

1. GENERAL CONDITIONS:

1.1 SCOPE OF WORK

- 1.1.1 THE SCOPE OF WORK FOR THIS PROJECT IS DEFINED BY THIS SPECIFICATION AND THE DRAWING SET ATTACHED TO THE PROJECT BID DOCUMENTS. SCOPE, TERMS AND BID FORM. SECTION 2 OF THIS DOCUMENT DESCRIBES EQUIPMENT REQUIREMENTS AND SECTION 3 DESCRIBES INSTALLATION EXECUTION REQUIREMENTS. EQUIPMENT DRAWINGS AND INSTALLATION GUIDES FOR EQUIPMENT PROVIDED BY NEXAMP ARE ATTACHED TO THE BID FORM.
- 1.1.2 THIS PROJECT COVERS THE INSTALLATION OF A PHOTOVOLTAIC (PV) SYSTEM AND/OR BATTERY ENERGY STORAGE SYSTEM.
- 1.1.3 THIS PV SYSTEM SHALL BE INTERACTIVE WITH THE ELECTRICAL DISTRIBUTION SYSTEM OF THE LOCAL UTILITY SERVICE PROVIDER.
- 1.1.4 PERMISSION TO OPERATE THE SYSTEM IS NOT GRANTED UNTIL THE SYSTEM HAS BEEN INSPECTED AND APPROVED BY NEXAMP, THE APPROPRIATE ELECTRICAL INSPECTOR, AND LOCAL UTILITY SERVICE PROVIDER PERSONNEL.
- 1.1.5 THE INSTALLATION CONSISTS OF A SOLAR ARRAY, INVERTER(S), METERING EQUIPMENT AND ASSOCIATED EQUIPMENT REQUIRED TO INTERCONNECT THE SYSTEM TO THE LOCAL UTILITY.
- 1.1.6 PLANNING AND INSTALLATION PRACTICES SHALL COMPLY WITH THE INTERNATIONAL BUILDING CODE, NATIONAL ELECTRICAL CODE, ALL APPLICABLE LOCAL CODES AND LOCAL UTILITY REQUIREMENTS, AND INSTRUCTIONS PROVIDED IN EQUIPMENT INSTALLATION DOCUMENTATION.
- 1.1.7 ALL ELECTRICAL WORK IS TO BE COMPLETED BY A QUALIFIED, LICENSED ELECTRICIAN AND APPRENTICES WORKING UNDER THE DIRECT SUPERVISION OF THE LICENSED ELECTRICIAN.
- 1.1.8 INSTALLATION SHALL BE COMPLETED IN A NEAT AND WORKMANLIKE MANNER.

1.2 QUALITY ASSURANCE

- 1.2.1 REFERENCE STANDARDS: ELECTRICAL MATERIAL AND EQUIPMENT SHALL CONFORM IN ALL RESPECTS TO THE LATEST APPROVED STANDARDS OF THE FOLLOWING, WHERE THE STANDARDS ARE APPLICABLE:
1. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA).
 2. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI).
 3. INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE).
 4. INSULATED CABLE ENGINEERS ASSOCIATION (ICEA).
 5. NATIONAL ELECTRICAL CODE (NEC).
 6. NATIONAL ELECTRICAL SAFETY CODE (NESC).
 7. ASTM A 48, GRAY IRON CASTINGS.
 8. ANSI A14.3, SAFETY REQUIREMENTS FOR FIXED LADDERS.
 9. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).

1.3 SHOP DRAWINGS

- 1.3.1 CONTRACTOR SHALL SUBMIT DETAILS OF SYSTEMS AND EQUIPMENT TO NEXAMP FOR REVIEW WITHIN FIVE DAYS AFTER AWARD OF CONTRACT. CONTRACTOR SHALL SUBMIT CONSOLIDATED ELECTRONIC COPIES CONTAINING ONE COPY EACH OF MANUFACTURER DATA SHEETS AND SHOP DRAWINGS. MANUFACTURER CUT SHEETS WITH MULTIPLE CHOICES SHALL BE CLEARLY FLAGGED TO INDICATE THE CATALOG NUMBERS FOR ITEMS SUBMITTED. IF CUT SHEETS ARE PROVIDED WITHOUT INDICATING ARROWS THEY WILL BE RETURNED WITHOUT A REVIEW. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO INSTALL ALL EQUIPMENT AND MATERIAL AS IT IS LISTED IN THE MANUFACTURER'S CUT SHEETS. ALL NEXAMP (OR THIRD PARTY) REVIEW COMMENTS SHALL REQUIRE A RESPONSE BACK FROM THE SUBCONTRACTOR BEFORE A SUBMITTAL IS CONSIDERED APPROVED.
- 1.3.2 SHOP DRAWINGS SHALL INCLUDE, BUT NOT LIMITED TO:
1. UNISTRUT
 2. FASTENERS/HARDWARE
 3. GROUNDING LUGS
 4. CABLE SUPPORTS, ZIP TIES, and CLIPS
 5. DUCT SEAL (SUITABLE FOR EXTERIOR USE)
 6. DISCONNECT SWITCHES
 7. FUSES
 8. CONDUITS AND RACEWAYS
 9. CONDUIT BUSHINGS/LOCKNUTS
 10. CONDUIT FITTINGS (COUPLINGS, CONNECTORS, CLIPS, ETC.)
 11. CONDUIT EXPANSION FITTINGS
 12. CONDUIT SUPPORTS
 13. WIRE AND CABLE
 14. HANDHOLES/MANHOLES
 15. ENCLOSURES (PULLBOXES, JUNCTION BOXES, ETC.)
 16. WIREWAYS
 17. ADHESIVES
 18. WATERPROOF CONDUIT SEALS
 19. POLYWATER FST-250 FOAM SEALANT
 20. POLYWATER INSTAGROUT
 21. POTENTIAL TRANSFORMERS/CURRENT TRANSFORMERS
 22. CT CABINETS
 23. UNDERGROUND WARNING TAPE MAGNETIC TYPE
 24. FIREPROOFING
 25. MEDIUM VOLTAGE EQUIPMENT
 26. PV MODULE WIRING CONNECTORS
 27. SURGE ARRESTERS
 28. MARKEL PAINT MARKER COLOR RED
 29. BRADY WM-A-Z CABLE AND WIRE MARKERS OR APPROVED EQUAL
 30. ANY ADDITIONAL COMPONENTS CALLED OUT ON THE DRAWINGS WHICH MAY NOT BE COVERED ABOVE.

2. PRODUCTS:

2.1 GENERAL

- 2.1.1 PROVIDE MATERIALS AND EQUIPMENT NECESSARY TO MAKE INSTALLATION COMPLETE IN EVERY DETAIL UNDER THIS CONTRACT WHETHER OR NOT SPECIFICALLY SHOWN ON CONSTRUCTION DRAWINGS OR SPECIFIED HEREIN. MATERIALS AND EQUIPMENT SHALL BE NEW.
- 2.1.2 ALL ELECTRICAL COMPONENTS AND MATERIALS USED IN THIS SYSTEM SHALL BE NEW AND UL LISTED FOR ITS PURPOSE.
- 2.1.3 ALL DC EQUIPMENT AND COMPONENTS ASSOCIATED WITH MODULES AND INVERTERS SHALL BE UL LISTED FOR EITHER 600 VOLTS DC, 1000 VOLTS DC, OR 1500 VOLTS DC MINIMUM, AS REQUIRED BY SYSTEM VOLTAGE.
- 2.1.4 INTENT OF SPECIFICATIONS IS THAT ONE MANUFACTURER, NOT COMBINATION, IS SELECTED FOR PARTICULAR CLASSIFICATION OF MATERIAL. FOR EXAMPLE, WIRE OF ONE MANUFACTURER, WIRE LUGS OF ONE MANUFACTURER, ETC. NEXAMP MAY GIVE SPECIFIC EXEMPTION FROM THIS REQUIREMENT.

2.2 LOW VOLTAGE WIRE AND CABLE

- 2.2.1 PROVIDE WIRE AND CABLES AND ASSOCIATED CONNECTORS, SPLICES, AND TERMINATIONS FOR RATED VOLTAGES AS INDICATED ON CONSTRUCTION DRAWINGS. WIRE AND CABLE SHALL BE AS MANUFACTURED BY AMERICAN INSULATED WIRE CORPORATION, GENERAL CABLE CORPORATION, SOUTH WIRE COMPANY, SENATOR WIRE AND CABLE COMPANY, OKONITE, PIRELLI, ALCAN, OR APPROVED EQUAL.
- 2.2.2 PROVIDE CONDUCTORS AND SPLICES OF SIZE, AMPACITY RATING, MATERIAL, TYPE, AND CLASS FOR APPLICATION AND SERVICE INDICATED.
- 2.2.3 CONDUCTOR MATERIAL SHALL BE SOFT DRAWN COPPER, UNLESS OTHERWISE NOTED ON CONSTRUCTION DRAWINGS. WIRE SIZE #12 AWG AND LARGER SHALL BE CLASS B STRANDED, AND CLASS C STRANDED FOR TRACKER SYSTEMS WHERE REQUIRED BY NATIONAL ELECTRICAL CODE.
- 2.2.4 SINGLE CONDUCTOR INSULATION SHALL BE TYPE THHN/THWN-2, XHHW-2, OR PV RATED WIRE.
- 2.2.5 EXPOSED CONDUCTORS FOR MODULE WIRING SHALL BE PV RATED WIRE.
- 2.2.6 CONDUCTORS INSTALLED IN CONDUIT EXPOSED TO SUNLIGHT ON ROOFTOP INSTALLATIONS SHALL BE XHHW-2 OR PV WIRE.
- 2.2.7 SERVICE ENTRANCE CONDUCTORS IN CONDUIT SHALL BE THHN/THWN-2 OR XHHW-2.
- 2.2.8 DIRECT BURIED CABLE SHALL HAVE JACKET RATED FOR DIRECT BURIAL.
- 2.2.9 METAL CLAD CABLE FOR DIRECT BURIAL SHALL BE ALCAN STABILLOY TYPE MC CABLE WITH PVC JACKET, XHHW-2 OR RHW-2, RATED FOR DIRECT BURIAL.
- 2.2.10 INSTRUMENT WIRE FOR DAS COMMUNICATIONS: RS-485 CABLE SHALL BE BELDEN 3106A OR EQUIVALENT. CAT5 CABLE SHALL BE 7919A OR EQUIVALENT. CAT6 CABLE SHALL BE SHIELDED (BELDEN 7953A OR EQUIVALENT). FIBER OPTIC CABLE SHALL BE USED FOR EXCESSIVELY LONG RUNS, WHEN INDICATED ON CONSTRUCTION DRAWINGS.
- 2.2.11 CONNECTORS SHALL BE OF THE LOCKING TYPE, APPROVED FOR USE WITH SPECIFIED MODULE.
- 2.2.12 ALUMINUM CABLE SHALL BE COMPACT AA 8000 CONDUCTORS.
- 2.2.13 #2 AWG IS THE MINIMUM WIRE SIZE TO BE USED FOR ALUMINUM PHASE CONDUCTORS, #4 AWG IS THE MINIMUM SIZE FOR ALUMINUM GROUND WIRES

2.3 MEDIUM VOLTAGE CABLE

- 2.3.1 CABLE SHALL BE SUITABLE FOR ENVIRONMENT AND VOLTAGE INSULATION LEVEL, AS INDICATED ON CONSTRUCTION DRAWINGS.
- 2.3.2 MEDIUM VOLTAGE CABLE TO BE MV 105 °C, JCN, (AT LEAST 1/3 NEUTRAL),133%, OR AS SPECIFIED IN THE CONTRACT DRAWINGS.

2.4 RACEWAYS

- 2.4.1 RIGID STEEL CONDUIT SHALL BE HOT-DIPPED GALVANIZED STEEL CONFIRMING TO ANSI C80.1 AND UL 6. CONDUIT SHALL BE AS MANUFACTURED BY ALLIED TUBE AND CONDUIT CO., WHEATLAND TUBE CO., LTV STEEL TUBULAR CO., OR APPROVED EQUAL.
- 2.4.2 INTERMEDIATE METAL CONDUIT SHALL BE HOT-DIPPED GALVANIZED STEEL CONFORMING TO ANSI C80.6 AND UL 1242. CONDUIT SHALL BE AS MANUFACTURED BY ALLIED TUBE AND CONDUIT CORP., WHEATLAND TUBE CO., LTV STEEL TUBULAR PRODUCTS CO. OR APPROVED EQUAL.
- 2.4.3 ELECTRIC METALLIC TUBING SHALL BE GALVANIZED STEEL CONFORMING TO ANSI C80.3 AND UL 797. TUBING SHALL BE AS MANUFACTURED BY PYLE NATIONAL, ALLIED TUBE AND CONDUIT CORP., WHEATLAND TUBE COMPANY, OR APPROVED EQUAL.
- 2.4.4 PLASTIC CONDUIT SHALL BE EITHER SCHEDULE 40 OR SCHEDULE 80 PVC 90°C AS INDICATED ON CONSTRUCTION DRAWINGS. UV RATED, PLASTIC CONDUIT SHALL BE AS MANUFACTURED BY CARLON ELECTRICAL PRODUCTS CO., ALLIED TUBE AND CONDUIT COMPANY, TRIANGLE COMPANY OR APPROVED EQUAL.
- 2.4.5 FLEXIBLE METAL CONDUIT SHALL BE GALVANIZED STEEL, LIQUID-TIGHT FLEXIBLE METAL CONDUIT SHALL BE SIMILAR, BUT WITH EXTRUDED MOISTURE AND OIL-PROOF OUTER JACKET OF POLYVINYL CHLORIDE PLASTIC.
- 2.4.6 RIGID AND INTERMEDIATE CONDUIT FITTINGS, COUPLINGS, AND CONNECTORS SHALL BE THREADED AND GALVANIZED. COMPRESSION TYPE FITTINGS, COUPLINGS, AND CONNECTORS SHALL NOT BE PERMITTED.
- 2.4.7 INDOOR COUPLINGS AND CONNECTORS FOR ELECTRIC METALLIC TUBING SHALL BE STEEL SET-SCREW. OUTDOOR COUPLINGS AND CONNECTORS FOR ELECTRIC METALLIC TUBING SHALL BE COMPRESSION TIGHT FITTINGS - RAIN TIGHT.
- 2.4.8 STEEL SUPPORT RODS OR SUPPORT BOLTS FOR CONDUITS SHALL BE 1/8 INCH DIAMETER FOR EACH INCH OR FRACTION THEREOF OF DIAMETER OF CONDUIT SIZE, BUT NO ROD OR BOLT SHALL BE LESS THAN 1/4 INCH IN DIAMETER. SUPPORT RODS FOR STEEL CHANNEL SHALL NOT BE LESS THAN 5/ 8 INCH IN DIAMETER.
- 2.4.9 ROOF EQUIPMENT SUPPORTS SHALL BE DURABLOCK DB10/DB20, OR APPROVED EQUAL.
- 2.4.10 EXPANSION FITTINGS FOR UP TO 2 INCH MOVEMENT IN EITHER DIRECTION, SHALL BE OZ GEDNEY TYPE 'TX' FOR EMT AND TYPE 'AX' FOR IMC/RMC, OR BY APPLETON, CROUSE-HINDS OR APPROVED EQUAL.
- 2.4.11 WATERPROOF CONDUIT SEALS FOR RMC/IMC ENTRY SHALL BE COMPRISED OF MALLEABLE IRON SEAL WITH GLAND ASSEMBLY AND ADJUSTABLE PRESSURE RINGS AND NEOPRENE SEALING GROMMETS, OZ GEDNEY OR APPROVED EQUAL, TYPE WSK FOR POURED CONCRETE WALLS AND TYPE FSK FOR FLOORS. FOR CORED WALLS AND FLOORS, PROVIDE PVC COATED STEEL DISCS, NEOPRENE SEALING RING AND STAINLESS STEEL SCREWS AND WASHERS, OZ GEDNEY TYPE CSML OR APPROVED EQUAL.
- 2.4.12 MYERS HUBS SHALL BE BY ARLINGTON INDUSTRIES OR APPROVED EQUAL.
- 2.4.13 CONDUIT SUPPORTS SHALL BE GALVANIZED MINERALLAC TYPE, GALVANIZED STEEL OR APPROVED PVC FOR USE ON PVC CONDUIT.
- 2.4.14 WIRE TERMINATIONS FOR ARRAY DC WIRING SHALL BE COMPATIBLE WITH THE MANUFACTURER SPECIFIED CONNECTORS ON THE PV MODULES. TERMINATIONS SHALL REQUIRE A SPECIAL TOOL TO OPEN IN ORDER TO PREVENT OPENING THE CONNECTION ACCIDENTALLY WHILE UNDER LOAD.

2.5 ENCLOSURES, PULL BOXES, WIREWAYS AND CHANNELS

- 2.5.1 ENCLOSURES, PULL BOXES, CONDUIT BODIES, AND WIREWAYS SHALL BE CODE GAUGE GALVANIZED STEEL WITH SCREW COVERS TO MATCH. NEMA 3R FOR OUTDOOR USE ON VERTICAL SURFACES, NEMA 4 FOR OUTDOOR USE ON HORIZONTAL SURFACES, AND NEMA 1, PAINTED STEEL FOR INDOOR USE.
- 2.5.2 ALUMINUM, PLATED GALVANIZED STEEL, AND HOT DIPPED GALVANIZED STEEL CHANNEL SUPPORTS SHALL BE MINIMUM 1-5/8 INCH MILD STRIP STEEL WITH MINIMUM 12 GAUGE WALL THICKNESS, UNISTRUT, B-LINE, OR APPROVED EQUAL. LOADINGS SHALL BE PER MANUFACTURER RECOMMENDATIONS.

2.6 DISCONNECTS

- 2.6.1 PROVIDE DISCONNECT SWITCHES FUSED OR UNFUSED AS SHOWN ON CONSTRUCTION DRAWINGS. SWITCHES SHALL BE TYPE HD SAFETY SWITCHES, RATED FOR MAXIMUM SYSTEM VOLTAGE, FOR HEAVY DUTY WITH INTERLOCKING COVER, SIDE OPERATED WITH LOCKABLE HANDLE. SWITCH ENCLOSURE SHALL BE NEMA LISTED FOR LOCATION AND ATMOSPHERE IN WHICH THEY ARE MOUNTED. SWITCHES SHALL BE LISTED FOR AC OR DC USE, AS APPLICABLE TO THE SYSTEM IN WHICH THEY ARE INSTALLED.
- 2.6.2 DISCONNECT SWITCHES SHALL BE AS MANUFACTURED BY ONE OF FOLLOWING: GENERAL ELECTRIC, EATON (CUTLER-HAMMER), SQUARE D CO., SIEMENS OR APPROVED EQUAL.

2.7 FUSES

- 2.7.1 FUSES ARE TO BE LISTED FOR THEIR USE.
- 2.7.2 FUSES SHALL BE FURNISHED WITH ALL FUSED DISCONNECTS.
- 2.7.3 PROVIDE UL FUSE REDUCERS WHERE APPLICABLE OR AS INDICATED ON CONSTRUCTION DRAWINGS.
- 2.7.4 PROVIDE CURRENT LIMITING, NON-RENEWABLE FUSES, BUSSMANN, FERRAZ-SHAMWUT OR APPROVED EQUAL, UL CLASS R UP TO 600 AMP, AND CLASS L OVER 600 AMP.
- 2.7.5 LOW VOLTAGE AC FUSES SHALL BE RATED 600V OR LESS AC, UL LISTED, AND HAVE MINIMUM INTERRUPTING RATINGS OF 200,000 RMS AMPERES WITH PEAK LET-THROUGH CURRENT AND MAXIMUM CLEARING VALUES WITHIN PRESCRIBED UL LIMITS UNLESS OTHERWISE APPROVED BY NEXAMP ENGINEERING.

