

NOTE:
EXHIBIT PHOTO IS FOR
REFERENCE USE ONLY AND
SHOULD NOT BE USED FOR
CONSTRUCTION PURPOSES.



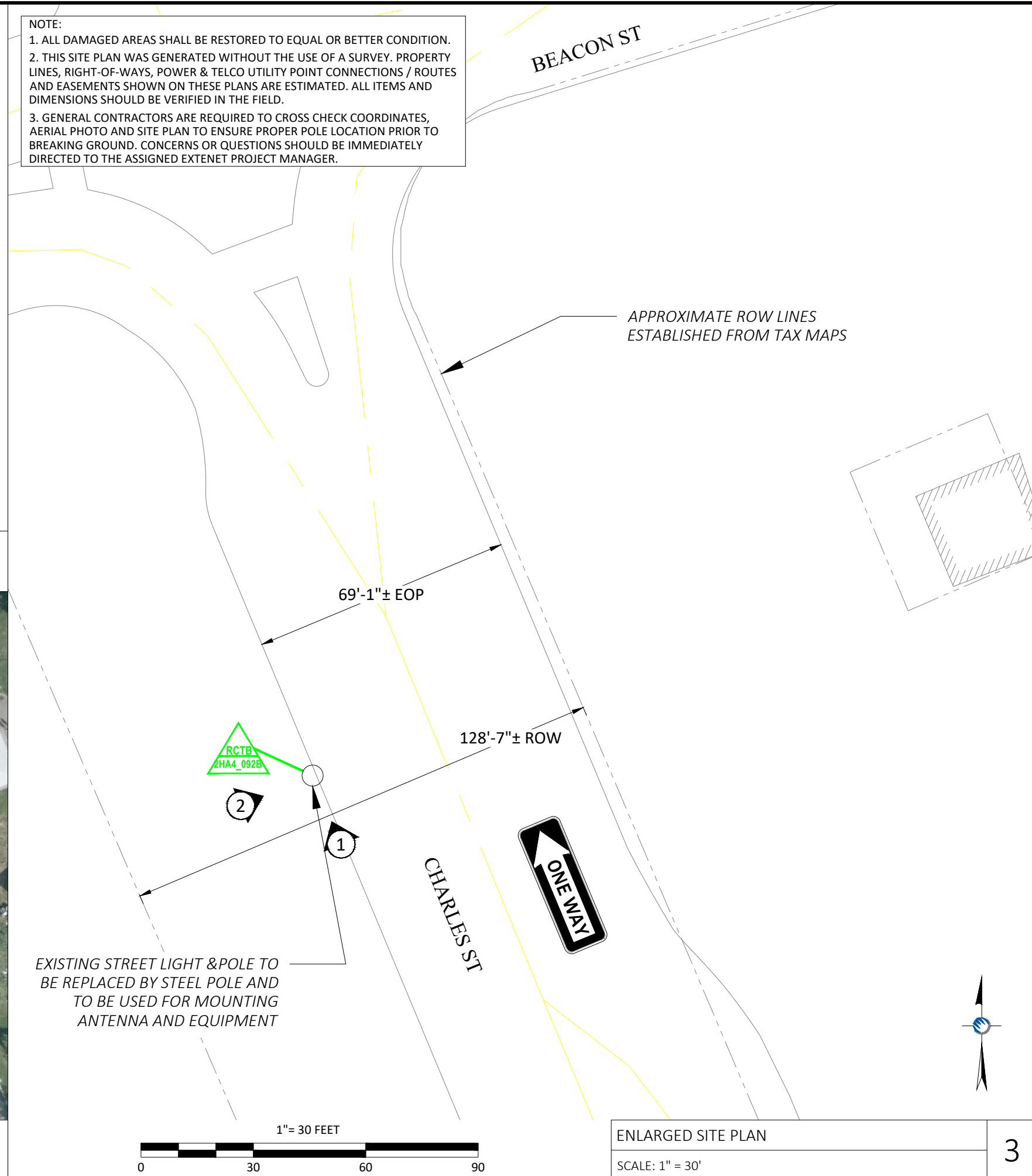
PROPOSED NODE POLE

EXHIBIT PHOTO

SCALE: NOT TO SCALE

1

NOTE:
1. ALL DAMAGED AREAS SHALL BE RESTORED TO EQUAL OR BETTER CONDITION.
2. THIS SITE PLAN WAS GENERATED WITHOUT THE USE OF A SURVEY. PROPERTY LINES, RIGHT-OF-WAYS, POWER & TELCO UTILITY POINT CONNECTIONS / ROUTES AND EASEMENTS SHOWN ON THESE PLANS ARE ESTIMATED. ALL ITEMS AND DIMENSIONS SHOULD BE VERIFIED IN THE FIELD.
3. GENERAL CONTRACTORS ARE REQUIRED TO CROSS CHECK COORDINATES, AERIAL PHOTO AND SITE PLAN TO ENSURE PROPER POLE LOCATION PRIOR TO BREAKING GROUND. CONCERNS OR QUESTIONS SHOULD BE IMMEDIATELY DIRECTED TO THE ASSIGNED EXTENET PROJECT MANAGER.



ENLARGED SITE PLAN

SCALE: 1" = 30'

3

PLANS PREPARED FOR:
extenet YOUR NETWORK EVERYWHERE
SYSTEMS

PLANS PREPARED BY:
UC SYNERGETIC
Innovative Thinking. Engineered Solutions.
21 OXFORD RD
MANSFIELD, MA 02048
www.ucseeng.com 1-508-337-7600

LOCATION:
**CHARLES ST
BOSTON, MA 02108
SUFFOLK COUNTY**

P.E. STAMP AREA:

DRAWING NOTES:

ORIGINAL PLAN:
SCALE: AS NOTED
DRAWN BY: GL
PLAN ORIG. DATE: 3/4/19

REVISIONS:

REV	DESCRIPTION	BY	DATE

SITE INFO:
LAT: 42.35568726°
LONG: -71.06930476°
CRAN ID:
CRAN_RCTB_2HA4_092B
EXTENET NODE ID:
NE-MA-BSTBSC01-00092B
SITE ADDRESS:
CCC
SHEET TITLE:
SITE PLAN & EXHIBIT PHOTO

SHEET NUMBER:
A-1

AERIAL SITE LOCATION

SCALE: 1" = 60'

2

N:\Engineering\Extenet_Systems\ATT_72_Nodes_Boston\00 - AUTOCAD\AB-NPP\CRAN_RCTB_2HA4_092B.dwg 1/7/21

DRAWINGS NOTES:

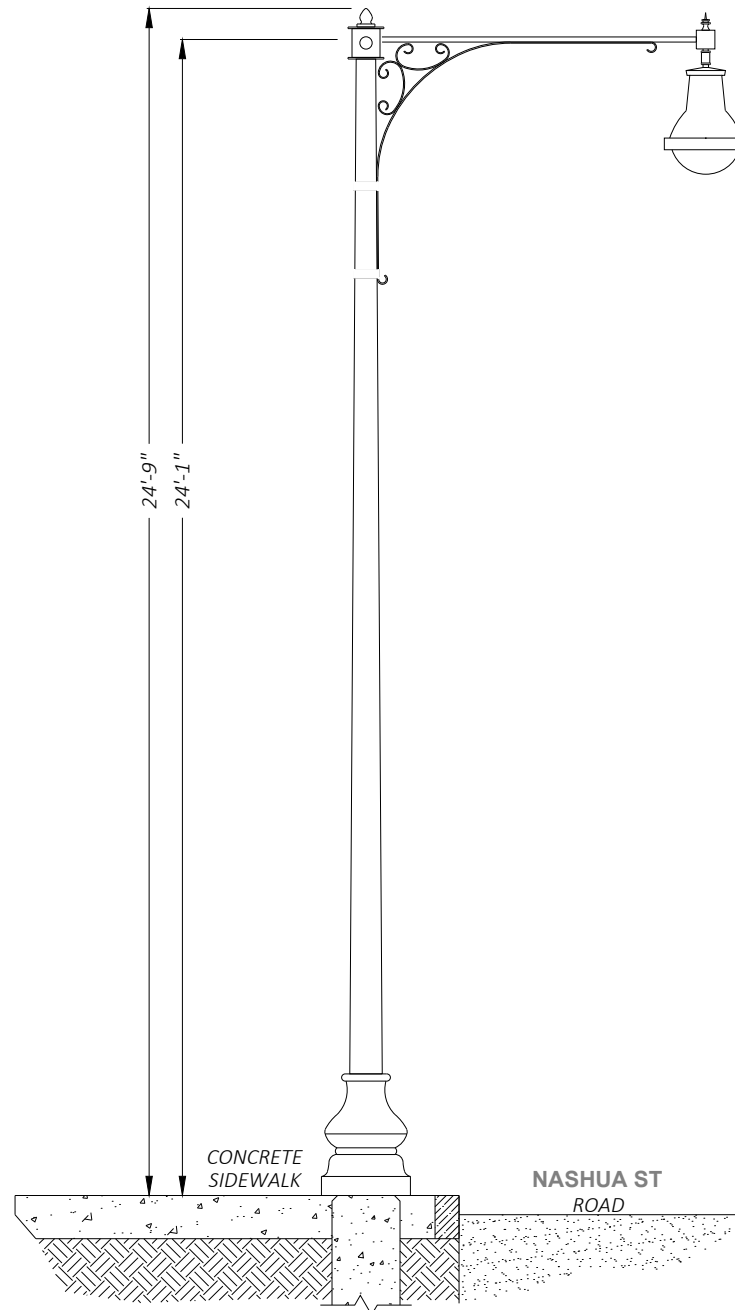
NOTE 1:
40" MIN. WORKER SAFETY ZONE
BETWEEN LOWEST POWER & HIGHEST
COMMUNICATIONS CABLE
IN ACCORDANCE WITH NESC REGULATIONS.

NOTE 2:
PROPOSED FIBER TO BE INSTALLED BY OTHERS.

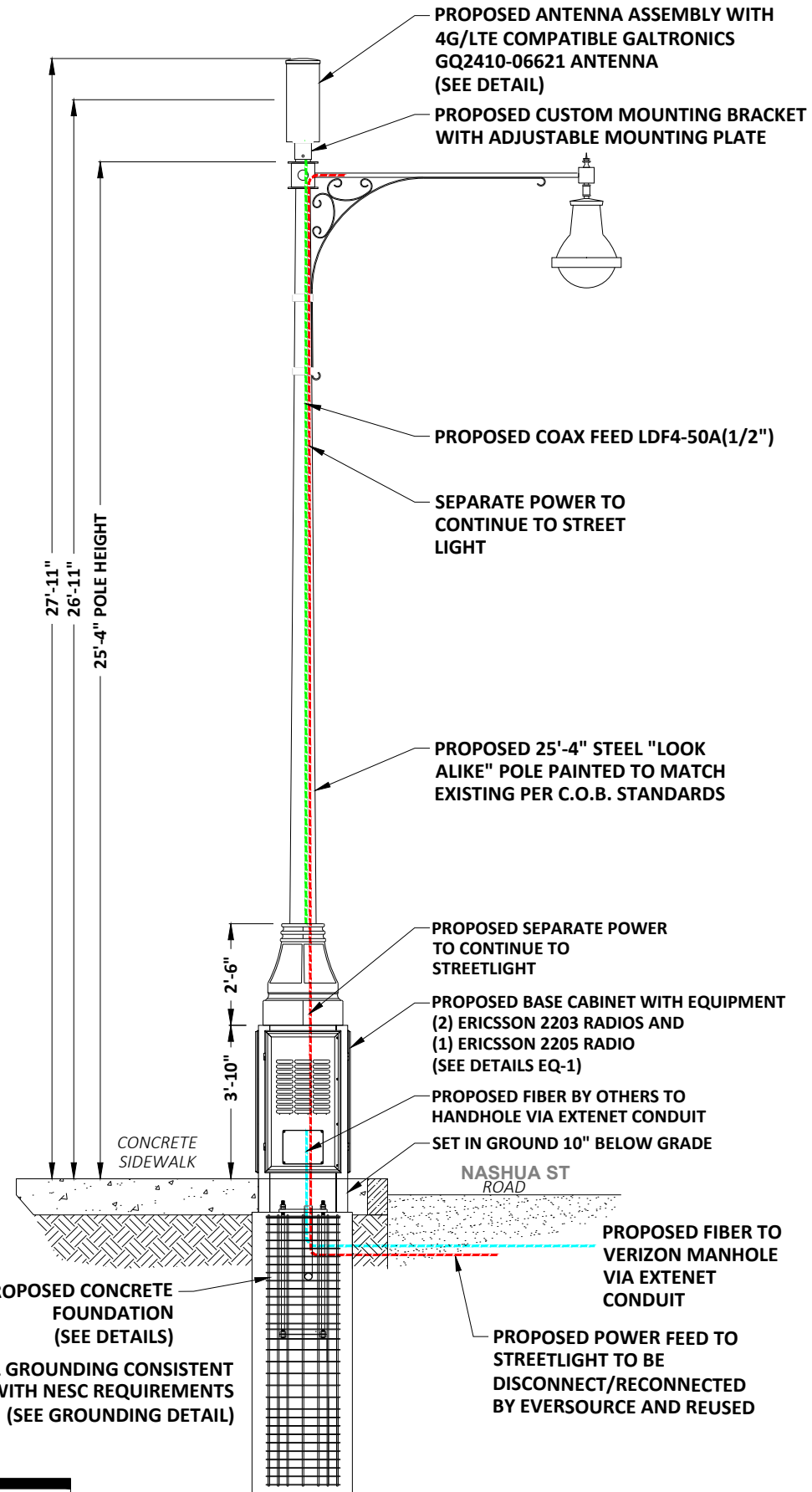
NOTE 3:
PROPOSED EQUIPMENT TO BE PAINTED TO BLEND
WITH POLE.

NOTE 4:
FCC MANDATED SIGNAGE TO BE ATTACHED TO POLE.

