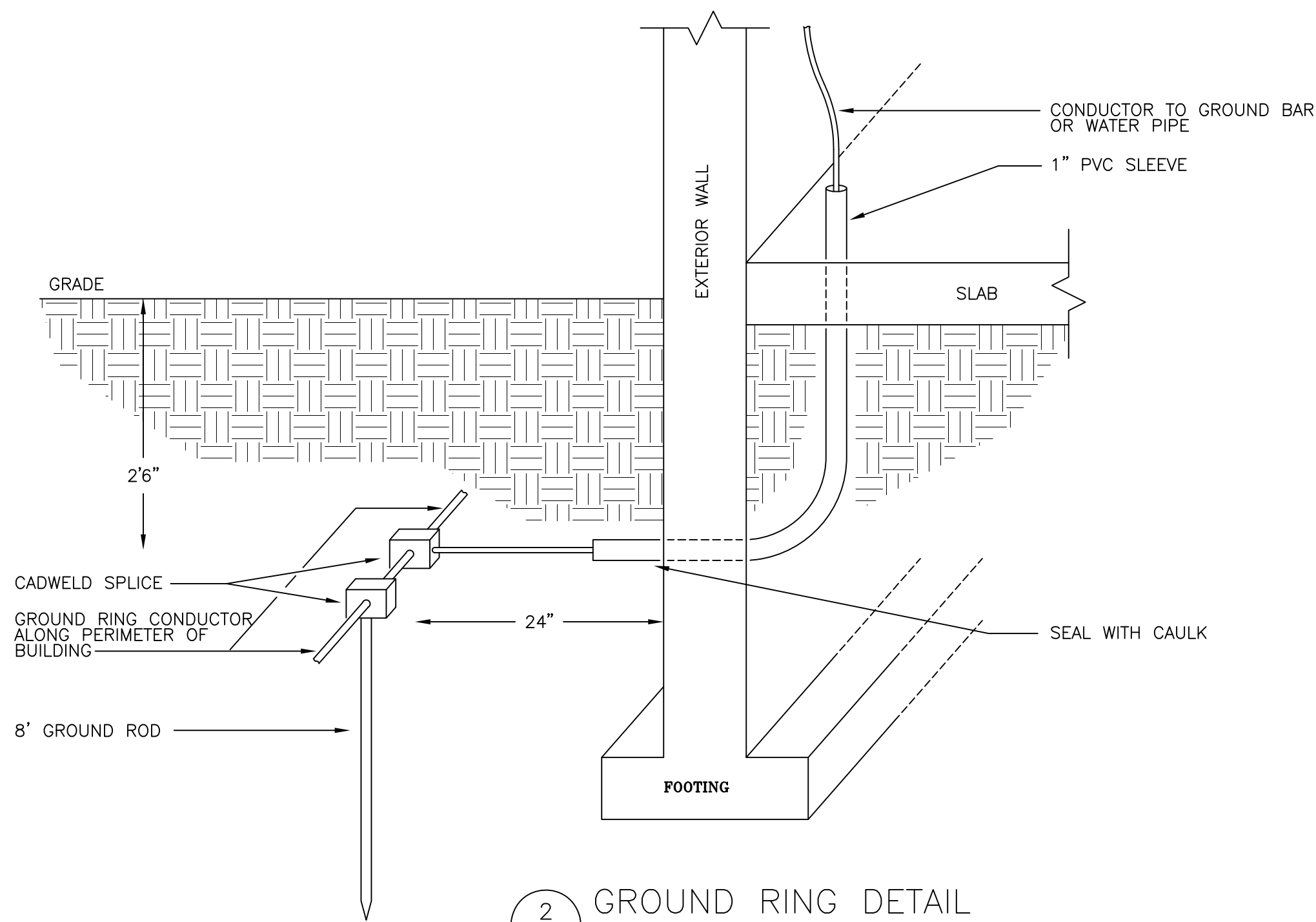