2.8 GROUNDING

- 2.8.1 ALL GROUNDING LUGS SHALL BE UL LISTED AND APPROVED FOR USE AS SPECIFIED BY MODULE AND MOUNTING MANUFACTURERS.
- 2.8.2 PROVIDE GROUNDING COMPONENTS THAT PREVENT THE CONTACTING OF DISSIMILAR METALS AND ARE SUITABLE FOR THE ENVIRONMENT.
- 2.8.3 PROVIDE COPPER GROUND RODS AND APPROVED UL LISTED CONNECTIONS. UNDERGROUND CONNECTIONS SHALL BE COMPRESSION FITTINGS LISTED FOR UNDERGROUND USAGE OR EXOTHERMIC WELD TYPE.
- 2.8.4 PROVIDE UL LISTED IRREVERSIBLE PRESSURE CONNECTIONS, BURNDY, ILSCO, T&B, OR APPROVED EQUAL.
- 2.8.5 PROVIDE GROUNDING CONDUCTORS AS INDICATED ON CONSTRUCTION DRAWINGS.

2.9 UTILITY METER SOCKET

- 2.9.1 PROVIDE UL LISTED METERING EQUIPMENT AS REQUIRED BY UTILITY.

2.10 ELECTRICAL MANHOLES

- 2.10.1 MANHOLES SHALL CONFORM TO THE REQUIREMENTS LISTED BELOW AND/OR DETAILED ON THE CONSTRUCTION DRAWINGS.
- 2.10.2 MATERIAL AND CONSTRUCTION:
1. PRE-CAST REINFORCED CONCRETE
 2. MINIMUM INTERIOR DIMENSIONS AS INDICATED ON THE DRAWINGS OR REQUIRED BY THE UTILITY COMPANY.
 3. DUCT ENTRANCES SIZED AND LOCATED TO SUIT DUCT BANKS. DUCT-BANK PENETRATION SHALL BE WATERTIGHT.
 4. MODULAR SECTIONS WITH TONGUE-AND-GROOVE JOINTS. JOINTS SHALL BE GASKETED AND WATER TIGHT.
 5. NOMINAL INSIDE DIMENSIONS AS SHOWN.
 6. BASE SECTION: SHALL INCLUDE SUMP AND GRATE AND GROUND ROD OPENINGS
 7. SUMP COVERS; ASTM A48; CLASS 30B GALVANIZED.
- 2.10.3 FRAMES AND COVERS:
1. MATERIAL SHALL BE CAST IRON CONFORMING TO ASTM A 48, CLASS 30A.
 2. COVERS SHALL BE 42" MINIMUM DIAMETER, WATERTIGHT, SEALED TYPE MARKED "ELECTRICAL" IN RAISED TWO INCH LETTERS.
 3. FRAME SHALL BE GROUTED ON THE MANHOLE.
 4. PROVIDE FRAMES AND COVERS OF ONE OF THE FOLLOWING:
 - a. NEENAH FOUNDRY COMPANY.
 - b. FLOCKHART FOUNDRY COMPANY.
 - c. CAMPBELL FOUNDRY COMPANY.
 - d. APPROVED EQUAL.
- 2.10.4 PULLING IRONS:
1. MATERIAL SHALL BE GALVANIZED STEEL.
 2. CAST IN THE WALL OPPOSITE TO THE CENTERLINE OF EACH INCOMING DUCT BANK AND 12 INCHES BELOW CENTERLINE OF BOTTOM LINE OF DUCTS.
 3. PRODUCT AND MANUFACTURER SHALL BE ONE OF THE FOLLOWING:
 - a. CAT. NO. DU273 BY MCGRAW EDISON COMPANY.
 - b. CAT. NO. 8119 BY A.B. CHANCE COMPANY.
 - c. APPROVED EQUAL.
- 2.10.5 CABLE RACKS:
1. CABLE RACKS SHALL ADEQUATELY SUPPORT CABLES WITH SPACE ALLOWED FOR FUTURE CABLES. PROVIDE AS INDICATED TO SUPPORT MOUNTING CHANNELS AND RACKS. CAST-IN PLACE ANCHORS WITH MINIMUM RATED PULLOUT WORKING CAPACITY OF 2000 POUNDS. PENNSYLVANIA INSERT CORP. 5/8-11-INSERT, WITH 5/8-11 HEX HEAD CAP SCREW MADE FROM 316 STAINLESS STEEL.
 2. EACH RACK SHALL BE A VERTICAL ASSEMBLY OF 24 INCH CABLE RACKS EXTENDING FROM WITHIN 6 INCHES OF THE MANHOLE ROOF SLAB TO WITHIN 6 INCHES OF THE MANHOLE FLOOR.
 3. CABLE RACK MOUNTING CHANNEL: HEAVY DUTY NON-METALLIC STANCHIONS. UNDERGROUND DEVICES, INC. MODEL C36 OR APPROVED.
 4. CABLE RACKS: HEAVY DUTY NON-METALLIC RACKS. 8, 14, 20 INCHES AS INDICATED.
 5. PRODUCT AND MANUFACTURER SHALL BE ONE OF THE FOLLOWING:
 - a. UNDERGROUND DEVICES, INC. MODEL RA 08, RA14, AND RA20.
 - b. APPROVED EQUAL.
- 2.10.6 INSULATORS:
1. MATERIAL SHALL BE PORCELAIN.
 2. PRODUCT AND MANUFACTURER SHALL BE ONE OF THE FOLLOWING:
 - a. CAT. NO. J_5122 BY JOSLYN MANUFACTURING AND SUPPLY COMPANY.
 - b. CAT. NO. 2120 BY HUBBARD AND COMPANY.
 - c. APPROVED EQUAL.
- 2.10.7 MANHOLE STEPS:
1. MATERIAL SHALL BE EXTRUDED ALUMINUM.
 2. STEPS SPACED EVENLY AT APPROXIMATELY TWELVE TO SIXTEEN INCH CENTERS AND SHALL PROJECT EVENLY FROM MANHOLE WALLS.
 3. MANUFACTURER SHALL BE ONE OF THE FOLLOWING:
 - a. FLOCKHART FOUNDRY COMPANY
 - b. NEENAH FOUNDRY COMPANY
 - c. APPROVED EQUAL.

2.11 HANDHOLES

- 2.11.1 THE PULL/SPLICE BOX UNDERGROUND ENCLOSURES SHALL BE CONSTRUCTED OF POLYMER CONCRETE CONSISTING OF SAND AND AGGREGATE BOUND TOGETHER WITH A POLYMER RESIN. INTERNAL REINFORCEMENT MAY BE PROVIDED BY MEANS OF STEEL, FIBERGLASS, OR A COMBINATION OF THE TWO. HANDHOLES FOR INSTALLATION IN ROADWAYS SHALL BE CONCRETE REINFORCED H20 TRAFFIC RATED.
- 2.11.2 ENCLOSURE:
1. THE ENCLOSURE MUST BE MANUFACTURED WITH AN OPEN BOTTOM AND A REMOVABLE GASKETED COVER. THE ENCLOSURES SHALL BE GREEN OR CONCRETE GRAY IN COLOR.
 2. THE ENCLOSURES SHALL BE DESIGNED TO BE INSTALLED FLUSH TO GRADE WITH THE COVER FITTING FLUSH TO THE BOX.
 3. THE ENCLOSURES SHALL BE SUITABLE FOR INSTALLATION IN EITHER DIRECT OR BURIED NATIVE SOIL, EMBEDDED IN CONCRETE, OR EMBEDDED IN ASPHALT SURFACING (A CONCRETE COLLAR IS REQUIRED FOR INSTALLATION IN ASPHALT).
 4. THE ENCLOSURES SHALL BE OF A STACKABLE DESIGN FOR GREATER INSTALLATION FLEXIBILITY.
 5. ALL COVERS ARE TO BE EQUIPPED WITH A MINIMUM OF TWO STAINLESS STEEL LOCKDOWN MECHANISMS. ALL COVERS SHALL HAVE A LOGO RECESSED INTO THE COVER AND IT SHALL READ ELECTRIC.
 6. ALL ENCLOSURE COVERS SHALL HAVE SOME TYPE OF RECESSED ACCESS POINT TO ALLOW REMOVAL OF THE COVER WITH A HOOK. THE ACCESS POINTS SHALL BE PLACED IN SUCH A LOCATION TO ALLOW FOR THE GREATEST AMOUNT OF LEVERAGE AND SAFETY POSSIBLE.
 7. ENCLOSURES SHALL BE DESIGNED AND SUITABLE FOR INSTALLATION AND USE THROUGH A TEMPERATURE RANGE OF -40°C (-40°F) TO 60°C (140°F).
 8. A CERTIFIED COPY OF ALL TEST REPORTS MUST BE SIGNED AND STAMPED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE WHERE CONSTRUCTION IS TO BE PERFORMED AND SUBMITTED PRIOR TO SHIPMENT OF PRODUCTS.
- 2.11.3 MATERIAL REQUIREMENTS:
1. PERMANENT DEFLECTION OF ANY SURFACE SHALL NOT EXCEED 10 PERCENT OF THE MAXIMUM ALLOWABLE STATIC DESIGN LOAD DEFLECTION.
 2. THE COVERS SHALL BE SKID RESISTANT AND HAVE A MAXIMUM COEFFICIENT OF FRICTION OF 0.50 ON THE TOP SURFACE OF THE OVER. COATINGS WILL NOT BE ALLOWED.
 3. ANY POINT ON THE COVERS MUST BE ABLE TO WITHSTAND A 70 FOOT-POUND IMPACT ADMINISTERED WITH A 12 POUND WEIGHT HAVING A "C" TUP (ASTM D-2444) WITHOUT PUNCTURING OR SPLITTING. THE TEST SHALL BE PERFORMED WITH THE COVER RESTING ON A FLAT, RIGID SURFACE SUCH AS CONCRETE OR A 1" STEEL PLATE.
 4. COVERS SHALL HAVE MOLDED LETTERING, ELECTRIC OR COMM AS APPLICABLE.
 5. FASTENING DEVICES USED TO SECURE THE COVER TO THE BOX SHALL BE CAPABLE OF WITHSTANDING A MINIMUM TORQUE OF 15 FOOT-POUNDS AND A MINIMUM STRAIGHT PULLOUT STRENGTH OF 750 POUNDS.
 6. THE MATERIAL SHALL BE TESTED ACCORDING TO THE REQUIREMENTS OF ASTM D643, SECTION 7, PROCEDURE 1, FOR CHEMICAL RESISTANCE. THE MANUFACTURER IS RESPONSIBLE FOR PROOF OF COMPLIANCE WITH THE LATEST VERSION OF THE ASTM STANDARDS.
 7. OTHER REQUIRED ACCEPTANCE STANDARDS ARE:
 - a. ASTM D756, PROCEDURE E: ACCELERATED SERVICE EXPOSURE.
 - b. ASTM G53: RECOMMENDED PRACTICE FOR OPERATING LIGHT AND WATER EXPOSURE ON NONMETALLIC MATERIALS (WITH A U.V.A. 340 BULB).
 - c. ASTM D570, SECTION 5, 6.1, 6.5: WATER ABSORPTION.
 - d. ASTM D790: FLEXURAL PROPERTIES.
 - e. ATSM D635: FLAMMABILITY TEST.
- 2.11.4 MANUFACTURERS SHALL BE STRONGWELL QUAZITE OR APPROVED EQUAL.

VERSION 3.0

DESIGN COORDINATOR



KNOBELSDORFF

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PROJECT

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ENGINEER



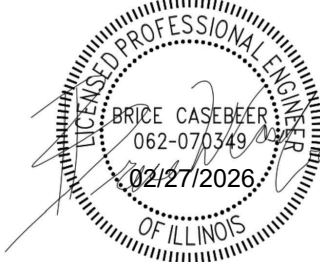
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SEAL



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REVISIONS

#	DESCRIPTION	DATE
0	IFC	02/06/2026
1	IFC R1	02/27/2026

ISSUED FOR CONSTRUCTION
FEBRUARY 27, 2026

138883 CEMETERY
SUN, LLC
FREDERICK, IL, 62639

SHEET TITLE

OWNER'S ELECTRICAL
SPECIFICATIONS

SHEET NO.

E-004

THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22" - THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING

2.12 THERMAL ADHESIVE

- 2.12.1 THERMAL ADHESIVE USED TO ATTACH THERMOCOUPLE TO BACK OF SOLAR MODULES SHALL BE ARCTIC ALUMINA OR APPROVED EQUAL.

2.13 SURGE ARRESTERS

- 2.13.1 WHEN DC SURGE ARRESTERS ARE INDICATED ON CONSTRUCTION DRAWINGS AND NOT FACTORY INTEGRATED, PROVIDE THE FOLLOWING SURGE ARRESTERS:
- 1500V DC SYSTEMS - CITEL DS50VGPVS-1500G/51
 - 1000V DC SYSTEMS - CITEL DS50PVS-1000
 - 600V DC SYSTEMS - CITEL DS50PVS-600
- 2.13.2 WHEN LOW VOLTAGE AC SURGE ARRESTERS ARE INDICATED ON CONSTRUCTION DRAWINGS AND NOT FACTORY INTEGRATED, PROVIDE THE FOLLOWING SURGE ARRESTERS:
- 120V - CITEL DS42S-120/G
 - 120V/240V - CITEL DS43S-120
 - 120/208V WYE - CITEL DS44S-120/G
 - 480V WYE - CITEL DS44S-400
 - 480V DELTA -CITEL DS43S-480
- 2.13.3 WHEN MEDIUM VOLTAGE AC SURGE ARRESTERS ARE INDICATED ON CONSTRUCTION DRAWINGS AND NOT FACTORY INTEGRATED, PROVIDE SURGE ARRESTERS AS INDICATED ON CONSTRUCTION DRAWINGS.

2.14 WEATHERPROOF GFCI OUTLET AND COVER

- 2.14.1 PROVIDE LEVITON GFCI SMARTLOCK PRO SLIM - WR899W.
- 2.14.2 PROVIDE INTERMATIC EXTRA DUTY CAST COVER - 1010MXD OR EQUAL.

2.15 PAINT MAKER

- 2.15.1 PROVIDE MARKAL RED PAINT MARKER FOR TORQUE MARKS.

3. EXECUTION:

3.1 GENERAL

- 3.1.1 SECTION 3 COVERS INSTALLATION METHODS AND REQUIREMENTS FOR CLASSES OF MATERIAL AND EQUIPMENT. SEE CONSTRUCTION DRAWINGS FOR ADDITIONAL REQUIREMENTS PERTAINING TO SPECIFIC MEANS AND METHODS.
- 3.1.2 ALL DISCONNECT SWITCHES AND COMBINER BOXES SHALL BE SECURED FROM UNAUTHORIZED/UNQUALIFIED PERSONNEL BY FASTENER SCREWS, LOCKS, OR LOCATION (LOCKED ACCESS ROOFTOP, LOCKED FENCED AREA, ETC.).
- 3.1.3 MARKINGS THAT VERIFY PROPER TORQUING OF CABLE TERMINATIONS AND FASTENERS SHALL BE MADE USING A PAINT MARKER.

3.2 PHOTOVOLTAIC MODULES

- 3.2.1 LOCATE AND INSTALL MODULES AS SHOWN ON CONSTRUCTION DRAWINGS.
- 3.2.2 INSTALL MODULES PER SUPPLIED MANUFACTURER INSTALLATION AND MOUNTING GUIDES WITH NO DEVIATIONS FROM SUCH DOCUMENTS.
- 3.2.3 HANDLING OF MODULES SHALL BE DONE IN THE MANNER SPECIFIED BY MANUFACTURER.
- 3.2.4 FASTENERS SHALL BE OF PROPER TRADE SIZES, 306 STAINLESS STEEL AND AT ALL LOCATIONS ON MODULE AS IDENTIFIED BY MANUFACTURER INSTALLATION AND MOUNTING SPECIFICATIONS.
- 3.2.5 TORQUE ALL SECURING HARDWARE PER SETTINGS SPECIFIED BY MODULE MANUFACTURER. I MPACT HAMMER TOOLS SHALL NOT BE USED TO SECURE MODULES. MARK TORQUED SECURING HARDWARE WITH SINGLE SLASH INDICATOR.

3.3 MOUNTING SYSTEM FOR PHOTOVOLTAIC MODULES

- 3.3.1 LOCATE AND INSTALL MOUNTING SYSTEM AS SHOWN ON CONSTRUCTION DRAWINGS. THERE SHALL BE NO DEVIATIONS FROM CONSTRUCTION DRAWINGS UNLESS PRIOR AUTHORIZATION IS RECEIVED IN WRITING BY NEXAMP.
- 3.3.2 ASSEMBLE MOUNTING SYSTEM PER MANUFACTURER SPECIFICATIONS AND INSTRUCTIONS.
- 3.3.3 TORQUE ALL SECURING HARDWARE PER SETTINGS SPECIFIED BY MODULE AND MOUNTING SYSTEM MANUFACTURERS. MARK TORQUED SECURING HARDWARE WITH SINGLE SLASH INDICATOR.
- 3.3.4 MOUNT AND FASTEN MODULES TO MOUNTING SYSTEM PER MOUNTING MANUFACTURER SPECIFICATIONS. IF MOUNTING SYSTEM METHODS DEVIATE FROM MODULE MANUFACTURER SPECIFIED MOUNTING METHODS, DO NOT PROCEED WITHOUT WRITTEN AUTHORIZATION FROM NEXAMP.
- 3.3.5 FOR ROOF MOUNTED EQUIPMENT, INSTALL PROTECTIVE PADDING MATERIAL (SUPPLIED BY NEXAMP) FOR THE PURPOSE OF PROTECTING ROOF INTEGRITY. PROTECTIVE PADDING SHALL BE COMPATIBLE WITH ROOF MATERIAL AS SPECIFIED BY ROOFING MANUFACTURER. PROTECTIVE PADDING SHALL BE ADHERED TO ROOF MOUNTED EQUIPMENT FOOT, BALLAST, AND/OR TRAY USING NEXAMP APPROVED ADHESIVE.

3.4 INVERTERS

- 3.4.1 INVERTER SHALL BE INSTALLED PER MANUFACTURER SPECIFICATIONS AND PROCEDURES.
- 3.4.2 TORQUE ALL TERMINATIONS (CONTRACTOR & MANUFACTURER) PER MANUFACTURER SPECIFICATIONS AND PROCEDURES. MARK ALL TORQUED TERMINATIONS WITH SINGLE SLASH INDICATOR.
- 3.4.3 INVERTER SHALL BE LOCATED AS INDICATED ON CONSTRUCTION DRAWING AND SHALL BE MOUNTED AND SEISMICALLY SECURED TO PAD PER LOCAL CODES AND MANUFACTURER INSTALLATION SPECIFICATIONS AND PROCEDURES.
- 3.4.4 ALL INVERTER OPENINGS SHALL BE SEALED TO PREVENT ANIMAL, INSECT, DUST, AND MOISTURE INFILTRATION.
- 3.4.5 CONCRETE PAD AND GROUND PREPARATIONS SHALL BE PROVIDED AS INDICATED ON CONSTRUCTION DRAWINGS.
- 3.4.6 BARRIERS SHALL BE PROVIDED TO PROTECT INVERTER FROM VEHICULAR TRAFFIC AS INDICATED ON CONSTRUCTION DRAWINGS.
- 3.4.7 CONTRACTOR SHALL VERIFY THAT ALL INVERTER DC CIRCUIT BREAKER AND FUSE LOCATIONS CORRESPOND TO CONSTRUCTION DRAWINGS.
- 3.4.8 INVERTER SHALL NOT BE TURNED ON BY CONTRACTOR UNLESS AUTHORIZED BY NEXAMP.

3.5 SWITCHBOARDS

- 3.5.1 ADJUST TRIP SETTINGS ON ALL CIRCUIT BREAKERS TO THE VALUES SHOWN ON THE CONSTRUCTION DRAWINGS.
- 3.5.2 SUBCONTRACTOR TO COORDINATE INVERTER TERMINATIONS TO THE CORRESPONDING BRANCH BREAKER NAMEPLATE IN THE SWITCHBOARD OR AS INDICATED IN DRAWINGS.