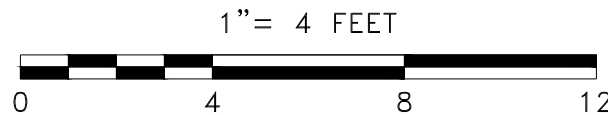
NOTE 5:
PROPOSED EQUIPMENT SHALL BE INSTALLED NO
HIGHER THAN 30" BELOW TELEPHONE UTILITY LINES.



① EXISTING PROFILE - SIDE VIEW
LOOKING SOUTHEAST ALONG CHARLES ST



① PROPOSED PROFILE - SIDE VIEW
LOOKING SOUTHEAST ALONG CHARLES ST



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SHEET TITLE:
POLE ELEVATIONS

SHEET NUMBER:
A-2

DRAWINGS NOTES:

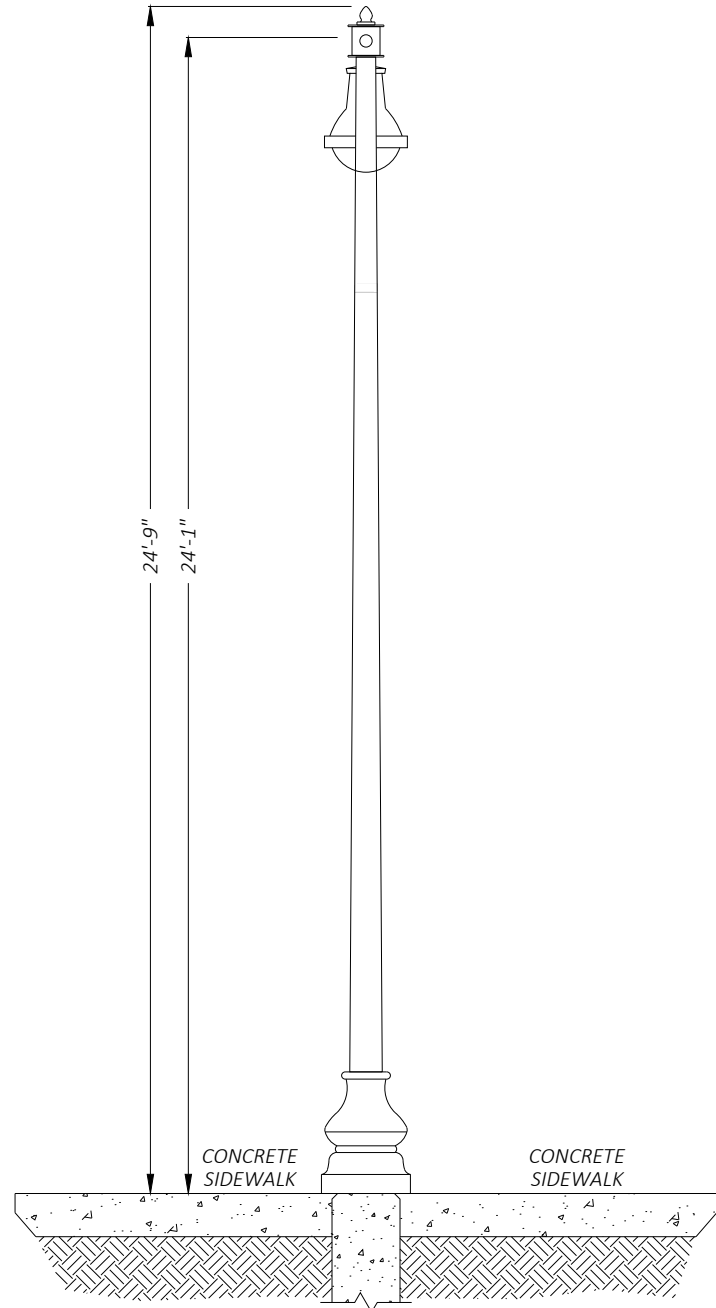
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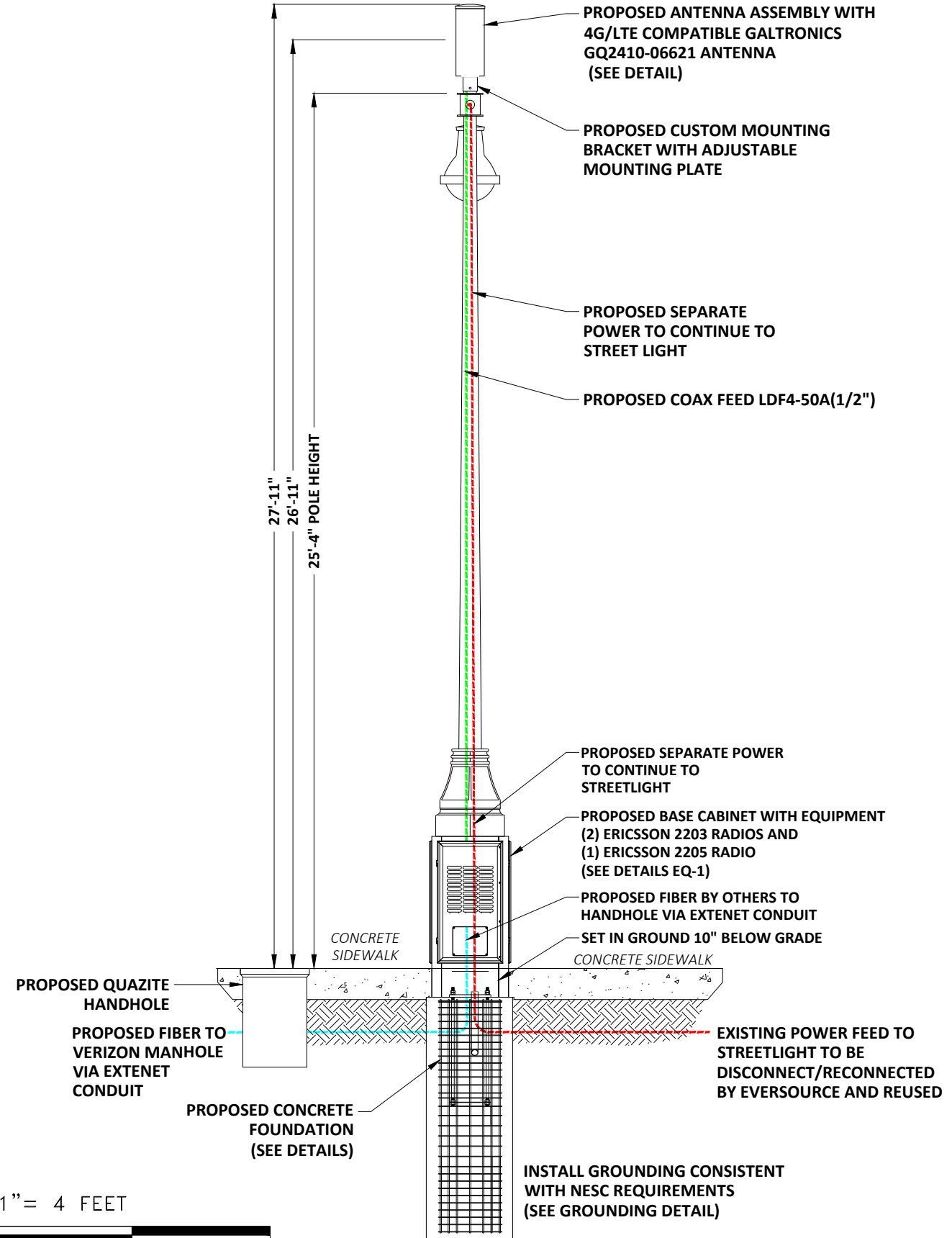
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② EXISTING PROFILE - REAR VIEW
LOOKING SOUTHWEST TOWARD CHARLES ST



② PROPOSED PROFILE - REAR VIEW
LOOKING SOUTHWEST TOWARD CHARLES ST

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A-3

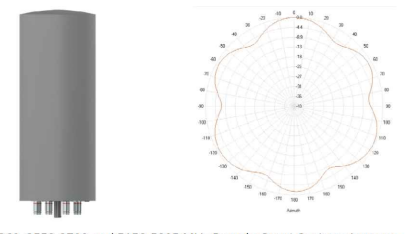
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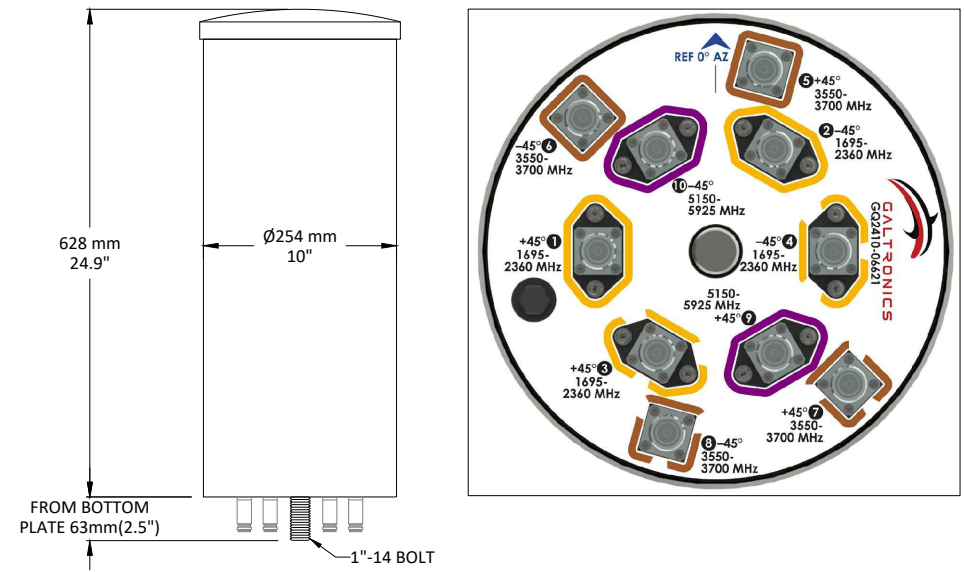
24"x 10" Pseudo Omni 10-Port Canister Antenna [1695-2360, 3550-3700 and 5150-5925 MHz]
GQ2410-06621

Description:

- Pseudo Omni Canister Antenna for Outdoor DAS and Small Cells.
- 4x ports for AWS/PCS/WCS Band 1695-2360 MHz
- 4x ports for CBRS Band 3550-3700 MHz
- 2x ports for UNII Band 5150-5925 MHz*

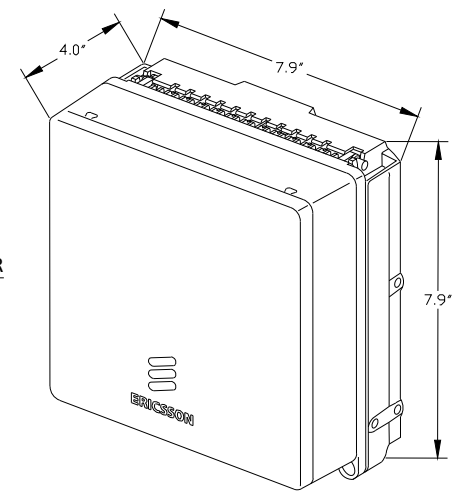


1695-2360, 3550-3700 and 5150-5925 MHz Pseudo Omni Canister Antenna

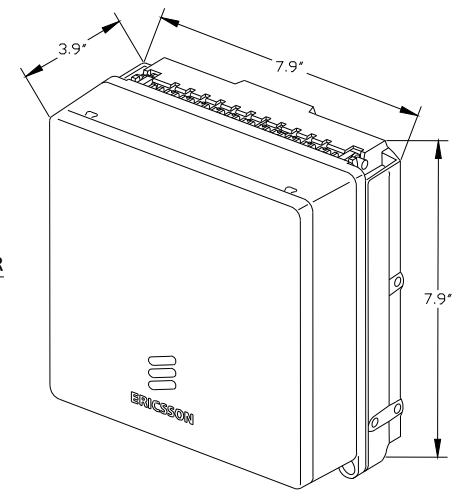


PHAZAR O-6002v-W4U6-F6 ANTENNA	1
SCALE: NOT TO SCALE	

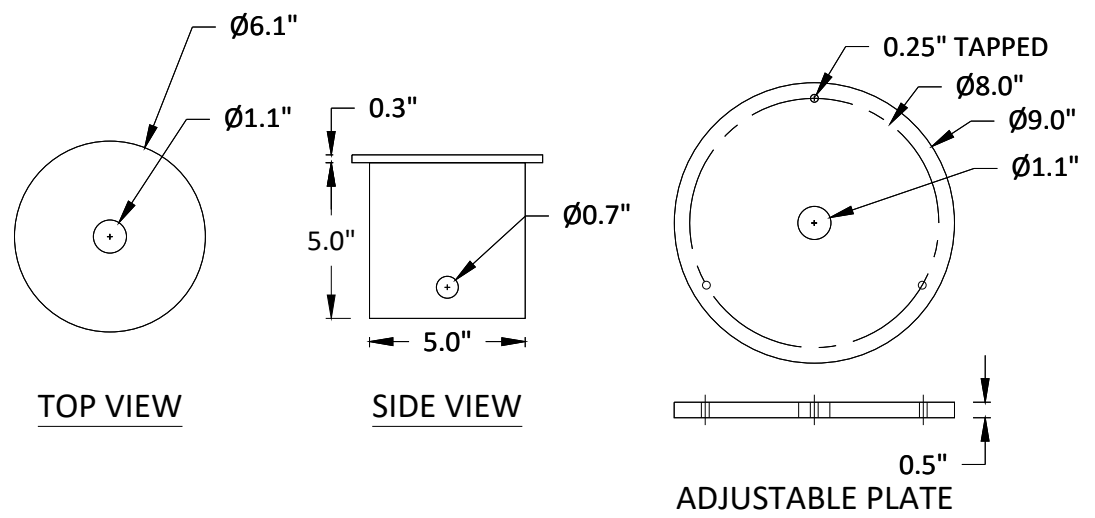
ERICSSON RADIO 2205 WITH COVER



ERICSSON RADIO 4402 WITH COVER



ERICSSON 2203 & 2205 RADIOS WITH COVER POLE MOUNT REMOTE UNIT	2
SCALE: NOT TO SCALE	



CUSTOM MOUNTING BRACKET	3
SCALE: NOT TO SCALE	

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PLANS PREPARED BY:



