT SPECIFICALLY DESCRIBED, WHICH ARE REQUIRED FOR A COMPLETELY OPERATIONAL SYSTEM AND PROPER INSTALLATION OF THE WORK.
- 2. PROVIDE PULL BOXES AND JUNCTION BOXES WHERE SHOWN OR REQUIRED BY NEC.

G. PANELS AND LOAD CENTERS:

- 1. ALL PANEL DIRECTORIES SHALL BE TYPEDWRITTEN.

PART 3 – EXECUTION

3.1 GENERAL:

- A. ALL MATERIAL AND EQUIPMENT SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- B. DURING INSTALLATION AND CONSTRUCTION PERIODS EQUIPMENT SHALL BE TIGHTLY COVERED AND PROTECTED AGAINST DIRT, WATER, AND CHEMICAL OR MECHANICAL INJURY.

3.2 LABOR AND WORKMANSHIP:

- A. ALL LABOR FOR THE INSTALLATION OF MATERIALS AND EQUIPMENT FURNISHED FOR THE ELECTRICAL SYSTEM SHALL BE INSTALLED BY EXPERIENCED WIREMEN IN A NEAT AND WORKMAN-LIKE MANNER.
- B. ALL ELECTRICAL EQUIPMENT SHALL BE ADJUSTED, ALIGNED, AND TESTED BY THE CONTRACTOR AS REQUIRED TO CONFIRM THE INTENDED PERFORMANCE.
- C. UPON COMPLETION OF WORK, THE CONTRACTOR SHALL THOROUGHLY CLEAN ALL EXPOSED EQUIPMENT, REMOVE ALL NECESSARY LABELS, DEBRIS, CRATING, OR CARTONS, AND LEAVE THE INSTALLATION FINISHED AND READY FOR OPERATION.

3.3 COORDINATION:

- A. THE CONTRACTOR SHALL COORDINATE THE INSTALLATION OF ELECTRICAL ITEMS WITH THE OWNER-FURNISHED EQUIPMENT DELIVERY SCHEDULE TO PREVENT UNNECESSARY DELAYS IN THE SCHEDULED WORK.

3.4 INSTALLATION:

- B. CONDUIT:
 - 1. ALL ELECTRICAL WIRING SHALL BE INSTALLED IN CONDUIT AS SPECIFIED. NO CONDUIT OR TUBING OF LESS THAN 3/4" TRADE SIZE SHALL BE UTILIZED.
 - 2. PROVIDE RIGID PVC SCHEDULE 80 CONDUITS FOR ALL RISERS UNLESS OTHERWISE NOTED. EMT MAY BE INSTALLED FOR EXTERIOR CONDUITS WHERE NOT SUBJECT TO PHYSICAL DAMAGE.
 - 3. INSTALL SCHEDULE 40 PVC CONDUIT WITH A MINIMUM COVER OF 24" UNDER ROADWAYS, PARKING LOTS, STREETS, AND ALLEYS. CONDUIT SHALL HAVE A MINIMUM COVER OF 18" IN ALL NON-TRAFFIC APPLICATIONS (REFER TO 2008 OR LATEST NEC, TABLE 300.5).
 - 4. USE GALVANIZED FLEXIBLE STEEL CONDUIT AT LOCATIONS OF DIRECT CONNECTION TO EQUIPMENT THAT MOVES OR VIBRATES, OR FOR EASE OF MAINTENANCE. USE LIQUID TIGHT, FLEXIBLE METAL CONDUIT FOR OUTDOOR APPLICATIONS. INSTALL GALVANIZED FLEXIBLE STEEL CONDUIT AT ALL POINTS OF CONNECTION TO EQUIPMENT MOUNTED ON SUPPORTS TO ALLOW FOR EXPANSION AND CONTRACTION.
 - 5. A RUN OF CONDUIT BETWEEN BOXES OR EQUIPMENT SHALL NOT CONTAIN MORE THAN THE EQUIVALENT OF THREE QUARTER-BENDS. CONDUIT BEND SHALL BE MADE WITH THE UL LISTED BENDER OR FACTORY 90 DEGREE ELBOWS MAY BE USED.
 - 6. FIELD FABRICATED CONDUITS SHALL BE CUT SQUARE WITH A CONDUIT CUTTING TOOL AND REAMED TO PROVIDE A SMOOTH INSIDE SURFACE.
 - 7. CONTRACTOR IS RESPONSIBLE FOR PROTECTING ALL CONDUITS DURING CONSTRUCTION. TEMPORARY OPENINGS IN THE CONDUIT SYSTEM SHALL BE PLUGGED OR CAPPED TO PREVENT ENTRANCE OF MOISTURE OR FOREIGN MATTER. CONTRACTOR SHALL REPLACE ANY CONDUITS CONTAINING FOREIGN MATERIALS THAT CANNOT BE REMOVED.
 - 8. ALL CONDUITS SHALL BE SWABBED CLEAN BY PULLING AN APPROPRIATE SIZE MANDREL THROUGH THE CONDUIT BEFORE INSTALLATION OF CONDUCTORS OR CABLES. CONDUIT SHALL BE FREE OF DIRT AND DEBRIS.
 - 9. INSTALL PULL STRINGS IN ALL CLEAN EMPTY CONDUITS. IDENTIFY PULL STRINGS AT EACH END.
 - 10. INSTALL 2" HIGHLY VISIBLE AND DETECTABLE TAPE 12" ABOVE ALL UNDERGROUND CONDUITS AND CONDUCTORS.
 - 11. CONDUITS SHALL BE INSTALLED IN SUCH A MANNER AS TO INSURE AGAINST COLLECTION OF TRAPPED CONDENSATION.