3.6 TRANSFORMERS

- 3.6.1 ADJUST TAPS ON TRANSFORMERS SO THAT LOW VOLTAGE IS WITHIN 5% OF NOMINAL INVERTER NAMEPLATE AC OUTPUT VOLTAGE.

3.7 STRING COMBINER BOX

- 3.7.1 INSTALL STRING COMBINER BOXES PER MANUFACTURER SPECIFICATIONS.
- 3.7.2 TORQUE ALL TERMINATIONS (CONTRACTOR & MANUFACTURER) PER MANUFACTURER SPECIFICATIONS AND PROCEDURES. MARK ALL TORQUED TERMINATIONS WITH SINGLE SLASH INDICATOR.
- 3.7.3 STRING COMBINER BOXES SHALL BE MOUNTED AS INDICATED ON CONSTRUCTION DRAWINGS.
- 3.7.4 ALL CONDUITS ENTERING THE ROOF TOP COMBINER BOXES SHALL BE TERMINATED WITHIN TOP 1/3 SECTION OF ENCLOSURE SIDEWALL AND SLOPED AWAY FROM BOX TO PREVENT THE INGRESS OF MOISTURE. AS INDICATED ON DRAWINGS.
- 3.7.5 CONDUIT AND CONDUCTORS ENTERING AND LEAVING COMBINER BOXES SHALL BE INSTALLED AS INDICATED ON CONSTRUCTION DRAWINGS AND ALL CONDUIT OPENINGS SHALL BE SEALED WITH POLYWATER FST-250 SEALANT.
- 3.7.6 STRING COMBINER BOX MOISTURE CONTROL DEVICES, DRAIN VENTS AND BREATHER DEVICES (SUPPLIED BY NEXAMP) SHALL BE INSTALLED PRIOR TO MOUNTING PER MANUFACTURER SPECIFICATIONS AND PROCEDURES, IF NOT PREVIOUSLY INSTALLED IN COMBINER BOX BY MANUFACTURER.
- 3.7.7 STRING COMBINER BOX FUSES SHALL BE INSTALLED WITH FUSE HOLDER IN OPEN POSITION UNTIL SYSTEM COMMISSIONING.
- 3.7.8 LABEL ALL STRING WIRING AT TERMINATIONS IN COMBINER BOXES.
- 3.7.9 ALL COMBINER BOX ENCLOSURES SHALL BE VACUUMED AND KEPT FREE OF DEBRIS AT ALL TIMES.

3.8 WIRING METHODS

- 3.8.1 WIRING SHALL BE ROUTED/PROTECTED TO AVOID INSULATION DAMAGE DUE TO RUBBING AGAINST EQUIPMENT (MOUNTING RACK, BALLAST BLOCKS, SHARP EQUIPMENT EDGES, ETC.)
- 3.8.2 EXPOSED WIRING, UNDER AND ALONG MODULES SHALL BE MECHANICALLY SECURED TO MODULE FRAMING AND MOUNTING SYSTEM FRAMING, AT THE DISTANCE INDICATED IN THE APPLICABLE NATIONAL ELECTRICAL CODE CYCLE AND AS INDICATED ON CONSTRUCTION DRAWINGS OR AS REQUIRED BY NEXAMP. NO DRILLING OR MODIFYING METAL WORK OF MODULES OR MOUNTING SYSTEM WITHOUT WRITTEN APPROVAL FROM NEXAMP. FASTENERS MUST NOT BLOCK DRAINAGE HOLES OF MODULES. FASTENING MATERIALS SHALL BE UV RESISTANT PLASTIC OR STAINLESS STEEL.
- 3.8.3 WIRING SHALL NOT BE EXPOSED WHEN EXTENDING BETWEEN ROWS OF MODULES. WIRING BETWEEN ROWS SHALL BE INSTALLED IN PROTECTIVE CONDUIT SLEEVE (TECHFLEX F6) AS INDICATED ON CONSTRUCTION DRAWINGS.
- 3.8.4 EXPOSED CONDUCTORS FOR MODULE WIRING SHALL BE PV RATED WIRE.
- 3.8.5 EXPOSED CONDUCTOR CONNECTIONS FOR MODULE WIRING SHALL USE CONNECTORS AS SPECIFIED BY MODULE MANUFACTURER. CONNECTORS SHALL NOT BE PLACED WHERE EXPOSED TO THE WEATHER, INSIDE CONDUIT, PROTECTIVE SHEATHING, INSIDE BUNDLES OF WIRES OR OTHER LOCATIONS WHERE CONNECTORS ARE NOT READILY ACCESSIBLE TO QUALIFIED PERSONNEL. ZIP TIES SHALL NOT BE INSTALLED AROUND CONNECTORS.
- 3.8.6 SOURCE AND FEEDER CONDUCTORS LOCATED IN CONDUIT SHALL BE THHN/THWN-2 OR XHHW-2. FOR CONDUCTORS INSTALLED IN CONDUIT EXPOSED TO SUNLIGHT ON ROOFTOP INSTALLATIONS, INSULATION SHALL BE XHHW-2.
- 3.8.7 SERVICE ENTRANCE CONDUCTORS IN CONDUIT SHALL BE THHN/THWN-2 OR XHHW-2.
- 3.8.8 INSULATING AND COLOR CODING TAPE SHALL BE PREMIUM GRADE PRESSURE SENSITIVE VINYL, HEAT/COLD/MOISTURE/SUNLIGHT/FADE RESISTANT. INSULATING SHALL BE BLACK. PROVIDE COLOR CODING FOR SECONDARY SERVICE, FEEDERS AND BRANCH CIRCUITS AS FOLLOWS:
- DC WIRING:
 - FUNCTIONALLY GROUNDED DC SYSTEM: POSITIVE (UNGROUNDED) - RED OR BLACK W/ RED TRACER, NEGATIVE (FUNCTIONALLY GROUNDED) - BLACK
 - GROUNDED DC SYSTEM (MONO POLAR OR BI POLAR):
 - NEGATIVELY GROUNDED ARRAY SECTIONS: POSITIVE (UNGROUNDED) - BLACK, NEGATIVE (GROUNDED) - WHITE
 - POSITIVELY GROUNDED ARRAY SECTIONS: POSITIVE (GROUNDED) - WHITE, NEGATIVE (UNGROUNDED) - BLACK
 - UNGROUNDED DC SYSTEM:
 - POSITIVE (UNGROUNDED) - RED
 - NEGATIVE (UNGROUNDED) - BLACK
 - GROUNDING CONDUCTORS:
 - EQUIP. GROUND EXPOSED - INSULATED GREEN
 - EQUIP. GROUND IN CONDUIT - INSULATED GREEN
 - 208/120VAC, 3-PHASE, 4-WIRE, WYE:

PHASE COLOR:

 - BLACK
 - RED
 - BLUE

NEUTRAL - WHITE

GROUND - GREEN
 - 480/277VAC, 3-PHASE, 4-WIRE, WYE:

PHASE COLOR:

 - BROWN
 - ORANGE
 - YELLOW

NEUTRAL - GRAY

GROUND - GREEN
 - AC MEDIUM VOLTAGE 3 PHASE, 3 WIRE:

PHASE A - RED TRACER - 1 BLACK BAND

PHASE B - RED TRACER - 2 RED BANDS

PHASE C - RED TRACER - 3 BLUE BANDS

COLOR CODING TAPE SHALL INCLUDE A PURPLE TRACE FOR NON-STANDARD VOLTAGES.

- 3.8.9 MAKE CONNECTIONS TO TERMINALS FROM LEFT TO RIGHT ARRANGED PHASE A, B, C, OR PER MANUFACTURER INSTRUCTIONS.
- 3.8.10 PHASE WIRES SHALL BE CONNECTED TO PHASE SUPPLY MAINS IN PROPER ROTATION TO ASSURE BALANCED CONDITION ON PANEL.
- 3.8.11 NO SPLICES SHALL BE ALLOWED ON DC WIRING.
- 3.8.12 SPLICES SHALL NOT BE USED WITHOUT WRITTEN APPROVAL BY NEXAMP.
- 3.8.13 MULTIPLE CONDUCTORS SHALL NOT BE TERMINATED ON THE SAME TERMINAL UNLESS TERMINAL IS LISTED FOR SUCH USE.
- 3.8.14 USE MANUFACTURER-APPROVED PULLING COMPOUND OR LUBRICANT WHERE NECESSARY; COMPOUND USED MUST NOT DETERIORATE CONDUCTOR OR INSULATION. DO NOT EXCEED MANUFACTURER RECOMMENDED MAXIMUM PULLING TENSIONS AND SIDEWALL PRESSURE VALUES.

- 3.8.15 USE APPROVED PULLING MEANS: INCLUDING FISH TAPE, CABLE, ROPE, AND BASKET-WEAVE WIRE/CABLE GRIPS, WHICH SHALL NOT DAMAGE CABLES OR RACEWAY.
- 3.8.16 INSTALL EXPOSED CABLES PARALLEL AND PERPENDICULAR TO SURFACES OF EXPOSED STRUCTURAL MEMBERS, AND FOLLOW SURFACE CONTOURS WHERE POSSIBLE.
- 3.8.17 TIGHTEN ELECTRICAL CONNECTORS AND TERMINALS ACCORDING TO MANUFACTURER PUBLISHED TORQUE TIGHTENING VALUES. IF MANUFACTURER TORQUE VALUES ARE NOT INDICATED, USE THOSE SPECIFIED IN UL 486A AND UL 486B. MARK ALL TORQUED TERMINATIONS WITH SINGLE SLASH INDICATOR.
- 3.8.18 LONG BARREL ALUMINUM COMPRESSION LUGS (THOMAS & BETTS OR APPROVED EQUAL) WITH BELLEVILLE WASHERS SHALL BE USED ON ALL ALUMINUM CABLE TO ALLOW FOR BOLTED CONNECTION TO EQUIPMENT BUS BAR. TWO-HOLE LUGS SHALL BE USED WHERE ALLOWED BY BUS BAR CONFIGURATION. LUGS SHALL BE PRE-FILLED WITH ANTI-OXIDANT TERMINATION COMPOUND. WIRE STRIPPING AND BRUSHING OF CONDUCTOR IN ACCORDANCE WITH VENDOR SPECIFICATIONS IS REQUIRED IMMEDIATELY PRIOR TO LUG INSTALLATION. COLD SHRINK SHALL BE APPLIED WHEN REQUIRED BY NEXAMP TO COVER ANY EXPOSED WIRE SURFACE WHERE THE WIRE MEETS THE TERMINAL. BELLEVILLE WASHERS SHALL BE USED WHEN CONNECTING ALUMINUM CONDUCTOR LUGS TO COPPER BUS BARS OR STUDS.
- 3.8.19 WHEN WIRE TIES ARE EXPOSED TO DIRECT SUNLIGHT THEY SHALL BE UV RESISTANT, BLACK NYLON 12.
- 3.8.20 USE COMPRESSION TOOLS LISTED FOR USE WITH SELECTED COMPRESSION CONNECTORS. USE OF A "ONE SHOT" CRIMPER OR DIE-LESS CRIMPERS SHALL NOT BE ALLOWED FOR ALUMINUM WIRE TERMINATIONS.
- 3.8.21 USE OXIDE INHIBITOR ON ALL ALUMINUM WIRE CONNECTIONS.

3.9 RACEWAY WORK

- 3.9.1 INSTALL WIRE AND CABLE IN APPROVED RACEWAYS AS INDICATED ON CONSTRUCTION DRAWINGS, UNLESS OTHERWISE NOTED BELOW.
- 3.9.2 ALL RACEWAYS SHALL BE SEALED AND ORIENTED TO AVOID MOISTURE INGRESS INTO ALL EXTERIOR EQUIPMENT ENCLOSURES.
- 3.9.3 PROPER GROUNDING BUSHING AND LOCKNUT SHALL BE INSTALLED ON ALL METALLIC CONDUITS WHERE REQUIRED AND/OR INDICATED ON CONSTRUCTION DRAWINGS.
- 3.9.4 RACEWAYS ON ROOFTOPS SHALL BE MOUNTED ON RUBBER EQUIPMENT SUPPORTS.
- 3.9.5 ROOF PENETRATIONS SHALL BE FLASHED AND SEALED TO MAKE WATERTIGHT PER ROOFING MANUFACTURER SPECIFICATIONS FOR CONDUIT PENETRATIONS. COORDINATE WITH ROOFING MANUFACTURER FOR PROPER ROOF PENETRATION PRODUCTS, PROCEDURES AND SPECIFICATIONS SHALL MEET ROOFING MANUFACTURER WARRANTY.
- 3.9.6 PROVIDE CONDUIT EXPANSION FITTINGS WHEREVER BUILDING EXPANSION JOINTS OCCUR, WHERE CONDUITS TURN UP OUT OF GRADE TO FIXED ENCLOSURES (SECURED TO SIDE OF BUILDING, UNISTRUT SUPPORTS, ETC.) AND AS INDICATED ON CONSTRUCTION DRAWINGS OR AS REQUIRED BY THE NATIONAL ELECTRICAL CODE. FLEXIBLE METAL CONDUIT IS NOT ACCEPTABLE AT EXPANSION JOINTS.
- 3.9.7 ALL CONDUIT TERMINATIONS INTO EXTERIOR PULL BOXES, ENCLOSURES, DISCONNECTS, AND OTHER EQUIPMENT SHALL USE MYERS HUB CONNECTORS WHERE NECESSARY TO MAINTAIN NEMA RATINGS.
- 3.9.8 UNLESS OTHERWISE SHOWN ON CONSTRUCTION DRAWINGS, MAKE CONNECTIONS TO INVERTER HOUSING/DISCONNECTS WITH LIQUID TIGHT FLEXIBLE METAL CONDUIT TO PREVENT VIBRATION/NOISE. FLEXIBLE CONNECTIONS SHALL BE MINIMUM OF 18 INCHES AND MAXIMUM OF 3 FEET LONG WITH GROUNDING BUSHINGS/LOCKNUTS.
- 3.9.9 UNLESS OTHERWISE SHOWN ON DRAWINGS, ADAPT UNDERGROUND PVC CONDUIT TO RIGID METAL CONDUIT AND IMC SWEEPS BELOW PROVIDE STEEL SWEEPS PRIOR TO TURNING OUT OF GRADE. PVC SCHEDULE 80 SWEEPS MAY BE USED WHEN THE CONDUIT LENGTH IS LESS THAN 50 FEET OR THE CONDUCTOR SIZE IS #6 OR SMALLER.
- 3.9.10 MINIMUM SIZE CONDUIT SHALL BE 3/4 INCH TRADE SIZE.
- 3.9.11 CAREFULLY CLEAN AND DRY ALL CONDUITS BEFORE INSTALLATION OF CONDUCTORS. PLUG AND CAP CONDUIT ENDS TO EXCLUDE DUST, MOISTURE, PLASTER, MORTAR OR OTHER DEBRIS WHILE UNDER CONSTRUCTION. LUBRICANTS OR CLEANING AGENTS WHICH MIGHT HAVE DELETERIOUS EFFECT ON CONDUCTOR COVERINGS SHALL NOT BE USED FOR DRAWING CONDUCTORS INTO RACEWAYS.
- 3.9.12 RIGID AND INTERMEDIATE METAL CONDUIT ENDS SHALL BE CUT SQUARE, THREADED, AND REAMED TO REMOVE BURRS AND SHARP FIELD THREADS SHALL BE OF SAME TYPE AND SAME EFFECTIVE LENGTH AS FACTORY-CUT THREADS. TURNS IN EXPOSED CONDUIT RUNS SHALL BE MADE BY USE OF FACTORY-MADE BENDS, OR FIELD MADE BENDS EQUIVALENT IN RADIUS AND CONSISTENCY WITH FACTORY-MADE BENDS, AS APPROVED. IN EVENT OF MULTIPLICITY OF CONDUITS MAKING SAME TURN, PROVIDE CONDUITS, OR STEEL JUNCTION BOX WITH REMOVABLE STEEL COVER. ROUTE CONDUITS SO AS NOT TO INTERFERE WITH OPERATION OR MAINTENANCE OF ANY EQUIPMENT. OFFSETS AND BENDS SHALL BE MADE IN CONDUITS AS REQUIRED BY JOB CONDITIONS. PERFORM WORK IN NEAT AND WORKMANLIKE MANNER, AS APPROVED BY NEXAMP. INSTALL CONDUIT TO KEEP EXPOSED THREADS TO AN ABSOLUTE MINIMUM.
- 3.9.13 ALL EXPOSED THREADS TO BE COLD GALVANIZED COATED TO PREVENT RUST, USING RUSTOLEUM BRAND OR APPROVED EQUAL. OVERSPRAY OF COATING TO ADJACENT SURFACES SHALL BE AVOIDED.
- 3.9.14 ENSURE ALL EMT COMPRESSION FITTINGS ARE TIGHTENED PER MANUFACTURER SPECIFICATIONS. MARK ALL EMT COMPRESSION FITTINGS WITH SINGLE SLASH MARK AFTER TIGHTENING.
- 3.9.15 PROVIDE SUPPORT RODS AND CLAMPS TO SUPPORT CONDUITS AS REQUIRED.
- 3.9.16 PROVIDE OFFSETS PRIOR TO ENTRANCE INTO OUTLET BOXES AND OTHER ELECTRICAL EQUIPMENT FOR PROPER ADJUSTMENT TO FINISHED BUILDING SURFACES. EXERCISE CARE WHEN ROUGHING-IN CONDUITS WHICH TURN UP OR DOWN TO SURFACE MOUNTED PANELBOARDS, SO THAT CONDUIT EXTENSIONS WILL BE FITTED CLOSE TO WALL. WHERE POSSIBLE, PROVIDE BACK ENTRY INTO SURFACE MOUNTED BOXES OR EQUIPMENT ITEMS.
- 3.9.17 CONDUIT ROUTING SHOWN ON CONSTRUCTION DRAWINGS ARE DIAGRAMMATIC. RUN CONDUITS TO COORDINATE WITH BUILDING STRUCTURE. EXPOSED CONDUIT SHALL BE RUN IN STRAIGHT LINES PARALLEL TO WALLS, BEAMS, AND COLUMNS WITH RIGHT ANGLE BENDS.
- 3.9.18 PROVIDE MINIMUM 3/16 INCH DIAMETER TWISTED NYLON FISH CORD IN ALL EMPTY RACEWAYS. PROVIDE TAG ON EACH END INDICATING LOCATION OF OTHER END. FISH CORD SHALL HAVE MINIMUM OF 200 POUNDS TENSILE STRENGTH.
- 3.9.19 CONDUIT BODIES SHALL ONLY BE USED FOR 2" CONDUIT AND SMALLER.
- 3.9.20 WEATHERHEADS SHALL BE PROVIDED ON ALL VERTICAL CONDUIT OPENINGS THAT ARE DIRECTLY EXPOSED TO DRIVEN RAIN.
- 3.9.21 CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING TRENCH WORK, AND SUPERVISING TRENCH BACKFILLS TO ENSURE THAT CLEAN FILL IS USED AND THAT CONDUITS AND CABLES ARE NOT DAMAGED DURING BACKFILL.

3.10 ENCLOSURES, PULL BOXES, WIREWAYS AND CHANNELS

- 3.10.1 PROVIDE BOLTS OR GALVANIZED STEEL RODS TO SUPPORT PULL BOXES OF MINIMUM THICKNESS EQUAL TO ROD OR BOLT SIZE REQUIRED ON LARGEST SIZE CONDUIT ENTERING PULL BOX, AS DEFINED UNDER "RACEWAYS" PARAGRAPH IN THIS SECTION.
- 3.10.2 ENCLOSURES, PULL BOXES, AND WIREWAYS ON ROOFTOPS SHALL BE MOUNTED ON RUBBER EQUIPMENT SUPPORTS.
- 3.10.3 WHERE STEEL SUPPORT CHANNELS ARE CUT OR UNPROTECTED STEEL IS EXPOSED, APPLY TWO COATS OF ALUMINUM, ZINC CHROMATE OR OTHER APPROVED RUST PREVENTIVE PAINT TO BARE SURFACES AFTER PROPER CLEANING.