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ANTENNA DETAILS

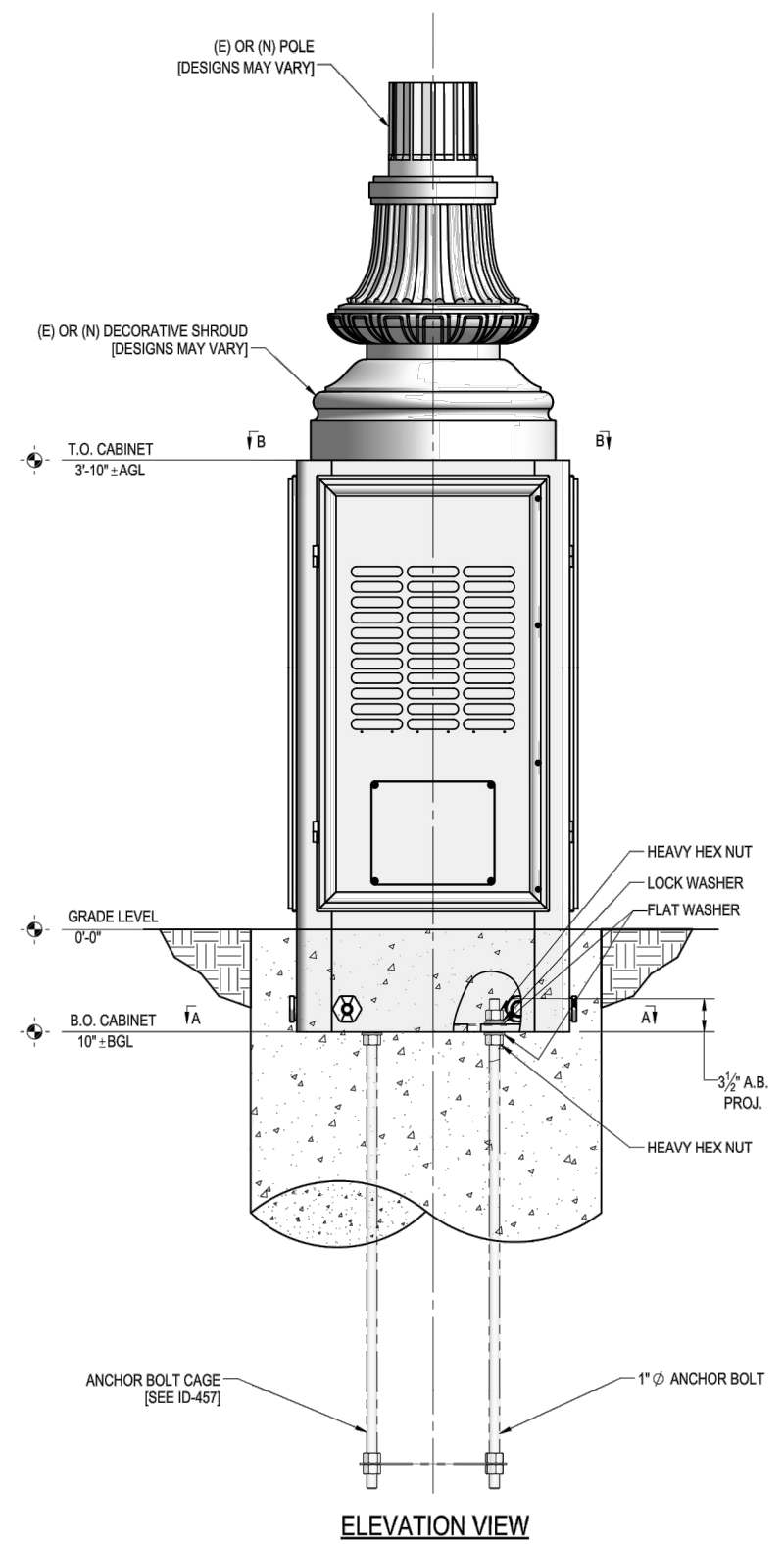
SHEET NUMBER:

D-1

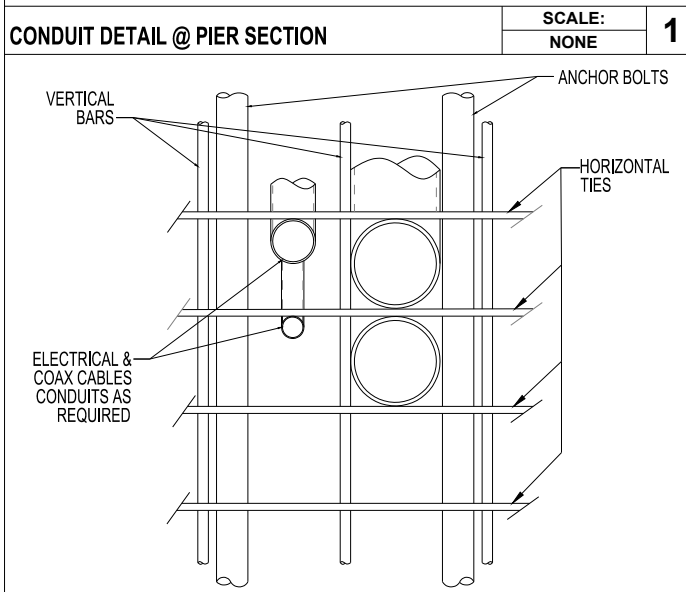
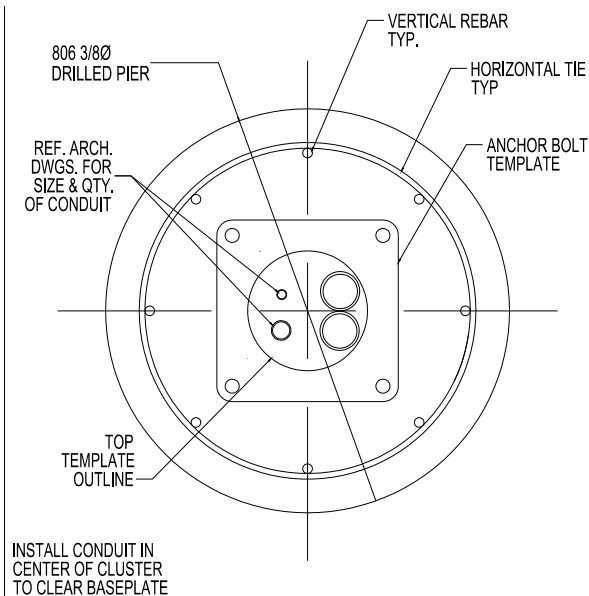
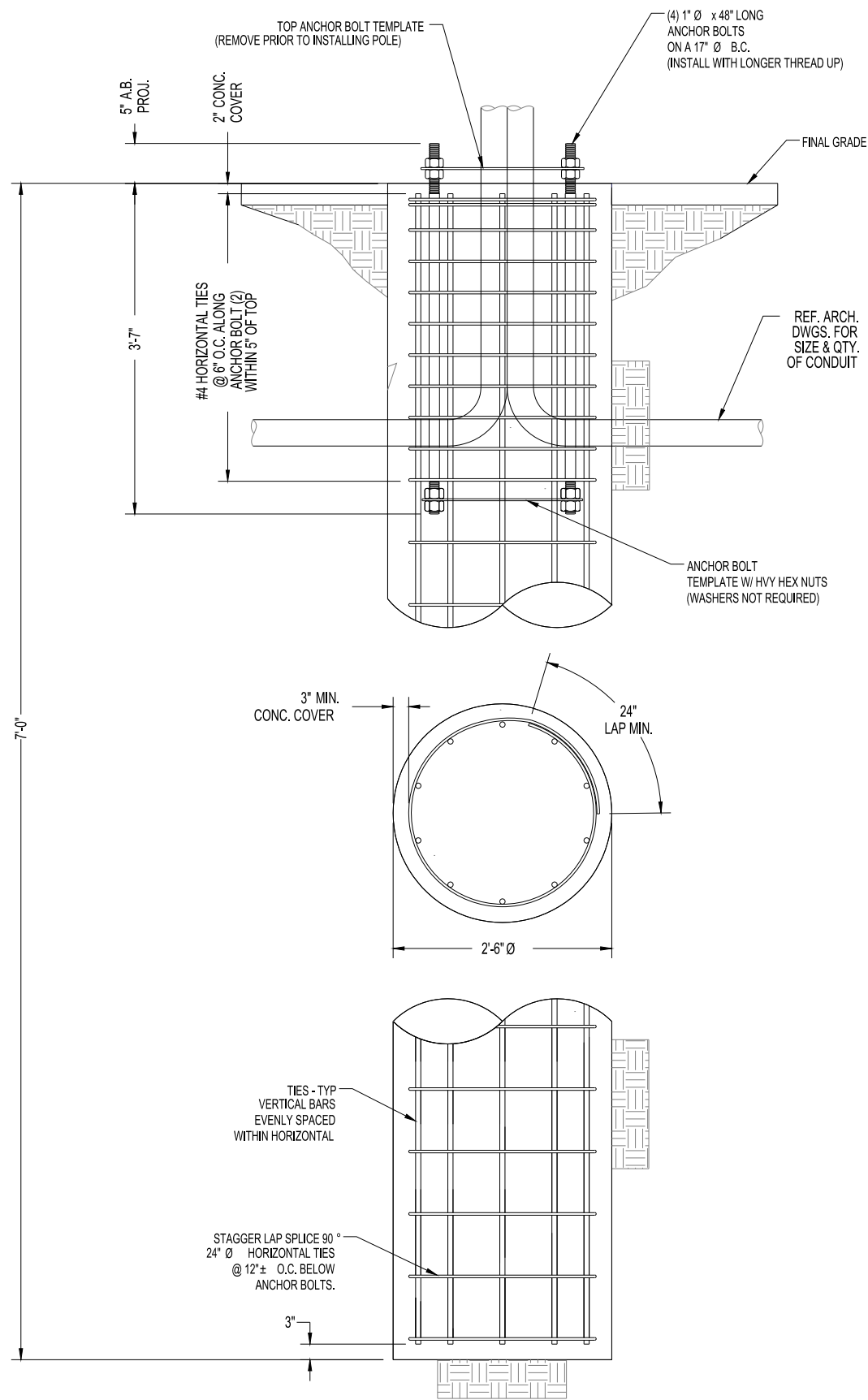
REVISIONS:

REV	DESCRIPTION	BY	DATE

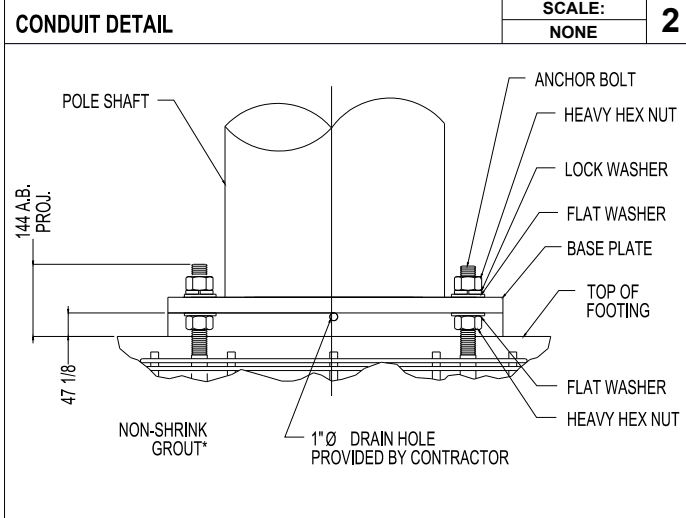
ITEM #	PART #	DESCRIPTION	QTY.	UNIT WT. (lbs)
* 1	AA-001	SH 12GA. x 13/16" x 2 1/4" G90, ION HANGING HOOK	8	0.1
* 2	AA-033	16GA.x1'-10 13/16"x3'-6 5/8" E.G. MATERIAL, VENTED COVER	2	41
* 3	AA-036	SH 16GA.x1'-10 13/16"x3'-6 5/8" E.G. MATERIAL, VENTED COVER	2	24
* 4	WA-940	20GA.x1'-5 1/4"x1'-5 1/4" S.S., FORMED SCREEN	2	3.3
* 5	WA-941	20GA.x1'-3/4"x2'-1 3/4" S.S., FORMED SCREEN	2	3.4
* 6	WA-959	16GA.x10"x1'-0" E.G. MATERIAL, COVER PLATE	2	5.9
* 7	PL-1633	14GA.x8 1/2"x2'-8 1/4" E.G. MATERIAL, ADAPTER PLATE	4	4.8
* 8	WA-1687	14GA.x2'-1 3/16"x3'-6 1/2" E.G. MATERIAL, PLENUM	1	64
9	WA-1988	2'-2 3/4" SQR. x 4'-8" TALL, A36 EQUIP. BASE W/LDMNT	1	536
* 10	PL-3141	1/2"x7 1/4"x9 1/4" EMBOSSED DAMPING FOAM	4	1.5
* 11	PL-3188	SH 14GA. x 10" x 3'-4 5/8" G90, ADAPTER PLATE	4	9.9
* 12	PL-3191	SH 12 GA x 8 1/4" x 1'-4" G90, COVER PLATE	4	4
* 13	PL-3215	SH 12GA. x 7 1/2" x 1'-2" G90, FORMED BRACKET	1	3.1
* 14	PL-4603	SH 12GA.x3"x11 3/4" G90, BRKT	2	1
HARDWARE				
* 15	PL-718	1/4"x2"x6" COPPER, BUS BAR	2	0.8
* 16	SS-908	3/4" NPT x 3" PVC, STRAINER	4	0.1
17	70304	#8-32 x 3/4" HEX WASHER SLOTTED MACHINE SCREW, S.S.	6	0.01
18	46005	#8 LOCK WASHER, S.S.	6	0.01
19	47005	#8 FLAT WASHER, S.S.	6	0.001
20	59001	#8-32 MACHINE SCREW NUT, S.S.	6	0.01
* 21	71218	1/4"Ø x 1/2" TAMPER-RESIS. BUTTON-HD SCKT CAP SCR. S.S.	8	0.001
22	70216	1/4"Ø x 3/4" S.S., FLGD BUTTON-HD SCKT CAP SCR	28	0.02
* 23	79100	1/4"Ø x 1" BOLT/NUT/LW, S.S.	2	0.3
* 24	71217	1/4"Ø x 1" TAMPER-RESISTANT BUTTON-HD, S.S.	16	0.002
* 25	80255	1/4"Ø x 1 1/2" THRD STUD, S.S.	20	0.02
* 26	41001	1/4"Ø LOCK WASHER, S.S.	24	0.002
* 27	40001	1/4"Ø FLAT WASHER, S.S.	32	0.003
* 28	55996	1/4"Ø HEX NUT, S.S.	24	0.01
* 29	91142	1/4" 1-LUG (4AWG-14AWG) BURNDY KA4C TERMINAL, COPPER	2	0.04
* 30	71017	3/8"Ø x 5/8" BOLT, S.S.	8	0.04
* 31	15230	3/8"Ø x 1" A307 FULLY TH'D BOLT/NUT/LW, GALV.	4	0.1
* 32	43010	3/8"Ø LOCK WASHER, S.S.	8	0.01
* 33	40011	3/8"Ø FLAT WASHER, S.S.	4	0.01
* 34	90060	3/8" STANDOFF INSULATOR (559640)	4	0.1
* 35	90801	3/4" NPT BULKHEAD FITTING	4	0.3
* 36	90803	3/4" NPT PVC PIPE CAP	4	0.04
*INDICATES FACTORY INSTALLED PART / HARDWARE			TOTAL GALV. WT.	847



