SITE NAME: FONTAINE & POWERS
SITE NUMBER: COLO2099

at&t

NOKIA MARKETS MODERNIZATION
IWM NUMBER: WSUTH0033975
FA #: 10115180
ROOFTOP

PROJECT DESCRIPTION

AT&T WIRELESS PROPOSES TO MODIFY AN EXISTING WIRELESS INSTALLATION. THE SCOPE WILL CONSIST OF THE FOLLOWING:

ROOFTOP WORK:

- REMOVE (12) RRHs
- REMOVE (9) ANTENNAS
- REMOVE (3) TMAs
- INSTALL (12) ANTENNAS
- INSTALL (9) RRHs
- INSTALL (1) DC9
- INSTALL (1) FIBER TRUNK
- INSTALL (1) POWER TRUNK

GROUND WORK:

- REMOVE (6) CONVERTERS
- INSTALL (10) CONVERTERS
- INSTALL (2) CONVERTER KITS
- INSTALL (2) RECTIFIERS
- INSTALL (8) BATTERIES
- INSTALL (1) FLEX 42
- INSTALL (1) GENERIC BBU
- INSTALL (1) DC12-48-60-0-25E

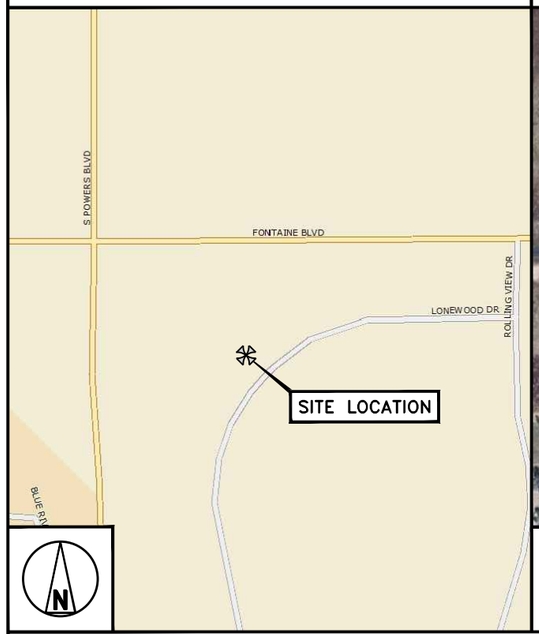
SITE INFORMATION

PROPERTY OWNER:	PIKES PEAK BAPTIST TEMPLE
ADDRESS:	7925 FONTAINE BLVD COLORADO SPRINGS, CO 80901
SITE ADDRESS:	7923 FONTAINE BLVD COLORADO SPRINGS, CO 80925
FA:	10115180
ROOFTOP OWNER:	DIAMOND
COUNTY:	EL PASO
LATITUDE (NAD83): LONGITUDE (NAD83):	38° 44' 10.65" N 104° 40' 48.65" W
GROUND ELEVATION:	5,874' AMSL
ZONING JURISDICTION:	EL PASO COUNTY
ZONING DISTRICT:	PF
PARCEL NUMBER:	5521002016
OCCUPANCY GROUP:	U
CONSTRUCTION TYPE:	V-B
POWER COMPANY:	COLORADO SPRINGS UTILITIES
TELEPHONE COMPANY:	N/A
SITE ACQUISITION MANAGER:	CORY HAMMEN (414) 455-2289
CONSTRUCTION MANAGER:	JOHN RUTKOWITZ (303) 264-0523
RF ENGINEER:	RON BLEDSOE (913) 458-8114

CONTACT INFORMATION

ENGINEER:	BLACK & VEATCH CORPORATION 4600 SOUTH SYRACUSE STREET, SUITE 800 DENVER, CO 80237
CONTACT:	DAN GRUMAN
PHONE:	(913) 458-6112

VICINITY MAP



LOCAL MAP

NO SCALE

DRIVING DIRECTIONS

DIRECTIONS FROM COLORADO SPRINGS AIRPORT

HEAD NORTH ON MILTON E PROBY PKWY. KEEP LEFT TO CONTINUE ON MILTON E PROBY PARKWAY AIRPORT EXIT. USE THE RIGHT LANE TO TURN SLIGHTLY LEFT ONTO MILTON E PROBY PKWY. TURN LEFT ONTO PEAK INNOVATION PKWY. AT THE ROUNDABOUT, TAKE THE 2ND EXIT AND STAY ON PEAK INNOVATION PKWY. TURN LEFT ONTO CO-21 S. SLIGHT LEFT TOWARD FONTAINE BLVD. TURN LEFT ONTO FONTAINE BLVD. TURN RIGHT. TURN RIGHT.

ENGINEERING

2021 INTERNATIONAL FIRE CODE
2021 INTERNATIONAL BUILDING CODE OR LATEST ADOPTED EDITION
2020 NATIONAL ELECTRIC CODE OR LATEST ADOPTED EDITION
TIA/EIA-222-H OR LATEST EDITION

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.

DRAWING INDEX

SHEET NO.	SHEET TITLE
T-1	TITLE SHEET
C-1	SITE PLAN
C-1.1	ENLARGED SITE PLAN
C-2	EQUIPMENT LAYOUTS
C-3	ELEVATIONS
C-4	ANTENNA LAYOUTS
C-5	ANTENNA SCHEDULE
C-6	EQUIPMENT DETAILS
C-6.1	EQUIPMENT DETAILS
E-1	ELECTRICAL AC ONE-LINE DIAGRAM
E-2	ELECTRICAL DC ONE-LINE DIAGRAM
G-1	GROUNDING ONE-LINE DIAGRAM
G-2	GROUNDING DETAILS
GN-1	LEGEND & ABBREVIATIONS
GN-2	GENERAL CONSTRUCTION NOTES
GN-3	GENERAL SITE WORK & DRAINAGE NOTES
GN-4	GENERAL CONCRETE WORK NOTES
GN-5	GENERAL STRUCTURAL STEEL NOTES
GN-6	GENERAL ELECTRICAL NOTES
GN-7	BATTERY SAFETY 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

at&t
188 INVERNESS DRIVE WEST
SUITE 400
ENGLEWOOD, CO 80112

BLACK & VEATCH
4600 SOUTH SYRACUSE STREET
SUITE 800
DENVER, COLORADO 80237

TOWER ENGINEERING PROFESSIONALS
326 TRYON RD. RALEIGH, NC
27603 OFFICE: (919) 661-6351

PROJECT#:	314248
DRAWN BY:	KRS
CHECKED BY:	KOO
RFDS:	N/A

REV	DATE	DESCRIPTION
0	07/23/24	ISSUED FOR CONSTRUCTION
A	06/24/24	ISSUED FOR REVIEW

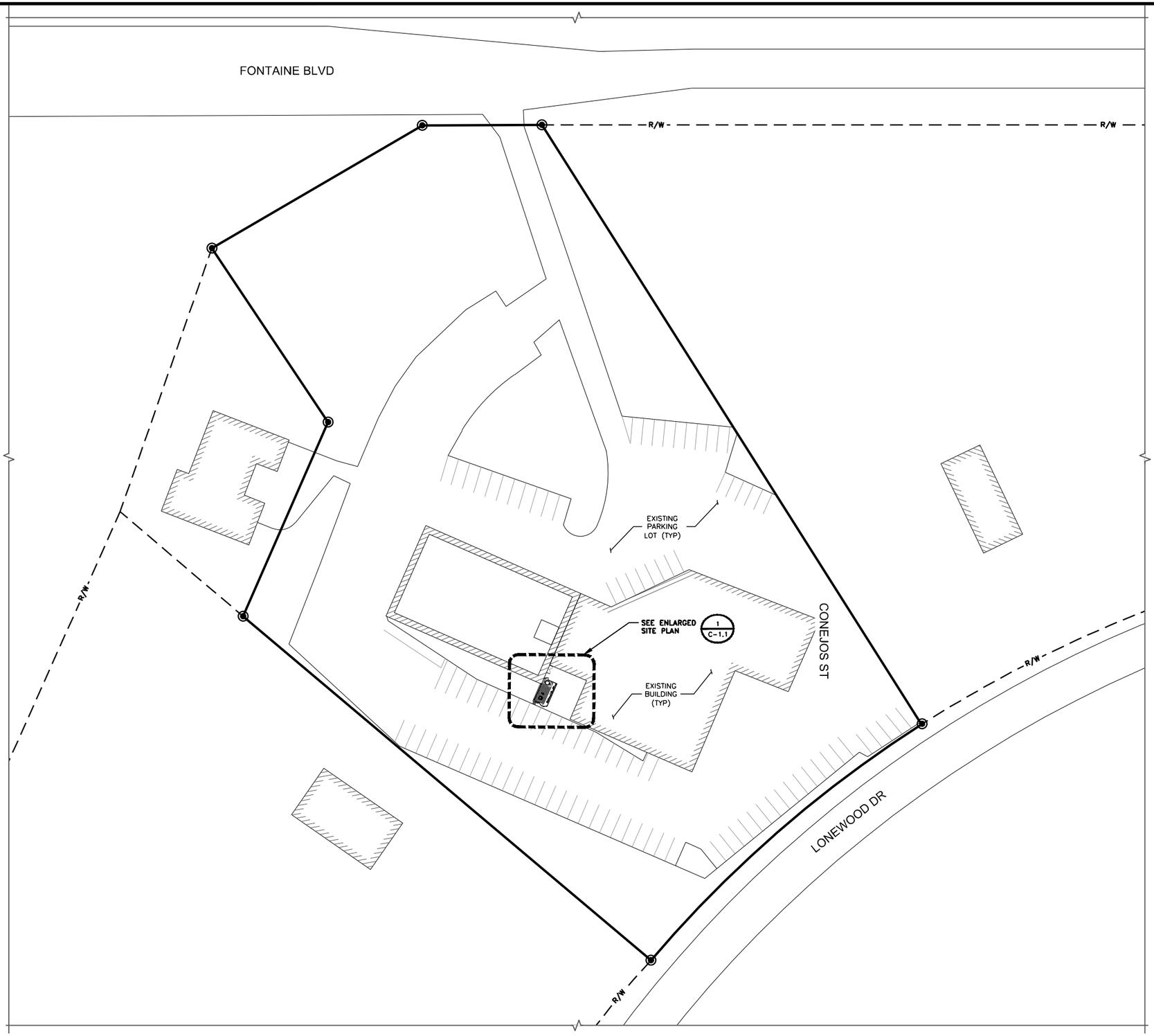
COLORADO LICENSED
NICHOLAS M. CONSTANTINE
45607
PROFESSIONAL ENGINEER
7/23/24

July 23, 2024

FONTAINE & POWERS
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

SHEET TITLE
TITLE SHEET

SHEET NUMBER
T-1



NOTES

1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.
2. ANTENNAS AND MOUNTS OMITTED FOR CLARITY.
3. SITE PLAN DISCLAIMER: THE EXISTING INFORMATION SHOWN IN THESE PLANS HAVE BEEN BASED ON EXISTING SITE INFORMATION PROVIDED BY OTHERS. TEP HAS NOT COMPLETED A SITE SURVEY AND THEREFORE MAKES NO CLAIMS AS TO THE ACCURACY OF INFORMATION DEPICTED ON THIS SHEET.

SITE PLAN

40' 20' 0 40' 80'
1"=40'

1

at&t
188 INVERNESS DRIVE WEST
SUITE 400
ENGLEWOOD, CO 80112

BLACK & VEATCH
4600 SOUTH SYRACUSE STREET
SUITE 800
DENVER, COLORADO 80237

TOWER ENGINEERING PROFESSIONALS
326 TRYON RD. RALEIGH, NC
27603 OFFICE: (919) 661-6351

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COLORADO LICENSED
NICHOLAS M. CONSTANT
45607
PROFESSIONAL ENGINEER

July 23, 2024

FONTAINE & POWERS
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

SHEET TITLE
SITE PLAN

SHEET NUMBER
C-1

NOTES

1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.
2. ANTENNAS AND MOUNTS OMITTED FOR CLARITY.
3. SITE PLAN DISCLAIMER: THE EXISTING INFORMATION SHOWN IN THESE PLANS HAVE BEEN BASED ON EXISTING SITE INFORMATION PROVIDED BY OTHERS. TEP HAS NOT COMPLETED A SITE SURVEY AND THEREFORE MAKES NO CLAIMS AS TO THE ACCURACY OF INFORMATION DEPICTED ON THIS SHEET.