- 3.10.4 CONDUIT SIZES INDICATED ON CONSTRUCTION DRAWINGS ARE BASED ON 40% FILL FOR STRAIGHT RUNS OF NO MORE THAN 150 FEET. CONTRACTOR SHALL INSTALL PULL BOXES AS REQUIRED TO AVOID DAMAGE TO CABLE DURING INSTALLATION.
- 3.10.5 EXTERIOR CONDUITS SHALL BE PAINTED TO MATCH BUILDING COLOR WHERE INDICATED ON CONSTRUCTION DRAWINGS.
- 3.10.6 NO CONDUIT BODIES SHALL BE USED ON ANY DC CIRCUITS RUNS.

3.11 WEATHERPROOF GFCI OUTLET AND COVER

- 3.11.1 PROVIDE WEATHERPROOF GFCI OUTLET AND EXTRA DUTY CAST COVER WHERE INDICATED ON CONSTRUCTION DRAWINGS.

3.12 DISCONNECTS

- 3.12.1 LOCATE AND INSTALL DISCONNECTS AS INDICATED ON CONSTRUCTION DRAWINGS.

3.13 GROUNDING

- 3.13.1 THE PHOTOVOLTAIC SOLAR POWER SYSTEM IS A NEW ELECTRICAL SERVICE AND MUST BE GROUNDED AS SUCH. PROVIDE COMPLETE GROUNDING SYSTEM IN CONFORMANCE WITH LOCAL CODE AND AS INDICATED ON CONSTRUCTION DRAWINGS.

3.14 SLEEVING AND FIRESTOPPING

- 3.14.1 PROVIDE INTERMEDIATE METAL CONDUIT OR RIGID STEEL CONDUIT SLEEVES IN INTERIOR BUILDING SLABS AS REQUIRED.
- 3.14.2 LAY OUT CONDUIT AND OPENINGS IN ADVANCE TO PERMIT PROVISIONS IN WORK. SET SLEEVES AND CONDUIT IN FORMS BEFORE CONCRETE IS POURED, PROVIDE REMEDIAL WORK WHERE SLEEVES AND CONDUITS ARE OMITTED OR IMPROPERLY PLACED IN SLABS, OR DECKS.
- 3.14.3 EXTEND SLEEVES IN HORIZONTAL SURFACES 2 INCHES ABOVE FINISHED FLOOR. PROVIDE THREADED CAPS ON BOTH SIDES OF SLEEVES AND OTHER UNUSED SLEEVES.
- 3.14.4 FIRESTOP ALL INTERIOR PENETRATIONS MADE IN FIRE RATED WALLS OR FLOORS WITH UL APPROVED MATERIALS TO PREVENT PASSAGE OF FIRE AND SMOKE AND MAINTAIN ORIGINAL FIRE RATING OF FLOORS OR WALLS.
- 3.14.5 HYDRAULIC CEMENT SHALL BE USED TO SEAL ALL BUILDING EXTERIOR WALL PENETRATIONS.

VERSION 3.0

DESIGN COORDINATOR



KNOBELSDORFF

25701 370TH STREET
GOODHUE, MN 55027

PROJECT

**138883 CEMETERY
SUN, LLC**

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ENGINEER



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REVISIONS

#	DESCRIPTION	DATE
0	IFC	02/06/2026
1	IFC R1	02/27/2026

ISSUED FOR CONSTRUCTION
FEBRUARY 27, 2026

**138883 CEMETERY
SUN, LLC**
FREDERICK, IL, 62639

SHEET TITLE

**OWNER'S ELECTRICAL
SPECIFICATIONS**

SHEET NO.

E-005



E-101

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PAPER SIZE 34" X 22"

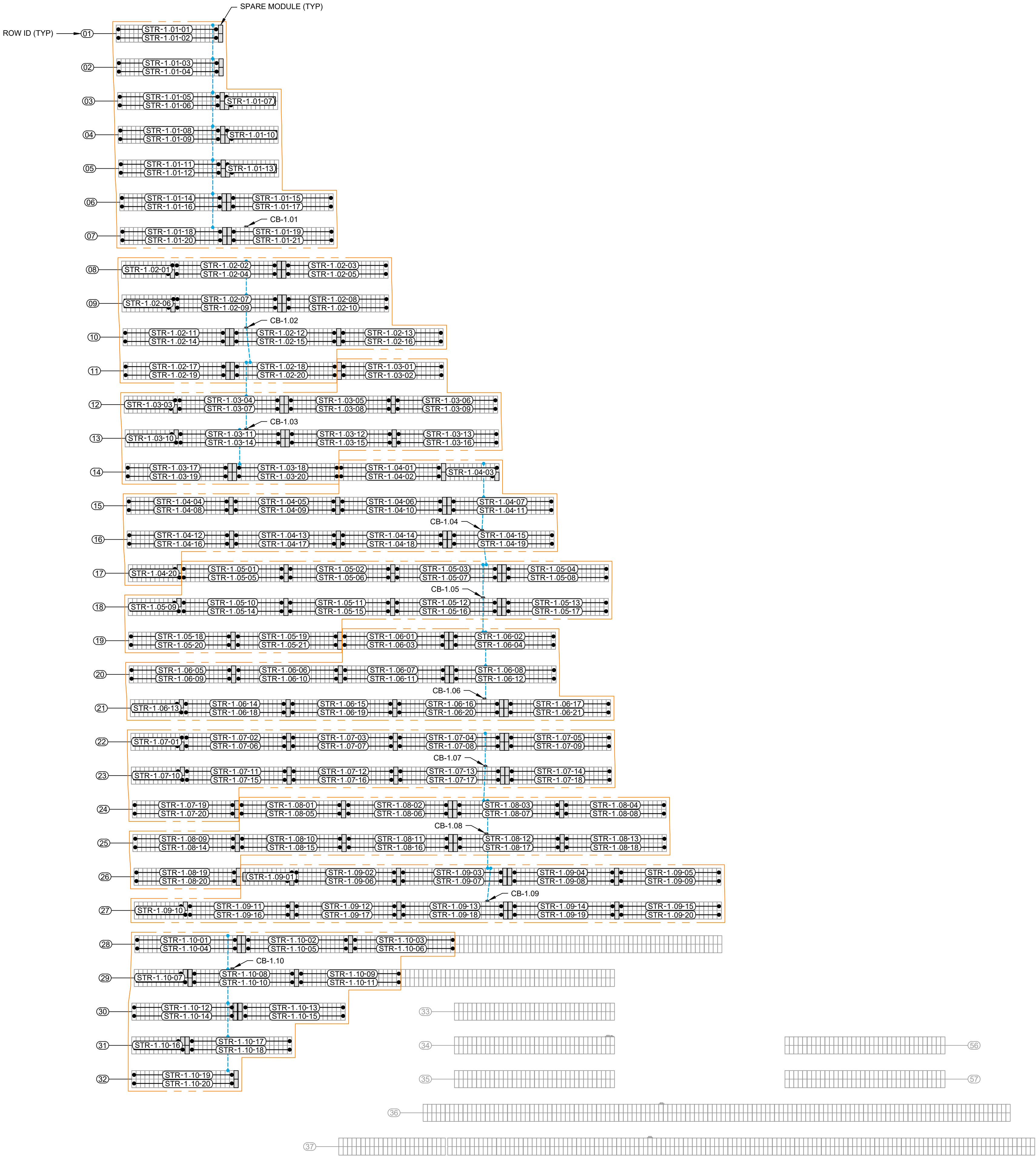
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PAPER SIZE 34" X 22"

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PAPER SIZE 34" X 22"

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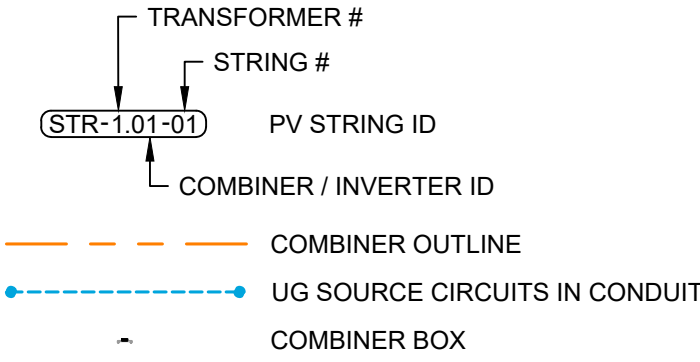
1 STRING WIRING PLAN - BLOCK 1
SCALE: 1" = 50'



SHEET NOTES:

1. REFER TO SHEET E-205 FOR STRING WIRING DETAILS.
2. Z PURLINS SHALL HAVE NO MORE THAN 20 CONDUCTORS ROUTED ALONG THE RACKING SYSTEM.

LEGEND:



PV SOURCE CIRCUIT CONDUIT SIZING TABLE	
CIRCUIT QUANTITY	PVC 40 CONDUIT SIZE
1	1"
2 - 4	1-1/2"

DESIGN COORDINATOR



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ENGINEER



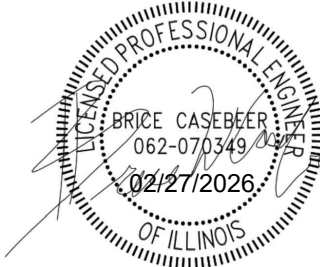
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ISSUED FOR CONSTRUCTION
FEBRUARY 27, 2026

138883 CEMETERY
SUN, LLC
FREDERICK, IL, 62639

SHEET TITLE

STRING WIRING PLAN -
BLOCK 1

SHEET NO.

E-203

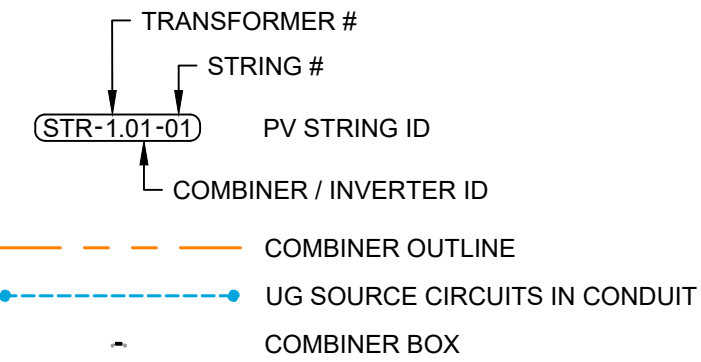
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LEGEND:



PV SOURCE CIRCUIT CONDUIT SIZING TABLE	
CIRCUIT QUANTITY	PVC 40 CONDUIT SIZE
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0	IFC	02/06/2026
1	IFC R1	02/27/2026

ISSUED FOR CONSTRUCTION
FEBRUARY 27, 2026

138883 CEMETERY
SUN, LLC
FREDERICK, IL, 62639

SHEET TITLE

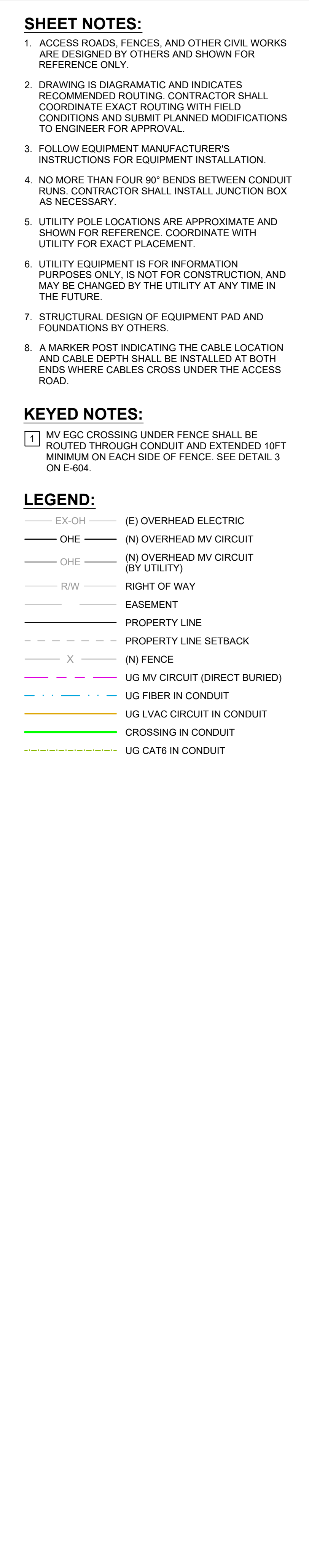
STRING WIRING PLAN - BLOCK 2

SHEET NO

E-204

The site plan illustrates the layout of the Solar Energy Center. Key features include:

- PV ARRAY (TYP)**: Multiple rows of solar panels are shown, with a specific array labeled "PV ARRAY (TYP)".
- 20' ACCESS ROAD**: A road providing access to the site, labeled "20' ACCESS ROAD".
- LAYDOWN AREA (TYP)**: A designated area for equipment storage, labeled "LAYDOWN AREA (TYP)".
- UTILITY POLE U3 DISCONNECT POLE**: A utility pole with a disconnect switch, labeled "UTILITY POLE U3 DISCONNECT POLE".
- UTILITY POLE RECLOSER PO**: A utility pole with a recloser switch, labeled "UTILITY POLE RECLOSER PO".
- EQUIPMENT PAD**: A central area containing the **EQUIPMENT PAD**, which includes **XFMR-1, SWBD-1, XFMR-2, SWBD-2, & DAS-1 ENCLOSURE**.
- INVERTER RACK 1**: Labeled "INV-1.01 THRU INV-1.10".
- INVERTER RACK 2**: Labeled "INV-2.01 THRU INV-2.10".
- SECURITY CAMERA**: A camera positioned to monitor the equipment area.
- 1 E-604**: A north arrow pointing towards the top right of the plan.



DESIGN COORDINATOR



KNOBELSDORFF

25701 370TH STREET
GOODHUE, MN 55027

PROJECT

138883 CEMETERY
SUN, LLC

24638 ADAMS RD,
FREDERICK, IL 62639
40.089020°, -90.442132°

ENGINEER



STELLAVISE
SOLAR ENGINEERING

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IL DESIGN FIRM #184.009162

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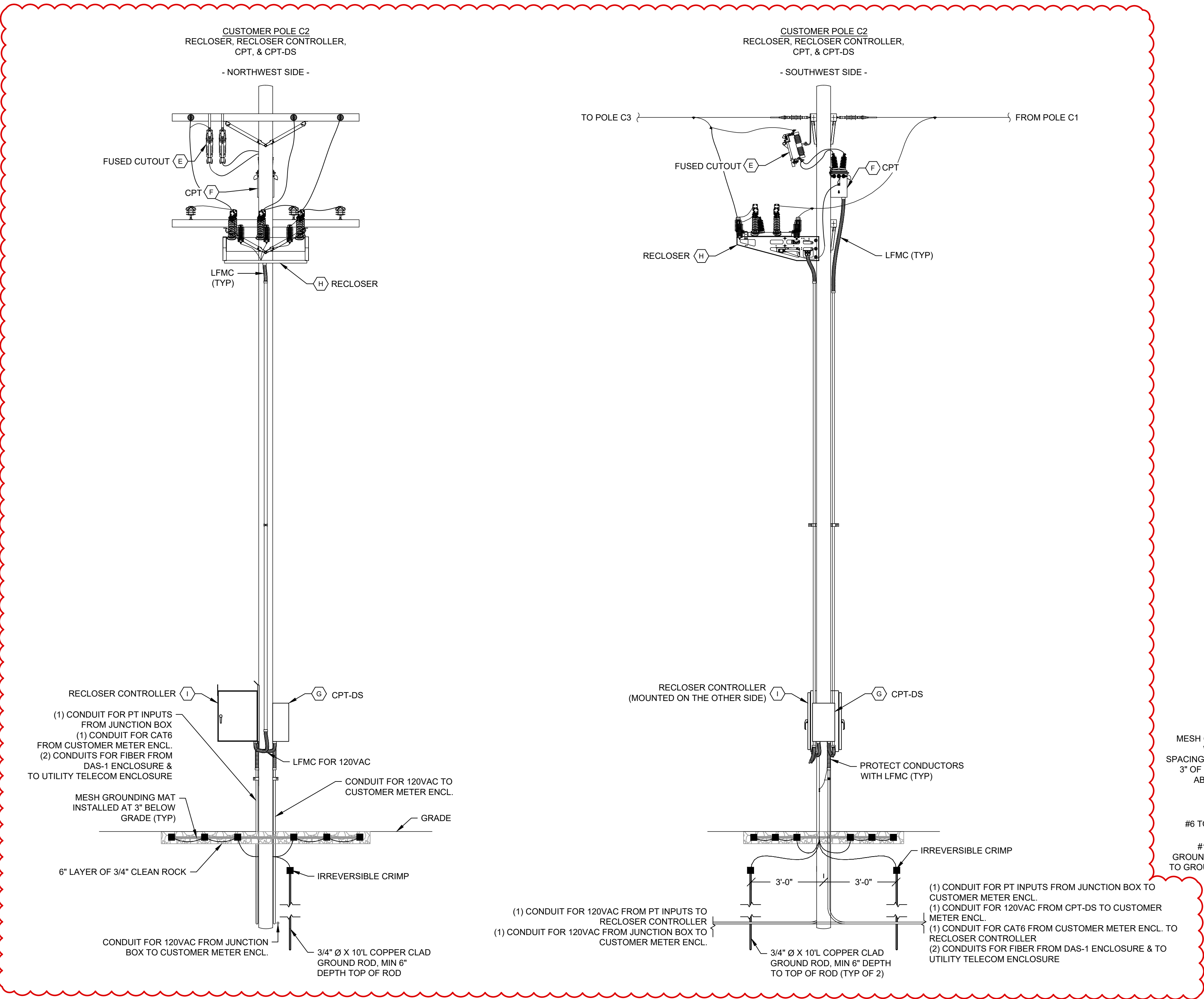
ENLARGED PLAN - POI

SHEET NO.