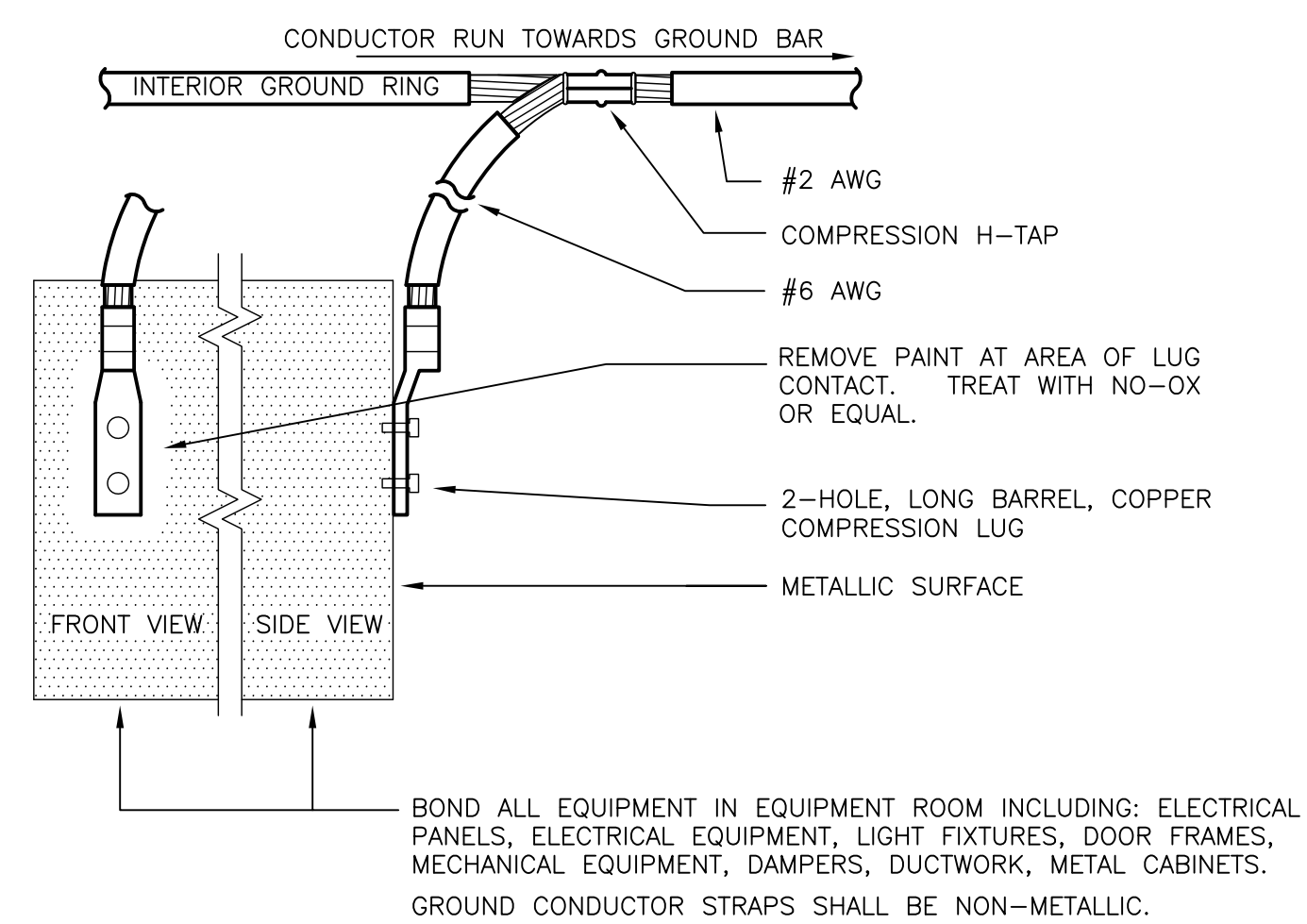