EXISTING ROOF

SEE ANTENNA LAYOUTS 2/C-4

SEE EQUIPMENT LAYOUTS 1/C-2

N

10' 0 10' 20'
1"=10'

ENLARGED SITE PLAN

1

at&t
188 INVERNESS DRIVE WEST
SUITE 400
ENGLEWOOD, CO 80112

BLACK & VEATCH
4600 SOUTH SYRACUSE STREET
SUITE 800
DENVER, COLORADO 80237

TOWER ENGINEERING PROFESSIONALS
326 TRYON RD. RALEIGH, NC
27603 OFFICE: (919) 661-6351

PROJECT#:	314248
DRAWN BY:	KRS
CHECKED BY:	KOO
RFDS:	N/A

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COLORADO LICENSED
NICHOLAS M. CONSTANT
45607
PROFESSIONAL ENGINEER

July 23, 2024

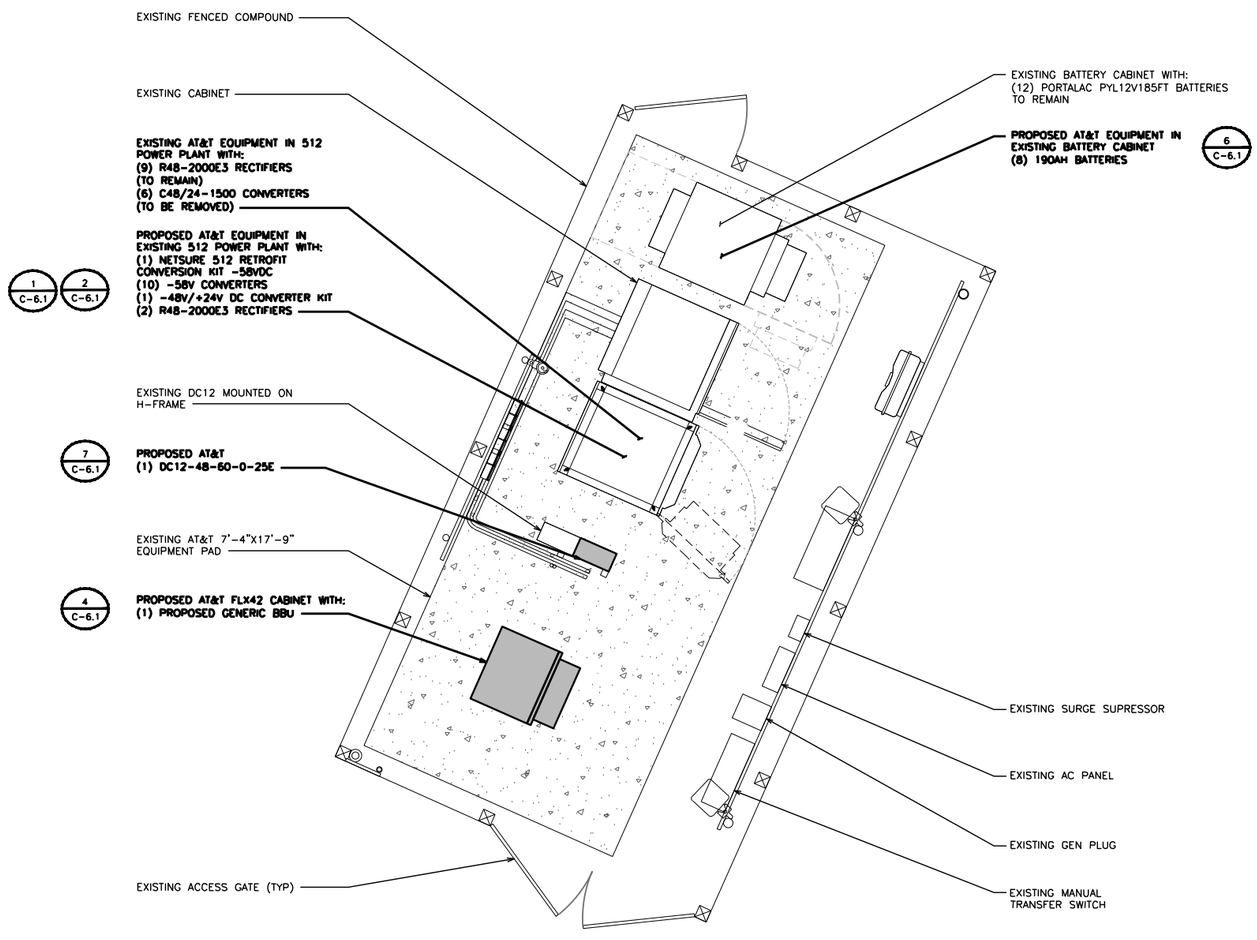
FONTAINE & POWERS
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

SHEET TITLE
ENLARGED SITE PLAN

SHEET NUMBER
C-1.1

NOTES

1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.
2. IFC 1207 & IMC 502.4 CODE ANALYSIS & BATTERY COMPLIANCE INFORMATION SHOWN ON SHEET GN-7.
3. THERE WILL BE A TOTAL OF 48.8 GALLONS OF ELECTROLYTE WITH THE 20 PROPOSED LEAD-ACID BATTERIES THAT ARE BEING ADDED.
4. TOTAL ELECTROLYTE IS 48.8 GAL. WHICH IS LESS THAN 50 GAL. REQUIRED TO MEET IFC COMPLIANCE STANDARD.
5. TEP DID NOT PERFORM ANY HVAC ANALYSIS.



FINAL EQUIPMENT LAYOUT

0 2' 4'
1"=2'-0"

1

at&t
188 INVERNESS DRIVE WEST
SUITE 400
ENGLEWOOD, CO 80112

BLACK & VEATCH
4600 SOUTH SYRACUSE STREET
SUITE 800
DENVER, COLORADO 80237

TOWER ENGINEERING PROFESSIONALS
326 TRYON RD. RALEIGH, NC
27603 OFFICE: (919) 661-6351

PROJECT#:	314248
DRAWN BY:	KRS
CHECKED BY:	KOO
RFDS:	N/A

REV	DATE	DESCRIPTION
0	07/23/24	ISSUED FOR CONSTRUCTION
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COLORADO LICENSED
THOMAS M. CONSTANTINE
45607
PROFESSIONAL ENGINEER

July 23, 2024

FONTAINE & POWERS
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

SHEET TITLE
EQUIPMENT LAYOUTS

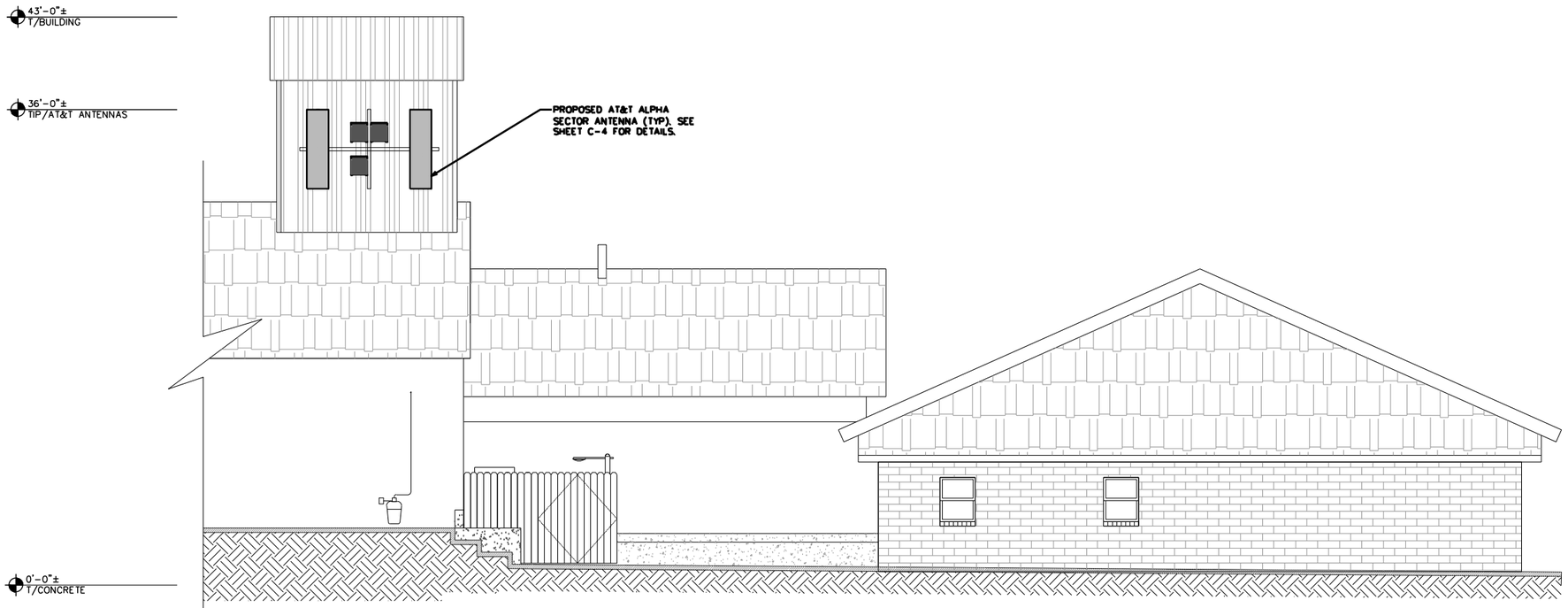
SHEET NUMBER
C-2

NOTES

1. PASSING STRUCTURAL ANALYSIS (CONFORMING TO TIA-222-H) FOR THE EXISTING ROOFTOP WAS COMPLETED BY ACCELERATED TOWER ENGINEERING ON 05/16/2024. ACCORDING TO THIS ANALYSIS, THE EXISTING ROOFTOP HAS SUFFICIENT CAPACITY TO SUPPORT THE LOADING INDICATED.
2. A PASSING ANTENNA MOUNT ANALYSIS (CONFORMING TO TIA-222-H) FOR THE EXISTING MOUNT WAS COMPLETED BY ATE ON 05/16/2024. ACCORDING TO THIS ANALYSIS, THE EXISTING MOUNT HAS SUFFICIENT CAPACITY TO SUPPORT THE LOADING INDICATED.

COAX & CABLE INFORMATION

- ALL EXISTING CABLES/COAX TO REMAIN UNLESS NOTED OTHERWISE
- **(1) PROPOSED 24 PAIR FIBER TRUNK**
- **(1) PROPOSED 6AWG DC TRUNK**
- (1) EXISTING 18 PAIR FIBER TRUNK
- (4) EXISTING 8AWG DC TRUNKS
- (12) EXISTING 7/8" COAX CABLES



FINAL NORTH ELEVATION

5' 2.5' 0 5' 10'
1"=5'-0"

at&t
188 INVERNESS DRIVE WEST
SUITE 400
ENGLEWOOD, CO 80112

BLACK & VEATCH
4600 SOUTH SYRACUSE STREET
SUITE 800
DENVER, COLORADO 80237

TOWER ENGINEERING PROFESSIONALS
326 TRYON RD. RALEIGH, NC
27603 OFFICE: (919) 661-6351

PROJECT#:	314248
DRAWN BY:	KRS
CHECKED BY:	KOO
RFDS:	N/A

REV	DATE	DESCRIPTION
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A	06/24/24	ISSUED FOR REVIEW