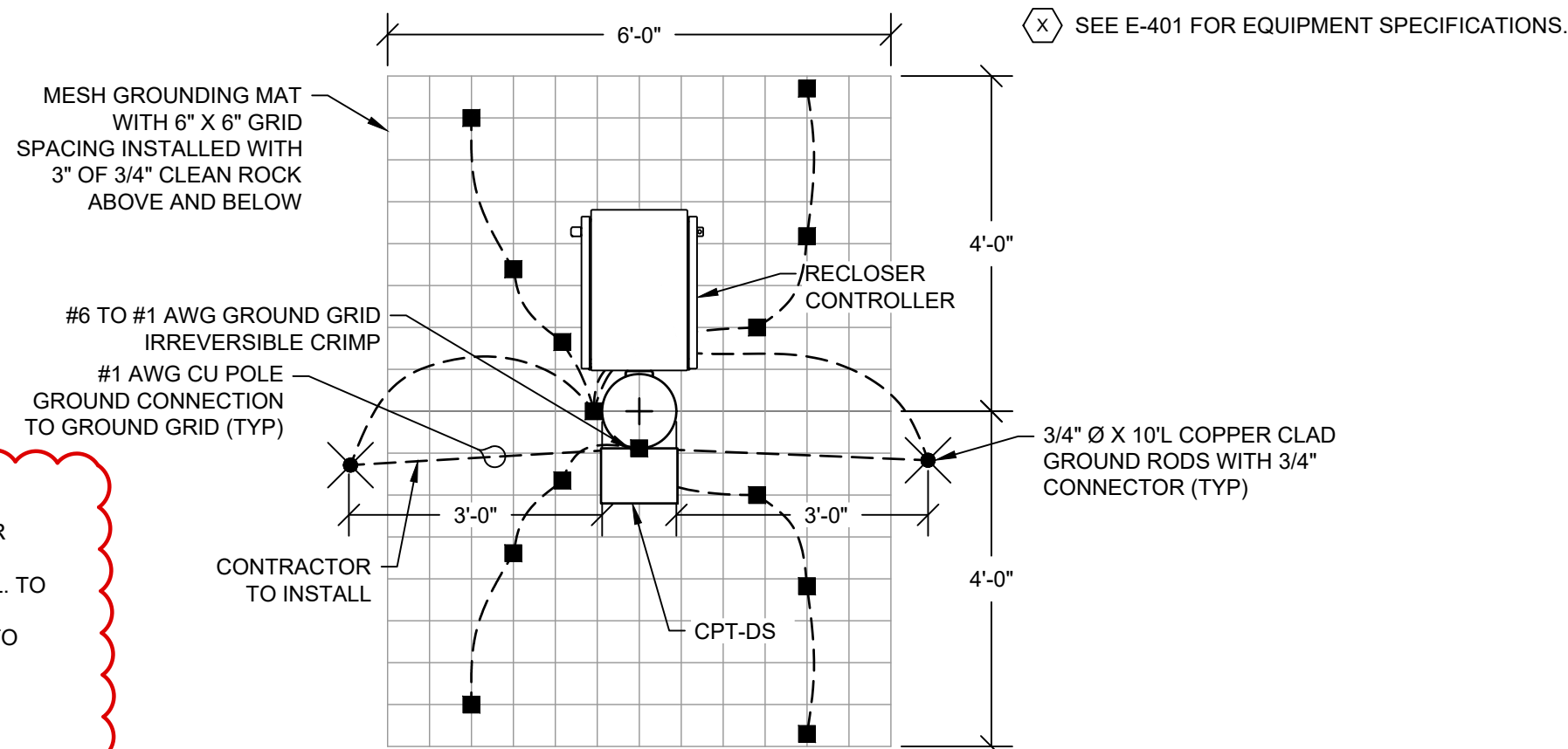
E-301

E-302

HOLD
PENDING COORDINATION WITH UTILITY SERVICE ENTRANCE



1 POI ELEVATIONS - CUSTOMER POLE C2
SCALE: NTS



2 DETAIL OF GROUND GRID AT POLE C2
SCALE: NTS

SHEET NOTES:

1. ELEVATIONS ARE DIAGRAMMATIC AND INTENDED TO SHOW MAJOR EQUIPMENT LOCATIONS. CONTRACTOR SHALL COORDINATE MOUNTING CONFIGURATIONS, TERMINATIONS AND CLEARANCE REQUIREMENTS WITH SELECTED EQUIPMENT MANUFACTURERS, SITE CONDITIONS AND RELEVANT CODES. FOLLOW LOCAL UTILITY OR RURAL UTILITIES SERVICE ASSEMBLY UNITS FOR POLE CONSTRUCTION.
2. CUSTOMER POLES SHALL HAVE THE SAME SPECIFICATIONS AND EMBEDMENT AS UTILITY POLES. CONTRACTOR TO VERIFY IN FIELD.
3. MINIMUM HEIGHT ABOVE GRADE OF OVERHEAD CONDUCTORS SHALL BE 20 FEET OR AS REQUIRED BY NESC TABLE 232-1, WHICHEVER IS GREATER.
4. ALL EQUIPMENT TO BE GROUNDED AS REQUIRED. NOT SHOWN FOR CLARITY.
5. KEEP GROUND WIRES FOR SURGE ARRESTERS SEPARATE FROM GROUND WIRES FOR POLE MOUNTED EQUIPMENT.
6. INSTALL MINIMUM OF (1) 3/4" X 10' COPPER GROUND ROD AT ALL CUSTOMER POLES.
7. STAPLES ON GROUND WIRE SHALL BE 2-0" APART EXCEPT FOR A DISTANCE OF 8'-0" ABOVE GROUND AND 8'-0" FROM TOP OF POLE WHERE THEY SHALL BE 6" APART.
8. MY CONDUIT INSTALLED ON POLES SHALL EXTEND TO MINIMUM 8 FEET ABOVE FINISHED GRADE PER NEC 300.50(C) AND NESC 239(D). CONDUIT SHALL BE RIGID STEEL GROUNDED AND SEALED AT THE TOP TO PREVENT INGRESS OF MOISTURE.
9. MAINTAIN PROPER CLEARANCES OR INSTALL INSULATED OVERHEAD JUMBERS.
10. ARRESTER LEAD LENGTH SHALL BE AS SHORT AS POSSIBLE. OVERHEAD CONDUCTORS SHALL CONNECT TO RISER ARRESTERS. RISER ARRESTERS SHALL THEN CONNECT TO THE UNDERGROUND CABLE TERMINATION.
11. ALL TERMINATIONS SHALL BE PROPERLY PREPARED INCLUDING USE OF OXIDE INHIBITOR.
12. GANG OPERATED AIR BREAK SWITCH SHALL BE GROUNDED ON BOTH FRAME AND HANDLE.
13. CONTRACTOR SHALL ALIGN AND ADJUST THE GANG OPERATED DISCONNECT SWITCH AS NEEDED TO ENSURE THAT THE SWITCH OPERATES PER THE MANUFACTURERS INSTALLATION AND OPERATION INSTRUCTIONS.
14. PROVIDE GRADIENT CONTROL MAT AT ALL OPERABLE SWITCH LOCATIONS.
15. MANUFACTURER AND CATALOG NUMBERS ARE FOR REFERENCE ONLY. ENGINEER APPROVED EQUALS WILL BE ACCEPTED.
16. ALL LIVE PARTS MUST BE 12" MIN FROM OTHER LIVE PARTS. ALL LIVE PARTS MUST BE 7" MIN FROM GROUNDED PARTS.
17. ALL UTILITY POLES SHALL CONFORM TO ANSI 05.1, AWP/C 2 AND ANSI C2 AND ANY OTHER APPLICABLE STANDARD.
18. CONTRACTOR SHALL LEAVE ADEQUATE CONDUCTOR LENGTH PER PHASE FOR UTILITY CONNECTION.
19. SEE ONE LINE DIAGRAM FOR CONDUCTOR SIZING, CONDUIT SIZING, AND EQUIPMENT SPECIFICATIONS.

LEGEND:

 SEE E-401 FOR EQUIPMENT SPECIFICATIONS.

DESIGN COORDINATOR

KNOBELSDORFF

25701 370TH STREET
GOODHUE, MN 55021

PROJECT

138883 CEMETERY

SUN, LLC

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FREDERICK, IL 62639
40.089020°, -90.442132°

ENGINEER

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SHEET TITLE

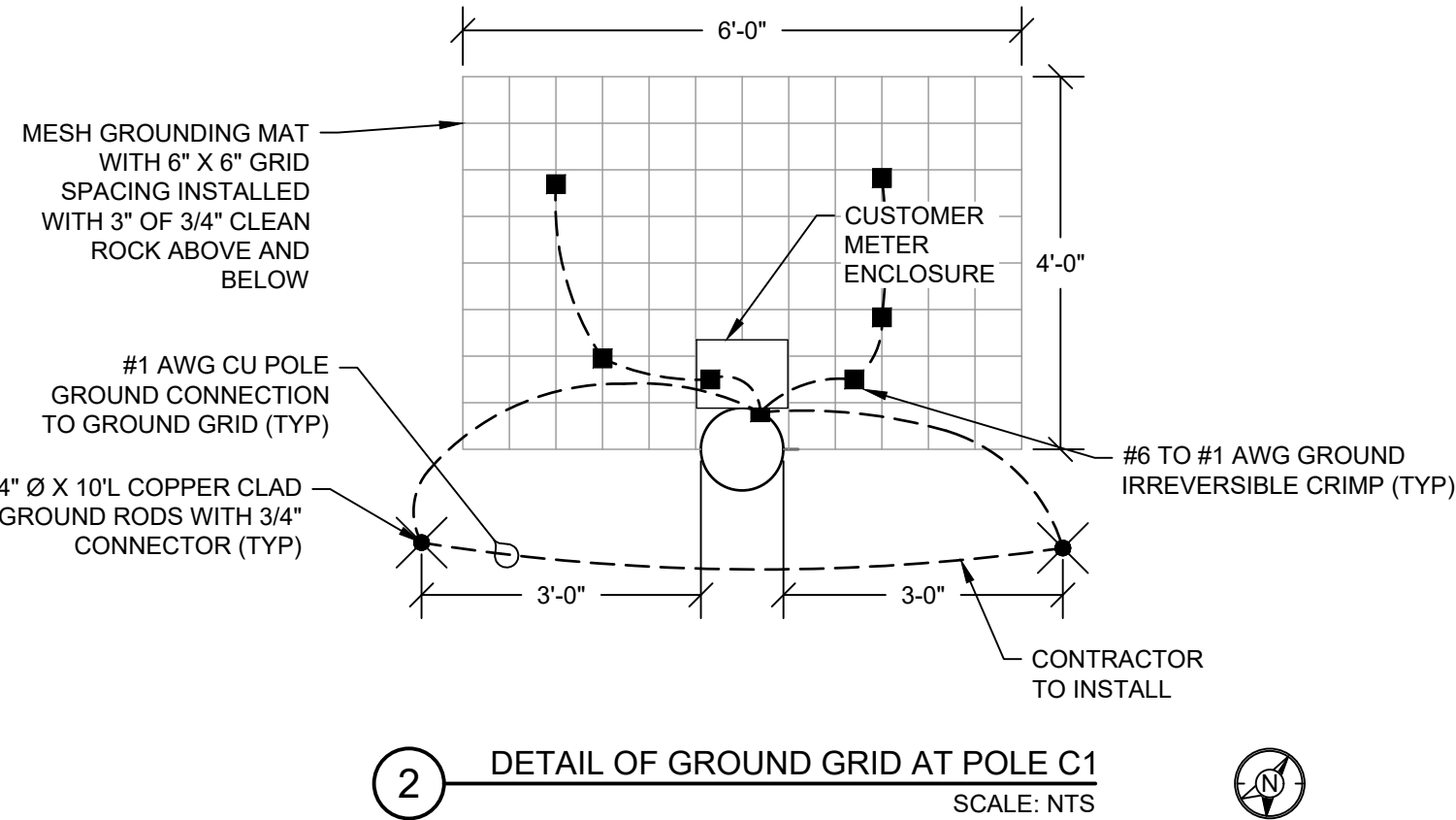
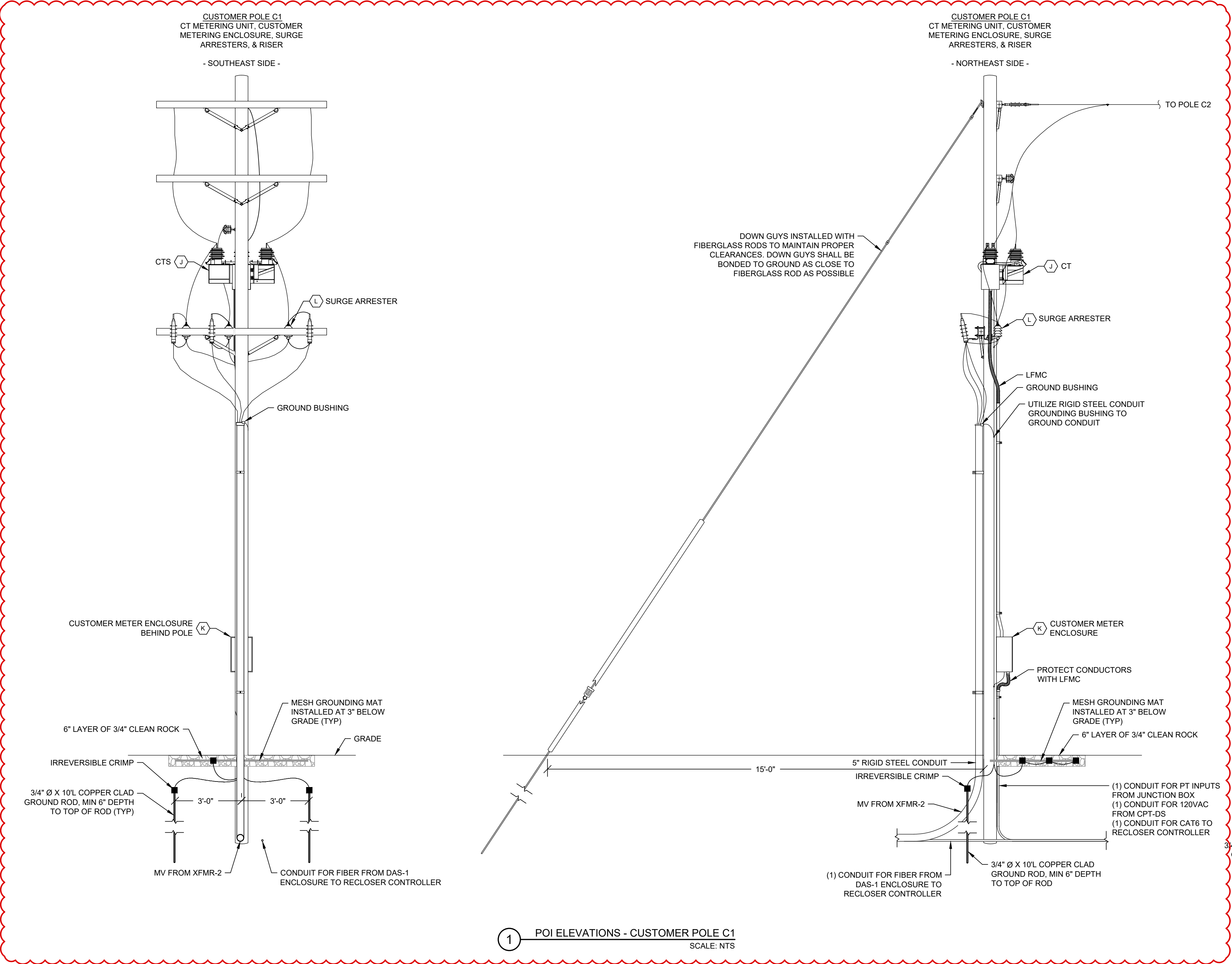
ELEVATION - RECLOSER

SHEET NO

E-303

HOLD

PENDING COORDINATION WITH UTILITY SERVICE ENTRANCE



SHEET NOTES:

- ELEVATIONS ARE DIAGRAMMATIC AND INTENDED TO SHOW MAJOR EQUIPMENT LOCATIONS. CONTRACTOR SHALL COORDINATE MOUNTING CONFIGURATIONS, TERMINATIONS AND CLEARANCE REQUIREMENTS WITH SELECTED EQUIPMENT MANUFACTURERS, SITE CONDITIONS AND RELEVANT CODES. FOLLOW LOCAL UTILITY OR RURAL UTILITIES SERVICE ASSEMBLY UNITS FOR POLE CONSTRUCTION.
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- MAINTAIN PROPER CLEARANCES OR INSTALL INSULATED OVERHEAD JUMPERS.
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- CONTRACTOR SHALL LEAVE ADEQUATE CONDUCTOR LENGTH PER PHASE FOR UTILITY CONNECTION.
- SEE ONE LINE DIAGRAM FOR CONDUCTOR SIZING, CONDUIT SIZING, AND EQUIPMENT SPECIFICATIONS.

LEGEND:

(X) SEE E-401 FOR EQUIPMENT SPECIFICATIONS.

DESIGN COORDINATOR



KNOBELSDORFF

25701 370TH STREET
GOODHUE, MN 55027

PROJECT

138883 CEMETERY
SUN, LLC

24638 ADAMS RD,
FREDERICK, IL 62639
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ENGINEER



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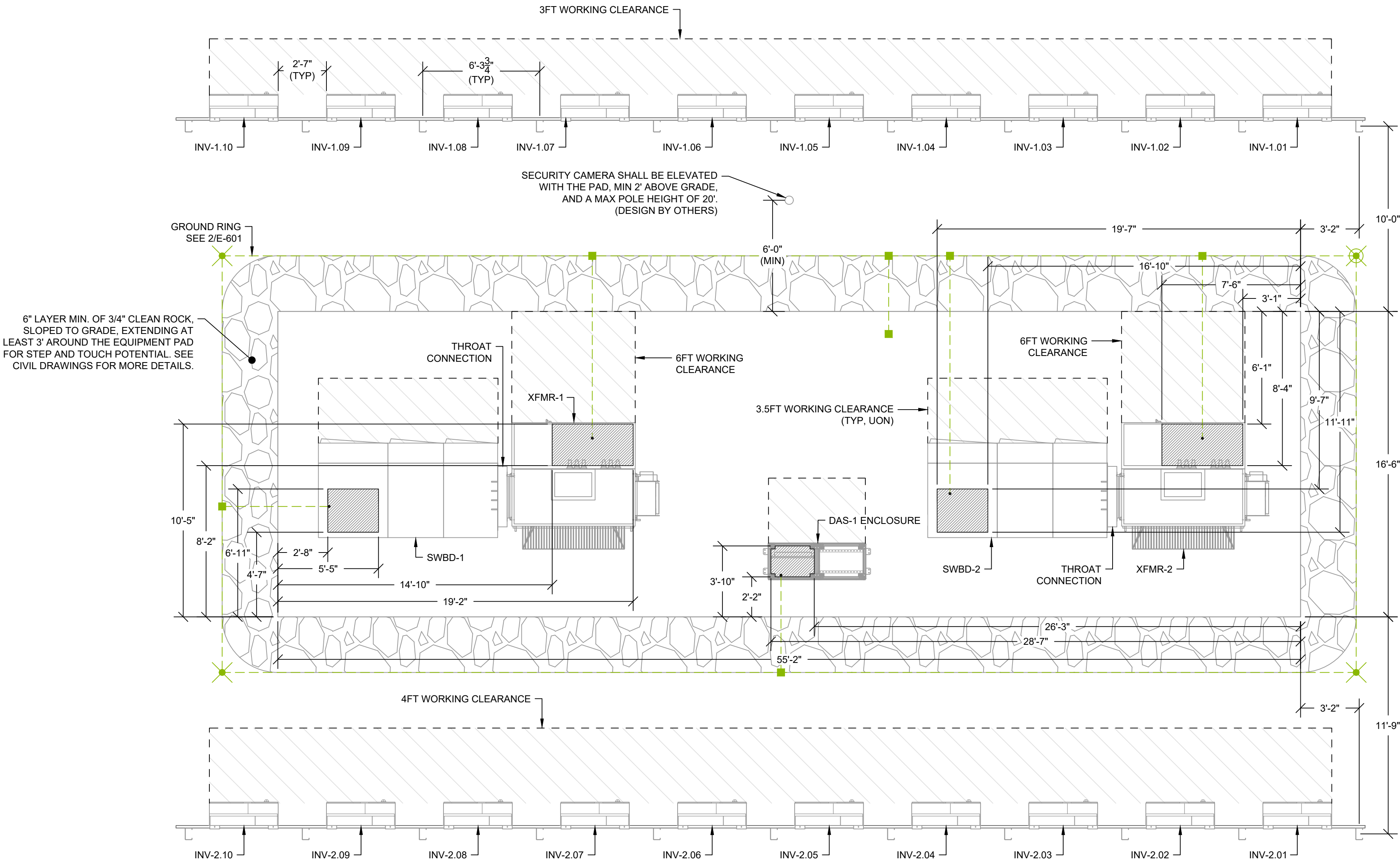
SHEET TITLE

ELEVATION - METER

SHEET NO.