- 12. PROVIDE CORE DRILLING AS NECESSARY FOR PENETRATIONS TO ALLOW FOR RACEWAYS AND CABLES TO BE ROUTED THROUGH THE BUILDING. DO NOT PENETRATE STRUCTURAL MEMBERS. SLEEVES AND/OR PENETRATIONS IN FIRE RATED CONSTRUCTION SHALL BE EFFECTIVELY SEALED WITH FIRE RATED MATERIAL WHICH SHALL MAINTAIN THE FIRE RATING OF THE WALL OR STRUCTURE. FIRE STOPS AT FLOOR PENETRATIONS SHALL BE INSTALLED TO PREVENT PASSAGE OF WATER, SMOKE, FIRE, AND FUMES. ALL MATERIAL SHALL BE UL APPROVED FOR THIS PURPOSE.

B. CONDUCTORS AND CABLE:

- 1. ALL POWER WIRING SHALL BE COLOR CODED AS FOLLOWS:

DESCRIPTION	208/240/120 VOLT SYSTEMS
PHASE A	BLACK
PHASE B	RED
PHASE C	BLUE
NEUTRAL	WHITE
GROUNDING	GREEN

- 2. SPLICES SHALL BE MADE ONLY AT OUTLETS, JUNCTION BOXES, OR ACCESSIBLE RACEWAY CONDULETS APPROVED FOR THIS PURPOSE.

- 3. PULLING LUBRICANTS SHALL BE UL APPROVED. CONTRACTOR SHALL USE NYLON OR HEMP ROPE FOR PULLING CONDUCTOR OR CABLES INTO THE CONDUIT.

- 4. CABLES SHALL BE NEATLY TRAINED, WITHOUT INTERLACING, AND BE OF SUFFICIENT LENGTH IN ALL BOXES AND EQUIPMENT TO ALLOW FOR A NEAT ARRANGEMENT. CABLES SHALL BE SECURED IN A MANNER TO AVOID TENSION ON CONDUCTORS AND/OR TERMINALS. CONDUCTORS SHALL BE PROTECTED FROM MECHANICAL INJURY AND MOISTURE. SHARP BENDS OVER CONDUIT BUSHINGS ARE PROHIBITED. DAMAGED CABLES SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.

C. DISCONNECT SWITCHES:

- 1. INSTALL DISCONNECT SWITCHES LEVEL AND PLUMB, AND CONNECT TO WIRING SYSTEM AND GROUNDING SYSTEM AS REQUIRED.