2'-2 3/4" SQ. x 4"-8" TALL, BASE CABINET
 SCALE: NOT TO SCALE



* ADJUST REBAR AS NEEDED TO ACCOMMODATE CONDUIT. SEE REINFORCEMENT SUMMARY FOR SIZE, QUANTITY AND LOCATION OF VERTICAL BARS AND HORIZONTAL TIES.



* NON-SHRINK GROUT SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 6,000 PSI.
BASE PLATE SHALL NOT BE GROUTED UNTIL AFTER THE STRUCTURE HAS BEEN INSTALLED AND PLUMBED.

GENERAL NOTES

- CONTRACTOR IS RESPONSIBLE FOR CHECKING AREA FOR UNDERGROUND FACILITIES PRIOR TO EXCAVATING ANY MATERIALS.
- CONTRACTOR SHALL INSPECT AND REMOVE ALL DEBRIS FROM BOTTOM OF EXCAVATION.
- CONTRACTOR SHALL VERIFY ANCHOR BOLT LAYOUT PRIOR TO, AND IMMEDIATELY AFTER PLACING CONCRETE. ANCHOR BOLT LAYOUT IS CRITICAL FOR MONOPOLE INSTALLATION.
- CONTRACTOR SHALL USE AND PROVIDE DEFORMED REINFORCING BARS CONFORMING TO ASTM A615 GR. 60 (60,000 PSI MIN. YIELD). CONTRACTOR SHALL USE STEEL WIRE TO HOLD REINFORCING BARS TOGETHER. IF WELDING REBAR IS PREFERRED, SUBSTITUTE USING A706 GR. 60 DEFORMED BARS.
- CONTRACTOR SHALL USE AND PROVIDE CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI. CONCRETE SHALL USE 1" MAXIMUM STONE AGGREGATE. MIX DESIGN: 6 1/2 SACKS OF CEMENT MINIMUM PER CUBIC YARD. 5" MINIMUM AND 7" MAXIMUM CONCRETE SLUMP.
- CONCRETE SHALL BE CONSOLIDATED USING VIBRATORY METHODS THROUGHOUT DEPTH OF FOUNDATION. VIBRATING LOWER DEPTHS MAY BE ACCOMPLISHED BY TOUCHING REBAR CAGE WITH VIBRATOR.
- CONTRACTOR SHOULD ANTICIPATE THE USE OF A FULL-LENGTH TEMPORARY CASING TO STABILIZE THE EXCAVATION. THE CASING SHALL BE WITHDRAWN DURING THE PLACEMENT OF CONCRETE IN THE EXCAVATED HOLE. CONCRETE SHALL BE PLACED USING CONVENTIONAL METHODS TO MINIMIZE SEGREGATION OF CONCRETE AND AGGREGATE. CONCRETE SHALL NOT FREE FALL MORE THAN 5 FT. CONCRETE MAY BE PLACED BELOW WATER USING TREMIE METHODS.
- CONCRETE SHALL BE PLACED TO THE DEPTH INDICATED, AND THE ABOVE GRADE PORTION SHALL BE FORMED. THE REBAR CAGE, ANCHOR BOLTS, AND CONCRETE SHALL BE PLACED WITHIN 24 HOURS OF COMPLETING THE EXCAVATION. COLD JOINTS ARE NOT ALLOWED.
- THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ADEQUATE CONCRETE COVERAGE OVER REINFORCING BARS TO MINIMIZE CORROSION POTENTIAL. UNLESS OTHERWISE NOTED, CONTRACTOR SHALL USE 3" CONCRETE COVER OVER REBAR. TOP OF FOOTING SHALL BE TROWELLED LEVEL AND SMOOTH.
- DRILLED PIER FOUNDATION DESIGN PER 2009/2012 IBC, TABLE 1806.2, CLASS 4 MATERIAL.
- TOTAL VOLUME OF CONCRETE REQUIRED FOR THIS FOUNDATION IS APPROXIMATELY 1.1 CU. YDS.

FACTORED BASE REACTIONS

MOMENT = 30.9 ft-kips
 SHEAR = 2.46 kips
 VERTICAL = 1.67 kips

SPECIAL INSPECTIONS

SPECIAL INSPECTION: THE FOLLOWING ELEMENTS OF CONSTRUCTION SHALL REQUIRE SPECIAL INSPECTION PER 2009/2012 IBC, SECTION 1704

ITEM	DESCRIPTION	INSPECTION BY	MATERIAL
1	PIER EXCAVATION LATERAL BEARING CAPACITY	SOILS ENGINEER	300 PSF/FT LATERAL
2	PIER CONSTRUCTION REINFORCING STEEL BAR SIZES AND INSTALLATION	SPECIAL INSPECTOR	ASTM A615 GR. 60
3	ANCHOR BOLTS BOLT SIZE AND LENGTHS INSTALLATION	SPECIAL INSPECTOR	ASTM F1554 GR. 55
4	CONCRETE TEST SPECIMENS PLACEMENT OF CONCRETE	SPECIAL INSPECTOR	f _c = 4,000 PSI TYPE II CEMENT

BASE GROUTING DETAIL SCALE: NONE 3

DESCRIPTION	QTY.	SIZE	LENGTH	WEIGHT	OVERLAP
VERTICAL BARS	8	#6	5'-6"	66 LBS.	N/A
HORIZONTAL TIES	10	#4	8'-4"	55 LBS.	2'-0"

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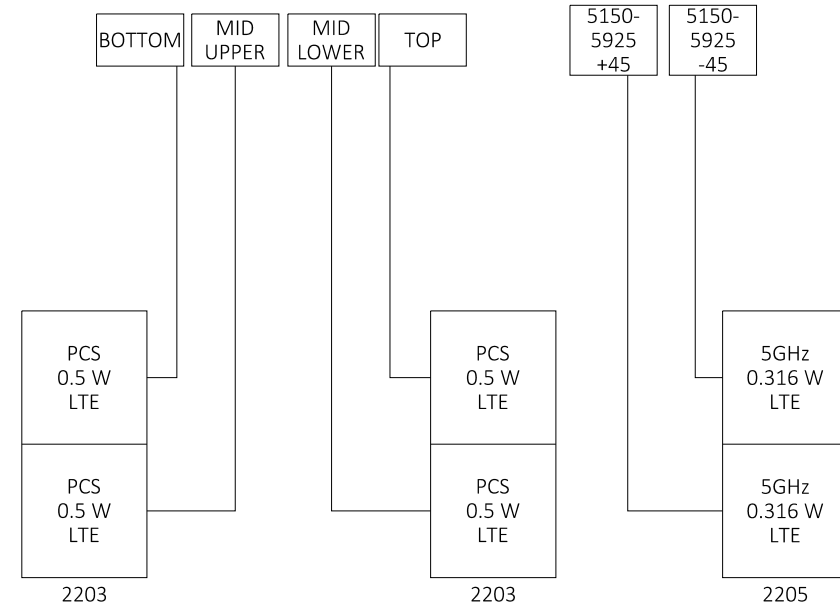
SHEET NUMBER:
D-3



EXISTING POLE
SCALE: NOT TO SCALE

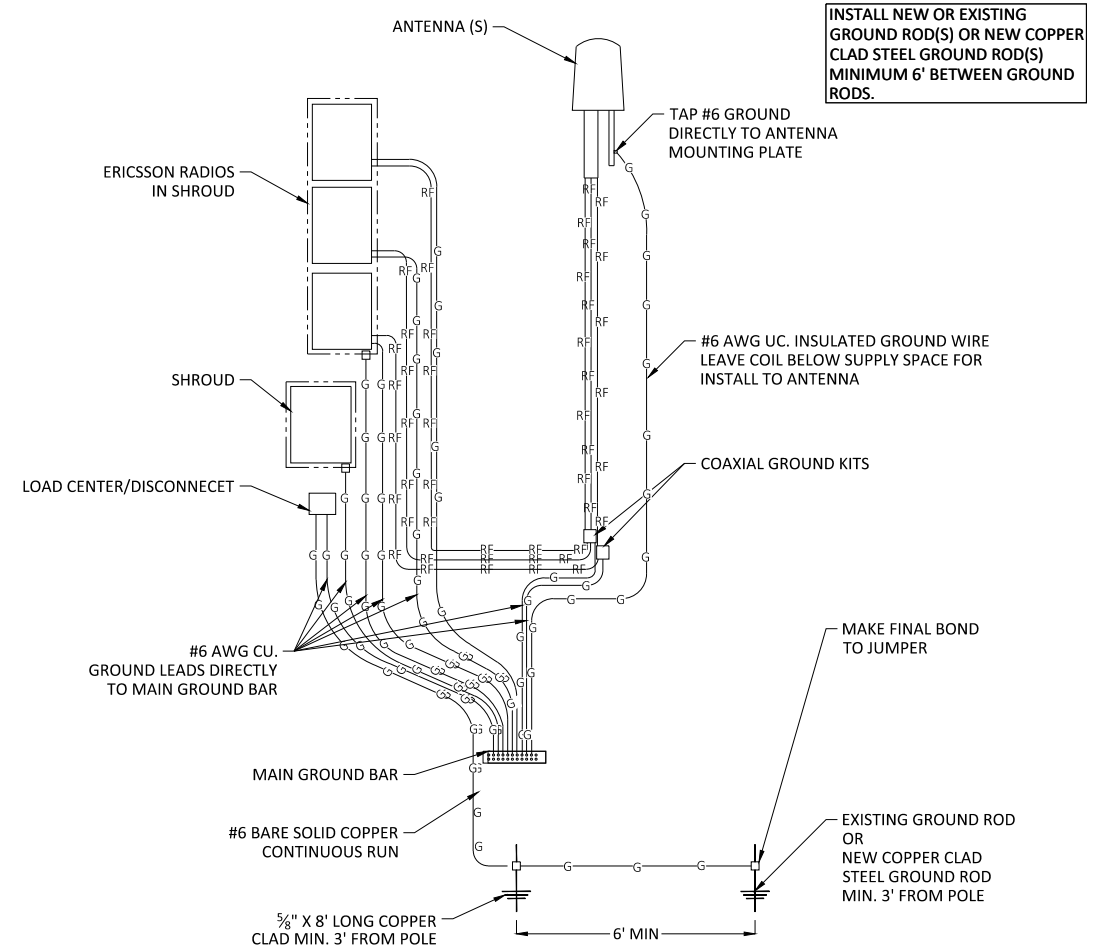
1

PHAZAR QQ-6002vx-W4U6-F6 ANTENNA



WIRING DIAGRAM
SCALE: NOT TO SCALE

2



GROUNDING DIAGRAM
SCALE: NOT TO SCALE

3

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SITE ADDRESS:
CCC

SHEET TITLE:
GROUNDING & WIRING DIAGRAMS

SHEET NUMBER:

D-4

3. **EROSION CONTROL**

- CONTRACTOR SHALL PROVIDE ALL EROSION AND SEDIMENTATION CONTROL MEASURES AS REQUIRED BY LOCAL CODES AND ORDINANCES TO PROTECT EMBANKMENTS FROM SOIL LOSS AND TO PREVENT ACCUMULATION OF SOIL AND SILT IN STREAMS AND DRAINAGE PATHS LEAVING THE CONSTRUCTION AREA. THIS MAY INCLUDE SUCH MEASURES AS SILT FENCE, STRAW BALES, SEDIMENT BARRIERS, AND CHECK DAMS.
- EROSION CONTROL MEASURES MAY BE REQUIRED IN ADDITION TO THOSE SHOWN ON DRAWINGS WHERE DETERMINED NECESSARY BY ACTUAL SITE CONDITIONS.