E-304

THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22" - THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22" - THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22" - THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22"



SHEET NOTES:

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- ALL UNDERGROUND CONDUITS SHALL BE PVC 40. ALL 90° UNDERGROUND ELBOWS FOR COMMUNICATION CONDUITS SHALL BE RMC. IF A CONDUIT RUN EXCEEDS 100', THE 90° UNDERGROUND ELBOWS AT THE PULLING END OF THE CIRCUIT SHALL BE IMC. ALL OTHER UNDERGROUND ELBOWS AND STUB UPS SHALL BE PVC 80, UON.
- PROVIDE EXPANSION FITTINGS ON ALL CONDUIT RISERS AND LEAVE ADDITIONAL SLACK FOR ALL CONDUCTORS PRIOR TO TERMINATION TO ALLOW FOR ANNUAL FROST HEAVE.
- THE PAD DESIGN SHALL BE SIZED WITH THE MINIMUM DIMENSIONS FOR EQUIPMENT AND WORKING SPACE CLEARANCES AS SHOWN. FINAL DIMENSIONS OF THE EQUIPMENT PAD/S SHALL BE COORDINATED WITH STRUCTURAL AND CIVIL.

LEGEND:

- GROUNDING CONDUCTOR
- IRREVERSIBLE CRIMP CONNECTION
- GROUND ROD
- GROUND ROD WITH TEST WELL

DESIGN COORDINATOR



KNOBELSDORFF

25701 370TH STREET
GOODHUE, MN 55027

PROJECT

138883 CEMETERY
SUN, LLC

24638 ADAMS RD,
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ENGINEER



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SUN, LLC
FREDERICK, IL, 62639

SHEET TITLE

ENLARGED PLAN

SHEET NO.

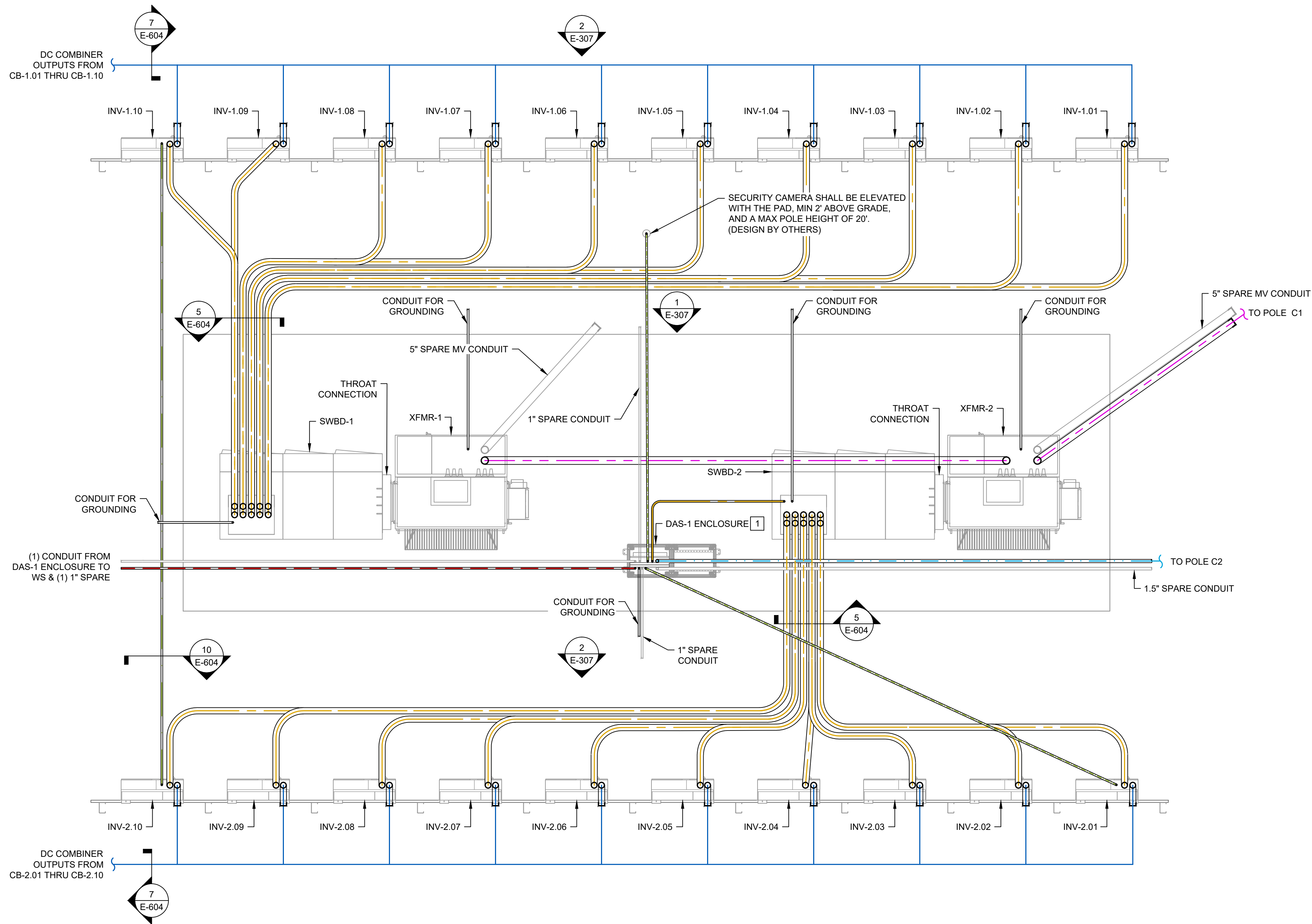
E-305

1 ENLARGED PLAN - EQUIPMENT PAD & INVERTER RACKS
SCALE: 1/4" = 1'-0" _1

0 2' 4' 8'



THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22" - THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22" - THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22" - THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22"



SHEET NOTES:

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2. FOLLOW EQUIPMENT MANUFACTURER'S INSTRUCTIONS FOR EQUIPMENT INSTALLATION.
3. WORKING CLEARANCES TO BE PROVIDED FOR ALL EQUIPMENT PER NEC 110.26 AND 110.34 BASED ON VOLTAGE AND CONDITIONS AS REQUIRED.
4. NO MORE THAN A TOTAL OF 360° BENDS ON A CONDUIT RUN. CONTRACTOR SHALL INSTALL PULL BOX AS NECESSARY.
5. IF TRENCHING IS REQUIRED NEAR STRUCTURAL PILES, CONSULT STRUCTURAL/GEOTECHNICAL ENGINEER TO CONFIRM GUIDELINES FOR REMEDIATION PRIOR TO EXCAVATION.
6. ALL UNDERGROUND CONDUITS SHALL BE PVC 40. ALL 90° UNDERGROUND ELBOWS FOR COMMUNICATION CONDUITS SHALL BE RMC. IF A CONDUIT RUN EXCEEDS 100', THE 90° UNDERGROUND ELBOWS AT THE LEAVING END OF THE CIRCUIT SHALL BE IF ALL OTHER UNDERGROUND ELBOWS AND STUB UPS SHALL BE PVC 80, UON.
7. PROVIDE EXPANSION FITTINGS ON ALL CONDUIT RISERS AND LEAVE ADDITIONAL SLACK FOR ALL CONDUITS PRIOR TO TERMINATION TO ALLOW FOR ANNUAL FROST HEAVE.
8. CONDUIT STUBS FOR GEC TO GROUND RING SHALL EXTEND MINIMUM 18" FROM PAD EDGE. ALL SPARES AND OTHER CONDUIT STUBS TO EXTEND 10" FROM THE SWEEP AND AT LEAST 18" FROM PAD EDGE.
9. THE PAD DESIGN SHALL BE SIZED WITH THE MINIMUM DIMENSIONS FOR EQUIPMENT AND WORKING SPACE. CLEARANCES AS SHOWN. FINAL DIMENSIONS OF THE EQUIPMENT PADS SHALL BE COORDINATED WITH STRUCTURAL AND CIVIL.
10. CONDUIT INSTALLATION MAY BE ADAPTED TO FIELD CONDITIONS AND CONTRACTOR PREFERENCES PROVIDED THE DEPTH AND THE MINIMUM SPACING ARE MAINTAINED. WHERE CONDUITS CONVERGE TO ENTER EQUIPMENT, THEIR SPACING MAY BE REDUCED BELOW THE MINIMUM FOR A SEGMENT NOT EXCEEDING THE LESSER OF 10FT OR 10% OF TOTAL CIRCUIT LENGTH.

KEYED NOTES:

- 1 CONDUIT ENTRY DIMENSIONS AND LOCATION WERE NOT INDICATED IN THE MANUFACTURER SHOP DRAWINGS. CONTRACTOR TO COORDINATE WITH MANUFACTURER

LEGEND:

- 
- UG MV CIRCUIT (DIRECT BURIED)
OUTSIDE PAD
 - UG FIBER IN CONDUIT
 - UG LVAC IN CONDUIT
 - UG DC COMBINER CIRCUITS
(DIRECT BURIED)
 - UG CAT6 IN CONDUIT
 - UG RS485 & 24VDC IN CONDUIT
 - CONDUIT - STUB
 - CONDUIT - CONTINUATION
 - CONDUIT - RISER
 - CAPPED SPARE CONDUIT - STUB

DESIGN COORDINATOR



KNOBELSDORFF

25701 370TH STREET
GOODHUE, MN 55027

PROJECT

138883 CEMETERY

SUN, LLC

24638 ADAMS RD,
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40.089020°, -90.442132°

ENGINEER

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SHEET TITLE

ENLARGED CIRCUIT PLAN

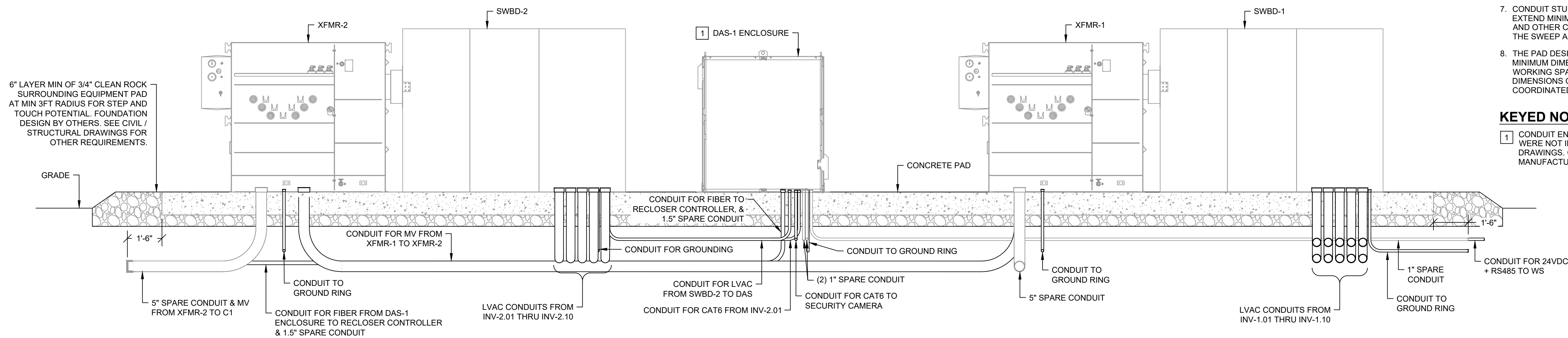
SHEET NO.

E-306

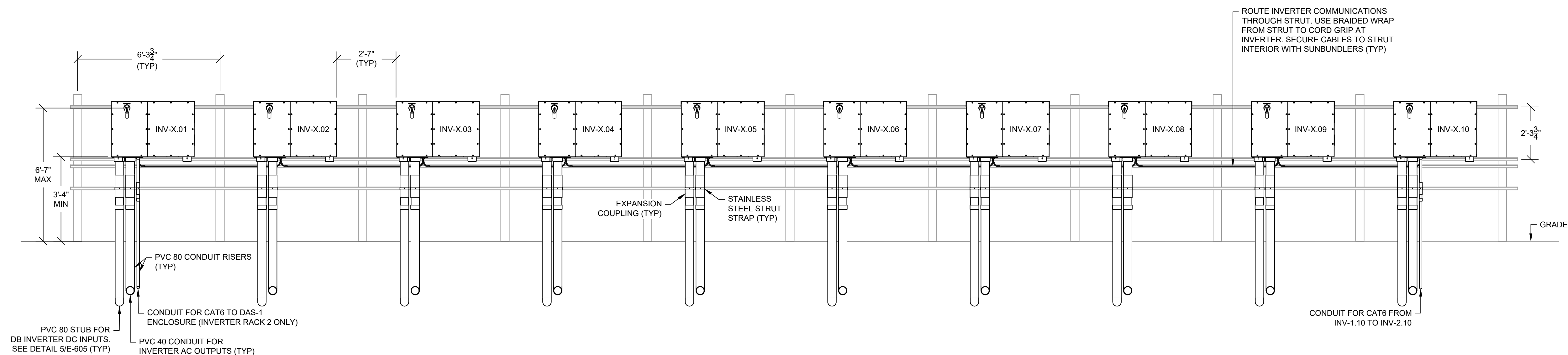
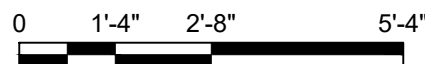
1 ENLARGED CIRCUIT PLAN - EQUIPMENT PAD & INVERTER RACKS
SCALE: 1/4" = 1'-0" 1



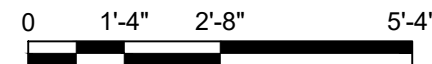
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1 ELEVATION - EQUIPMENT PAD
SCALE: 3/8" = 1'-0" 1



2 TYPICAL ELEVATION - INVERTER RACK
SCALE: 3/8" = 1'-0" 1



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KEYED NOTES:

- 1 CONDUIT ENTRY DIMENSIONS AND LOCATION WERE NOT INDICATED IN THE MANUFACTURER SHOP DRAWINGS. CONTRACTOR TO COORDINATE WITH MANUFACTURER.

DESIGN COORDINATOR



KNOBELSDORFF

25701 370TH STREET
GOODHUE, MN 55027

PROJECT

138883 CEMETERY

SUN, LLC

24638 ADAMS RD,
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ENGINEER



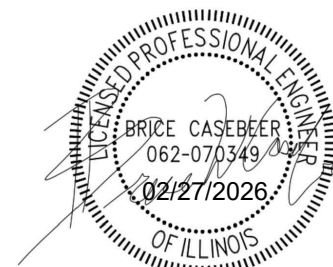
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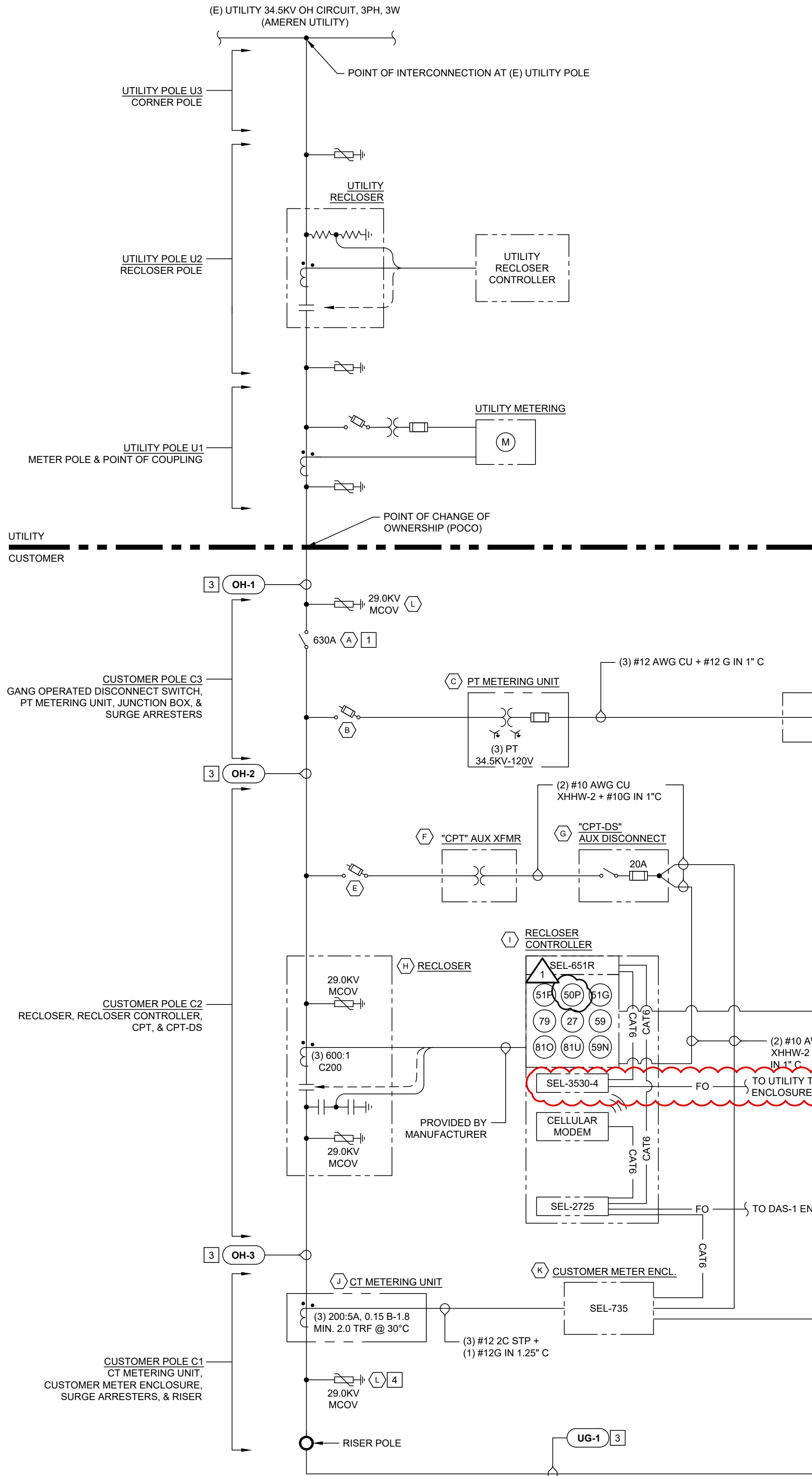
SHEET TITLE

ELEVATIONS

SHEET NO.