D. GROUNDING:

- 1. ALL METALLIC PARTS OF ELECTRICAL EQUIPMENT WHICH DO NOT CARRY CURRENT SHALL BE GROUNDED IN ACCORDANCE WITH THE REQUIREMENTS OF THE BUILDING MANUFACTURER, AT&T GROUNDING AND BONDING STANDARDS TP-76416, TP-76300, AND THE NATIONAL ELECTRICAL CODE.
- 2. PROVIDE ELECTRICAL GROUNDING AND BONDING SYSTEM WITH ASSEMBLY OF MATERIALS, INCLUDING GROUNDING ELECTRODES, BONDING JUMPERS, AND ADDITIONAL ACCESSORIES AS REQUIRED FOR A COMPLETE INSTALLATION.
- 3. ALL GROUNDING CONDUCTORS SHALL PROVIDE A STRAIGHT DOWNWARD PATH TO GROUND. GROUNDING CONDUCTORS SHALL NOT BE LOOPED OR SHARPLY BENT. ROUTE GROUNDING CONNECTIONS AND CONDUCTORS TO GROUND IN THE SHORTEST AND STRAIGHTEST PATHS POSSIBLE TO MINIMIZE TRANSIENT VOLTAGE RISES.
- 4. AT BUILDINGS AND/OR NEW TOWERS GREATER THAN 75 FEET IN HEIGHT AND WHERE THE MAIN GROUNDING CONDUCTORS ARE REQUIRED TO BE ROUTED TO GRADE, THE CONTRACTOR SHALL ROUTE TWO GROUNDING CONDUCTORS FROM THE ROOFTOP, TOWERS, AND WATER TOWER GROUND RING, TO THE EXISTING GROUNDING SYSTEM. THE GROUNDING CONDUCTORS SHALL NOT BE SMALLER THAN #2 AWG COPPER. ROOFTOP GROUND RING SHALL BE BONDED TO THE EXISTING GROUNDING SYSTEM, THE BUILDING STEEL COLUMNS, THE LIGHTNING PROTECTION SYSTEM, AND/OR THE BUILDING MAIN WATER LINE (FERROUS OR NONFERROUS METAL PIPING ONLY). SEE STANDARD 6.3.2.2.
- 5. TIGHTEN GROUNDING AND BONDING CONNECTORS, INCLUDING SCREWS AND BOLTS, IN ACCORDANCE WITH MANUFACTURER'S PUBLISHED TORQUE TIGHTENING SPECIFICATIONS. WHERE MANUFACTURER'S TORQUING REQUIREMENTS ARE NOT AVAILABLE, TIGHTEN CONNECTIONS TO COMPLY WITH TIGHTENING TORQUE VALUES SPECIFIED IN UL TO ASSURE PERMANENT AND EFFECTIVE GROUNDING.
- 6. CONTRACTOR SHALL VERIFY THE LOCATIONS OF GROUNDING TIE-IN POINTS TO THE EXISTING GROUNDING SYSTEM. ALL UNDERGROUND GROUNDING CONNECTIONS SHALL BE MADE BY THE EXOTHERMIC WELD PROCESS AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
- 7. ALL GROUNDING CONNECTIONS SHALL BE INSPECTED FOR TIGHTNESS. EXOTHERMIC WELDED CONNECTIONS SHALL BE APPROVED BY THE INSPECTOR HAVING JURISDICTION PRIOR TO PERMANENT CONCEALMENT.
- 8. APPLY CORROSION-RESISTANCE FINISH TO FIELD CONNECTIONS AND AREAS/COMPONENTS WHERE FACTORY APPLIED PROTECTIVE COATINGS HAVE BEEN DESTROYED.
- 9. A SEPARATE, CONTINUOUS, INSULATED EQUIPMENT GROUNDING CONDUCTOR SHALL BE INSTALLED IN ALL FEEDER AND BRANCH CIRCUITS.
- 10. BOND ALL INSULATED GROUNDING BUSHINGS WITH A BARE #6 AWG GROUNDING CONDUCTOR TO A GROUND BUS.
- 11. DIRECT-BURIED GROUNDING CONDUCTORS SHALL BE INSTALLED AT A NOMINAL DEPTH OF 30" MINIMUM BELOW GRADE, OR 6" MINIMUM BELOW THE FROST LINE, USING THE GREATER OF THE TWO DISTANCES.
- 12. ALL GROUNDING CONDUCTORS EMBEDDED IN OR PENETRATING CONCRETE SHALL BE INSTALLED IN SCHEDULE 40 PVC CONDUIT.
- 13. THE INSTALLATION OF A CHEMICAL ELECTROLYTIC GROUNDING SYSTEM IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. REMOVE SEALING TAPE FROM LEACHING AND BREATHER HOLES. INSTALL THE PROTECTIVE BOX FLUSH WITH GRADE.
- 14. IF COAX ON THE ICE BRIDGE IS MORE THAN 6 FEET FROM THE GROUND BAR AT THE BASE OF THE TOWER, INSTALL A SECOND GROUND BAR AT THE END OF THE ICE BRIDGE TO GROUND THE COAX CABLE GROUNDING KITS AND IN-LINE ARRESTORS.
- 15. CONTRACTOR SHALL REPAIR, AND/OR REPLACE, EXISTING GROUNDING SYSTEM COMPONENTS DAMAGED DURING CONSTRUCTION AT THE CONTRACTORS EXPENSE.