4. **CONCRETE**

4.1 **GENERAL**

- DESIGN AND CONSTRUCTION OF ALL CONCRETE ELEMENTS SHALL CONFORM TO THE LATEST EDITIONS OF THE FOLLOWING APPLICABLE CODES:
 - ACI 308 - SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS
 - ACI 304 - GUIDE FOR MEASURING, MIXING, TRANSPORTING, AND PLACING CONCRETE
 - ACI 309 - GUIDE FOR CONSOLIDATION OF CONCRETE
 - ACI 318 - BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE
 - ACI 544.1R - FIBER REINFORCED CONCRETE (IF SPECIFIED)
 - ACI 544.2R - MEASUREMENT OF PROPERTIES OF FIBER REINFORCED CONCRETE (IF SPECIFIED)
- MIX DESIGN SHALL BE APPROVED BY THE OWNERS REPRESENTATIVE AND THE LOCAL JURISDICTION PRIOR TO POURING CONCRETE.
- CONCRETE SHALL MEET THE FOLLOWING REQUIREMENTS: 6% AIR ENTRAINED (+/- 1.5%) WITH A MAXIMUM OF 4-1/2" SLUMP, AND HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI UNLESS OTHERWISE NOTED. THE USE OF MINERAL ADDITIVES OR SUPPLEMENTS IS PROHIBITED. WATER MAY BE ADDED TO THE MIX IN ACCORDANCE WITH ASTM C94.
- MAXIMUM AGGREGATE SIZE SHALL BE 1"
- THE FOLLOWING MATERIALS SHALL BE USED:
 - PORTLAND CEMENT: ASTM C150, TYPE 11
 - REINFORCEMENT: ASTM A185 & A615
 - NORMAL WEIGHT AGGREGATE: ASTM C33
 - WATER: DRINKABLE
 - ADMIXTURES: NON - CHLORIDE CONTAINING
 - FIBROUS REINFORCEMENT: ASTM C1116 (IF SPECIFIED)
- REINFORCING DETAILS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF ACI 315.
- REINFORCING STEEL SHALL CONFORM TO ASTM A 615, GRADE 60, DEFORMED UNLESS OTHERWISE NOTED, WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 165 WELDED WIRE FABRIC UNLESS OTHERWISE NOTED. SPLICES SHALL BE CLASS "B" AND ALL HOOKS SHALL BE STANDARD, U.N.O.
- THE FOLLOWING MINIMUM CONCRETE COVER SHALL BE PROVIDED FOR REINFORCING STEEL UNLESS SHOWN OTHERWISE ON DRAWINGS:
 - CONCRETE CAST AGAINST EARTH: 3 IN
 - CONCRETE EXPOSED TO EARTH OR WEATHER:
 - #6 AND LARGER: 2 IN
 - #5 AND SMALLER AND WWF: 1 1/2 IN
 - CONCRETE NOT EXPOSED TO EARTH OR WEATHER OR NOT CAST AGAINST THE GROUND:
 - SLABS AND WALL: 1/2 IN
 - BEAMS AND COLUMNS: 1 1/2 IN
- A CHAMFER OF 1/4 IN SHALL BE PROVIDED AT ALL EXPOSED EDGES OF CONCRETE, U.N.O. IN ACCORDANCE WITH ACI 301 SECTION 4.2.4
- INSTALLATION OF CONCRETE EXPANSION/JEDEC ANCHORS SHALL BE PER MANUFACTURER'S RECOMMENDATION FOR EMBEDMENT DEPTH OR AS SHOWN ON THE DRAWINGS. NO REBAR SHALL BE CUT WITHOUT PRIOR ENGINEERING APPROVAL WHEN DRILLING HOLES IN CONCRETE.
- CURING COMPOUNDS SHALL CONFORM TO ASTM C - 309.
- ADMIXTURE SHALL CONFORM TO THE APPROPRIATE ASTM STANDARD AS REFERENCED IN ACI 301.
- CONCRETE FOR REPLACEMENT CONCRETE SIDEWALKS OR DRIVEWAYS SHALL BE PLACED TO A THICKNESS NOT LESS THAN 4", AND NOT MORE THAN THE THICKNESS OF THE ADJACENT CONCRETE SIDEWALK OR DRIVEWAY.
- DO NOT WELD OR TACKWELD REINFORCING STEEL.
- ALL DOWELS, ANCHOR BOLTS, EMBEDMENT STEEL, ELECTRICAL CONDUITS, PIPE SLEEVES, GROUNDS AND ALL OTHER EMBEDDED ITEMS AND FORMED DETAILS SHALL BE IN PLACE BEFORE START OF CONCRETE PLACEMENT.
- LOCATE ADDITIONAL CONSTRUCTION JOINTS REQUIRED TO FACILITATE CONSTRUCTION AS ACCEPTABLE TO ENGINEER. PLACE REINFORCEMENT CONTINUOUSLY THROUGH JOINT.
- REINFORCEMENT SHALL BE COLD BENT WHEN BENDING IS REQUIRED.
- PLACE CONCRETE IN A UNIFORM MANNER TO PREVENT THE FORMATION OF COLD JOINTS AND OTHER PLANES OF WEAKNESS. VIBRATE THE CONCRETE TO FULLY EMBED REINFORCING. DO NOT USE VIBRATOR TO TRANSPORT CONCRETE THROUGH CHUTES OR FORMWORK.
- DO NOT PLACE CONCRETE IN PONDING WATER, ICE, OR ON FROZEN GROUND.
- FOR COLD WEATHER AND HOT WEATHER CONCRETE PLACEMENT, CONFORM TO APPLICABLE ACI CODES AND RECOMMENDATIONS. IN EITHER CASE, MATERIALS CONTAINING CHLORIDE, CALCIUM, SALTS, ETC. SHALL NOT BE USED. PROTECT FRESH CONCRETE FROM WEATHER FOR 7 DAYS MINIMUM.
- FIBER REINFORCED CONCRETE MIX, IF SPECIFIED, SHALL INCLUDE 1 1/2 LBS. OF FIBER PER CUBIC YARD.
- WASTE CEMENT FROM CLEANING OF CONCRETE DELIVERY TRUCKS SHALL NOT BE ALLOWED TO ENTER THE STORM DRAIN OR SEWER SYSTEM.

5. **FOUNDATION**

5.1 **GENERAL**

- ALL WORK SHALL COMPLY WITH OSHA AND STATE SAFETY REQUIREMENTS. PROCEDURES FOR THE PROTECTION OF EXCAVATIONS, EXISTING CONSTRUCTIONS AND UTILITIES SHALL BE ESTABLISHED PRIOR TO FOUNDATION INSTALLATION.
- PRIOR TO INITIATING EARTHWORK OPERATIONS, GROUND WATER AND SURFACE WATER CONTROL MEASURES NEED TO BE TAKEN.
- THE CONTRACTOR SHALL PROVIDE ADEQUATE SLOPING, SHORING, AND BRACING FOR ALL EXCAVATION TO PROTECT ADJACENT STRUCTURES AND COMPLY WITH LOCAL CODES, ORDINANCES, OSHA AND ANSI REQUIREMENTS.
- PRIOR TO CONSTRUCTION OF ANY PERMANENT STRUCTURE, THE SITE SHALL BE STRIPPED OF ALL SURFACE VEGETATION, TOP SOIL, AND ORGANIC MATERIAL. ALL WET, SOFT, LOOSE, FROZEN, OR OTHERWISE UNSUITABLE SOIL SHALL BE REMOVED.
- THE CONTRACTOR IS TO PREVENT SURFACE WATER FROM ENTERING EXCAVATIONS, PUDDLE, AND FROM FLOODING ADJACENT PROPERTIES DURING CONSTRUCTION. CONTRACTOR IS ALSO RESPONSIBLE FOR PREVENTING SOFTENING OF THE FOUNDATION SOILS PRIOR TO PLACING CONCRETE.
- THE EXPOSED SUB GRADE SHALL BE PROOF-ROLLED WITH MEDIUM WEIGHT ROLLERS OR OTHER APPROVED EQUIPMENT TO DETERMINE IF ANY POCKETS OF SOFT, COMPRESSIBLE SOIL EXISTS BELOW THE EXPOSED SUB GRADE. WHEREVER SUCH MATERIAL IS ENCOUNTERED, THE AREA SHALL BE UNDERCUT TO SUITABLE SOIL, AS DIRECTED BY A QUALIFIED ENGINEER.
- ALL STRUCTURAL FILL EXTENDING FROM SUITABLE SUB GRADE TO BOTTOM OF FOUNDATIONS OR FLOOR SLABS SHALL CONSIST OF GRANULAR MATERIAL AND 3% TO 10% BY DRY WEIGHT PASSING THE U.S. STD #200 SIEVE SIZE, COMPACTED TO 95% OF THE MODIFIED PROCTOR MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D1557 IN LAYERS NOT EXCEEDING 8".
- THE SOIL PREPARATION, INCLUDING FOOTING EXCAVATION, FILL, BACK FILL, AND COMPACTING SHALL BE DONE FOLLOWING THE RECOMMENDATION CONTAINED IN INTERNATIONAL BUILDING CODE (2012).
- PROPORTIONS OF CONCRETE MATERIALS SHALL BE SUITABLE FOR THE INSTALLATION METHOD UTILIZED AND SHALL RESULT IN DURABLE CONCRETE FOR RESISTANCE TO ANTICIPATED AGGRESSIVE ACTIONS IN THE VICINITY OF THE FOUNDATION. THE DURABILITY REQUIREMENTS OF ACI 318 CHAPTER 4 SHALL BE SATISFIED BASED ON CONDITIONS EXPECTED AT THE SITE. AS A MINIMUM, CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI (20.7 MPa) IN 28 DAYS.
- CONCRETE MATERIALS SHALL CONFORM TO THE APPROPRIATE STATE REQUIREMENTS FOR EXPOSED STRUCTURAL CONCRETE.
 - WELDING IS PROHIBITED ON REINFORCING STEEL EMBEDMENTS.
 - MINIMUM CONCRETE COVER FOR REINFORCEMENT SHALL BE 3 INCHES (76MM) UNLESS OTHERWISE NOTED. APPROVED SPACERS SHALL BE USED TO INSURE A 3" (76MM) MINIMUM COVER ON REINFORCEMENT.
 - CONCRETE COVER FROM THE TOP OF FOUNDATION TO ENDS OF REINFORCEMENT SHALL NOT EXCEED 3 INCHES (76MM) NOR BE LESS THAN 2 INCHES (51MM).
 - FOOTINGS IS DESIGNED TO BEAR ON EXISTING NATURALLY OCCURRING, NON-EXPANSIVE SOILS, OR ENGINEERED FILL CAPABLE OF SAFELY SUSTAINING 2000 PSI.
 - IF SOIL PROPERTIES WERE NOT AVAILABLE, THE FOUNDATION DESIGN HAS BEEN DEVELOPED IN ACCORDANCE WITH GENERALLY ACCEPTED PROFESSIONAL ENGINEERING PRINCIPLES AND PRACTICES WITHIN THE LIMITS OF THE SUBSURFACE DATA PRESCRIBED BY GOVERNING CODE. FOUNDATION DESIGN IS BASED ON SOIL PARAMETERS FROM THE ABOVE REFERENCED BUILDING CODE HAS FOLLOWS:
 - DESIGNABLE SOIL BEARING PRESSURE = 2000 PSF
 - ALLOWABLE SLIDING RESISTANCE = 150 PSF/FT.
- FOUNDATION SHALL BE FORMED WITH PLYWOOD OR METAL PANELS SUFFICIENT FOR STRUCTURAL AND VISUAL REQUIREMENTS. FORMS SHALL BE STRUCTURALLY ADEQUATE TO WITHSTAND UNCURED CONCRETE PRESSURE. FORMS SHALL BE REMOVED ONCE CONCRETE HAS ATTAINED 75% OF ITS ULTIMATE STRENGTH.
- THE CONTRACTOR SHALL EXPECT SUBMERGED DRILLING CONDITIONS FOR DEEP FOUNDATION CONSTRUCTION SUCH AS DRILLED PIERS OR DEADMAN ANCHORS AND SHALL MOBILIZE ACCORDINGLY.
- FOUNDATION INSTALLATION SHALL BE SUPERVISED BY PERSONNEL KNOWLEDGEABLE AND EXPERIENCED WITH THE PROPOSED FOUNDATION TYPE. CONSTRUCTION SHALL BE IN ACCORDANCE WITH GENERALLY ACCEPTED INSTALLATION PRACTICES.
- FOUNDATION DESIGN ASSUMES FIELD INSPECTIONS WILL BE PERFORMED TO VERIFY THAT CONSTRUCTION MATERIALS, INSTALLATION METHODS, AND ASSUMED DESIGN PARAMETERS ARE ACCEPTABLE BASED ON CONDITIONS EXISTING AT THE SITE.
- CONCRETE SHALL BE PLACED IN A MANNER THAT WILL PREVENT SEGREGATION OF CONCRETE MATERIALS, INFILTRATION OF WATER OR SOIL, AND OTHER OCCURRENCES WHICH MAY DECREASE THE STRENGTH OR DURABILITY OF THE FOUNDATION. FREE FALL CONCRETE MAY BE USED PROVIDED FALL IS VERTICAL DOWN WITHOUT HITTING SIDES OF EXCAVATION, FORM WORK, REINFORCING BARS, FORM TIES, OR OTHER OBSTRUCTIONS. UNDER NO CIRCUMSTANCES SHALL CONCRETE FALL THROUGH WATER.
- FOUNDATION DESIGN ASSUMES CONTINUOUS CONCRETE PLACEMENT WITHOUT CONSTRUCTION JOINTS.
- TOP OF FOUNDATION OUTSIDE LIMITS OF ANCHOR BOLTS SHALL BE SLOPED TO DRAIN WITH A FLOATED FINISH AREA INSIDE LIMITS OF ANCHOR BOLTS SHALL BE LEVEL, WITH A SCRATCHED FINISH.
- EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 1/4"x1/4" (19mm x 19mm) MINIMUM.
- INTIMATE CONTACT BETWEEN CONCRETE AND SOIL WALLS OF PAD IS ESSENTIAL FOR ADEQUATE FOUNDATION PERFORMANCE. THE CONCRETE SHOULD BE APPROPRIATELY VIBRATED DURING CONSTRUCTION.
- THE CONTRACTOR MIGHT HAVE TO BUILD THE FOUNDATION WITH SUBMERGED CONDITIONS AND SHALL MOBILIZE ACCORDINGLY.
- ALL EXISTING GROUNDING RINGS AND DEVICES EXPOSED BY EXCAVATION OR REGRADING SHALL BE REPLACED AND PROPERLY CONNECTED TO EXISTING SYSTEM PER NEC OR LOCAL JURISDICTION REQUIREMENTS.