E-307

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HOLD
PENDING OWNER PROVIDED SETTINGS
AND UTILITY COORDINATION

HOLD

PENDING UTILITY CONFIRMATION
OF RTAC REQUIREMENTS

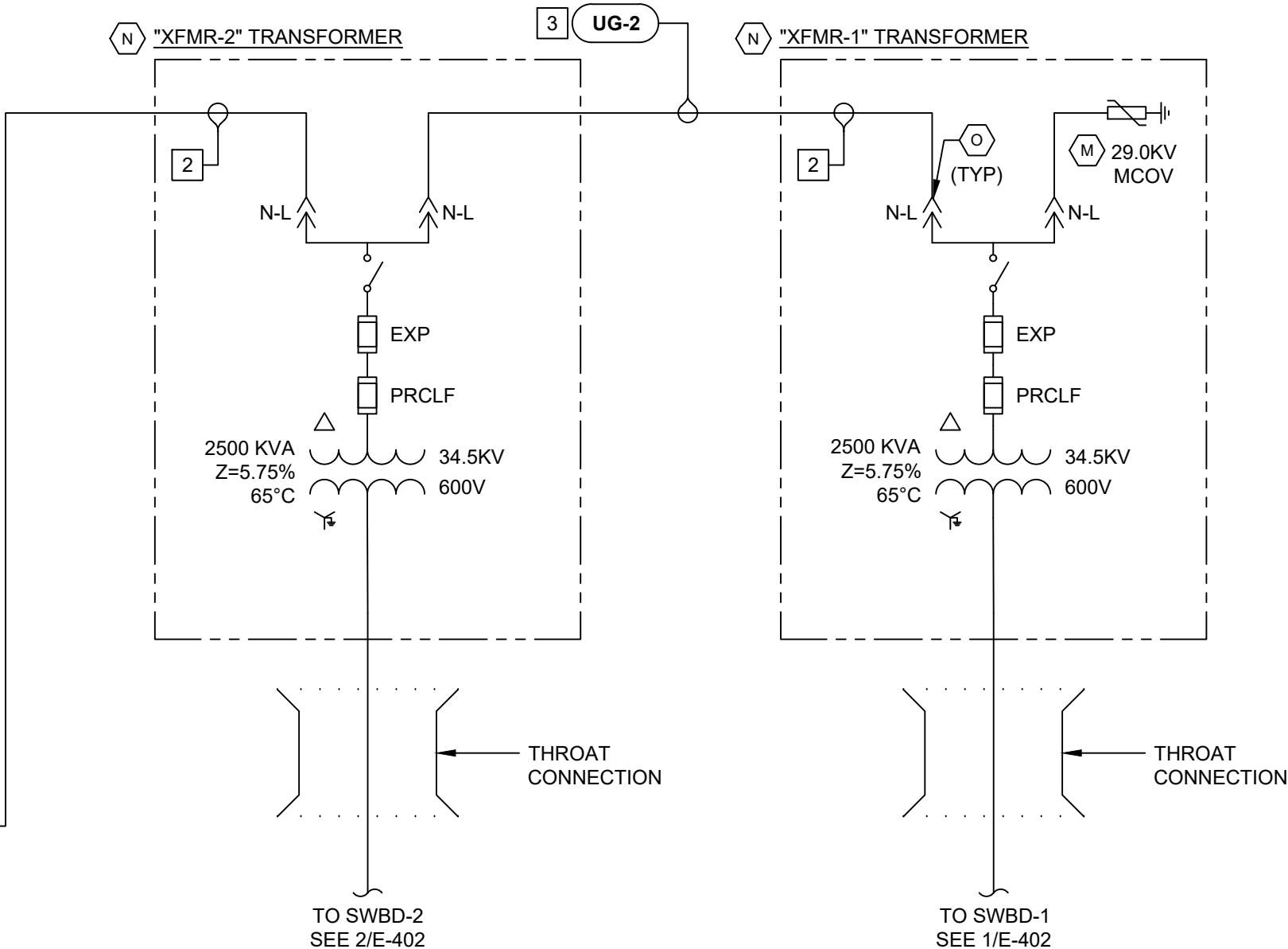
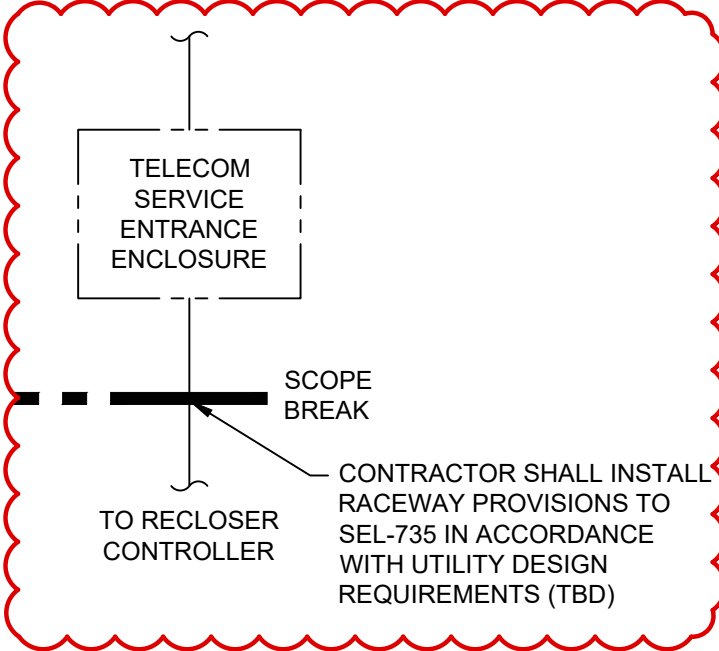
HOLD
PENDING UTILITY CONFIRMATION
OF RTAC REQUIREMENTS

RELAY SETTINGS

DEVICE	FUNCTION	PICKUP	TIME DELAY
27-1	UNDER VOLTAGE	0.5 V PU	1.1 S
27-2	UNDER VOLTAGE	0.88 V PU	2.0 S
59-1	OVER VOLTAGE	1.10 V PU	2.0 S
59-2	OVER VOLTAGE	1.20 V PU	0.16 S
59N	NEUTRAL VOLTAGE	0.2083 V PU	INST
81-O-1	OVER FREQUENCY	60.5 HZ	300 S
81-O-2	OVER FREQUENCY	62.0 HZ	0.16 S
81-U-1	UNDER FREQUENCY	56.5 HZ	0.16 S
81-U-2	UNDER FREQUENCY	58.5 HZ	300 S
50P	OVER CURRENT	TBD	TBD
51P	OVER CURRENT	TBD	TBD
51G	OVER CURRENT	TBD	TBD
79	RECLOSING	$0.95 \text{ PU} \leq V \leq 1.05 \text{ PU}$ $59.5 \leq F \leq 60.5$	300 S

NOTES:

1. 79 ELEMENT IS SET TO CLOSE IN 300S AFTER VOLTAGE AND FREQUENCY RETURN TO NORMAL RANGES. RECLOSER IS SET TO LOCKOUT AFTER OVERCURRENT TRIP.
2. 59N ELEMENT PICKUP TRANSLATE TO 6.94% VOLTAGE IMBALANCE
3. POWER SYSTEM STUDY IS PERFORMED BY THE OWNER AND THE SETTINGS ARE PROVIDED BY THE OWNER.



SHEET NOTES:

1. UTILITY INTERCONNECTION INFORMATION:
SOLAR AC CURRENT: 4.812A @ 600V
SOLAR AC CURRENT: 83.69A @ 34.5KV
UTILITY EXISTING FAULT CURRENT AT 34.500V:
3ø: 1975.5A
1ø: 2305.9A
2. GROUND MEDIUM VOLTAGE UNDERGROUND CONDUCTOR SHIELDS ON BOTH ENDS.
3. UTILITY EQUIPMENT SHOWN FOR REFERENCE ONLY. FINAL DESIGN OF UTILITY EQUIPMENT SHALL BE BY UTILITY. NOT ALL UTILITY EQUIPMENT MAY BE SHOWN.
4. DESIGN ASSUMES EXISTING UTILITY CIRCUIT IS A SINGLE POINT GROUNDING-WYE CONFIGURATION. CUSTOMER MY EQUIPMENT RATINGS AND DESIGN ARE ONLY SUITABLE FOR THIS CONFIGURATION.
5. ALL SWITCHBOARDS, PANELBOARDS AND TRANSFORMERS SHALL BE NEMA 3R RATED.
6. LOW VOLTAGE AC WIRING SHALL BE COPPER AND XHHW-2 UNLESS OTHERWISE NOTED.

KEYED NOTES:

- 1 PER UTILITY INTERCONNECTION GUIDELINES, PROVIDE MANUAL DISCONNECT DEVICE WITH VISIBLE DISCONNECT TO ISOLATE GENERATING FACILITY FROM UTILITY DISTRIBUTION SYSTEM. THE DEVICE MUST BE ACCESSIBLE TO UTILITY PERSONNEL AND BE CAPABLE OF BEING LOCKED IN THE OPEN POSITION.
- 2 SUBCONTRACTOR SHALL PROVIDE ADDITIONAL SLACK (4FT) OF MV CABLES ON ALL THREE PHASES AT THE TRANSFORMER TERMINALS.
- 3 SEE MV CABLE SCHEDULE ON SHEET E-502.
- 4 ARRESTERS SHALL HAVE ZERO LEAD LENGTH.

EQUIPMENT SPECS:

- (A) 630A, 38KV, 25KA, 200KV BIL GANG-OPERATED DISCONNECT SWITCH, HORIZONTAL MOUNTING, FIBERGLASS CONTROL ROD, S&C 147434R4-A2-P1, OAE.
- (B) (3) 100A, 38KV, 12KA, 170KV BIL CUTOUT SWITCH HUBBELL CP710613, OAE. 0.4A FUSE LINKS SHALL BE REMOVABLE BUTTONHEAD, HUBBELL TYPE M0D45FA23, OAE.
- (C) (3) 34.5KV, 200KV BIL, VOLTAGE TRANSFORMERS FEEDING UNIT, ARTECH TYPE URS-36, OAE WITH RATINGS AS SHOWN, VOLTAGE TRANSFORMER SECONDARIES SHALL BE FUSED, PRIMARY METERING MOUNT, ALUMA-FORM PMM-6.
- (D) NEMA 3R JUNCTION BOX WITH TERMINAL BLOCK.
- (E) (2) 100A, 38KV, 12KA, 170KV BIL CUTOUT SWITCH, HUBBELL CP710613, OAE. 0.4A FUSE LINKS SHALL BE REMOVABLE BUTTONHEAD, HUBBELL TYPE M0D45FA23, OAE.
- (F) 2.0KVA, 1Ø, 34.5KV-120V AUXILIARY TRANSFORMER PROVIDED BY RECLOSER MANUFACTURER AND MOUNTED TO RECLOSER.
- (G) 30A, 120V, 1P FUSIBLE DISCONNECT SWITCH IN NEMA 3R ENCLOSURE, EATON TYPE DH111NRK, OAE. FUSE SIZE AS SHOWN, CLASS RK5.
- (H) 1250A, 38KV, 16KA, 170KV BIL, TAVRIDA OM35 SMART 5 OAE, POLE MOUNT RECLOSER WITH TRANSFORMER, 4-HOLE NEMA PADS AND WILDLIFE PROTECTIONS, WITH UPS BATTERY BACKUP, POLE MOUNT FRAME, LOAD SIDE VOLTAGE SENSORS, SOURCE AND LOAD SIDE SURGE ARRESTERS.
- (I) SEL-651R RECLOSER CONTROL, POLE MTD, 120VAC SUPPLY, 16AH BATTERY, DUAL REDUNDANT 10/100BASE-T METALLIC ETHERNET PORTS, 40FT CONTROL CABLE.
- (J) (3) 34.5 KV, 200KV BIL, CURRENT TRANSFORMERS METERING UNIT, ARTECH TYPE CRF-36, OAE WITH RATINGS AS SHOWN. PRIMARY METERING MOUNT, ALUMA-FORM PMM-6.
- (K) SEL-735 REVENUE METER WITH TEST SWITCH PROVISIONS, BACKUP UPS, AND 10/100BASE-T PORTS IN NEMA 3R ENCLOSURE.
- (L) POLE-MOUNTED ARRESTER, HEAVY DUTY (HD) RISE-CLASS, 29KV, 1000V, 20KA, HUBBELL MODEL PVR OPTIMA CAT#2621929, OAE.
- (M) ELBOW ARRESTER, 200A, 35 KV CLASS, 29KV MOV COOPER POWER MODEL M O V E CAT#3238020C36M, PROVIDE LOAD REDUCING TAP PLUG FOR ELBOW ARRESTER ON DEADBREAK CONNECTOR.
- (N) PAD MOUNTED STEP-UP TRANSFORMER WITH VOLTAGE AND POWER RATING AS INDICATED, TRANSFORMER SHALL BE LOOP FEED TYPE WITH 600A DEAD BREAK TERMINATIONS, EXTERNAL VISIBLE DISCONNECT REQUIRED.
- (O) 600A, 35KV, MIN 25KA AT 10 CYCLES, 10KA AT 3 SECS 150KV BIL, DEAD-BREAK CONNECTOR COOPER MODEL BOL-T CAT#BT635*****

DESIGN COORDINATOR



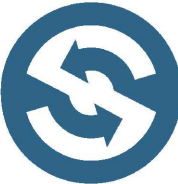
KNOBELSDORFF

25701 370TH STREET
GOODHUE, MN 55021

PROJECT

**138883 CEMETERY
SUN, LLC**

24638 ADAMS RD,
FREDERICK, IL 62639
40.089020°, -90.442133°

ENGINEER

STELLAVISE
SOLAR ENGINEERING

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FREDERICK, IL, 62639

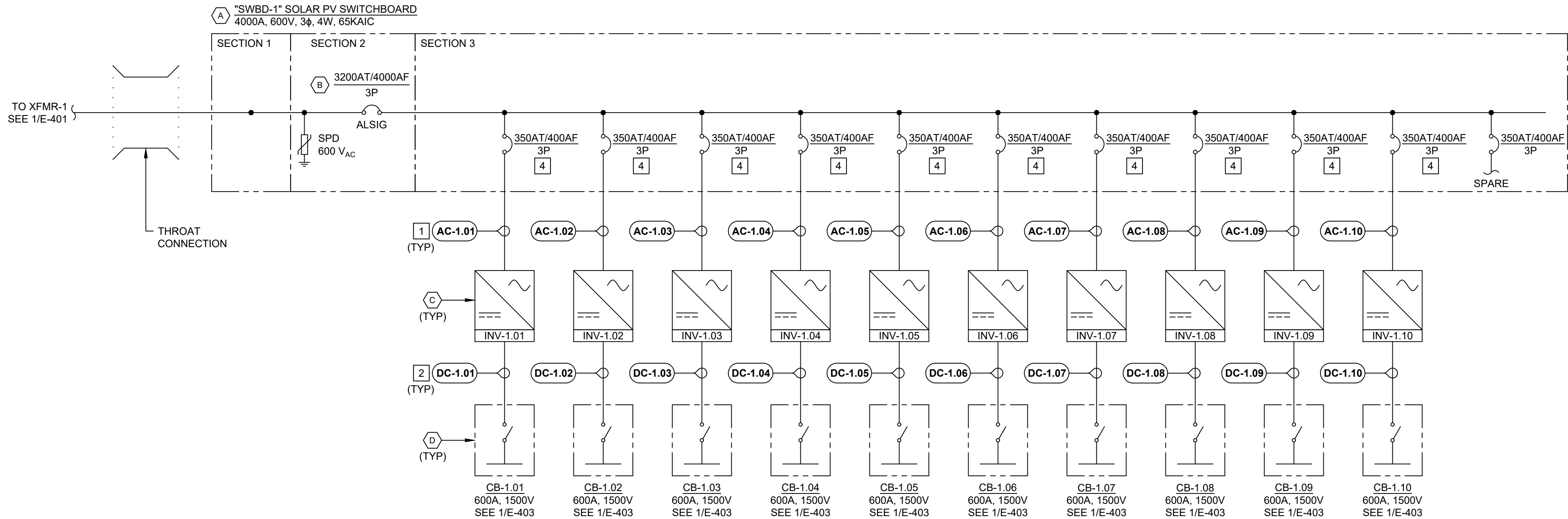
SHEET TITLE

SINGLE LINE DIAGRAM - MV

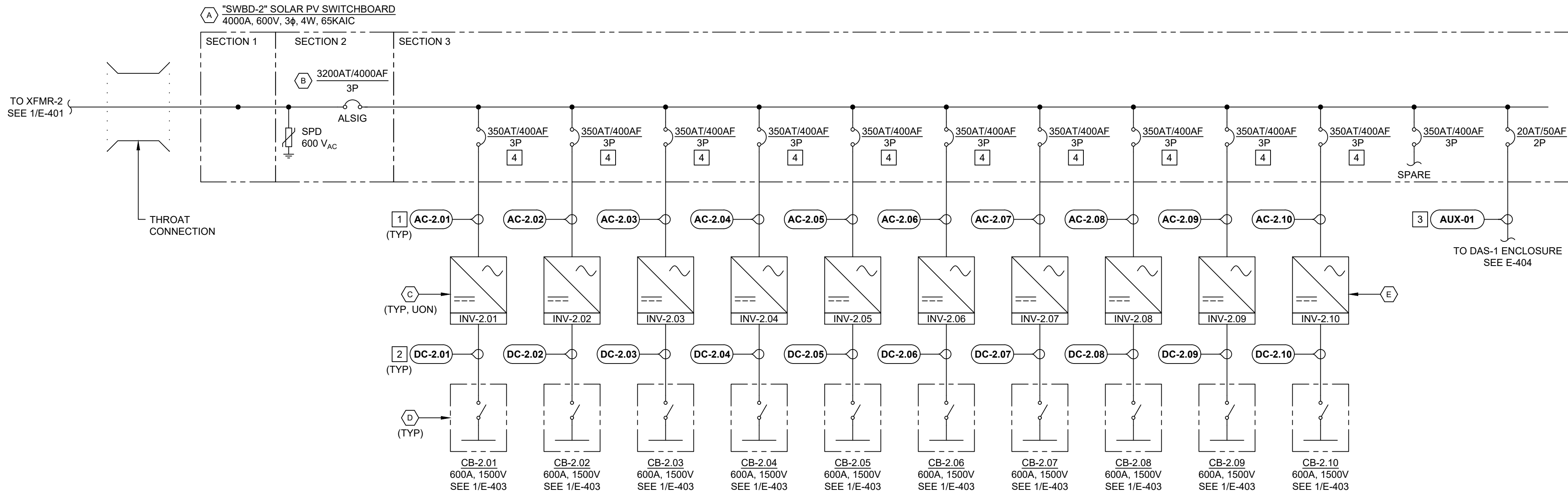
SHEET NO

E-401

THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22" - THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING



1 SINGLE LINE DIAGRAM - SWBD-1
SCALE: NTS



2 SINGLE LINE DIAGRAM - SWBD-2
SCALE: NTS

EQUIPMENT SPECS:

- (A) 4000A, 600V, 3 ϕ , 4W, 65KAIC LOW VOLTAGE AC SWITCHBOARD, FRONT ACCESS, BOTTOM ENTRANCE IN NEMA 3R WEATHERPROOF ENCLOSURE, OAE. EQUIPMENT RATINGS SHALL BE AS INDICATED. ALL CIRCUIT BREAKERS SHALL BE 100% RATED, BI-DIRECTIONAL, AND LOCKABLE.
- (B) MAIN BREAKER SHALL HAVE RATINGS AS INDICATED, AND SHALL INCLUDE GROUND FAULT PROTECTION AND ARC FLASH ENERGY REDUCTION MAINTENANCE SYSTEM (AERMS).
- (C) 250KW, 250KVA, 240.6A, 600V, 3 ϕ , 3W STRING INVERTER, SOLECTRIA XGI 1500-250/250-600.
- (D) 1500VDC, NEMA 4X STANDARD COMBINER BOX WITH 100% RATED INTEGRATED DC DISCONNECT SWITCH. COMBINER BOX SHALL BE SUITABLE FOR UNGROUNDED SYSTEM PER NEC 2020 AND SHALL HAVE FUSED INPUTS FOR POSITIVE CONDUCTORS. COMBINER BOX SHALL BE UL 1741 LISTED AND FUSES SHALL BE UL 2579 LISTED, IN A PAD-LOCKABLE ENCLOSURE. FUSES TO BE PROCURED AND INSTALLED BY CONTRACTOR.
- (E) 225KW, 225KVA, 216.5A, 600V, 3 ϕ , 3W STRING INVERTER, SOLECTRIA XGI 1500-225/225-600.

KEYED NOTES:

- 1 SEE LVAC CABLE SCHEDULE ON E-502.
- 2 SEE DC CABLE SCHEDULE ON E-501.
- 3 SEE AUX CABLE SCHEDULE ON E-404.
- 4 CONDUCTORS ARE LARGER THAN THE STANDARD SIZE THE BREAKER TERMINALS ACCEPT. CONTRACTOR SHALL USE COMPRESSION PIN ADAPTERS COMPATIBLE WITH CABLE SIZE AND BREAKER TERMINALS. CONTRACTOR SHALL CONFIRM THAT SWITCHBOARD HAS ADEQUATE BENDING SPACE TO ACCOMMODATE.