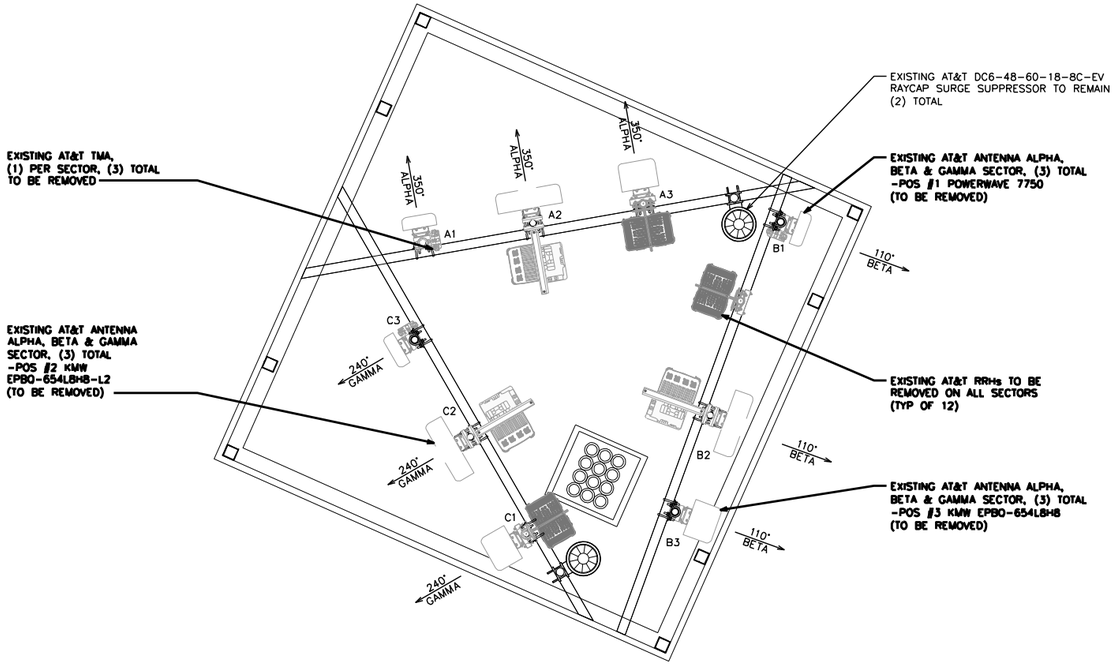
COLORADO LICENSED
NICHOLAS M. COMBATTI
45607
PROFESSIONAL ENGINEER

July 23, 2024

FONTAINE & POWERS
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

SHEET TITLE
FINAL ELEVATIONS

SHEET NUMBER
C-3



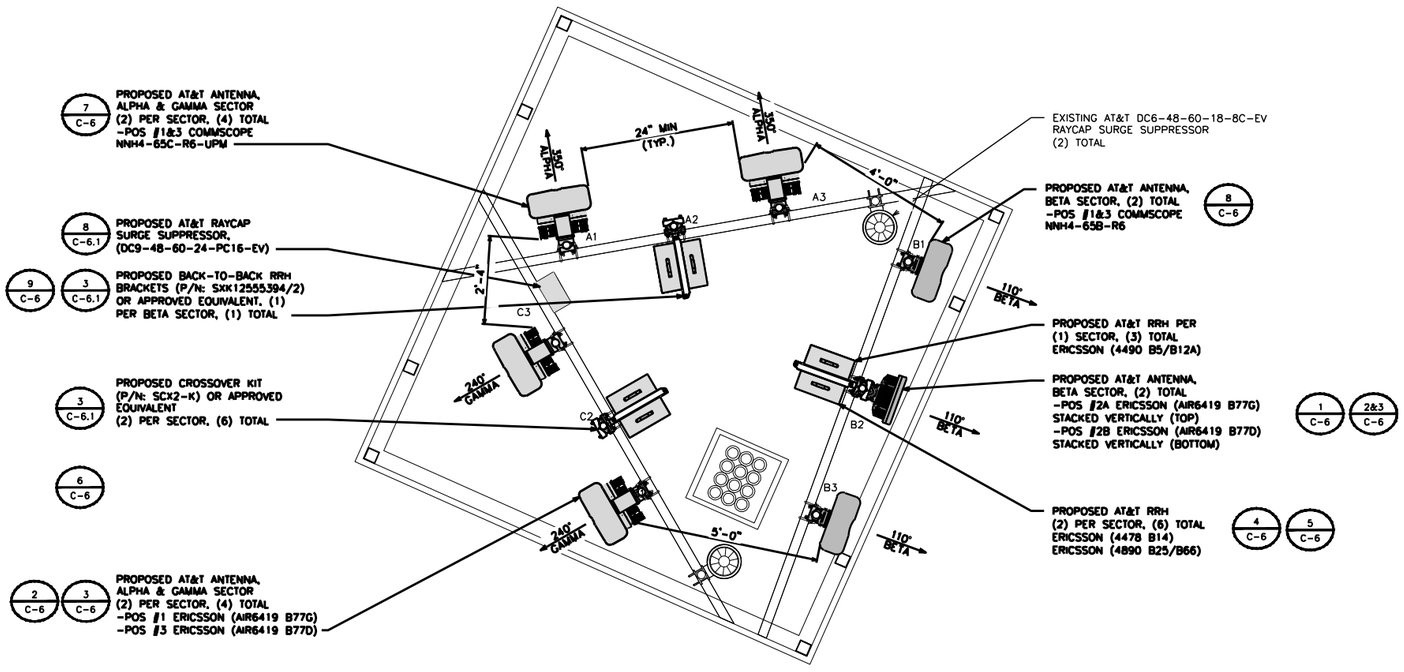
EXISTING ANTENNA LAYOUT

0 2' 4'
1"=2'-0"

1

NOTE

1. PASSING STRUCTURAL ANALYSIS (CONFORMING TO TIA-222-H) FOR THE EXISTING ROOFTOP WAS COMPLETED BY ACCELERATED TOWER ENGINEERING ON 05/16/2024. ACCORDING TO THIS ANALYSIS, THE EXISTING ROOFTOP HAS SUFFICIENT CAPACITY TO SUPPORT THE LOADING INDICATED.
2. A PASSING ANTENNA MOUNT ANALYSIS (CONFORMING TO TIA-222-H) FOR THE EXISTING MOUNT WAS COMPLETED BY ATE ON 05/16/2024. ACCORDING TO THIS ANALYSIS, THE EXISTING MOUNT HAS SUFFICIENT CAPACITY TO SUPPORT THE LOADING INDICATED.
3. CONTRACTOR TO REWORK EXISTING MOUNTS TO EVENLY SPACE 3 MOUNT PIPES AS FAR AS POSSIBLE. FIELD FABRICATE MOUNT HOLES FOR ANTENNA PIPE POSITIONS AS NEEDED.
4. ANTENNA PIPE MOUNTS TO BE EVENLY SPACED (PER SECTOR). ENSURE 24" MIN SPACING IS MAINTAINED BETWEEN ANTENNAS.



PROPOSED ANTENNA LAYOUT

0 2' 4'
1"=2'-0"

2

at&t
188 INVERNESS DRIVE WEST
SUITE 400
ENGLEWOOD, CO 80112

BLACK & VEATCH
4600 SOUTH SYRACUSE STREET
SUITE 800
DENVER, COLORADO 80237

TOWER ENGINEERING PROFESSIONALS
326 TRYON RD. RALEIGH, NC
27603 OFFICE: (919) 661-6351

PROJECT#:	314248
DRAWN BY:	KRS
CHECKED BY:	KOO
RFDS:	N/A

REV	DATE	DESCRIPTION
0	07/23/24	ISSUED FOR CONSTRUCTION
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COLORADO LICENSED
CHRISTOPHER M. CONSTANTINE
45607
PROFESSIONAL ENGINEER

July 23, 2024

FONTAINE & POWERS
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

SHEET TITLE
ELEVATIONS

SHEET NUMBER
C-4

SECTOR	TECH.	ANTENNA MODEL	AZIMUTH	TIP HEIGHTS	TMAS	RRH/RRU MODEL & RELATED EQUIPMENT	RAYCAP MODEL
	FINAL	FINAL	FINAL	FINAL	FINAL	FINAL	FINAL
A1	LTE	COMMSCOPE NNH4-65B-R3-UPM /AIR6419 B77G	350°	36'-0"	–	(1) 4490 B5/B12A (1) 6419 B77G (INTEGRATED)	DC6-48-60-18-8C-EV
A2	–	–	–	–	–		
A3	LTE	COMMSCOPE NNH4-65B-R3-UPM /AIR6419 B77D	350°	36'-0"		(1) 6419 B77D (INTEGRATED) (1) 4478 B14 (1) 4890 B25/66	
B1	LTE	COMMSCOPE NNH4-65B-R6	110°	36'-0"	–	(1) 4490 B5-B12A	DC6-48-60-18-8C-EV
B2	5G	AIR6419 B77D+6419 B77G STACKED	110°	36'-0"	–	(1) AIR6419 B77D/B77G (INTEGRATED)	
B3	LTE	COMMSCOPE NNH4-65B-R6	110°	36'-0"		(1) 4494 B14/B29 (1) 4890 B25/66	
C1	LTE	COMMSCOPE NNH4-65B-R3-UPM /AIR6419 B77G	240°	36'-0"	–	(1) 4490 B5/B12A (1) 6419 B77G (INTEGRATED)	DC9-48-60-24-PC16-EV
C2	–	–	–	–			
C3	LTE	COMMSCOPE NNH4-65B-R3-UPM /AIR6419 B77D	240°	36'-0"		(1) 6419 B77D (INTEGRATED) (1) 4478 B14 (1) 4890 B25/66	

*TO BE RELOCATED

at&t
188 INVERNESS DRIVE WEST
SUITE 400
ENGLEWOOD, CO 80112

BLACK & VEATCH
4600 SOUTH SYRACUSE STREET
SUITE 800
DENVER, COLORADO 80237

TOWER ENGINEERING PROFESSIONALS
326 TRYON RD. RALEIGH, NC
27603 OFFICE: (919) 661-6351

PROJECT#:	314248
DRAWN BY:	KRS
CHECKED BY:	KOO
RFDS:	N/A

REV	DATE	DESCRIPTION
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A	06/24/24	ISSUED FOR REVIEW

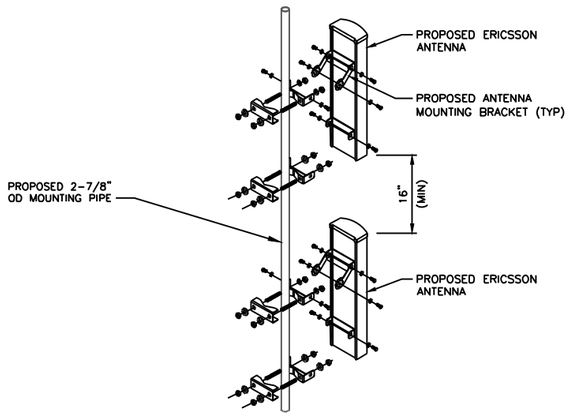
COLORADO LICENSED
NICHOLAS M. CONSTANTINE
45607
PROFESSIONAL ENGINEER

July 23, 2024

FONTAINE & POWERS
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

SHEET TITLE
ANTENNA SCHEDULE

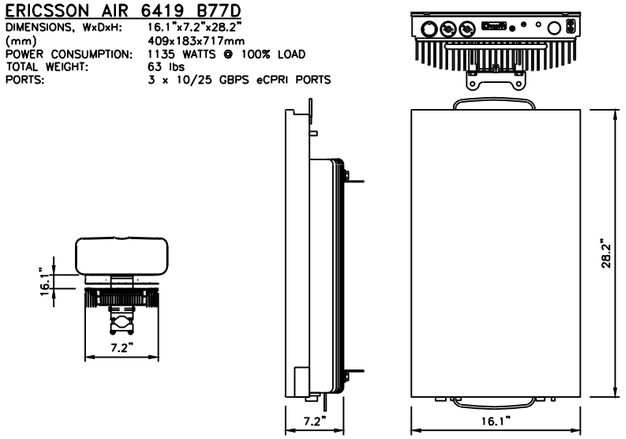
SHEET NUMBER
C-5



ANTENNA PIPE MOUNTING DETAIL | NO SCALE | 1

ERICSSON AIR 6419 B77D

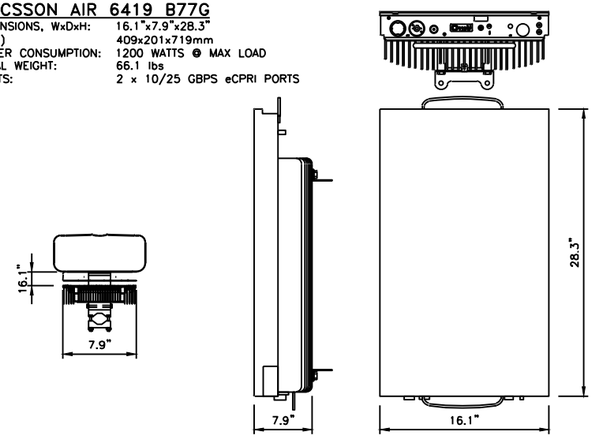
DIMENSIONS, WxDxH: 16.1"x7.2"x28.2"
(mm) 409x183x717mm
POWER CONSUMPTION: 1135 WATTS @ 100% LOAD
TOTAL WEIGHT: 63 lbs
PORTS: 3 x 10/25 GBPS eCPRI PORTS



PROPOSED ANTENNA SPECIFICATIONS | NO SCALE | 2

ERICSSON AIR 6419 B77G

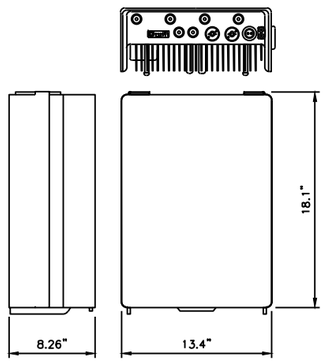
DIMENSIONS, WxDxH: 16.1"x7.9"x28.3"
(mm) 409x201x719mm
POWER CONSUMPTION: 1200 WATTS @ MAX LOAD
TOTAL WEIGHT: 66.1 lbs
PORTS: 2 x 10/25 GBPS eCPRI PORTS



PROPOSED ANTENNA SPECIFICATIONS | NO SCALE | 3

ERICSSON RADIO 4478 B14

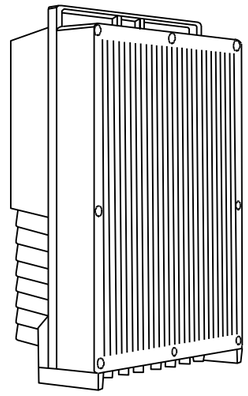
DIMENSIONS, WxDxH: 13.4"x8.26"x18.1"
(mm) 342x210x460mm
POWER CONSUMPTION: 650W
TOTAL WEIGHT: 59.4 lbs