3.5 ACCEPTANCE TESTING:

- A. CERTIFIED PERSONNEL USING CERTIFIED EQUIPMENT SHALL PERFORM REQUIRED TESTS AND SUBMIT WRITTEN TEST REPORTS UPON COMPLETION.
- B. WHEN MATERIAL AND/OR WORKMANSHIP IS FOUND TO BE NON-COMPLIANT WITH THE SPECIFIED REQUIREMENTS, THE NON-COMPLIANT ITEMS/ELEMENTS SHALL BE PROMPTLY REMOVED FROM THE PROJECT SITE AND REPLACED WITH ITEMS COMPLYING WITH THE SPECIFIED REQUIREMENTS.
- C. TEST PROCEDURES:
 - 1. ALL FEEDERS SHALL HAVE INSULATION TESTED AFTER INSTALLATION, BEFORE CONNECTION TO DEVICES. THE CONDUCTORS SHALL TEST FREE FROM SHORT CIRCUITS AND GROUNDS. TESTING SHALL BE FOR ONE MINUTE USING 1,000VOLT DC.
 - 2. PRIOR TO ENERGIZING CIRCUITRY, TEST WIRING DEVICES FOR ELECTRICAL CONTINUITY AND PROPER POLARITY CONNECTIONS.
 - 3. MEASURE AND RECORD VOLTAGES BETWEEN PHASES AND BETWEEN PHASE CONDUCTORS AND NEUTRALS. SUBMIT A REPORT OF MAXIMUM AND MINIMUM VOLTAGES TO APPROPRIATE PARTS.
 - 4. PERFORM GROUNDING TEST TO MEASURE RESISTANCE OF GROUNDING SYSTEM USING THE IEEE STANDARD 3-POINT "FALL-OF-POTENTIAL" METHOD. PROVIDE PLOTTED TEST VALUES AND LOCATION SKETCH. NOTIFY THE ENGINEER IMMEDIATELY IF MEASURED VALUE IS OVER 5 OHMS.



188 INVERNESS DRIVE WEST
SUITE 400
ENGLEWOOD, CO 80112



BLACK & VEATCH

4600 SOUTH SYRACUSE STREET
SUITE 800
DENVER, COLORADO 80237

PROJECT/PHASE NO: 129051/3034

DRAWN BY: BDU

CHECKED BY: NCP

RFDS: 2.00

REV	DATE	DESCRIPTION
0	11/30/17	ISSUED FOR CONSTRUCTION



IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

DRENNAN AND POWERS
COL02022
5275 YUCATAN DRIVE
COLORADO SPRINGS, CO 80911
LTE - 3C/4C/4T4R

SHEET TITLE
**GENERAL ELECTRICAL
NOTES**

SHEET NUMBER

GN-6