1 GROUND BAR DETAILS
E802 NOT TO SCALE



2 GROUND RING DETAIL
E802 NOT TO SCALE



3 INTERIOR GROUND LOOP DETAIL
E802 N.T.S.

GROUNDING NOTES:

- CADWELD ALL CONNECTIONS IN BURIED GROUNDING SYSTEM. CADWELD CONNECTIONS OF CONDUCTORS #2 AWG AND LARGER TO GROUND BARS. CADWELD ALL OUTDOOR CONNECTIONS. REFERENCES TO EXOTHERMIC WELDING OR CADWELD ON DRAWINGS SHALL IMPLY "CADWELD" BY ERICO PRODUCTS, INC. OR "THERMOWELD" BY BURNDY CORP.
- BURIED GROUNDING SYSTEM SHALL BE INSPECTED BY THE AT&T REPRESENTATIVE. NO BACK FILL SHALL BE PLACED OVER EXTERIOR GROUNDS UNTIL INSPECTED AND APPROVED.
- WHERE BURIED CONNECTION IS MADE BETWEEN DISSIMILAR METALS, SUCH AS CADWELD CONNECTION TO STEEL; THE CONNECTION SHALL BE COATED WITH A PLASTIC SEALER: "PERMAGUM", PRESTITE SEALANTS #578.2. ALL OTHER BURIED CONNECTIONS SHALL BE COMPLETELY COVERED WITH "KOPR-SHIELD" COMPOUND BY THOMAS & BETTS CO.
- CONNECTIONS OF CONDUCTORS TO THE BURIED EXTERNAL GROUND RING SHALL BE MADE AT DIFFERENT LOCATIONS THAN THE GROUND ROD CADWELDS.
- CONTRACTOR SHALL PROVIDE THE SERVICES OF AN INDEPENDENT, NETA CERTIFIED, ELECTRICAL TESTING FIRM FOR GROUND RESISTANCE TESTING. GROUND RESISTANCE SHALL BE LESS THAN 5 OHMS. CONTRACTOR SHALL SUPPLEMENT GROUND SYSTEM AS DIRECTED BY ENGINEER TO OBTAIN 5 OHMS RESISTANCE.
- ALL WORK SHALL BE IN ACCORDANCE WITH AT&T STANDARDS.
- PROVIDE 1" PVC SLEEVE FOR GROUND CONDUCTOR PASSING THROUGH WALLS. SEAL SLEEVE WITH CAULK AROUND GROUND WIRE.
- ALL CO GRD SYSTEM CONDUCTORS SHALL BE ROUTED ON AND SECURED TO: A CABLE RACK OR CABLE BRACKET CONTAINING ONLY GROUNDING CONDUCTORS THE SIDE OR BOTTOM OF IRONWORK DETAILS OR CABLE RACK CONTAINING OTHER CABLE TYPES, THE SURFACE OF CEILINGS, COLUMNS, OR PERMANENT WALLS. GROUNDING CONDUCTORS MAY BE PLACED ON THE SAME CABLE BRACKETS USED TO SUPPORT OTHER CABLES IF THE GROUNDING CONDUCTORS ARE SECURED TO THE SURFACE OF THE BRACKET OPPOSITE THAT USED TO SECURE THE OTHER CABLES. GROUNDING CONDUCTORS SHALL NOT OTHERWISE BE INTERMIXED WITH ANY OTHER TYPE WIRES OR CABLES.
- THE EXTERIOR SURFACE OF CONDUITS OR RACEWAYS CONTAINING AC POWER CONDUCTORS SHALL NOT BE USED TO SUPPORT CO GRD SYSTEM CONDUCTORS.
- WHEN GROUNDING CONDUCTORS ARE ROUTED ON THE SIDE OR BOTTOM OF CABLE RACKS OR OTHER IRONWORK, OR THE SURFACE OF CEILINGS, COLUMNS OR WALLS, THE CONDUCTORS SHALL BE SECURED AT AN INTERVAL OF 11 TO 12 INCHES. WHEN CABLE BRACKETS ARE USED FOR SUPPORT, THEY SHALL BE PLACED AT AN INTERVAL OF 18 TO 20 INCHES. THE GROUNDING CONDUCTOR MUST BE CONTINUOUSLY VISIBLE FROM THE FLOOR.
- WHEN A CABLE BRACKET OR OTHER SUPPORT DETAIL IS PLACED UNDER A HORIZONTALLY-RUN GROUNDING CONDUCTOR, THE CONDUCTOR SHALL BE SECURED TO EACH BRACKET OR SUPPORT DETAIL USING 9-PLY WAXED POLYESTER TWINE. GROUNDING CONDUCTORS UP TO AND INCLUDING #1/0 AWG MAY BE SECURED TO THE SIDES OF CABLE RACK STRINGERS, AUXILIARY FRAMING BARS, THREADED RODS AND OTHER IRONWORK DETAILS WITH 9-PLY WAXED POLYESTER TWINE.
- GROUNDING CONDUCTORS LARGER THAN #1/0 AWG SHALL BE SECURED TO THE SIDES OF CABLE RACK STRINGERS, AUXILIARY FRAMING BARS, THREADED RODS AND OTHER IRONWORK DETAILS WITH 9-PLY WAXED POLYESTER TWINE.
- GROUNDING CONDUCTORS SECURED TO THE UNDERSIDE OF CABLE RACKS SHALL BE SECURED TO ALTERNATE CROSS STRAPS WITH 9-PLY WAXED POLYESTER TWINE.