RRU SPECIFICATIONS | NO SCALE | 4

ERICSSON RADIO 4890 B25/66

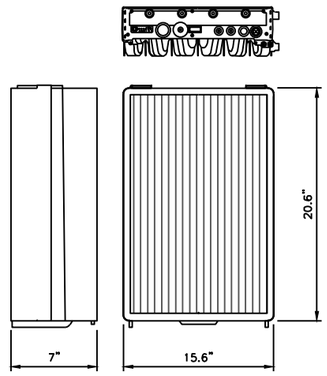
DIMENSIONS, HxWxD: 17.5"x15.1"x6.9"
(mm) 444x384x176mm
POWER CONSUMPTION: 480 WATTS
TOTAL WEIGHT: 68 lbs



RRU SPECIFICATIONS | NO SCALE | 5

ERICSSON RADIO 4490 B5/12A

DIMENSIONS, HxWxD: 20.6"x15.6"x7"
(mm) 524x397x178mm
POWER CONSUMPTION: 480W
TOTAL WEIGHT: 65 lbs



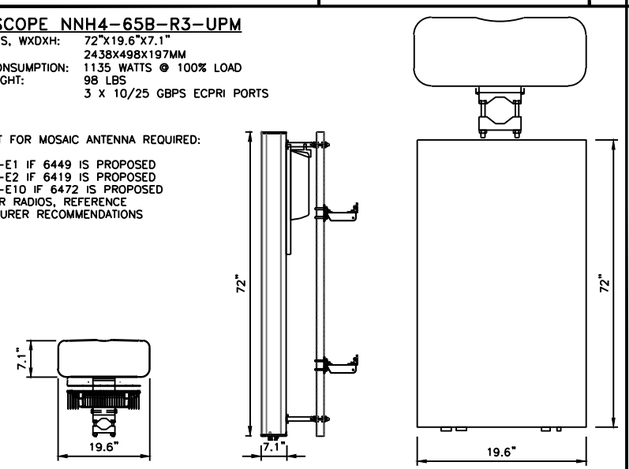
RRU SPECIFICATIONS | NO SCALE | 6

COMMSCOPE NNH4-65B-R3-UPM

DIMENSIONS, WXDXH: 72"X19.6"X7.1"
(mm) 2438X498X197MM
POWER CONSUMPTION: 1135 WATTS @ 100% LOAD
TOTAL WEIGHT: 98 LBS
PORTS: 3 X 10/25 GBPS ECPRI PORTS

FRAME KIT FOR MOSAIC ANTENNA REQUIRED:

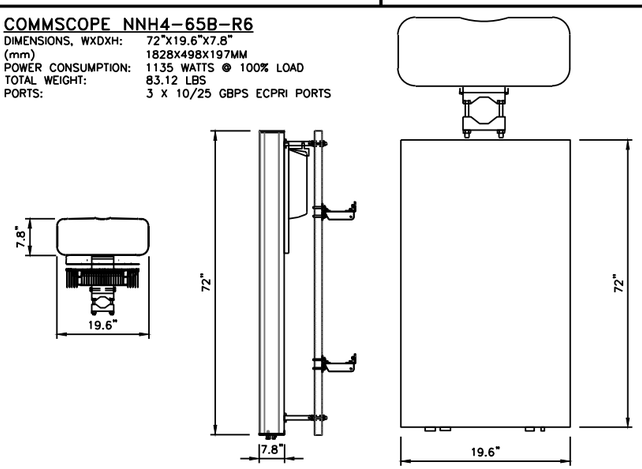
FRAME-U-E1 IF 6449 IS PROPOSED
FRAME-U-E2 IF 6419 IS PROPOSED
FRAME-U-E10 IF 6472 IS PROPOSED
ALL OTHER RADIOS, REFERENCE MANUFACTURER RECOMMENDATIONS



PROPOSED ANTENNA SPECIFICATIONS | NO SCALE | 7

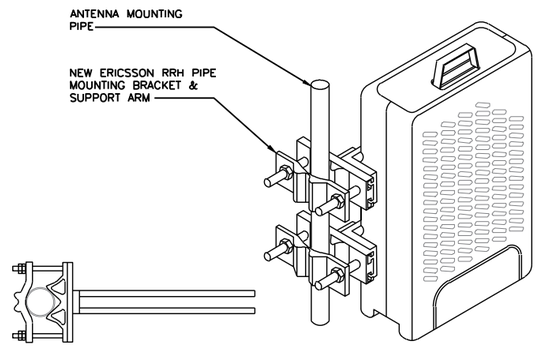
COMMSCOPE NNH4-65B-R6

DIMENSIONS, WXDXH: 72"X19.6"X7.8"
(mm) 1828X498X197MM
POWER CONSUMPTION: 1135 WATTS @ 100% LOAD
TOTAL WEIGHT: 83.12 LBS
PORTS: 3 X 10/25 GBPS ECPRI PORTS



PROPOSED ANTENNA SPECIFICATIONS | NO SCALE | 8

ERICSSON SXK12553394/2



DUAL RRH MOUNTING DETAIL | NO SCALE | 9

at&t
188 INVERNESS DRIVE WEST
SUITE 400
ENGLEWOOD, CO 80112

BLACK & VEATCH
4600 SOUTH SYRACUSE STREET
SUITE 800
DENVER, COLORADO 80237

TOWER ENGINEERING PROFESSIONALS
326 TRYON RD. RALEIGH, NC
27603 OFFICE: (919) 661-6351

PROJECT#:	314248
DRAWN BY:	KRS
CHECKED BY:	KOO
RFDS:	N/A

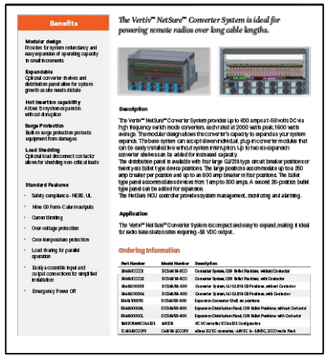
REV	DATE	DESCRIPTION
0	07/23/24	ISSUED FOR CONSTRUCTION
A	06/24/24	ISSUED FOR REVIEW

July 23, 2024

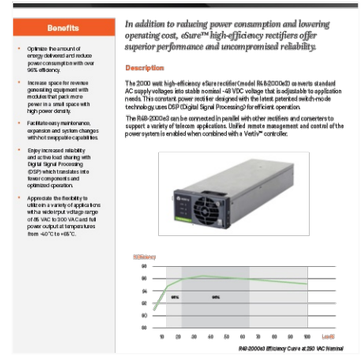
FONTAINE & POWERS
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

SHEET TITLE
EQUIPMENT DETAILS

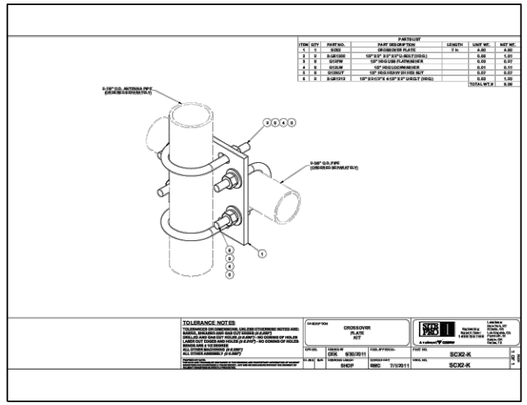
SHEET NUMBER
C-6



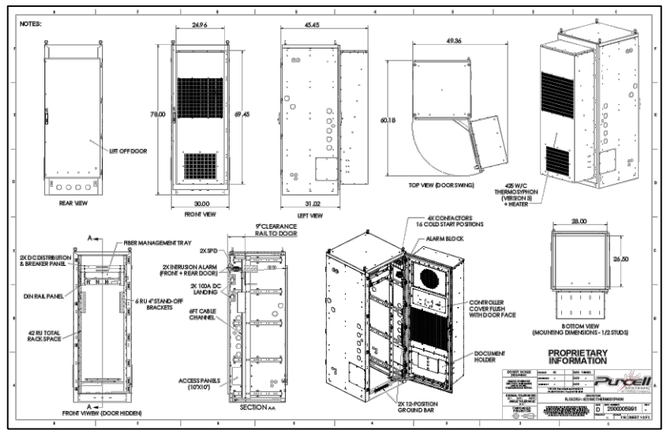
PROPOSED CONVERTER DETAIL | NO SCALE | 1



PROPOSED RECTIFIER DETAIL | NO SCALE | 2

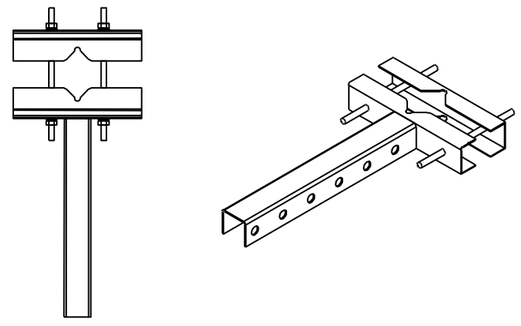


CROSSOVER PLATE KIT DETAILS | NO SCALE | 3



PROPOSED FLX42 PURCELL CABINET | NO SCALE | 4

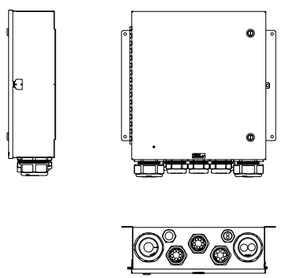
TALLEY CABLE SUPPORT BRACKET
P/N SS-TB2550



RRU CABLE SUPPORT BRACKET DETAIL | NO SCALE | 5

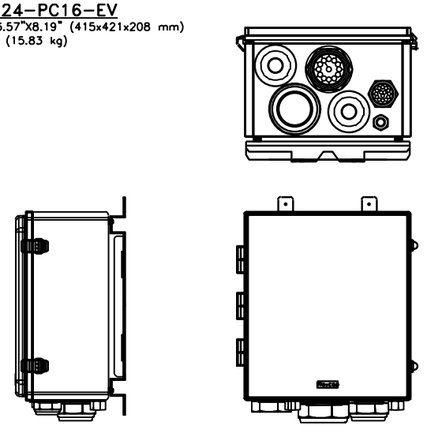
PROPOSED ENERSYS SBS 190AH BATTERY DETAILS | NO SCALE | 6

RAYCAP DC12-48-60-0-25E
DIMENSIONS, LXWXH: 24"X24"X8.8" (609.6x609.6x203.2 mm)
NOMINAL OPERATING VOLTAGE: 48 VOC
NOMINAL DISCHARGE CURRENT: 20 kA 8/20ms
MAX. DISCHARGE CURRENT: 60 kA 8/20ms
MAX. CONT. OPERATING VOLTAGE: 75 VOC
VOLTAGE PROTECTION RATING: 400v
TOTAL WEIGHT: 56.3 LBS



PROPOSED DC12 DETAILS | NO SCALE | 7

RAYCAP DC9-48-60-24-PC16-EV
DIMENSIONS, LXWXH: 16.34"X16.57"X8.19" (415x421x208 mm)
TOTAL WEIGHT: 34.9 LBS (15.83 kg)



PROPOSED DC9-48-60-24-PC16-EV DEATILS | NO SCALE | 8

NOT USED | NO SCALE | 9

at&t
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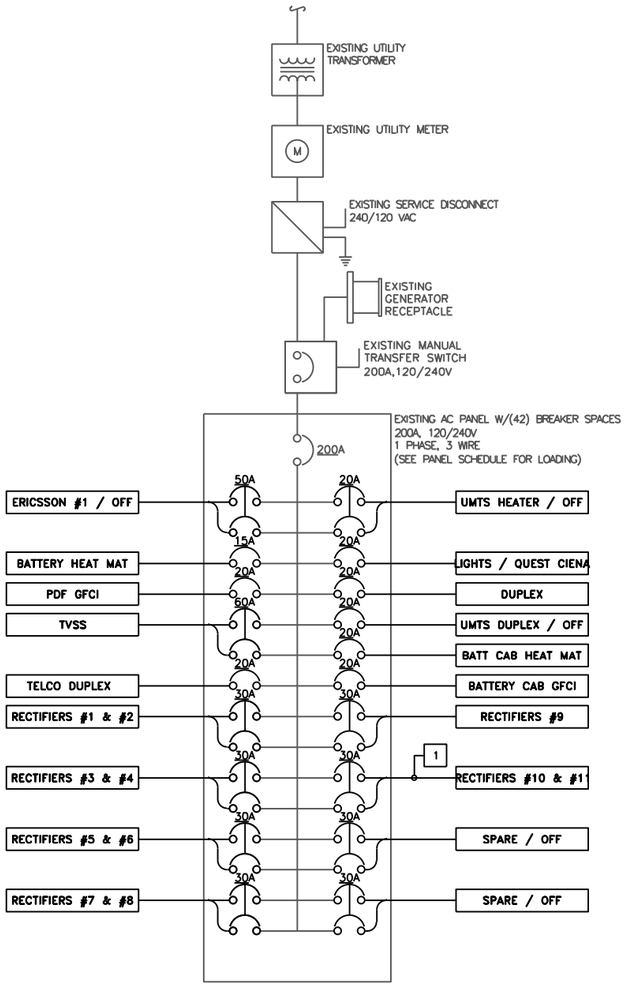
COLORADO LICENSED
NICHOLAS M. CONSTANTINO
45607
PROFESSIONAL ENGINEER

July 23, 2024

FONTAINE & POWERS
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

SHEET TITLE
EQUIPMENT DETAILS

SHEET NUMBER
C-6.1



AC CIRCUIT SCHEDULE			
NO.	FROM	TO	CONFIGURATION
1	AC LOAD CENTER	RECTIFIERS #10 & #11	(4) #10 CU THHN/THWN-2, (2) #10 CU EGC

NOTES
1. CIRCUIT #10 – #11 TO BE RAN TOGETHER IN MINIMUM 1" CONDUIT.