5.2 **DRILLED SHAFT**

- REINFORCING CAGES SHALL BE BRACED TO RETAIN PROPER DIMENSIONS DURING HANDLING AND THROUGHOUT PLACEMENT OF CONCRETE. WHEN TEMPORARY CAGES ARE UTILIZED, BRACING SHALL BE ADEQUATE TO RESIST FORCES OCCURRING FROM THE FLOWING CONCRETE DURING CASING EXTRACTION.
- CONCRETE COVER FROM TOP OF FOUNDATION TO ENDS OF VERTICAL REINFORCEMENT SHALL NOT EXCEED 3 INCHES (76 MM) NOR BE LESS THAN 2 INCHES (51 MM).
- SPACERS SHALL BE ATTACHED INTERMITTENTLY THROUGHOUT THE ENTIRE LENGTH OF VERTICAL REINFORCING CAGES TO INSURE CONCENTRIC PLACEMENT OF CAGES IN EXCAVATIONS.
- FOUNDATION DESIGN MODIFICATIONS MAY BE REQUIRED IN THE EVENT OF THE FOLLOWING DESIGN PARAMETERS ARE NOT APPLICABLE FOR THE SUBSURFACE CONDITIONS ENCOUNTERED.
- FOR FOUNDATION AND ANCHOR TOLERANCES REFER TO TOWER MANUFACTURER DRAWINGS FOR SPECIFIC JOB NUMBER AND DATE. IN ABSENCE OF MORE SPECIFIC INFORMATION, THE CONTRACTOR MAY USE THE FOLLOWING:
 - POLE FOUNDATION:
 - LOCATION: 1/24 OF SHAFT DIAMETER (MAX.)
 - OUT-OF-PLUMB: 1/8" OF SHAFT LENGTH NOT TO EXCEED 12.5% OF SHAFT DIAMETER OR 12"
 - CONCRETE CUT OFF ELEVATION: +/- 1/2"
- FOUNDATION DESIGN ASSUMES CASING, IF USED, WILL NOT BE LEFT IN PLACE. EQUIPMENT, PROCEDURES AND PROPORTIONS OF CONCRETE MATERIALS SHALL INSURE CONCRETE WILL NOT BE ADVERSELY DISTURBED UPON CASING REMOVAL.
- DRILLING FLUID, IF USED, SHALL BE FULLY DISPLACED BY CONCRETE AND SHALL NOT BE DETRIMENTAL TO CONCRETE OR SURROUNDING SOIL. CONTAMINATED CONCRETE SHALL BE REMOVED FROM TOP OF FOUNDATION AND REPLACED WITH FRESH CONCRETE.
- INTIMATE CONTACT BETWEEN CONCRETE AND SOIL WALLS OF DRILLED SHAFT IS ESSENTIAL FOR ADEQUATE FOUNDATION PERFORMANCE. THE CONCRETE SHOULD BE APPROPRIATELY VIBRATED DURING CONSTRUCTION.

6. **ELECTRICAL**

6.1 **GENERAL**

- THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, TRANSPORTATION, CONSTRUCTION TOOLS, ETC. FOR THE INSTALLATION OF COMPLETE AND PROPERLY OPERATING SYSTEMS.
- INSTALLATION SHALL COMPLY WITH ALL APPLICABLE LAWS AND ORDINANCES OF ALL AUTHORITIES HAVING JURISDICTION AND WITH ALL ASSOCIATED UTILITY COMPANY REGULATIONS AND APPLICABLE REQUIREMENTS. INSTALLATION WILL ALSO COMPLY WITH THE LATEST EDITIONS OF ALL CODES AND STANDARDS OF THE ENTITIES LISTED UNDER ITEM #1.1, PARAGRAPH 1. THE MOST STRINGENT CODE WILL APPLY IN THE CASE OF DISCREPANCIES OR DIFFERENCES IN THE CODE REQUIREMENTS.
- THE CONTRACTOR SHALL SECURE ALL NECESSARY ELECTRICAL PERMITS AND PAY ALL REQUIRED FEES.
- RECORD DRAWINGS: MAINTAIN A RECORD OF ALL CHANGES, SUBSTITUTIONS BETWEEN WORK AS SPECIFIED AND INSTALLED. RECORD CHANGES ON A CLEAN SET OF CONTRACT DOCUMENTS WHICH SHALL BE TURNED OVER TO THE CONSTRUCTION MANAGER UPON COMPLETION OF THE PROJECT.
- ALL BROCHURES, OPERATION MANUALS, CATALOGS, SHOP DRAWINGS, SPECIFICATIONS, ETC. SHALL BE TURNED OVER TO THE CARRIER AT THE COMPLETION OF THE PROJECT.
- GUARANTEE/WARRANTY: GUARANTEE INSTALLATION TO BE FREE OF DEFECTS, SHORTS, GROUND, ETC. FOR A PERIOD OF ONE YEAR. FURNISH WARRANTY SO THE DEFECTIVE MATERIAL AND/OR WORKMANSHIP WILL BE REPAIRED/REPLACED IMMEDIATELY UPON NOTIFICATION AT NO COST TO THE OWNER FOR THE OPTION OF WARRANTY, IF AFTER THIRTY (30) DAYS THE CORRECTIONS ARE NOT COMPLETE, THE OWNER RESERVES THE OPTION OF ARRANGING FOR THE NECESSARY REPAIRS AND BACK CHARGING THE CONTRACTOR FOR THE WORK.
- THE CONTRACTOR SHALL COORDINATE WITH OTHER TRADES, AS NECESSARY.
- DO NOT INTERRUPT EXISTING SERVICES WITHOUT WRITTEN PERMISSION OF THE OWNER OF THAT SERVICE AND WRITTEN PERMISSION OF THIS INSTALLATION'S CARRIER.
- CHANGES: NO ADDITIONAL COSTS FOR LABOR OR MATERIALS WILL BE ALLOWED FOR CHANGES OR MODIFICATIONS MADE UNLESS PRIOR WRITTEN APPROVAL IS OBTAINED FROM THE ARCHITECT, ENGINEER OR OWNER IN THE FORM OF A CHANGE ORDER.
- DRAWINGS: ELECTRICAL DRAWINGS ARE DIAGRAMMATIC IN NATURE AND ARE NOT TO BE SCALED.
- DISCREPANCIES: DISCREPANCIES ON THESE PLANS, SPECIFICATIONS, ETC. SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER.
- SURVEY AND CONDITIONS: VISIT THE JOB SITE PRIOR TO SUBMITTING BID, AND MAKE A SURVEY OF EXISTING CONDITIONS WHICH MAY AFFECT THE WORK TO BE PERFORMED. NO OTHER ALLOWANCES WILL BE GIVEN FOR THIS SITE CONDITION.
- CO-OPERATION: CO-OPERATE WITH OTHER CONTRACTORS AND SUBCONTRACTORS ON THE SITE ARRANGE AND EXECUTE WORK IN SUCH A MANNER AS REQUIRED FOR THE SATISFACTORY AND EFFICIENT CONSTRUCTION OF THIS PROJECT BY ALL TRADES CONCERNED.
- INSTALLATION SHALL COMPLY SPECIFICALLY WITH ENGINEERING STANDARDS MANUAL. ANY DEVIATIONS SHALL BE BROUGHT TO THE ATTENTION OF THE PROJECT MANAGER PRIOR TO COMMENCEMENT OF WORK.
- PROCUREMENT VERIFICATION: PROVIDE AN ITEMIZED CERTIFICATION TO THE PROJECT MANAGER THAT EQUIPMENT AND RELATED HARDWARE HAVE BEEN ORDERED WITHIN 24 HOURS OF NOTICE TO PROCEED.
- THE SUBCONTRACTOR SHALL NOTIFY AND OBTAIN NECESSARY AUTHORIZATION FROM THE CONTRACTOR BEFORE COMMENCING WORK ON THE AC POWER DISTRIBUTION PANELS

6.2 **INSPECTIONS**

- GENERAL: DURING AND UPON COMPLETION OF WORK, ARRANGE AND PAY ALL ASSOCIATED INSPECTIONS OF ALL ELECTRICAL WORK INSTALLED UNDER THIS CONTRACT IN ACCORDANCE WITH THE CONDITIONS OF THE CONTRACT.
- INSPECTIONS REQUIRED: AS PER THE LAWS AND REGULATIONS OF THE LOCAL AND/OR STATE AGENCIES HAVING JURISDICTION AT THE PROJECT SITE.
- INSPECTIONS AGENCY: APPROVED BY THE LOCAL AND/OR STATE AGENCIES HAVING JURISDICTION AT THE PROJECT SITE.
- CERTIFICATES: SUBMIT ALL REQUIRED INSPECTION CERTIFICATES TO THE CARRIER AND UTILITY.

6.3 **HANGERS AND SUPPORTS**

- MATERIALS: ALL HANGERS, SUPPORTS, FASTENERS AND HARDWARE SHALL BE ZINC COATED OR OF EQUIVALENT CORROSION RESISTANCE BY TREATMENT OR INHERENT PROPERTY AND SHALL BE MANUFACTURED PRODUCTS DESIGNED FOR THE APPLICATION. PRODUCTS FOR OUTDOOR USE SHALL BE HOT DIP GALVANIZED.
- TYPES: HANGERS, STRAPS, RISER SUPPORTS, CLAMPS, U-CHANNEL, THREADED RODS, ETC. AS INDICATED OR REQUIRED.
- INSTALLATION: RIGIDLY SUPPORT AND SECURE ALL MATERIAL, RACEWAY AND EQUIPMENT AS BUILDING STRUCTURE USING HANGERS, SUPPORTS AND FASTENERS SUITABLE FOR THE USE ON MATERIALS AND LOADS ENCOUNTERED, PROVIDE ALL NECESSARY HARDWARE, PROVIDE CONDUIT SUPPORTS AT MAXIMUM 5 FT. O.C.
- STRUCTURAL MEMBERS: DO NOT CUT, DRILL OR WELD ANY STRUCTURAL MEMBER EXCEPT AS SPECIFICALLY APPROVED BY THE ENGINEER.
- MISCELLANEOUS SUPPORTS: PROVIDE ANY ADDITIONAL STRUCTURAL SUPPORT STEEL BRACKETS, ANGLES, FASTENERS AND HARDWARE AS REQUIRED TO ADEQUATELY SUPPORT ALL ELECTRICAL MATERIALS AND EQUIPMENT.
- ONE-HOLE STRAPS SHALL NOT BE USED FOR CONDUITS LARGER THAN 1/2 INCH.

6.4 **ENCLOSURES/WIRERAYS**

- EQUIPMENT CABINETS, TERMINAL BOXES, JUNCTION BOXES AND PULL BOXES SHALL BE GALVANIZED OR EPOXY-COATED SHEET STEEL. SHALL MEET OR EXCEED UL 50, AND BE RATED NEMA 1 (OR BETTER) INDOORS OR NEMA 3R (OR BETTER) OUTDOORS.
- WIRERAYS SHALL BE EPOXY-COATED (GRAY) AND INCLUDE A HINGED COVER AND RATE NEMA 1 (OR BETTER) INDOORS, OR NEMA 3R (OR BETTER) OUTDOORS.
- JUNCTION BOXES: JUNCTION BOXES SHALL BE A MINIMUM SIZE OF 4 INCHES SQUARE BY 1-1/4 INCHES DEEP.

6.5 **HOLES, SLEEVES AND OPENINGS**

- GENERAL: PROVIDE ALL HOLES, SLEEVES AND OPENINGS REQUIRED FOR THE COMPLETION OF WORK AND RESTORE ALL DAMAGED SURFACES TO MATCH SURROUNDING SURFACES.
- CONDUIT PENETRATIONS: SIZE CORE-DRILLED HOLES SO THAT AN ANNULAR SPACE OF NOT LESS THAN 1/4 INCH AND NOT MORE THAN 1 INCH IS LEFT AROUND THE CONDUIT. PIPE, ETC. WHEN OPENINGS ARE CUT IN LIEU OF CORE-DRILLED, PROVIDE SLEEVE IN ROUGH OPENING. SIZE SLEEVES TO PROVIDE AN ANNULAR SPACE OF NOT LESS THAN 1/4 INCH AND NOT MORE THAN 1 INCH AROUND THE CONDUIT. PIPE, ETC. PATCH AROUND SLEEVES TO MATCH SURROUNDING SURFACE.
- PROVIDE APPROPRIATE WEATHERPROOFING MATERIALS FOR PENETRATIONS NEEDING TO BE SEALED FROM POTENTIAL WATER INTRUSION. PROVIDE FIREPROOF MATERIALS FOR PENETRATIONS REQUIRING A FIRE RATED SEAL. REFER TO CUTTING AND PATCHING NOTES UNDER SECTION 1 - GENERAL.
- IF ANY ROOFTOP WORK IS TO BE PERFORMED, THE CONTRACTOR SHALL USE THE BUILDING OWNERS APPROVED ROOFING CONTRACTOR TO PREVENT VOIDING ANY EXISTING ROOFING WARRANTIES. ANY DAMAGE TO THE EXISTING ROOFING MEMBRANE SHALL BE REPAIRED IMMEDIATELY TO AVOID MOISTURE INTRUSION INTO THE BUILDING SHELL.
- GENERAL: PROVIDE ALL CUTTING, DRILLING, FITTING AND PATCHING NECESSARY FOR ACCOMPLISHING THE WORK. THIS INCLUDES REMOVAL AND REPLACEMENT OF DEFECTIVE WORK AND WORK NOT CONFORMING TO THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.
- REPAIRS: REPAIR ANY AND ALL DAMAGE TO WORK OTY CUTTING AND PATCHING OPERATIONS USING SKILLED MECHANICS OF THE TRADES INVOLVED.
- DO NOT CUT MAJOR STRUCTURAL ELEMENTS WITHOUT APPROVAL. PATCHING SHALL BE OF QUALITY EQUAL TO AND OF MATCHING APPEARANCE OF EXISTING CONSTRUCTION.
- ABSOLUTELY NO FIELD CORING / DRILLING / CUTTING OF METALLIC POLES TO BE ALLOWED.