- UNLESS EXPRESSLY REQUIRED BY LOCAL CODE, CO GRD SYSTEM CONDUCTORS (OTHER THAN ACEG CONDUCTORS) SHALL NOT BE RUN IN METALLIC CONDUIT. IF A CO GRD SYSTEM CONDUCTOR IS PLACED IN A METALLIC CONDUIT, RACEWAY OR SLEEVE MORE THAN 3 FEET IN LENGTH, IT SHALL BE BONDED TO THE CONDUIT, RACEWAY OR SLEEVE AT EACH END WITH A MINIMUM #6 AWG CONDUCTOR. THE BOND SHALL BE PLACED BETWEEN EACH END OF THE METALLIC CONDUIT TO THE EXPOSED COPPER CONDUCTOR WHERE IT EMERGES FROM EACH END OF THE CONDUIT. IF LOCAL CODES DICTATE THAT A GROUNDING CONDUCTOR MUST BE RUN IN METAL CONDUIT OR RACEWAY, THEN THE CONDUIT OR RACEWAY MUST BE BONDED TO THE CONDUCTOR AT BOTH ENDS WITH A NO. 6 AWG STRANDED CONDUCTOR, H-TAPPED TO THE CONDUCTOR AND CONNECTED TO THE CONDUIT WITH A BONDING DEVICE LISTED FOR THE PURPOSE.
- WHEN METAL CLAMPS ARE USED TO SUPPORT OR SECURE CO GRD CONDUCTORS, THEY SHOULD NOT COMPLETELY ENCIRCLE THE CONDUCTOR. THE METALLIC CONTINUITY SHOULD BE INTERRUPTED BY NON-METALLIC HARDWARE, A CABLE TIE OR 9-PLY WAXED POLYESTER TWINE.
- THE PHRASE COMPLETELY ENCIRCLE APPLIES PRIMARILY TO FERROUS METAL CABLE CLAMPS. IT DOES NOT APPLY TO AN OPENING OR RING FORMED BY A COMBINATION OF INTERCONNECTED METALLIC OBJECTS SUCH AS CABLE RACKS, AUXILIARY FRAMING, THREADED RODS, FIRE STOP COLLARS ETC., UNLESS THE LENGTH (L) OF THIS OPENING IS MORE THAN 3 TIMES ITS DIAMETER (d). EXAMPLES OF OPENINGS THAT DO NOT CREATE COMPLETE ENCIRCLEMENT OF A GROUNDING CONDUCTOR ARE:
 - WHERE THE CONDUCTOR IS ROUTED THROUGH A METAL HOLE COVER INSTEAD OF A FLOOR SLEEVE (L IS TYPICALLY < 1/4", d IS TYPICALLY > 1-1/2")
 - WHERE THE CONDUCTOR IS ON A CABLE RACK AND PASSES THROUGH THE OPENING FORMED BY THE CABLE RACK'S STRINGERS AND STRAPS (L IS TYPICALLY < 3", d IS TYPICALLY > 18")
 - WHERE THE CONDUCTOR PASSES THROUGH AN INTERIOR WALL CONSTRUCTED WITH SHEET METAL STUDS (L IS TYPICALLY < 8", d IS TYPICALLY > 48")
 - ARRANGEMENTS SIMILAR TO (A) THROUGH (C) ABOVE.
- BENDS IN CO GRD SYSTEM CONDUCTORS SHOULD BE MADE WITH A MINIMUM RADIUS OF 12 INCHES. IF THE 12-INCH OBJECTIVE CANNOT BE MET, THE MANUFACTURERS MINIMUM BEND RADIUS OF 5 TIMES THE CABLE DIAMETER SHALL BE MET.
- GROUNDING CONDUCTOR CONNECTIONS SHALL BE MADE SO THAT CONDUCTORS ARE DRESSED IN THE DIRECTION OF THE MAIN GROUND REFERENCE WHENEVER POSSIBLE. INCREASED CONDUCTOR LENGTH AND BENDING RADIUS ARE MORE IMPORTANT CONSIDERATIONS THAN THE DIRECTION OF CONNECTION. THE DIRECTION OF THE BEND SHALL BE MADE FOR EASE OF INSTALLATION AND TO MAINTAIN AN ACCEPTABLE BENDING RADIUS.
- UNPLATED METALLIC SURFACES SHALL BE PREPARED TO A BARE, BRIGHT FINISH BEFORE JOINING. A THIN LAYER OF CORROSION PREVENTIVE COMPOUND SUCH AS NO-OX-ID "A" (ELECTRICALLY CONDUCTIVE) SHALL BE APPLIED TO THE UNPLATED SURFACE. IF A CONNECTOR IS TO BE SECURED DIRECTLY TO A PAINTED SURFACE, THE PAINT SHALL BE REMOVED TO REVEAL BARE METAL COMPLETELY AROUND THE AREA OF THE COMPLETED CONNECTION AND A THIN LAYER OF A CORROSION PREVENTIVE COMPOUND SUCH AS NO-OX-ID "A" SHALL BE APPLIED TO THE BARE METAL SURFACE.
- BOLTS, NUTS, SCREWS, THREADED PRESSURE DEVICES, RACEWAY FITTINGS AND EVERY GROUND SYSTEM CONNECTING OR SECURING DEVICE SHALL BE FREE FROM CORROSION, PROPERLY ASSEMBLED, CORRECTLY TIGHTENED AND ACCESSIBLE FOR INSPECTION. TWO GROUNDING CONNECTORS MAY BE SECURED ON OPPOSITE SIDES OF A BUSBAR BY THE SAME FASTENERS UNDER ONE OR THE OTHER OF THE FOLLOWING CONDITIONS:
 - THE EQUIPMENT SERVED BY BOTH CONDUCTORS WILL BE COMPLETELY DE-POWERED BEFORE THE SECURING HARDWARE IS LOOSENEED (E.G. CONNECTIONS AT A BUS BAR OR AN EQUIPMENT ENCLOSURE)
 - A SUFFICIENT LENGTH OF THE CONDUCTOR THAT WILL NOT BE PERMANENTLY DISCONNECTED IS BOTH AVAILABLE AND ACCESSIBLE TO ATTACH A TEMPORARY BOND AROUND THE SECURING HARDWARE (E.G. CONNECTIONS AT A CO GRD OR OTHER BUS BAR).