1. CONTRACTOR SHALL INSPECT THE EXISTING CONDITIONS PRIOR TO SUBMITTING A BID. ANY QUESTIONS ARISING DURING THE BID PERIOD IN REGARDS TO THE CONTRACTOR'S 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, NOT AFTER THE CONTRACT HAS BEEN AWARDED.
2. ALL ELECTRICAL WORK SHALL BE DONE IN ACCORDANCE WITH CURRENT NATIONAL ELECTRICAL CODES AND ALL STATE AND LOCAL CODES, LAWS, AND ORDINANCES. PROVIDE ALL COMPONENTS AND WIRING SIZES AS REQUIRED TO MEET NEC STANDARDS.
3. LOCATION OF EQUIPMENT, CONDUIT AND DEVICES SHOWN ON THE DRAWINGS ARE APPROXIMATE AND SHALL BE COORDINATED WITH FIELD CONDITIONS PRIOR TO CONSTRUCTION.
4. CONDUIT ROUGH-IN SHALL BE COORDINATED WITH THE MECHANICAL EQUIPMENT TO AVOID LOCATION CONFLICTS. VERIFY WITH THE MECHANICAL EQUIPMENT CONTRACTOR AND COMPLY AS REQUIRED.
5. CONTRACTOR SHALL PROVIDE ALL BREAKERS, CONDUITS AND CIRCUITS AS REQUIRED FOR A COMPLETE SYSTEM.
6. CONTRACTOR SHALL PROVIDE PULL BOXES AND JUNCTION BOXES AS REQUIRED BY THE NEC ARTICLE 314.
7. CONTRACTOR SHALL PROVIDE ALL STRAIN RELIEF AND CABLE SUPPORTS FOR ALL CABLE ASSEMBLIES. INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND RECOMMENDATIONS.
8. ALL DISCONNECTS AND CONTROLLING DEVICES SHALL BE PROVIDED WITH ENGRAVED PHENOLIC NAMEPLATES INDICATING EQUIPMENT CONTROLLED, BRANCH CIRCUITS INSTALLED ON, AND PANEL FIELD LOCATIONS FED FROM.
9. INSTALL AN EQUIPMENT GROUNDING CONDUCTOR IN ALL CONDUITS PER THE SPECIFICATIONS AND NEC 250. THE EQUIPMENT GROUNDING CONDUCTORS SHALL BE BONDED AT ALL JUNCTION BOXES, PULL BOXES, AND ALL DISCONNECT SWITCHES, AND EQUIPMENT CABINETS.
10. ALL NEW MATERIAL SHALL HAVE A U.L. LABEL.
11. PANEL SCHEDULE LOADING AND CIRCUIT ARRANGEMENTS REFLECT POST-CONSTRUCTION EQUIPMENT.
12. CONTRACTOR SHALL BE RESPONSIBLE FOR AS-BUILT PANEL SCHEDULE AND SITE DRAWINGS.
13. AIR CONDITIONING SYSTEM IS COMPRISED OF TWO COMPRESSOR/CONDENSER AND AIR HANDLING UNITS. THE ELECTRICAL CONTROLLER FOR THE AIR CONDITIONING SYSTEM WILL ONLY ALLOW PERMISSION FOR ONE HVAC TO BE ENERGIZED AT ANY GIVEN TIME. IN EXAMPLE ONE, IF HVAC #1 HAS A FAILURE, HVAC #2 WILL BE ENERGIZED. IN EXAMPLE TWO, WHEN HVAC CYCLE, THE CONTROLLER WILL DE-ENERGIZE FOR IT'S TIMED CYCLE.

CIRCUIT SCHEDULE | 2 | NOTES | 3

PROPOSED AC POWER PANEL A
120/240 VOLTS, 1-PHASE, 3-WIRE, 200A

MAIN BREAKER RATING (A) : 200 | SYSTEM VOLTAGE (V) : 240

DESCRIPTION	VA	c/nc	BKR	POSN	L1	L2	POSN	BKR	c/nc	VA	DESCRIPTION
ERICSSON #1 / OFF	0	nc	50/2	1	0		2	20/2	nc	0	UMTS HEATER / OFF
	0	nc		3		0	4		nc	0	
BATTERY HEAT MAT	1440	nc	15/1	5	1940		6	20/1	nc	500	LIGHTS / QUEST CIENA
PDF GFCI	180	nc	20/1	7		360	8	20/1	nc	180	DUPLEX
TVSS	100	nc	60/2	9	100		10	20/1	nc	0	UMTS DUPLEX / OFF
	100	nc		11		2020	12	20/1	nc	1920	BATT CAB HEAT MAT
TELCO DUPLEX	180	nc	20/1	13	360		14	20/1	nc	180	BATTERY CAB GFCI
RECTIFIER #1 & #2	1720	c	30/2	15		2580	16	30/2	c	860	RECTIFIER #9
	1720	c		17	2580		18		c	860	
RECTIFIER #3 & #4	1720	c	30/2	19		3440	20	30/2	c	1720	RECTIFIER #10 & #11
	1720	c		21	3440		22		c	1720	
RECTIFIER #5 & #6	1720	c	30/2	23		1720	24	30/2	nc	0	SPARE / OFF
	1720	c		25	1720		26		nc	0	
RECTIFIER #7 & #8	1720	c	30/2	27		1720	28	30/2	nc	0	SPARE / OFF
	1720	c		29	1720		30		nc	0	
PHASE TOTALS (VA):					11860	11840					
PHASE TOTALS (A):					99	99					
CURRENT PER PHASE W/ 125% Continuous Loads(A):					119	118	Amperes/phase cannot exceed main breaker rating				
PANEL TOTAL (VA):					23700		Legend: c = continuous, nc = non-continuous				
PANEL TOTAL W/ 125% Continuous Loads (VA):					28430						

*LOAD PROVIDED TO TEP BY B&V. TEP DID NOT PERFORM A LOAD STUDY TO CONFIRM EXISTING PANEL LOADING.

ELECTRICAL AC ONE-LINE DIAGRAM | NO SCALE | 1 | PANEL SCHEDULE | NO SCALE | 4

at&t
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DENVER, COLORADO 80237

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27603 OFFICE: (919) 661-6351

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CHECKED BY:	KOO
RFDS:	N/A

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COLORADO LICENSED NICHOLAS M. CONSTANT 45607 PROFESSIONAL ENGINEER

July 23, 2024

FONTAINE & POWERS
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

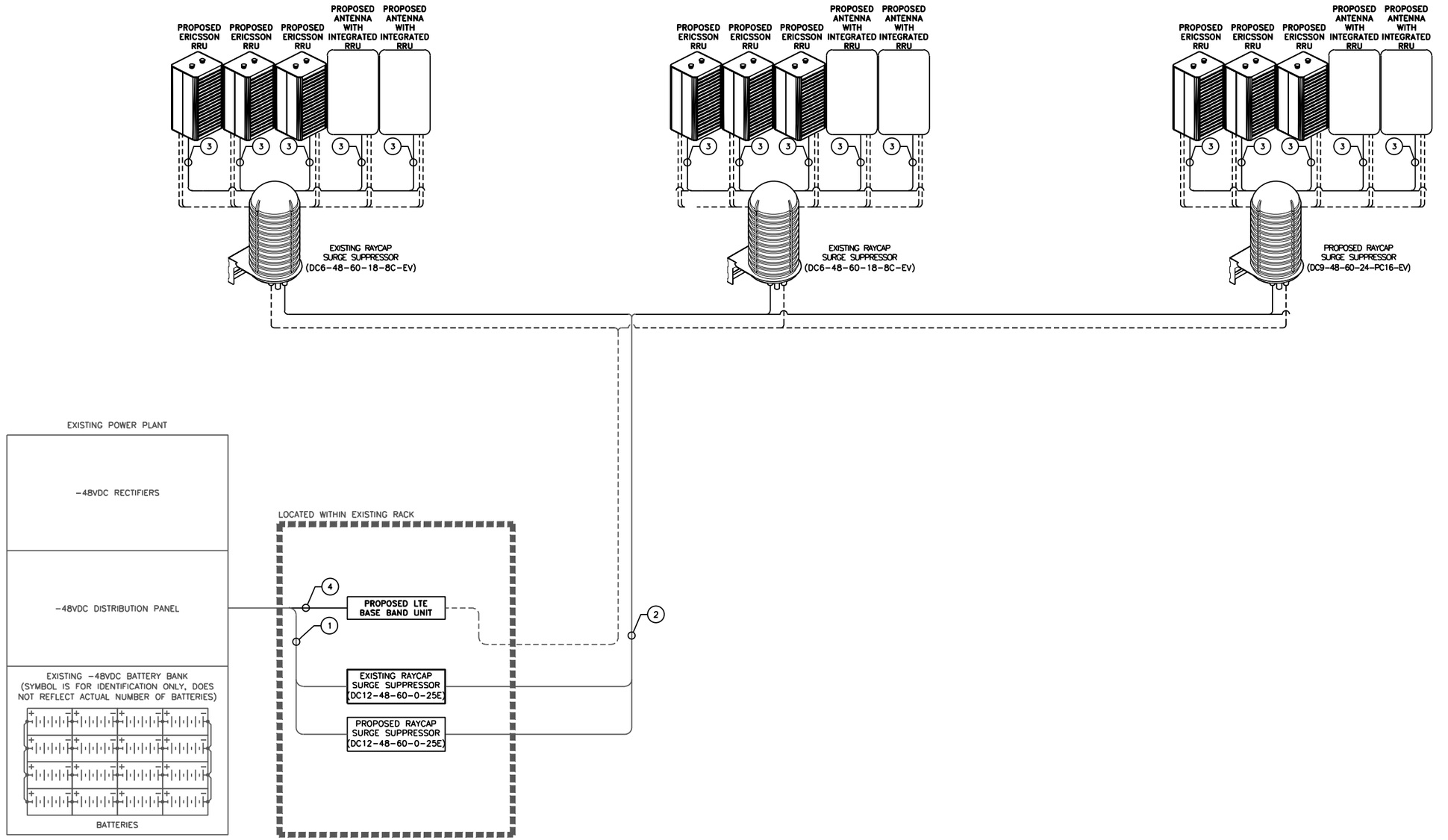
SHEET TITLE
ELECTRICAL AC ONE-LINE DIAGRAM

SHEET NUMBER
E-1

DC CIRCUIT SCHEDULE			
NO.	FROM	TO	CONFIGURATION
1	DISTRIBUTION PANEL	RACK MOUNTED SURGE SUPPRESSOR	(2) 1-#8 TELCOFLEX IV DC CABLE
2	RACK MOUNTED SURGE SUPPRESSOR	SECTOR MOUNTED SURGE SUPPRESSOR	(3) 6-#6 THHN/THWN/VW-1 TYPE TC-ER DC CABLE
3	SECTOR MOUNTED SURGE SUPPRESSOR	PROPOSED REMOTE RADIO UNIT (RRU)	(15) 2-#8 THHN/THWN/VW-1 TYPE TC-ER DC CABLE
4	DISTRIBUTION PANEL	PROPOSED BASE BAND UNIT	(1) 1-#12 TELCOFLEX III DC CABLE

NOTES

1. 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.
2. NON-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.
3. LTE POWER WIRING SHALL BE IN ACCORDANCE WITH ATT-002-290-531.
4. DC ELECTRICAL DEMAND FOR THE PROPOSED ADDITIONS WERE INCLUDED IN AC LOAD CALCULATIONS.
5. CONNECT ALL PROPOSED AIRSCALE RRU SECOND CPRI TO SURGE SUPPRESSOR FOR FUTURE USE.
6. CONTRACTOR TO RECONNECT ALL EXISTING EQUIPMENT TO PROPOSED POWER PLANT.