6.6 **CONDUCTORS**

- USE 98% CONDUCTIVITY COPPER WITH TYPE XHM-2 INSULATION, 600 VOLT, COLOR CODED. USE SOLID CONDUCTORS FOR WIRE UP TO AND INCLUDING NO. 8 AWG. STRANDED CONDUCTORS FOR WIRE LARGER THAN NO. 8 AWG. USE PRESSURE-TYPE INSULATED TWIST-ON CONNECTORS FOR NO. 10 AWG AND SMALLER. SOLDERLESS MECHANICAL TERMINAL LUGS FOR NO. 8 AWG AND LARGER. ALUMINUM CONDUCTORS SHALL NOT BE USED.
- NO. 10, 12, OR ROMEX CABLE SHALL BE PERMITTED.
- EACH END OF EVERY POWER, GROUNDING AND T1 CONDUCTOR AND CABLE SHALL BE LABELED WITH COLOR-CODED INSULATION OR ELECTRICAL TAPE (3M BRAND, 1/2 INCH PLASTIC ELECTRICAL TAPE WITH UV PROTECTION, OR EQUAL). THE IDENTIFICATION METHOD SHALL CONFORM WITH NEC AND OSHA AND MATCH EXISTING INSULATION REQUIREMENTS.
- ALL THE WRAPS SHALL BE CUT FLUSH WITH APPROVED CUTTING TOOL. REMOVE SHARP EDGES.
- ALL CONDUIT SIZES SPECIFIED IN THIS DOCUMENT WERE DONE TAKING INTO ACCOUNT THE USE OF COPPER CONDUCTORS.

6.7 **ELECTRICAL SERVICE**

- GENERAL: COMPLY WITH AND CO-ORDINATE ALL REQUIREMENTS OF THE UTILITY COMPANY.
- SHORT CIRCUIT RATINGS: PROVIDE EQUIPMENT WITH HIGHER FAULT CURRENT RATINGS AS NEEDED TO MATCH UTILITY COMPANY AVAILABLE FAULT CURRENT.
- CONTRACTOR TO VERIFY UTILITY CO. FAULT CURRENT AND ENSURE THAT ALL EQUIPMENT MEETS FAULT CURRENT TO AT A MINIMUM ALL EQUIPMENT TO BE 10,000 AC.
- THE CONTRACTOR IS RESPONSIBLE FOR MAKING ARRANGEMENTS WITH THE ELECTRIC UTILITY RELATIVE TO A TIMELY INSTALLATION OF THE NEW SERVICE AND PAYING ALL ASSOCIATED FEES.
- IDENTIFICATION: IDENTIFY SERVICE DISCONNECTION MEANS WITH PERMANENT NAMEPLATE.
- THE LOCATION SHOWN FOR A UTILITY POLE OR CONNECTION TO NEW UTILITIES IS FOR CONCEPTUAL USE ONLY. THE CONTRACTOR SHALL COORDINATE THE ACTUAL LOCATION WITH THE ELECTRIC UTILITY.
- LOCATION AND ARRANGEMENTS: DRAWINGS INDICATE DIAGRAMMATICALLY THE DESIRED LOCATION OF EQUIPMENT, FIXTURES, OUTLETS, ETC., AND ARE NOT TO BE SCALED. PROPER JUDGMENT MUST BE EXERCISED IN THE EXECUTION TO ENSURE THE BEST POSSIBLE INSTALLATION.
- PANEL AND DISTRIBUTION BOARD IDENTIFICATION: SWITCHBOARDS, PANELBOARDS, TRANSFORMERS AND DISTRIBUTION SECTIONS SHALL BE IDENTIFIED WITH ENGRAVED, WHITE ON BLACK, LAMINATED, RIGID PHENOLIC NAMEPLATES WITH 1/4 INCH CHARACTERS, SECURELY AFFIXED TO FACE OF CABINET.

6.8 **CHECKOUT, TESTING AND ADJUSTING**

- CORRECTION/REPLACEMENT AFTER TESTING BY CONTRACTOR, OWNER OR ENGINEER, CORRECT ANY DEFICIENCIES AND REPLACE MATERIALS AND EQUIPMENT SHOWN TO BE DEFECTIVE OR UNABLE TO PERFORM AT DESIGN OR RATED CAPACITY.
- POWER CONDUCTORS: CONTRACTOR SHALL CONDUCT A CONTINUITY AND INSULATION TEST ON CONDUCTORS BETWEEN SERVICE DISCONNECT SWITCH AND LOAD CENTER.
- WHEN SITE POWER IS DERIVED FROM A 3-PHASE SOURCE, LOAD READINGS WILL BE TAKEN AND RECORDED TO MAINTAIN A BALANCED LOAD AT THE PRIMARY SOURCE. RECORDS SHALL BE RETURNED TO THE OWNERS REPRESENTATIVE.

6.9 **RACEWAY SYSTEMS/CONDUIT**

- UNDERGROUND CONDUIT SHALL BE SCHEDULE 40 PVC CONDUIT OR BETTER AS REQUIRED BY LOCAL JURISDICTION AND/OR UTILITY. UNDERGROUND PVC CONDUIT SHALL TRANSITION TO RIGID GALVANIZED STEEL CONDUIT OR SCHEDULE 80 PVC CONDUIT BEFORE RISING ABOVE GRADE OR CONCRETE SLAB.
- EXPOSED CONDUIT SHALL BE RIGID GALVANIZED STEEL CONDUIT OR BETTER AS REQUIRED BY LOCAL JURISDICTION AND/OR UTILITY.
- GRS CONDUITS, WHEN SPECIFIED, SHALL MEET UL-6 FOR GALVANIZED STEEL. ALL FITTINGS SHALL BE SUITABLE FOR USE WITH THREADED RIGID CONDUIT.
- ELECTRICAL METALLIC TUBING (EMT) OR RIGID, NONMETALLIC CONDUIT (RIGID PVC SCHEDULE 40, OR RIGID PVC SCHEDULE 80 FOR LOCATIONS SUBJECT TO PHYSICAL DAMAGE) SHALL BE USED FOR EXPOSED INDOOR LOCATIONS.
- ELECTRICAL METALLIC TUBING (EMT) OR RIGID NONMETALLIC CONDUIT (RIGID PVC SCHEDULE 40) SHALL BE USED FOR CONCEALED INDOOR LOCATIONS.
- LIQUID-TIGHT FLEXIBLE METALLIC CONDUIT (LIQUID-TITE FLEX) SHALL BE USED INDOORS AND OUTDOORS, WHERE VIBRATION OCCURS OR FLEXIBILITY IS NEEDED.
- PLUG AND CAP EACH END OF SPARE AND EMPTY CONDUITS AND PROVIDE TWO SEPARATE PULL STRINGS - 200 LB. TEST POLYETHYLENE CORD.
- ALL CONDUIT BENDS SHALL BE MINIMUM OF 24-INCH RADIUS.
- ALL METALLIC RACEWAYS SHALL BE GROUNDED PER NEC.
- THE CONTRACTOR SHALL FIELD VERIFY THE BEST AND LEAST DISRUPTIVE ROUTING OF CONDUITS, CABLE TRAYS AND DUCTS. CONDUIT ROUTING IS SHOWN AS A GUIDE ONLY. ACTUAL CONDUIT PLACEMENT IS TO BE DONE IN A PROFESSIONAL MANNER.

6.10 **BELOW GRADE**

- THIS SITE INCLUDES NEW CRITICAL UNDERGROUND ELECTRIC, TELEPHONE AND OTHER SERVICES IN THE VICINITY OF OTHER UNDERGROUND SERVICES AND EQUIPMENT SUPPORTS. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID SERVICE DISRUPTION TO THESE FACILITIES. THE CONTRACTOR SHALL ALSO CONTACT ELECTRIC AND TELEPHONE, AND ALL OTHER APPROPRIATE AGENCIES PRIOR TO EXCAVATION AT THIS SITE.
- PRIOR TO EXCAVATION, A UTILITY MARK OUT SHALL BE DONE TO LOCATE EXISTING UNDERGROUND UTILITIES. ALL UNDERGROUND UTILITIES MUST BE LOCATED AND MARKED OUT PRIOR TO ANY EXCAVATION WORK BEING PERFORMED. PHOTOS SHALL BE TAKEN OF ALL UNDERGROUND WORK AND GIVEN TO THE OWNER OR OWNERS REPRESENTATIVE DURING THE SITE'S HANDOFF.
- ALL TRENCHING AND EXCAVATION WITHIN EXISTING COMPOUNDS MUST BE PERFORMED BY HAND IN ACCORDANCE WITH THE OWNERS SPECIFICATIONS. ANY OTHER METHODS OF DIGGING MUST FIRST BE APPROVED BY THE CONSTRUCTION MANAGER.
- ALL LOW VOLTAGE CONDUIT (600V OR LESS) SHALL HAVE A MINIMUM BURIAL DEPTH OF 24". ALL HIGH VOLTAGE CONDUIT (600V OR MORE) SHALL HAVE A MINIMUM BURIAL DEPTH OF 36"
- UNDERGROUND CONDUIT SHALL BE ENCASED IN REINFORCED CONCRETE IN AREAS OF VEHICLE TRAFFIC. CONCRETE ENCASEMENT SHALL BE 3" MINIMUM ALL AROUND AND BETWEEN CONDUITS.
- ALL BURIED CONDUIT SHALL BE IDENTIFIED WITH ELECTRICAL MARKER TAPE. TAPE SHALL BE PLACED 12" ABOVE CONDUIT FOR EASY IDENTIFICATION.

6.11 **EQUIPMENT**

- THE MAIN CIRCUIT BREAKER SHALL BE RATED FOR STANDARD A.I.C. RATING HIGHER THAN INCOMING EQUIPMENT A.I.C.
- ALL EQUIPMENT SHALL BE BRACED FOR STANDARD A.I.C. RATING HIGHER THAN INCOMING FROM UTILITY CO.
- THE CONTRACTOR SHALL PROVIDE AN ITEMIZED CERTIFICATION TO THE CARRIER OF ALL EQUIPMENT AND RELATED HARDWARE, SPECIFIED TO BE PURCHASED AND INSTALLED BY THE CONTRACTOR, WHERE ORDERED WITHIN 24 HRS. OF THE NOTICE TO PROCEED.
- ALL ELECTRICAL CONNECTIONS SHALL BE CLEARLY LABELED WITH ENGRAVED PLASTIC LABELS. ALL EQUIPMENT SHALL BE LABELED WITH ITS VOLTAGE RATING, PHASE CONFIGURATION, WIRE CONFIGURATION, POWER OR CAPACITY RATING AND BRANCH CIRCUIT ID NUMBERS (I.E. PANELBOARD AND CIRCUIT ID'S).
- METAL RECEPTACLE SWITCH AND DEVICE BOXES SHALL BE GALVANIZED, EPOXY-COATED OR NON-CORRODING. SHALL MEET OR EXCEED UL 51A AND NEMA OS 1, AND BE RATED NEMA 1 (OR BETTER) INDOORS OR WEATHER-PROTECTED (WP OR BETTER) OUTDOORS.
- NONMETALLIC RECEPTACLE SWITCH AND DEVICE BOXES SHALL MEET OR EXCEED NEMA OS 2, AND BE RATED NEMA 1 (OR BETTER) INDOORS OR WEATHER-PROTECTED (WP OR BETTER) OUTDOORS.

6.12 **TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS)**

- TVSS DEVICES FOR AC POWER SHALL BE INSTALLED IN ALL EXISTING FACILITIES THAT ARE MISSING TVSS DEVICES OR HAVE UNSUITABLE TVSS DEVICES.
- THE AC POWER COMMON MODE NOISE SUPPRESSION SHALL BE CONNECTED TO THE COMMERCIAL POWER SUPPLY SIDE OF THE MANUAL TRANSFER SWITCH.
- IN MARKETS WITH LIGHTNING ZONE "OR" - TO 4, RF TVSS DEVICE SHALL BE INSTALLED AT THE ENTRANCE TO THE SHELTER OR AS CLOSE AS POSSIBLE TO THE BTS CABINET FOR OUTDOOR SITES, TO PROTECT AGAINST LIGHTNING AND TRANSIENT VOLTAGES.
- A T1 TRANSPORT TVSS DEVICE SHALL BE INSTALLED AT ALL SITES BETWEEN THE NTU AND THE BTS.