- CERTAIN CO GRD SYSTEM CONDUCTORS SHALL BE EQUIPPED WITH AN APPROVED IDENTIFICATION TAG WITH THE PHRASE: "DO NOT DISCONNECT" STENCILED ON IT OR STAMPED INTO IT. THE LETTERS SHALL BE 3/16" MINIMUM. THE FOLLOWING CONDUCTORS SHALL ALWAYS BE EQUIPPED WITH THIS TAG:
 - CONDUCTORS FROM EARTH ELECTRODES
 - GROUNDING CONDUCTORS AT A WATER PIPE OR GAS PIPE
 - GROUNDING ELECTRODE CONDUCTORS FROM A HOUSE SERVICE PANEL OR OTHER SOURCE OF A SEPARATELY DERIVED SYSTEM (E.G., UPS, TRANSFORMER, ETC)
 - VERTICAL AND HORIZONTAL EQUALIZER CONNECTIONS TO A BUS BAR
 - BOTH ENDS OF A DC POWER PLANT GROUNDING CONDUCTOR
 - BOTH ENDS OF A GROUNDING CONDUCTOR BETWEEN THE PROTECTOR FRAME AND OPGP/COG
 - BOTH ENDS OF THE CONDUCTOR BETWEEN THE CEF AND OPGP