ELECTRICAL DC ONE-LINE DIAGRAM

NO SCALE

at&t
188 INVERNESS DRIVE WEST
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BLACK & VEATCH
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COLORADO LICENSED THOMAS M. CONSTANTINE 45607 PROFESSIONAL ENGINEER

July 23, 2024

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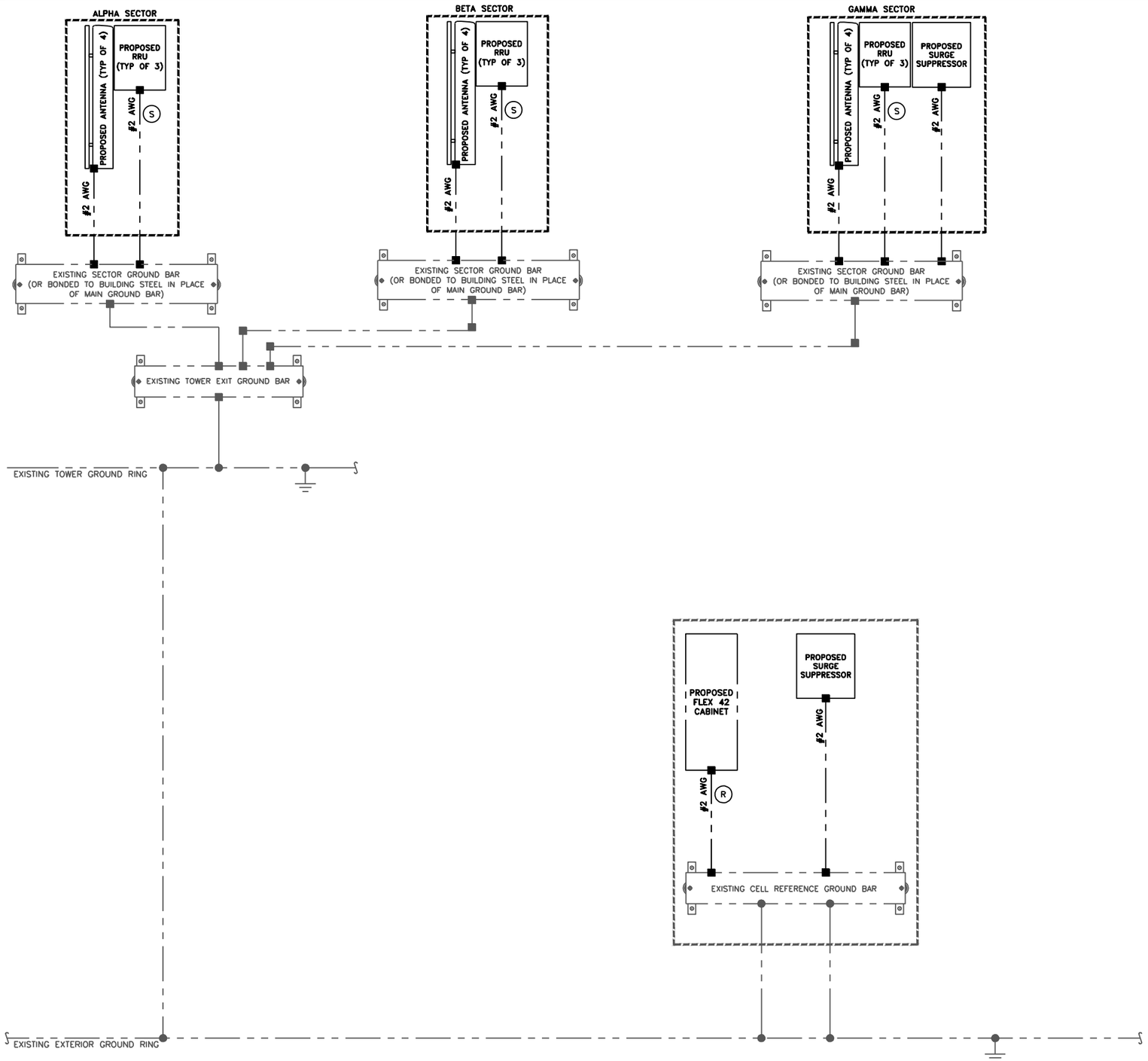
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

SHEET TITLE
ELECTRICAL DC ONE-LINE DIAGRAM

SHEET NUMBER
E-2



GROUNDING ONE-LINE DIAGRAM

NO SCALE

- EXOTHERMIC CONNECTION
- MECHANICAL CONNECTION
- GROUND ROD
- 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) INTERIOR GROUND RING: #2 AWG STRANDED GREEN INSULATED COPPER CONDUCTOR EXTENDED AROUND THE PERIMETER OF THE EQUIPMENT AREA. ALL NON-TELECOMMUNICATIONS RELATED METALLIC OBJECTS FOUND WITHIN A SITE SHALL BE GROUNDED TO THE INTERIOR GROUND RING WITH #6 AWG STRANDED GREEN INSULATED CONDUCTOR. (ATT-TP-76416 / 7.6.4)

(D) BOND TO INTERIOR GROUND RING: #2 AWG SOLID TINNED COPPER WIRE PRIMARY BONDS SHALL BE PROVIDED AT LEAST AT FOUR POINTS ON THE INTERIOR GROUND RING, LOCATED AT THE CORNERS OF THE BUILDING. (ATT-TP-76416 7.5.2.2)

(E) 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)

(F) CELL REFERENCE GROUND BAR: POINT OF GROUND REFERENCE FOR ALL COMMUNICATIONS EQUIPMENT FRAMES. ALL BONDS ARE MADE WITH #2 AWG UNLESS NOTED OTHERWISE STRANDED GREEN INSULATED COPPER CONDUCTORS. BOND TO GROUND RING WITH (2) #2 SOLID TINNED COPPER CONDUCTORS. (ATT-TP-76416 / 7.6.7)

(G) HATCH PLATE GROUND BAR: BOND TO THE INTERIOR GROUND RING WITH TWO #2 AWG STRANDED GREEN INSULATED COPPER CONDUCTORS. WHEN A HATCH-PLATE AND A CELL REFERENCE GROUND BAR ARE BOTH PRESENT, THE CRGB MUST BE CONNECTED TO THE HATCH-PLATE AND TO THE INTERIOR GROUND RING USING (2) TWO #2 AWG STRANDED GREEN INSULATED COPPER CONDUCTORS EACH.

(H) EXTERIOR CABLE ENTRY PORT GROUND BARS: LOCATED AT THE ENTRANCE TO THE CELL SITE BUILDING. BOND TO GROUND RING WITH A #2 AWG SOLID TINNED COPPER CONDUCTORS WITH AN EXOTHERMIC WELD AND INSPECTION SLEEVE. (ATT-TP-76416 / 7.6.7.2)

(J) TOWER EXIT GROUND BAR: #2 AWG SOLID TINNED COPPER BOND TO THE TOWER GROUND RING. (ATT-TP-76416 / 7.4.2.6)

(K) TELCO GROUND BAR: BOND TO BOTH CELL REFERENCE GROUND BAR AND EXTERIOR GROUND RING. (ATT-TP-76416 / 7.6.8)

(L) 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)

(M) INTERIOR UNIT BONDS: METAL FRAMES, CABINETS AND INDIVIDUAL METALLIC UNITS LOCATED WITH THE AREA OF THE INTERIOR GROUND RING REQUIRE A #6 AWG STRANDED GREEN INSULATED COPPER BOND TO THE INTERIOR GROUND RING. (ATT-TP-76416 / 7.12.3.1)

(N) 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)

(P) EXTERIOR UNIT BONDS: METALLIC OBJECTS, EXTERNAL TO OR MOUNTED TO THE BUILDING, SHALL BE BONDED TO THE EXTERIOR GROUND RING. (ATT-TP-76416 7.12.2)

(Q) 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)

(R) DURING ALL DC POWER SYSTEM CHANGES INCLUDING DC SYSTEM CHANGE OUTS, RECTIFIER REPLACEMENTS OR ADDITIONS, BREAKER DISTRIBUTION CHANGES, BATTERY ADDITIONS, BATTERY REPLACEMENTS AND INSTALLATIONS OR CHANGES TO DC CONVERTER SYSTEMS IT SHALL BE REQUIRED THAT SERVICE CONTRACTORS VERIFY ALL DC POWER SYSTEMS ARE EQUIPPED WITH A MASTER DC SYSTEM RETURN GROUND CONDUCTOR FROM THE DC POWER SYSTEM COMMON RETURN BUS DIRECTLY CONNECTED TO THE CELL SITE REFERENCE GROUND BAR (CRGB) PER TP76300 SECTION H 6 AND TP76416 FIGURE 7-11 REQUIREMENTS.

(S) OUTDOOR GROUNDING CONDUCTORS: GROUNDING CONDUCTORS INSTALLED OUTDOORS AND RUN ENTIRELY ABOVE GRADE SHALL BE TINNED STRANDED COPPER AND BE SUNLIGHT RESISTANT.

GROUNDING KEY NOTES

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SHEET TITLE
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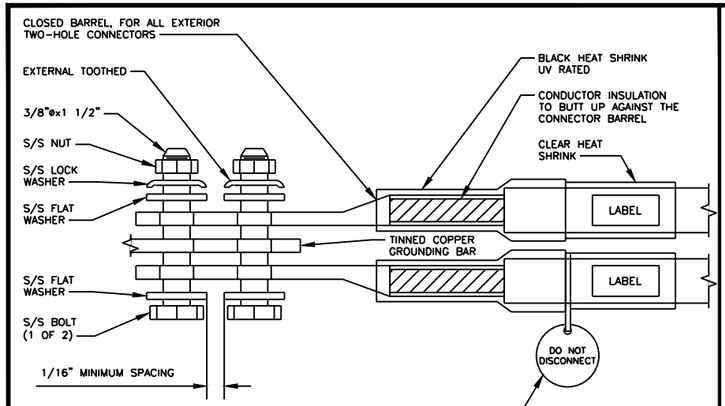
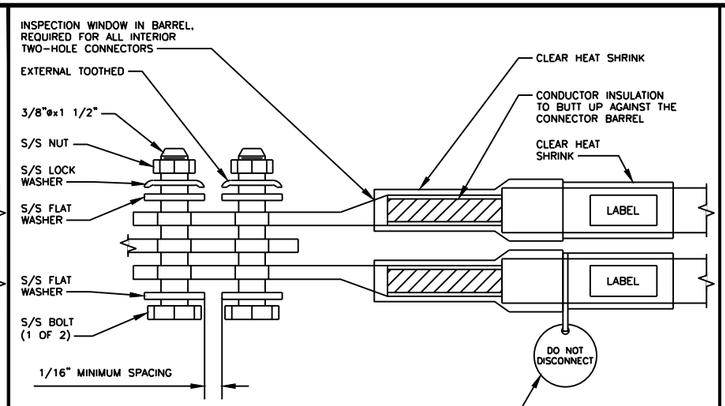
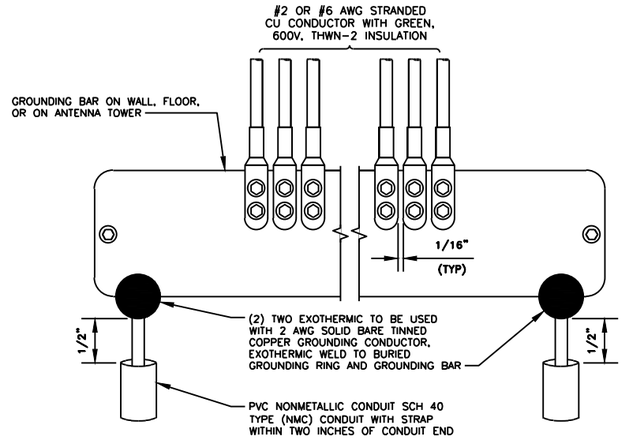
SHEET NUMBER
G-1



INTERIOR TWO HOLE LUG | NO SCALE | 1



EXTERIOR TWO HOLE LUG | NO SCALE | 2



INSTALLATION OF GROUNDING CONDUCTOR TO GROUNDING BAR | NO SCALE | 3

NEWTON INSTRUMENT COMPANY, INC.
BUTNER, NC

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

EACH GROUND CONDUCTOR TERMINATING ON ANY GROUND BAR SHALL HAVE AN IDENTIFICATION TAG ATTACHED AT EACH END THAT WILL IDENTIFY ITS ORIGIN AND DESTINATION