7. **GROUNDING**

7.1 **GENERAL GROUNDING MATERIALS AND NOTES**

- THE SUBCONTRACTOR SHALL VERIFY THAT THE SYSTEM IS EFFECTIVELY GROUNDED, MEETS NEC ARTICLE 250 REQUIREMENTS, IS ACCEPTABLE TO THE LOCAL UTILITY AND THE LOCAL AUTHORITY HAVING JURISDICTION, AND MEETS THE CARRIER'S ELECTRICAL AND GROUNDING SPECIFICATIONS. FOLLOWING COMPLETION OF WORK, CONDUCT GROUND TEST. OWNERS REPRESENTATIVE WILL INSPECT CABLES AND REVIEW GROUND TEST PRIOR TO BURIAL. USE CLEAN SAND AND CLAY BACKFILL FOR BURIED GROUND CONDUCTORS.
- ALL DETAILS SHOWN ARE DIAGRAMMATIC. ACTUAL GROUNDING INSTALLATION AND CONSTRUCTION MAY VARY DUE TO SITE SPECIFIC CONDITIONS.
- NOTIFY CONSTRUCTION MANAGER IF THERE ARE ANY DIFFICULTIES INSTALLING THE GROUND SYSTEM DUE TO SITE/SOIL CONDITIONS.
- GROUND CONNECTIONS: WHERE POINT CONNECTIONS ARE MADE, THE CONTACT POINTS SHALL BE THOROUGHLY CLEANED AND MADE OF FOREIGN MATERIAL SUCH AS PAINT, GALVANIZATION, AND CORROSION, TO ENSURE ADEQUATE BOND. REFER TO EXOTHERMIC WELD, LUGS, AND ANTI-OXIDATION COMPOUND NOTES FOR FURTHER DETAILS.
- GROUND WIRE: OUTSIDE/UNDERGROUND, MINIMUM NO. 2 AMERICAN WIRE GAUGE (AWG) BARE, SOLID, ANNEALED, TINNED COPPER WIRE (B7C) BUT SIZED IN ACCORDANCE WITH NEC TABLE 250.68, SERVICE SIZE, AND LOCAL UTILITY REQUIREMENTS. UNDER NO CIRCUMSTANCES IS STRANDED WIRE ACCEPTABLE. ALL BURIED WIRE SHALL BE INSTALLED TO MEET MINIMUM BEND RADIUS. SHARP BENDS AND KINKS ARE NEVER ACCEPTABLE. WHEN ANY GROUNDING OR BONDING WIRE RUNS THROUGH CONCRETE, IT SHALL BE SLEEVED IN PVC. GROUND WIRES SHALL NOT BE INSTALLED OR ROUTED THROUGH HOLES IN ANY METAL OBJECTS OR SUPPORTS.
- GROUND WIRE - INSIDE: WIRE SHALL BE NO. 2 AWG THIN OR THIN-2, CLASS B STRANDED COPPER CABLE RATED FOR 90 WC (WET AND DRY) OPERATION, GREEN INSULATED (A HIGH-STRAIND CONDUIT WIRE IS PREFERRED).
- BURIED GROUND RING: THE EQUIPMENT/SHELTER PAD OR PLATFORM SHALL HAVE A BURIED GROUND RING (BRG) THAT CONSISTS OF A RING NO. 2 AWG BARE, SOLID, ANNEALED, TINNED COPPER WIRE AND EXOTHERMICALLY WELDED GROUND RODS. THE BRG DESIGN SHOULD RESULT IN 10 OHMS OR LESS WITH SOIL RESISTIVITY OF UP TO 50,000 OHM-CM. SOIL RESISTIVITIES HIGHER THAN THIS WILL REQUIRE FURTHER ALLEGATION ALL UNDERGROUND (BELOW GRADE) GROUNDING CONNECTIONS, INCLUDED COPPER GROUND RODS, CHEMICAL GROUND RODS ATTACHMENTS, AND GROUND LEADS FROM EQUIPMENT, TOWER, AND COAX SHALL BE MADE BY AN EXOTHERMIC WELD. THE GROUND RING SHALL BE BETWEEN A MINIMUM OF TWO FEET FROM THE SHELTER FOUNDATION, BRG PAD, OR PLATFORM PERIMETER AT A MINIMUM DEPTH OF TWO FEET, SIX INCHES, AND WITH NO BEND HAVING A RADIUS OF LESS THAN TWO FEET. THE TRENCH SHALL BE 6 INCHES BELOW THE REQUIRED WIRE DEPTH. GROUND RODS SHALL BE INSTALLED AT A MINIMUM AT EACH CORNER OF THE BRG, OR PER NPPA 70, ARTICLE 250-56. EVERY EFFORT SHALL BE MADE TO ENSURE THAT ALL GROUND PATHS TO THE BRG ARE INSTALLED SO THAT ANY POTENTIAL DISCHARGE OF ELECTRICITY WILL NOT GO THROUGH ANY GROUND PATH CO UPWARD.
- EXOTHERMIC WELDING: EXOTHERMIC WELDS SHALL BE CADWELD, A REGISTERED TRADEMARK OF ERCO PRODUCTS, INC. OF CLEVELAND, OHIO, OR THERMOWELD, A DIVISION OF CONTINENTAL INDUSTRIES, INC. OF TULSA, OKLAHOMA OR EQUIVALENT.
- GROUND ROD: 5/8" X 8-FEET (MINIMUM LENGTH) STEEL WITH PURE COPPER JACKET NOT LESS THAN 0.002 INCHES THICK. GROUND RODS SHALL BE SPACED NO GREATER THAN 15 FT. O.C. AND NO LESS THAN 6 FT. O.C.
- GROUND ROD COUPLING: 5/8" GROUND ROD COUPLING MADE OF THE SAME MATERIAL AS THE GROUND ROD TO PREVENT DISSIMILAR METAL, HIGH OXIDATION POINTS.
- CHEMICAL GROUND ROD: COMPRISED OF A HOLLOW COPPER GROUND ROD, A GROUND TEST WELL, A 4'-0" EXOTHERMICALLY WELDED DIGITAL AND CONDUCTIVE BACKFILL MATERIAL. THE CHEMICAL GROUND ELECTRODE SHALL BE MADE OF A MINIMUM OF 2-INCH LUD. TYPE K COPPER TUBE WITH A MINIMUM WALL THICKNESS OF 0.083 INCH AND SHALL BE A MINIMUM OF 8 FEET IN LENGTH. THE CHEMICAL GROUND ROD SHALL BE UL LISTED. IN SITUATIONS WHERE DRILLING VERTICALLY IS TOO DIFFICULT OR COSTLY, HORIZONTAL U-SHAPE CHEMICAL GROUND RODS ARE ACCEPTABLE.
- GROUND BARS: GROUND BARS SHALL BE MANUFACTURED EXACTLY AS SPECIFIED. IF DEVIATIONS OR APPROVED DIMENSIONS SHALL BE ACCURATE WITHIN 1/32 INCH. HOLE DIAMETERS SHALL BE ACCURATE WITHIN 1/64 INCH. BARS SHALL BE 1/2 INCH THICK SOLID ELECTRICAL GRADE COPPER MANUFACTURED BY HARGREY OR EQUIVALENT. GROUND BARS SHALL NOT BE FABRICATED OR MODIFIED IN THE FIELD. COAXIAL CABLE GROUND BARS SHOULD BE MECHANICALLY CONNECTED TO THE TOWER STRUCTURAL STEEL. HOWEVER, DO NOT DRILL HOLES OR USE EXOTHERMIC WELDS TO CONNECT GROUND LEADS TO A STEEL TOWER EXCEPT ON STEEL TABS OR FLANGES SPECIFICALLY DESIGNED FOR THAT PURPOSE. HOLES AND/OR EXOTHERMIC WELDING CAN NEGATIVELY IMPACT THE STRUCTURAL INTEGRITY OF THE TOWER AND INCREASE CHANCES OF CORROSION.
- INSULATORS: POLYESTER FIBERGLASS, 15 KV MINIMUM DIELECTRIC STRENGTH, FLAME RESISTANT PER UL 94 V0 CLASSIFICATION.
- CUPS: WHEN SECURING ANY GROUND WIRES, SOLID OR STRANDED, INSULATED OR UNINSULATED, NEVER USE ANY CUPS OR OTHER DEVICES THAT ARE CONDUCTIVE AND FORM A CLOSED LOOP. METALLIC CLIPS ARE ACCEPTABLE IF THEY DO NOT FORM A CLOSED LOOP.
- GROUND CLAMP: BURNIDY GAR STYLE UL CLAMP WITH TWO-HOLE PROVISIONS FOR LONG BARREL, MULTIPLE CRMP TWO-HOLE LUGS.
- COAX GROUNDING KIT: COAX GROUND KITS SHALL BE FROM THE SAME MANUFACTURER AS THE COAX. GROUND KITS SHALL BE SOLID STRAP TYPE WITH NO. 6 AWG WIRE AND 2-HOLE COMPRESSION CRIMPED LUGS (INSTALLED USING THE PROPER UL TOOL AND CIRCUMFERENTIAL HEXAGON DIE), BRAND OR HOSE CLAMP TYPE SHALL NOT BE USED. SOLID COPPER STRAP TYPE WITH SINGLE HOLE LUGS SHALL NOT BE USED. ALL COAX CABLES ARE TO BE GROUNDED AT THEIR SECTOR CGS, THE COLLECTOR CGS, MIDPOINT CGS (IF REQUIRED), BOTTOM CGS, WAVEGUIDED BRIDGE CGS (IF REQUIRED), AND AT THE SHELTER WALL. A MIDPOINT CGS IS ONLY REQUIRED IF THE COAX LENGTH EXCEEDS 200'. A WAVEGUIDE BRIDGE CGS IS ONLY REQUIRED WHEN THE LENGTH OF CABLE (FROM TOWER TO EQUIPMENT) IS GREATER THAN 15 FEET.
- WEATHERPROOFING: ALL COAX GROUND KITS SHALL BE WEATHERPROOFED. ONLY GROUND KITS APPROVED BY THE COAX MANUFACTURER SHALL BE USED.
- METALLIC CONDUIT: ANY GROUND RODS WIRE, SOLID OR STRANDED, THAT PASS-THROUGH CONDUIT, METALLIC SLEEVE, OR CABLE COVER, SHALL BE BONDED AT BOTH ENDS.
- ANTENNA GROUNDING: ALL ANTENNAS (INCLUDING THE GPS ANTENNAS) ARE GROUNDED BY THEIR MOUNTS/BASIS AND BY THE GROUND KITS ON THE COAXIAL CABLE CONNECTED TO THE COAX GROUND BARS. DO NOT INSTALL SEPARATE ANTENNA GROUND CONNECTIONS UNLESS SPECIFIED BY THE ANTENNA'S MANUFACTURER. THE GPS ANTENNAS) SHALL BE INSTALLED AND CONNECTED TO THE COAX GROUND BAR AT THE END OF THE WAVEGUIDE BRIDGE.
- ANTI-OXIDATION COMPOUND: ANTI-OXIDATION COMPOUND SHALL BE THOMAS AND BETTS KOPR-SHIELD (TM OF JET LUBE, INC.) OR BURNIDY PENETROX - E. ANTI-OXIDATION COMPOUND SHALL BE APPLIED BETWEEN LUG AND GROUND BAR ONLY. DO NOT COVER THE LUG.
- SERVICE DISCONNECT GROUNDING: IF THERE IS A SERVICE DISCONNECT SEPARATE FROM THE PPC MAIN CIRCUIT BREAKERS, THE NEUTRAL TO GROUND BOND SHALL BE MADE AT THE SERVICE DISCONNECT SWITCH LOCATED SEPARATELY AND ON THE SUPPLY SIDE OF THE PPC CABINET AND NO NEUTRAL TO GROUND CONNECTION SHOULD BE IN THE PPC. IT IS CRITICAL THAT ONLY ONE NEUTRAL TO GROUND BOND BE MADE AT THE SERVICE ENTRANCE EQUIPMENT AS DEFINED BY THE NATIONAL ELECTRICAL CODE.

8. **REPAIR AND TOWER APPURTENANCE INSTALLATION RELATED NOTES**

8.1 **COAXIAL CABLE REQUIREMENTS**

- GENERAL: PROVIDE ALL LABOR, EQUIPMENT, AND MATERIALS NECESSARY FOR RECEIVING, INSTALLING, TESTING, AND ADJUSTING ANTENNA CABLES FROM THE ANTENNA TO THE CONNECTIONS AT THE BASE TRANSMISSION SYSTEM (BTS). THIS SHALL INCLUDE ALL EQUIPMENT SHOWN OR REQUIRED FOR A COMPLETE OPERATING SYSTEM, ANTENNA, ANTENNA CABLES, CONNECTORS, AND FITTING SHALL BE THIRD PARTY FURNISHED COMPONENTS AS SHOWN ON THE BILL OF MATERIALS.

8.2 **INSTALLATION**

- COAXIAL CABLE LENGTHS SHALL BE FIELD MEASURED. INSTALLER SHALL NOTIFY CARRIER PRIOR TO PURCHASE OF CABLE OF THE OVERALL LENGTH REQUIRED.
- COAXIAL CABLE TYPE AND DIAMETER SHALL BE VERIFIED WITH CARRIER.
- COAXIAL CABLES SHALL BE LABELED IN ACCORDANCE WITH CARRIER ELECTRICAL MATERIALS AND METHODS SPECIFICATIONS. ALL MAIN CABLES WILL BE COLOR CODED AT FOUR LOCATIONS: A) AT ANTENNA PRIOR TO JUMPER, B) AT THE BOTTOM OF THE TOWER, C) EXTERIOR PART OF THE WAVE GUIDE ENTRY PORT (AT THE SHELTER/CABINET WALL), D) INTERIOR OF THE SHELTER/CABINET.
- INSTALL CONNECTORS TO COAXIAL CABLE AT BOTH ENDS (ANTENNA END AND BTS LOCATION).
- UPON SUCCESSFUL COMPLETION OF THE SWEEP TEST, THE CONTRACTOR SHALL PROVIDE A WEATHERTIGHT SEAL ON THE COAX CABLES AT THE ANTENNA CONNECTION ONLY.

F. **MINIMUM BENDING RADIUS FOR ALL ANTENNA CABLES SHALL BE AS SHOWN BELOW OR PER THE MANUFACTURER, WHICHEVER IS MORE CONSERVATIVE:**

CABLE	IN AIR OR CABLE TRAY	IN CONDUIT
	1/4"	1"
	1/2"	5"
	7/8"	10"
	1-5/8"	20"

3. CABLES SHALL BE INSTALLED WITH THE MINIMUM NUMBER OF BENDS. CABLE SHALL NOT BE LEFT UNTERMINATED IN THE FIELD.

4. **GROUNDING**

- GROUNDING KITS - AFTER INSTALLATION OF GROUND STRAPS, THE CONNECTIONS SHALL BE MADE WEATHER TIGHT USING WEATHERPROOF KITS AS IDENTIFIED. GROUND PIGTAILS SHALL BE BROUGHT OUT IN THE DOWNWARD DIRECTION FROM THE CONNECTION SHALL BE MADE TO GROUNDING SYSTEM.

8.2 **ANTENNA REQUIREMENTS**


- AZIMUTHS ARE ORIENTED CLOCKWISE FROM TRUE NORTH.
- CONTRACTOR SHALL VERIFY ANTENNA TYPE, AZIMUTHS, AND DOWN/TILT WITH THE CARRIER PRIOR TO CONSTRUCTION.
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