LIGHTNING PROTECTION NOTES:

- LIGHTNING PROTECTION CONTRACTOR SHALL BE A FIRM HAVING A MINIMUM OF 15 YEARS EXPERIENCE. THE SYSTEM SHALL BE INSTALLED BY A LIGHTNING PROTECTION CONTRACTOR WHO IS LISTED BY UNDERWRITERS LABORATORIES, INC. THE INSTALLATION COMPANY SHALL UTILIZE LIGHTNING PROTECTION INSTITUTE CERTIFIED MASTER INSTALLERS. THE FOLLOWING COMPANIES ARE APPROVED:
 - NORTHEAST LIGHTNING PROTECTION, BLOOMFIELD, CT
 - EAST COAST LIGHTNING PROTECTION EQUIPMENT, WINSTED, CT
 - ADVANCED LIGHTNING TECHNOLOGIES, ARGYLE, TX
- PROVIDE AND INSTALL A COMPLETE LIGHTNING PROTECTION SYSTEM IN COMPLIANCE WITH THE SPECIFICATIONS AND STANDARDS OF THE MOST CURRENT EDITIONS OF THE NATIONAL FIRE PROTECTION ASSOCIATION'S LIGHTNING PROTECTION STANDARD NFPA-780, AND UNDERWRITERS LABORATORIES LIGHTNING PROTECTION STANDARD UL96-A.
- PROVIDE LONGER AIR TERMINALS AS REQUIRED FOR TIP HEIGHT TO BE 10" ABOVE SURROUNDING STRUCTURE.
- CABLE STRAPS SHALL BE NON-FERROUS, COPPER. CABLE CONNECTORS SHALL BE MECHANICAL BOLTED TYPE MEETING CLASS 2 REQUIREMENTS.
- LIGHTNING PROTECTION EQUIPMENT INCLUDING CONDUCTORS, AIR TERMINALS, BASES, AND CABLE STRAPS SHALL BE PROVIDED BY ONE OF THE FOLLOWING VENDORS:
 - HARGER LIGHTNING PROTECTION.
 - THOMPSON LIGHTNING PROTECTION.
 - A-C LIGHTNING SECURITY.
- COORDINATE LOCATION OF AIR TERMINALS AND CONDUCTORS WITH OTHER TRADES AND OWNER. MAINTAIN ACCESS TO EQUIPMENT SUCH AS LOAD BANKS AND COOLING TOWERS.
- AIR TERMINALS ALONG RIDGES AND AROUND THE PERIMETER SHALL HAVE BLUNT POINTS. AIR TERMINALS ON FLAT ROOF AREAS SHALL HAVE SPRING-LOADED BASES AND SAFETY CABLE.
- BOND ALL MISCELLANEOUS METAL COMPONENTS REQUIRED BY NFPA 780, INCLUDING BUT NOT LIMITED TO MECHANICAL EQUIPMENT, VENTS AND STACKS, LADDERS, PIPES, CONDUITS, FLASHING, LOUVERS, DOOR FRAMES, AND ROOF DRAINS.
- FITTINGS FOR CABLES MAY BE BOLTED CLAMP OR COMPRESSION CONNECTORS. CRIMP, OR PRESSURE, FITTINGS ARE NOT ACCEPTABLE.
- CONTRACTOR SHALL PREPARE A CONSTRUCTION DRAWING BASED ON FIELD MEASUREMENTS TO SHOW ALL CONDUCTORS, BONDING, AND AIR TERMINALS. THIS DRAWING TO BE USED FOR COORDINATION WITH OTHER TRADES.

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2015.01.083

REVISIONS / AUTHORIZATIONS		
NO.	REVISIONS / AUTHORIZATIONS	DATE
BID SET		08/30/17

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DRAWINGS PREPARED FOR
AT&T CORPORATE REAL ESTATE

PROJECT TITLE:
TELECOMMUNICATIONS HUT
UNION STATION PLAZA
240-280 SAINT JOHN ST
PORTLAND

PTLFME01	Archoid	AAB7WJ
SHEET TITLE: ELECTRICAL GROUNDING DETAILS		
AT&T PROJECT NUMBER: E15823	DATE: 08/30/2017	SCALE: AS NOTED
DRAWN BY: JAP	CHECKED BY: SJM	
AT&T AUTHORIZATION: GREGG MIRANDO	SHEET: 11 OF: 15 SHEETS	SHEET NO. E802

CONSTRUCTION DOCUMENT SUBMISSION (BID SET)