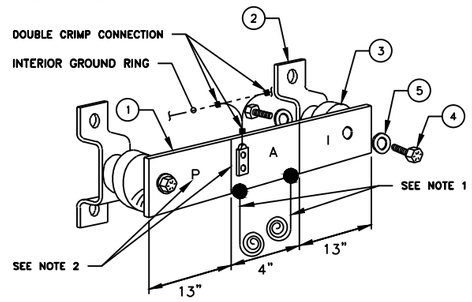
SECTION "P" – SURGE PROTECTORS
(EC) CABLE ENTRY PORTS (HATCH PLATES) (#2)
(EC) TELCO GROUND BAR (#2)
(EC) COMMERCIAL POWER COMMON NEUTRAL/GROUND BOND (#2)
(AT&T) CELL SITE +24V POWER SUPPLY RETURN BAR (#2)
(AT&T) CELL SITE -48V POWER SUPPLY RETURN BAR (#2)
(EC) GENERATOR FRAMEWORK (IF AVAILABLE) (#2)
(AT&T) RECTIFIER FRAMES
(AT&T) ANTENNA SUPPRESSION

SECTION "A" – SURGE ABSORBERS
(EC) INTERIOR GROUND RING (#2)
(EC) EXTERNAL EARTH GROUND FIELD (BURIED GROUND RING) (#2)
(EC) METALLIC COLD WATER PIPE (IF AVAILABLE) (#2)
(EC) BUILDING STEEL (IF AVAILABLE) (#2)

SECTION "I" – ISOLATED GROUNDING ZONE
(AT&T) ALL CELL SITE COMMUNICATIONS EQUIPMENT FRAMES

DETAIL NOTES

1. EXOTHERMICALLY WELD #2 AWG BARE TINNED SOLID COPPER CONDUCTOR TO GROUND BAR. ROUTE CONDUCTOR TO BURIED GROUND RING AND PROVIDE PARALLEL EXOTHERMIC WELD.
2. EC SHALL PERMANENTLY MARK THE LINES BETWEEN EACH SECTION AND LABEL EACH SECTION ("P", "A", "I") WITH 1" HIGH LETTERS.
3. GROUND BAR SHALL BE ENGRAVED PER AT&T SPECIFICATIONS TO PREVENT THEFT.



(MGB) REFERENCE GROUNDING BAR | NO SCALE | 4

NOTES

1. ALL MAIN CABLES WILL BE GROUNDED W/ COAXIAL CABLE GROUND KITS AT:
   A. THE ANTENNA LEVEL.
   B. MID LEVEL IF TOWER IS OVER 200'.
   C. BASE OF TOWER PRIOR TO TURNING HORIZONTAL
   D. OUTSIDE THE EQUIPMENT SHELTER AT ENTRY PORT.
   E. INSIDE THE EQUIPMENT SHELTER AT THE ENTRY PORT.
2. ALL PROPOSED GROUND BAR DOWNLEADS ARE TO BE CADWELDED TO THE EXISTING ADJACENT GROUND BAR DOWNLEADS A MINIMUM DISTANCE OF FOUR FEET BELOW GROUND BAR.
3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ANTENNA AND COAX CONFIGURATION, MAKE AND MODELS PRIOR TO INSTALLATION.
4. DO NOT ALLOW THE COPPER CONDUCTOR TO TOUCH THE GALVANIZED GUY WIRE AT THE CONNECTION POINT OR AT ANY OTHER POINT. NO EXOTHERMICALLY WELDED CONNECTION SHALL BE MADE TO THE GUY WIRE.
5. SUBCONTRACTOR SHALL GROUND ALL EQUIPMENT INCLUDING ANTENNAS, RET MOTORS, TMA'S, COAX CABLES, AND RET CONTROL CABLES AS A COMPLETE SYSTEM. GROUNDING SHALL BE EXECUTED BY QUALIFIED PERSONEL IN COMPLIANCE WITH MANUFACTURER'S SPECIFICATIONS AND RECOMMENDATIONS.
6. DO NOT INSTALL CABLE GROUNDING KIT AT A BEND AND ALWAYS DIRECT GROUNDING CONDUCTOR DOWN TO GROUNDING BAR.
7. GROUNDING KIT SHALL BE TYPE AND PART NUMBER AS SUPPLIED OR RECOMMENDED BY CABLE MANUFACTURER.
8. WEATHERPROOFING SHALL BE TYPE AND PART NUMBER AS SUPPLIED OR RECOMMENDED BY CABLE MANUFACTURER.
9. ALL EXTERIOR HEAT SHRINK OR HEAT SHRINK EXPOSED TO U/V LIGHT SHALL BE BLACK. ALL INTERIOR HEAT SHRINK SHALL BE CLEAR.
10. NUMBER OF GROUNDING BARS MAY VARY DEPENDING ON THE TYPE OF TOWER, ANTENNA LOCATION, AND CONNECTION ORIENTATION. THE SUBCONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING ADDITIONAL GROUNDING BAR AS REQUIRED, PROVIDING 50% SPARE CONNECTION POINTS.
11. PROVIDE GROUNDING KIT 6" BEFORE TURN TRANSITION FROM TOWER TO ICE BRIDGE.

NOTES | NO SCALE | 5

NOT USED | NO SCALE | 6

NOT USED | NO SCALE | 7

NOT USED | NO SCALE | 8

at&t
188 INVERNESS DRIVE WEST
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ENGLEWOOD, CO 80112

BLACK & VEATCH
4600 SOUTH SYRACUSE STREET
SUITE 800
DENVER, COLORADO 80237

TOWER ENGINEERING PROFESSIONALS
326 TRYON RD. RALEIGH, NC
27603 OFFICE: (919) 661-6351

PROJECT#:	314248
DRAWN BY:	KRS
CHECKED BY:	KOO
RFDS:	N/A

REV	DATE	DESCRIPTION
0	07/23/24	ISSUED FOR CONSTRUCTION
A	06/24/24	ISSUED FOR REVIEW

July 23, 2024

FONTAINE & POWERS
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

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-DDBTXD

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

LEGEND

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	UNITERRUPTIBLE POWER SYSTEM (DC POWER PLANT)
VIF	VERIFIED IN FIELD
W	WIDE
W/	WITH
WD	WOOD
WP	WEATHERPROOF
WT	WEIGHT

ABBREVIATIONS

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COLORADO LICENSED
NICHOLAS M. CONSTANTINE
45607
PROFESSIONAL ENGINEER

July 23, 2024

FONTAINE & POWERS
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

SHEET TITLE
LEGEND & ABBREVIATIONS

SHEET NUMBER
GN-1

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 OT 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) ATRICLE 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 DISTACE 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 LASTEST 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.

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COLORADO LICENSED
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July 23, 2024

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NOKIA MARKETS MODERNIZATION

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 500Xi) 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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SHEET TITLE
GENERAL SITE WORK & 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 Fl = 15. THE MINIMUM LOCAL NUMBER FOR FLATNESS, Ff= 15 AND Fl=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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PROJECT#:	314248
DRAWN BY:	KRS
CHECKED BY:	KOO
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COLORADO LICENSED
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July 23, 2024

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SHEET TITLE
GENERAL CONCRETE WORK NOTES

SHEET NUMBER
GN-4

GENERAL STRUCTURAL STEEL NOTES

PART 1 – GENERAL

1.1 SCOPE:

A. PROVIDE FABRICATION AND ERECTION OF STRUCTURAL STEEL AND OTHER ELEMENTS AS SHOWN ON THE DRAWINGS OR REQUIRED BY OTHER SECTIONS OF THESE SPECIFICATIONS.

1.2 REFERENCES:

A. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC). MANUAL OF STEEL CONSTRUCTION, ALLOWABLE STRESS DESIGN (ASD).

B. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM).
ASTM A36: STRUCTURAL STEEL
ASTM A53: PIPE, STEEL BLACK AND HOT DIPPED, ZINC-COATED WELDED AND SEAMLESS.
ASTM A108: STEEL BARS, CARBON, COLD FINISHED, STANDARD QUALITY.
ASTM A123: ZINC (HOT-DIPPED GALVANIZED) COATING ON IRON AND STEEL PRODUCTS.
ASTM A307: CARBON STEEL BOLTS AND STUD, 60,000 P.S.I. TENSILE STRENGTH.
ASTM A325: HIGH-STRENGTH BOLT FOR STRUCTURAL STEEL JOINTS.
ASTM A490: HEAT-TREATED, STRUCTURAL STEEL BOLTS, 150 (KSI) (1035MPA) TENSILE STRENGTH.
ASTM A500: COLD-FORMED WELDED AND SEAMLESS CARBON STEEL STRUCTURAL TUBING IN ROUNDS AND SHAPES.
ASTM A563: CARBON AND ALLOY STEEL NUTS.
ASTM B695: COATINGS OF ZINC MECHANICALLY DEPOSITED ON IRON AND STEEL.
ASTM F436: HARDENED STEEL WASHERS.
ASTM F959: COMPRESSIBLE-WASHER-TYPE DIRECT TENSION INDICATOR FOR USE WITH STRUCTURAL FASTENERS.

C. AMERICAN WELDING SOCIETY (AWS):
AWS A5.1: COVERED CARBON STEEL ARC WELDING ELECTRODES.
AWS A5.5: LOW ALLOY STEEL COVERED ARC WELDING ELECTRODES.
AWS D1.1: STRUCTURAL WELDING CODE – STEEL.

D. RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS (RCSC): "SPECIFICATIONS FOR STRUCTURAL JOINTS USING ASTM A325 BOLTS OR ASTM A490 BOLTS." AS ENDORSED BY AISC.

E. STEEL STRUCTURES PAINTING COUNCIL (SSPC):
SSPC-SP3: POWER TOOL CLEANING.
SSPC-PAINT 11: RED IRON OXIDE, ZINC CHROME, RAW LINSEED OIL OR ALKYD PAINT.

1.3 SUBMITTALS:

A. SUBMIT THE FOLLOWING FOR APPROVAL:

1. FABRICATION AND ERECTION DRAWINGS SHOWING ALL DETAILS, CONNECTIONS, MATERIAL DESIGNATIONS, AND ALL TOP STEEL ELEVATIONS.

B. WELDERS SHALL BE QUALIFIED AS PRESCRIBED IN AWS D1.1.

PART 2 – PRODUCTS

2.1 STRUCTURAL STEEL:

A. SHAPES, PLATES, AND BARS SHALL CONFORM TO ASTM A36.

B. STRUCTURAL TUBING SHALL CONFORM TO ASTM A500, GRADE B. STEEL PIPE SHALL CONFIRM TO ASTM A53, TYPE E OR S, GRADE B.

2.2 ANCHOR BOLTS:

A. ANCHOR BOLTS SHALL CONFORM TO ASTM A307 WITH HEAVY HEXAGONAL NUTS.

2.3 BOLTS:

A. COMMON (MACHINE) BOLTS SHALL CONFORM TO ASTM A307 GRADE A AND NUTS TO ASTM A563. ONE COMMON BOLT ASSEMBLY SHALL CONSIST OF A BOLT, A HEAVY HEX NUT, AND A HARDENED WASHER.

B. HIGH-STRENGTH BOLTS SHALL CONFORM TO ASTM A325 ONE HIGH. STRENGTH BOLT ASSEMBLY SHALL CONSIST OF A HEAVY HEX STRUCTURAL BOLT, A HEAVY HEX NUT, AND A HARDENED WASHER CONFORMING TO ASTM F436. THE HARDENED WASHER SHALL BE INSTALLED AGAINST THE ELEMENT TURNED IN TIGHTENING. UNLESS NOTED OTHERWISE ON THE DRAWINGS, ALL CONNECTIONS SHALL BE BEARING TYPE CONNECTIONS.

2.4 WELDING ELECTRODES:

A. WELDING ELECTRODES SHALL COMPLY WITH AWS D1.1 USING A5.1 OR A5.5 E70XX AND SHALL BE COMPATIBLE WITH THE WELDING PROCESS SELECTED.

2.5 PRIMER:

A. PRIMER SHALL BE RED OXIDE-CHROMATE PRIMER COMPLYING WITH SSPC PAINT SPECIFICATION NO. 11.

PART 3 – EXECUTION

3.1 FABRICATION:

A. SHOP FABRICATE AND ASSEMBLY MATERIALS AS SPECIFIED HEREIN.

1. FABRICATE ITEMS OF STRUCTURAL STEEL IN ACCORDANCE WITH THE AISC-ASD SPECIFICATIONS, AND AS INDICATED ON THE APPROVED SHOP DRAWINGS.

2. ALL EXPOSED STRUCTURAL STEEL SHALL BE HOT DIP GALVANIZED PER ASTM.

3. PROPERLY MARK AND MATCH-MARK MATERIALS FOR FIELD ASSEMBLY AND FOR IDENTIFICATION AS TO INTENDED LOCATION.

4. FABRICATE AND DELIVER IN A SEQUENCE WHICH WILL EXPEDITE ERECTION AND MINIMIZE FIELD HANDLING OF MATERIALS.

5. WHERE FINISHING IS REQUIRED, COMPLETE THE ASSEMBLY, INCLUDING THE WELDING OF UNITS, BEFORE START OF FINISHING OPERATIONS.

6. THE FINISH SURFACE OF MEMBERS EXPOSED IN THE FINISHED STRUCTURE SHALL BE FREE FROM MARKINGS, BURNS, AND OTHER DEFECTS.

B. PROVIDE CONNECTIONS AS SPECIFIED HEREIN:

1. PROVIDE BOLTS AND WASHERS OF TYPES AND SIZE REQUIRED FOR COMPLETION OF FIELD ERECTION. USE 3/4" DIAMETER A325 BOLTS UNLESS NOTED OTHERWISE.

2. INSTALL HIGH STRENGTH THREADED FASTENERS IN ACCORDANCE WITH "SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR ASTM A490 BOLTS."

3. WELDED CONSTRUCTION SHALL COMPLY WITH AWS D1.1 FOR PROCEDURES, APPEARANCE, QUALITY OF WELD, AND METHODS USED IN CORRECTING WELDED WORK.

4. THE FABRICATOR SHALL FURNISH AND INSTALL ERECTION CLIPS FOR FIT-UP OF WELDED CONNECTIONS.

5. DOUBLE ANGLE MEMBERS SHALL HAVE WELDED FILLERS SPACED IN ACCORDANCE WITH CHAPTER E4 OF THE AISC-ASD SPECIFICATION.

6. GUSSET AND STIFFENER PLATES SHALL BE 3/8" THICK MINIMUM.

3.2 PRIMING:

A. STRUCTURAL STEEL SHALL BE PRIMED AS SPECIFIED HEREIN, UNLESS SHOWN OTHERWISE ON THE DRAWINGS.

B. STRUCTURAL STEEL SURFACE PREPARATION SHALL CONFIRM TO SSPC-SP3, "POWER TOOL CLEANING."

C. SURFACE PREPARATION AND PRIMER SHALL BE IN ACCORDANCE WITH AISC CODE OF STANDARD PRACTICE IN THE ASD MANUAL OF STEEL CONSTRUCTION.

D. MATERIALS SHALL REMAIN CLOSED UNTIL REQUIRED FOR USE. MANUFACTURER'S POT-LIFE REQUIREMENTS SHALL BE STRICTLY ADHERED TO.

E. PRIMER SHALL BE APPLIED TO DRY, CLEAN, PREPARED SURFACE AND UNDER FAVORABLE CONDITIONS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. UNLESS OTHERWISE RECOMMENDED BY THE MANUFACTURER, PRIMING SHALL NOT BE DONE WHEN AMBIENT TEMPERATURE IS LESS THAN 50 DEGREES FAHRENHEIT, THE RELATIVE HUMIDITY IS MORE THAN 90 PERCENT, OR THE SURFACE TEMPERATURE IS LESS THAN 5 DEGREES FAHRENHEIT ABOVE THE DEW POINT.

F. GENERALLY ALL PRIMER SHALL BE SPRAY APPLIED. BRUSH OR ROLLER APPLICATION SHALL BE LIMITED TO TOUCHUP AND TO AREAS NOT ACCESSIBLE BY SPRAY GUN.

G. PRIMER SHALL BE UNIFORMLY APPLIED WITHOUT RUNS, SAGS, SOLVENT BLISTERS, DRY SPRAY, OR OTHER BLEMISHES. ALL BLEMISHES AND OTHER IRREGULARITIES SHALL BE REPAIRED OR REMOVED AND THE AREA RE-COATED. SPECIAL ATTENTION SHALL BE PAID TO CREVICES, WELD LINES, BOLT HEADS, CORNERS, EDGES, ETC., TO OBTAIN THE REQUIRED NOMINAL FILM THICKNESS.

H. DRY COAT FILM THICKNESS OF THE PRIMER SHALL BE 2.0 MILLIMETERS

I. IF THE PRIMER IS DAMAGED BY WELDING OR IN ANY OTHER MANNER, THE AREA SHALL BE TOUCHED UP AND REPAIRED. THE TOUCHUP PAINT SHALL BE COMPATIBLE WITH THE PREVIOUS APPLIED PRIMER COAT WITH MINIMUM DRY FILM THICKNESS OF 1.5 MILLIMETERS.

3.3 INSTALLATION:

A. INSTALLATION OF STRUCTURAL STEEL SHALL COMPLY WITH AISC "CODE OF STANDARD PRACTICE."

B. STRUCTURAL FIELD WELDING SHALL BE DONE BY THE ELECTRIC SUBMERGED OR SHIELDED METAL ARC PROCESS. WELDED CONSTRUCTION METHODS SHALL COMPLY WITH AWS D1.1.

C. PROVIDE ANCHOR BOLTS AND OTHER CONNECTORS REQUIRED FOR SECURING STRUCTURAL STEEL TO MASONARY WALLS AND TO OTHER IN-PLACE WORK. PROVIDE TEMPLATES AND OTHER DEVICES NECESSARY FOR PRESETTING BOLTS AND ANCHORS TO ACCURATE LOCATIONS.

D. SPLICE MEMBERS ONLY WHERE INDICATED ON THE DRAWINGS.

E. PROVIDE TEMPORARY SHORING BRACING WITH CONNECTIONS OF SUFFICIENT STRENGTH TO BEAR IMPOSED LOADS. REMOVE TEMPORARY CONNECTIONS AND MEMBERS WHEN PERMANENT MEMBERS ARE IN PLACE AND THE FINAL CONNECTIONS HAVE BEEN MADE.

F. BEFORE ASSEMBLY ALIGN AND ADJUST MEMBERS AND OTHER SURFACES WHICH WILL BE IN THE PERMANENT CONTACT, BEFORE ASSEMBLY.

G. AS A MINIMUM, HIGH-STRENGTH BOLTS, SHALL BE TIGHTENED TO A "SNUG-TIGHT" CONDITION AS DEFINED IN THE LATEST AISC SPECIFICATIONS. ALL HIGH-STRENGTH BOLTS SPECIFIED ON THE DESIGN DRAWINGS TO BE USED IN PRETENSIONED OR SLIP-CRITICAL JOINTS SHALL BE TIGHTENED TO A BOLT TENSION NOT LESS THAN SPECIFIED IN AISC TABLE J3.1. INSTALLATION SHALL BE BY ANY OF THE FOLLOWING METHODS: TURN-OF NUT METHOD, A DIRECT-TENSION-INDICATOR, TWIST-OFF-TYPE TENSION-CONTROL BOLT, CALIBRATED WRENCH, OR ALTERNATIVE DESIGN BOLT.

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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 PIGTAIL, 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 TYPEWRITTEN.

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 ¾" 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 2020 OR LASTEST 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.

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PROJECT#:	314248
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CHECKED BY:	KOO
RFDS:	N/A

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NICHOLAS M. CONSTANTINE
45607
PROFESSIONAL ENGINEER

July 23, 2024

FONTAINE & POWERS
COLO2099
7923 FONTAINE BLVD
COLORADO SPRINGS, CO 80925
NOKIA MARKETS MODERNIZATION

SHEET TITLE
GENERAL ELECTRICAL NOTES

SHEET NUMBER
GN-6

BATTERY SAFETY NOTES

PART 1 – GENERAL

1.1 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.

1.2 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
9. IFC (INTERNATIONAL FIRE CODE)
10. IMC (INTERNATIONAL MECHANICAL CODE)

1.3 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 BATTERY & POWER SYSTEMS ARE EQUIPPED WITH TEMPERATURE SENSORS & ARE PRE-PROGRAMMED WITH THE BATTERY VOLTAGE TEMPERATURE COMPENSATION & BATTERY THERMAL RUNAWAY MANAGEMENT FEATURES ENABLED PER AT&T MOBILITY'S SPECIFICATIONS.

D. DOOR(S) INTO EQUIPMENT ROOM MUST BE PROVIDED WITH APPROVED SIGNS AND APPROPRIATELY MARKED NFPA 704 PLACARD THAT STATE THE FOLLOWING:
- EQUIPMENT ROOM CONTAINS ENERGIZED BATTERY SYSTEMS
- EQUIPMENT ROOM CONTAINS ENERGIZED ELECTRICAL CIRCUITS
- BATTERY ELECTROLYTE SOLUTIONS WHERE PRESENT, ARE CORROSIVE LIQUIDS

E. CABINETS SHALL HAVE EXTERIOR LABELS THAT IDENTIFY THE MANUFACTURER AND MODEL NUMBER OF THE SYSTEM AND ELECTRICAL RATING (VOLTAGE AND CURRENT) OF THE CONTAINED BATTERY SYSTEM. SIGNS WITHIN THE CABINET SHALL INDICATE RELEVANT ELECTRICAL, CHEMICAL, AND FIRE HAZARDS.

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. BATTERIES:

1. BATTERIES SHALL BE VRLA(VALVE REGULATED LEAD-ACID) BATTERIES COMPLYING WITH IFC 608.
2. CONTRACTOR TO INSTALL ENERSYS POWERSAFE SBS BATTERIES OR ENGINEERING APPROVED EQUIVALENT.

B. POWER PLANTS/CABINETS:

1. POWER PLANTS/CABINETS SHALL BE EQUIPPED WITH TEMPERATURE SENSORS AND ARE PRE-PROGRAMMED WITH THE BATTERY VOLTAGE TEMPERATURE COMPENSATION & BATTERY THERMAL RUNAWAY MANAGEMENT FEATURES ENABLED PER AT&T MOBILITY'S SPECIFICATIONS.
2. CONTRACTOR TO INSTALL VERTIV POWER PLANTS/CABINETS PER AT&T SPECIFICATIONS; AND COMPLYING WITH IFC 608 AND IMC 502.4.

C. BATTERY RACKS/CABINETS:

1. BATTERY RACKS/CABINETS SHALL BE EQUIPPED WITH TEMPERATURE SENSORS PER AT&T MOBILITY'S SPECIFICATIONS.
2. CONTRACTOR TO INSTALL VERTIV BATTERY RACKS/CABINETS PER AT&T SPECIFICATIONS; AND COMPLYING WITH IFC 608 AND IMC 502.4.

IFC 1207 CODE ANALYSIS & COMPLIANCE INFORMATION

- PER TABLE 1207.1.1 (THRESHOLD QUANTITIES) OF THE 2021 IFC FOR LEAD-ACID BATTERIES: 48.8 GAL < 50 GAL THRESHOLD (PER NOTE C, 70KWH = 50 GAL OF LEAD-ACID ELECTROLYTE), THEREFORE, THIS ENERGY STORAGE SYSTEM (ESS) NEED NOT COMPLY WITH THIS SECTION OF THE IFC. THIS INCLUDES EXEMPTIONS FROM, BUT NOT LIMITED TO, CONSTRUCTION AND OPERATIONAL PERMITS, FIRE DETECTION AND SUPPRESSION, VENTILATION, SPILL CONTROL AND NEUTRALIZATION, ETC.

IMC 502.4 CODE ANALYSIS & COMPLIANCE INFORMATION

- (IMC 502.4) STATIONARY STORAGE BATTERY SYSTEMS.
  STATIONARY STORAGE BATTERY SYSTEMS, AS REGULATED BY SECTION 608 OF THE INTERNATIONAL FIRE CODE, SHALL BE PROVIDED WITH VENTILATION IN ACCORDANCE WITH IMC 502.4 AND SECTION 502.4.1 OR 502.4.2.

  EXCEPTION: LITHIUM-ION AND LITHIUM METAL POLYMER BATTERIES SHALL NOT REQUIRE ADDITIONAL VENTILATION BEYOND THAT WHICH WOULD NORMALLY BE REQUIRED FOR HUMAN OCCUPANCY OF THE SPACE.
- (SECTION 502.4.1) HYDROGEN LIMIT IN ROOMS.
  FOR FLOODED LEAD ACID, FLOODED NICKEL CADMIUM AND VRLA BATTERIES, THE VENTILATION SYSTEM SHALL BE DESIGNED TO LIMIT THE MAXIMUM CONCENTRATION OF HYDROGEN TO 1.0 PERCENT OF THE TOTAL VOLUME OF THE ROOM.
- (SECTION 502.4.2) VENTILATION RATE IN ROOMS
  CONTINUOUS VENTILATION SHALL BE PROVIDED AT A RATE OF NOT LESS THAN 1 CUBIC FOOT PER MINUTE PER SQUARE FOOT OF FLOOR AREA OF THE ROOM.
- (SECTION 502.4.3) SUPERVISION
  MECHANICAL VENTILATION SYSTEMS REQUIRED BY SECTION 502.4 SHALL BE SUPERVISED BY AN APPROVED CENTRAL, PROPRIETARY OR REMOTE STATION SERVICE OR SHALL INITIATE AN AUDIBLE AND VISUAL SIGNAL AT A CONSTANTLY ATTENDED ON-SITE LOCATION.

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