DESIGN COORDINATOR



KNOBELSDORFF

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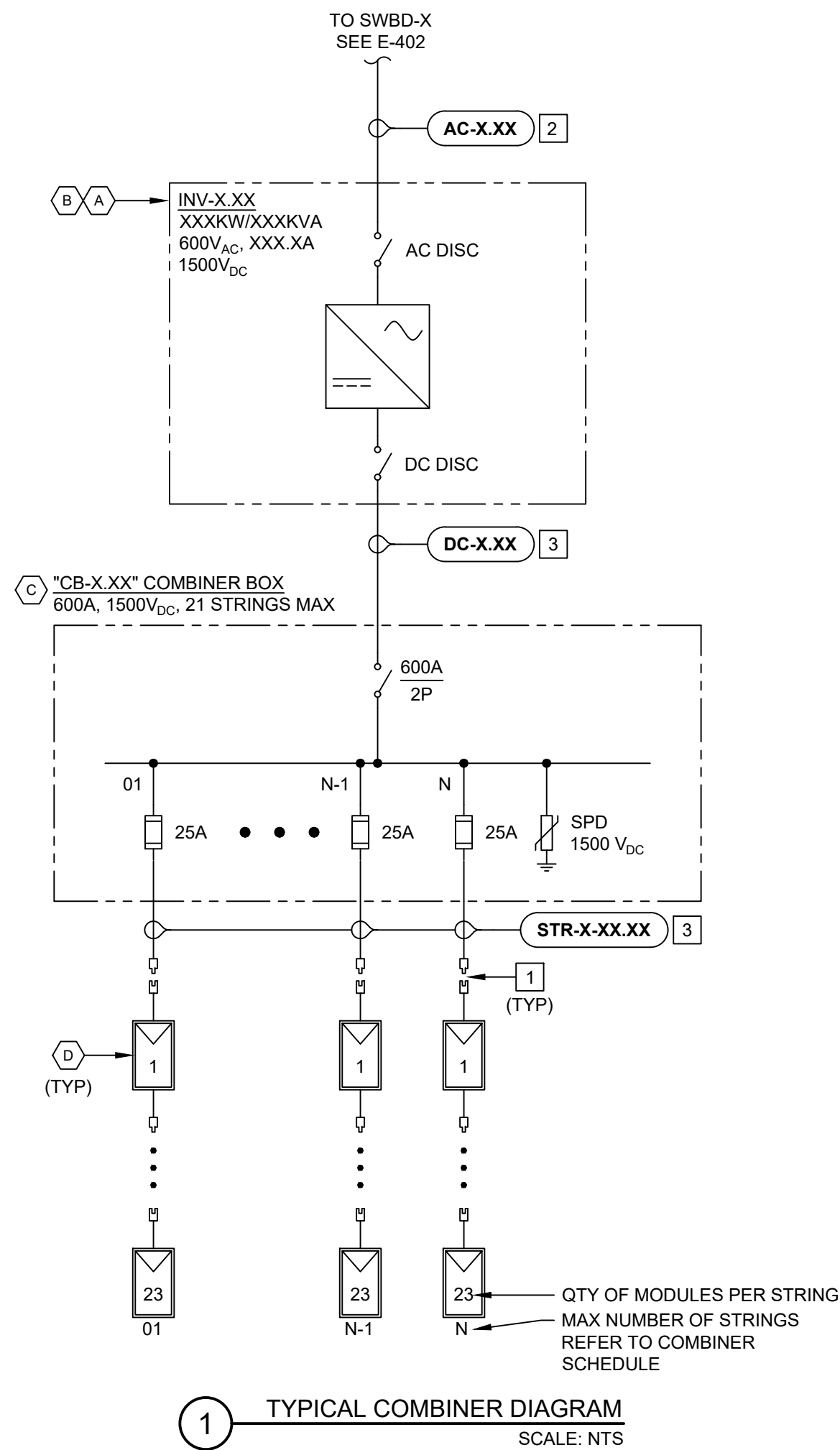
SHEET TITLE

**SINGLE LINE DIAGRAM -
LVAC**

SHEET NO.

E-402

THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22" - THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22" - THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22" - THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING - PAPER SIZE 34" X 22"



COMBINER SCHEDULE																											
COMBINER	MODULES PER STRING																					MODULE QTY	STRING QTY	MODULE RATING (W)	DC SIZE (KW)	INVERTER AC SIZE (KW)	DC/AC RATIO
	INPUT 01	INPUT 02	INPUT 03	INPUT 04	INPUT 05	INPUT 06	INPUT 07	INPUT 08	INPUT 09	INPUT 10	INPUT 11	INPUT 12	INPUT 13	INPUT 14	INPUT 15	INPUT 16	INPUT 17	INPUT 18	INPUT 19	INPUT 20	INPUT 21						
CB-1.01	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	483	21	640	309.1	250	1.24
CB-1.02	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	250	1.18
CB-1.03	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	250	1.18
CB-1.04	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	250	1.18
CB-1.05	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	483	21	640	309.1	250	1.24
CB-1.06	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	483	21	640	309.1	250	1.24
CB-1.07	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	250	1.18
CB-1.08	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	250	1.18
CB-1.09	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	250	1.18
CB-1.10	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	250	1.18
CB-2.01	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	483	21	640	309.1	250	1.24
CB-2.02	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	483	21	640	309.1	250	1.24
CB-2.03	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	250	1.18
CB-2.04	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	483	21	640	309.1	250	1.24
CB-2.05	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	250	1.18
CB-2.06	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	250	1.18
CB-2.07	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	250	1.18
CB-2.08	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	250	1.18
CB-2.09	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	250	1.18
CB-2.10	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	-	460	20	640	294.4	225	1.31
TOTAL																						9,338	406	-	5,976.32	4,975	1.20

LOW/HIGH VOLTAGE RIDE THROUGH SETTINGS				
REGION	VOLTAGE RANGE (% OF NOMINAL VOLTAGE)	OPERATING MODE/RESPONSE	MINIMUM RIDE - THROUGH TIME	MAXIMUM TRIP TIME
HIGH VOLTAGE 2 (HV2)	120	CEASE TO ENERGIZE	N/A	0.16 SECONDS
HIGH VOLTAGE 1 (HV1)	110	MOMENTARY CESSATION	12 SECONDS	13 SECONDS
LOW VOLTAGE 1 (LV1)	88	MANDATORY OPERATION	20 SECONDS	21 SECONDS
LOW VOLTAGE 3 (LV3)	50	MOMENTARY CESSATION	1 SECOND	2 SECONDS

NOTES:
 1. SETTINGS ARE PER INVERTER AMEREN WITNESS TESTING & DER INTERCONNECTION REQUIREMENTS.
 2. INVERTERS RAMP RATE TO BE CONFIGURED TO NOT EXCEED 2% PER SECOND UPON START-UP.

LOW/HIGH FREQUENCY RIDE THROUGH SETTINGS				
REGION	SYSTEM FREQUENCY DEFAULT SETTINGS	MINIMUM RIDE - THROUGH TIME	MAXIMUM TRIP TIME	MAXIMUM TRIP TIME
HIGH FREQ 2 (HF2)	62	NO RIDE THROUGH	N/A	0.16 SECONDS
HIGH FREQ 1 (HF1)	61.2	299 SECONDS	MANDATORY OPERATION	300 SECONDS
LOW FREQ 1 (LF1)	58.5	299 SECONDS	MANDATORY OPERATION	300 SECONDS
LOW FREQ 2 (LF2)	56.5	NO RIDE THROUGH	N/A	0.16 SECONDS

NOTES:
 1. SETTINGS ARE PER INVERTER AMEREN WITNESS TESTING & DER INTERCONNECTION REQUIREMENTS.
 2. INVERTERS RAMP RATE TO BE CONFIGURED TO NOT EXCEED 2% PER SECOND UPON START-UP.

VOLT-VAR SETTINGS		
VOLT-VAR PARAMETER	DEFINITIONS	DEFAULT VALUES (% OF NOMINAL VOLTAGE)
V1	VOLTAGE AT WHICH DER SHALL INJECT Q1 REACTIVE POWER	92%
Q1	REACTIVE POWER INJECTION AT VOLTAGE V1	44%
V2	DEAD BAND LOWER VOLTAGE LIMIT	98%
Q2	REACTIVE POWER INJECTION OR ABSORPTION AT VOLTAGE V2	0%
V3	DEAD BAND UPPER VOLTAGE LIMIT	102%
Q3	REACTIVE POWER INJECTION OR ABSORPTION AT VOLTAGE V3	0%
V4	VOLTAGE AT WHICH DER SHALL ABSORB Q4 REACTIVE POWER	108%
Q4	REACTIVE POWER ABSORPTION AT VOLTAGE V4	44%
OPEN LOOP RESPONSE TIME	TIME TO 90% OF THE REACTIVE POWER CHANGE IN RESPONSE TO THE CHANGE IN VOLTAGE	5 SECONDS

HOLD
PENDING UTILI
APPROVAL

SHEET NOTES:

1. INVERTER VOLT/VAR OPERATION IS REQUIRED. CONTRACTOR SHALL COORDINATE WITH AMEREN FOR SPECIFICS.

KEYED NOTES:

- 1 MODULE CONNECTORS MATED TOGETHER SHALL BE OF THE SAME TYPE AND FROM THE SAME MANUFACTURER. MC4 EVO-2 CONNECTORS SHALL ONLY BE ALLOWED WITH USE OF DUAL JACKETED PV CABLE.
- 2 SEE LVAC CABLE SCHEDULE ON E-502.
- 3 SEE DC CABLE SCHEDULE ON E-501.

EQUIPMENT SPECS:

- (A) 250KW, 250KVA, 240.6A, 600V, 3ø, 3W STRING INVERTER, SOLLECTRIA XGI 1500-250/250-600
- (B) 225KW, 225KVA, 216.5A, 600V, 3ø, 3W STRING INVERTER, SOLLECTRIA XGI 1500-225/225-600
- (C) 1500VDC, NEMA 4X STANDARD COMBINER BOX WITH 100% RATED INTEGRATED DC DISCONNECT SWITCH. COMBINER BOX SHALL BE SUITABLE FOR UNGROUNDED SYSTEM PER NEC 2020 AND SHALL HAVE FUSED INPUTS FOR POSITIVE CONDUCTORS. COMBINER BOX SHALL BE UL 1741 LISTED AND PADLOCKABLE SHALL BE 2500VDC LISTED. PAD-LOCKABLE ENCLOSURE. FUSES TO BE PROCURED AND INSTALLED BY CONTRACTOR.
- (D) 640W, 1500VDC SOLAR PV MODULE, HELIONE 156HC M10 NTP ST BIFACIAL MODULE

DESIGN COORDINATOR



KNOBELSDORFF

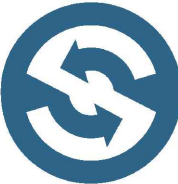
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ENGINEER

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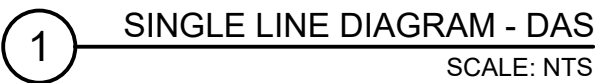
SHEET TITLE

SINGLE LINE DIAGRAM - DC

SHEET NO

E-403

PENDING UTILITY RTAC REQUIREMENTS



1. LOW VOLTAGE AC WIRING SHALL BE COPPER, XHHW-2 UNLESS OTHERWISE NOTED.
2. DAS MONITORING EQUIPMENT SUPPLIED BY DAS MANUFACTURER. REFER TO DAS SYSTEM DESIGN DRAWINGS FOR ADDITIONAL DETAILS.

—————	120V AC POWER
——— FO ———	FIBER OPTIC CABLE IN 1.5" C
——— CAT6 ———	CAT6 ETHERNET CABLE IN 1" C
——— 24V ———	24V DC POWER
——— RS485 ———	RS485 INDUSTRIAL CABLE
-----	ANALOG/PULSE/DRY CONTACT

25701 370TH STREET
GOODHUE, MN 55027

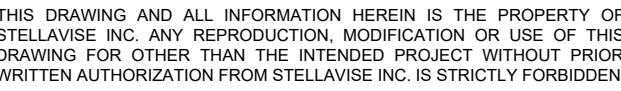
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SHEET TITLE

SINGLE LINE DIAGRAM - DAS

SHEET NO.

E-405

MODULE CHARACTERISTICS		
MANUFACTURER		HELIENE
MODEL		156HC M10 NTPP SL
MAXIMUM POWER @ STC		640 W
MAXIMUM POWER VOLTAGE, Vmp		48.8 V
MAXIMUM POWER CURRENT, Imp		13.1 A
OPEN-CIRCUIT VOLTAGE, Voc		57.7 V
SHORT-CIRCUIT CURRENT, Isc		13.8 A
MAXIMUM SYSTEM VOLTAGE, Vmax		1500 V
MAXIMUM SERIES FUSE RATING		30.0 A
THERMAL PROPERTIES	Pmax COEFFICIENT (γ)	-0.300%
	Voc COEFFICIENT (β)	-0.250%
	Isc COEFFICIENT (α)	0.045%

INVERTER CHARACTERISTICS		
MANUFACTURER	YASKAWA SOLECTRIA SOLAR	YASKAWA SOLECTRIA SOLAR
MODEL	XGI 1500 225/225-600	XGI 1500 250/250-600
RATED AC POWER	225 kW	250 kW
MIN. MPPT VOLTAGE	860 V	860 V
MAX. MPPT VOLTAGE	1250 V	1250 V
MAX. DC INPUT VOLTAGE	1500 V	1500 V
AC OUTPUT VOLTAGE	600 V	600 V
AC OUTPUT CURRENT	216.5 A	240.6 A
MAX AC CABLE OUTPUT	2 (SETS) OF 600 KCMIL	

WEATHER STATION DATA	
JACKSONVILLE, IL	
2% AVERAGE HIGH TEMP	33.0 °C
20-YR EXTREME HIGH TEMP	39.1 °C
EXTREME LOW TEMP	-20.5 °C
SITE ELEVATION	
205 m (672 FT)	

OUTDOOR THERMAL EXPANSION		
CONDUIT	4" EXPANSION JOINT REQ'D ON CONTINUOUS SPANS OVER 'X' FT	4" EXPANSION JOINT ALLOWS SPAN OF 'X' FT
STEEL	25	406
ALUMINUM	13	206
PVC	6	94

VOLTAGE DROP SUMMARY		
SYSTEM	AVERAGE	MAX
DC SYSTEM - BLOCK 1	1.90%	3.22%
LVAC SYSTEM - BLOCK 1	0.14%	0.20%
DC SYSTEM - BLOCK 2	1.56%	2.27%
LVAC SYSTEM - BLOCK 2	0.13%	0.18%
MVAC	0.05%	0.05%

SHEET NOTES:

1. CONDUCTOR LENGTHS INDICATED ARE APPROXIMATIONS. CONTRACTOR SHALL VERIFY ACTUAL LENGTHS ON SITE.
2. ALL UNDERGROUND CONDUITS SHALL BE PVC 40. IF A CONDUIT RUN EXCEEDS 100 FT, THE 90° UNDERGROUND ELBOWS AT THE PULLING END OF THE CIRCUIT SHALL BE IMC. ALL OTHER UNDERGROUND ELBOWS AND STUB UPS SHALL BE PVC 80, UON.

KEYED NOTES:

- | | |
|---|--|
| 1 | MINIMUM 1) #2 AWG CU EGC SHALL BE INSTALLED PER COMBINER OUTPUT CONDUIT STUB-UP AND PER INVERTER DC INPUT CONDUIT STUB-UP. |
| 2 | CONDUIT SIZES AND QUANTITIES VARY. SEE SHEETS E-201 THRU E-204 FOR REFERENCE. |

DC SOURCE CIRCUIT CABLE SCHEDULE AND CALCULATIONS - BLOCK 1																																							
GENERAL			CONDUCTOR DETAILS				EGC DETAILS		RACEWAY DETAILS					MODULE					OCPD / TERMINATION AMPACITY					FREE AIR AMPACITY					RACEWAY AMPACITY					VOLTAGE DROP CALCULATIONS					
CABLE ID	FROM	TO	QTY	SIZE	MATERIAL	INSULATION	SIZE	MATERIAL	QTY	SIZE	TYPE	MAX CONDUCTORS PER CONDUIT	FILL (%)	TYPE	SIZE (W)	MAX ISC (A)	MAX ISC x 125% (A)	OCPD RATING (A)	90°C TERM RATING (A)	90°C AMPACITY (A)	TEMP CORR.	FILL ADJUST	C.O.U. AMPACITY (A)	90°C AMPACITY (A)	TEMP CORR.	FILL ADJUST	C.O.U. AMPACITY (A)	MODULES PER STRING	AVG. ONE-WAY CABLE LENGTH (FT)	MAX ONE-WAY CABLE LENGTH (FT)	OPERATING CURRENT (Imp @ STC)	OPERATING VOLTAGE (Vmp @ STC)	IN-STRING VOLTAGE DROP (%)	AVG. TOTAL VOLTAGE DROP (%)	MAX TOTAL VOLTAGE DROP (%)				
STR 1.01-XX	STR 1.01-XX	CB-1.01	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	145	360	13.1	1121.7	0.56%	0.98%	1.60%				
STR 1.02-XX	STR 1.02-XX	CB-1.02	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	105	317	11.7	1121.7	0.56%	0.99%	0.99%				
STR 1.03-XX	STR 1.03-XX	CB-1.03	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	184	335	13.3	1121.7	0.56%	1.09%	0.53%				
STR 1.04-XX	STR 1.04-XX	CB-1.04	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	177	330	13.1	1121.7	0.56%	1.06%	1.52%				
STR 1.05-XX	STR 1.05-XX	CB-1.05	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	172	330	13.1	1121.7	0.56%	1.06%	1.52%				
STR 1.06-XX	STR 1.06-XX	CB-1.06	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	155	310	13.1	1121.7	0.56%	1.01%	1.46%				
STR 1.07-XX	STR 1.07-XX	CB-1.07	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	172	325	13.1	1121.7	0.56%	1.06%	1.50%				
STR 1.08-XX	STR 1.08-XX	CB-1.08	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	161	330	13.1	1121.7	0.56%	1.03%	1.52%				
STR 1.09-XX	STR 1.09-XX	CB-1.09	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	146	270	13.1	1121.7	0.56%	0.98%	1.34%				
STR 1.10-XX	STR 1.10-XX	CB-1.10	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	248	370	13.1	1121.7	0.56%	1.28%	1.63%				
																												AVERAGE DC VD		1.04%									
																												MAXIMUM DC VD		1.63%									

DC SOURCE CIRCUIT CABLE SCHEDULE AND CALCULATIONS - BLOCK 2																																								
GENERAL			CONDUCTOR DETAILS				EGC DETAILS		RACEWAY DETAILS						MODULE					OCPD / TERMINATION AMPACITY					FREE AIR AMPACITY					RACEWAY AMPACITY				VOLTAGE DROP CALCULATIONS						
CABLE ID	FROM	TO	QTY	SIZE	MATERIAL	INSULATION	SIZE	MATERIAL	QTY	SIZE	TYPE	MAX CONDUCTORS PER CONDUIT	FILL (%)	TYPE	SIZE (W)	MAX ISC (A)	MAX ISC x 125% (A)	OCPD RATING (A)	90°C TERM RATING (A)	90°C AMPACITY (A)	TEMP CORR.	FILL ADJUST	C.O.U. AMPACITY (A)	90°C AMPACITY (A)	TEMP CORR.	FILL ADJUST	C.O.U. AMPACITY (A)	MODULES PER STRING	AVG. ONE-WAY CABLE LENGTH (FT)	MAX ONE-WAY CABLE LENGTH (FT)	OPERATING CURRENT (Imp @ STC)	OPERATING VOLTAGE (Vmp @ STC)	IN-STRING VOLTAGE DROP (%)	AVG. TOTAL VOLTAGE DROP (%)	MAX TOTAL VOLTAGE DROP (%)					
STR 2.01-XX	STR 2.01-XX	CB-2.01	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	132	210	13.1	1121.7	0.56%	0.94%	1.17%					
STR 2.02-XX	STR 2.02-XX	CB-2.02	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	186	295	13.1	1121.7	0.56%	1.10%	1.41%					
STR 2.03-XX	STR 2.03-XX	CB-2.03	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	181	250	13.1	1121.7	0.56%	1.18%	1.59%					
STR 2.04-XX	STR 2.04-XX	CB-2.04	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	213	305	13.1	1121.7	0.56%	1.18%	1.59%					
STR 2.05-XX	STR 2.05-XX	CB-2.05	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	180	350	13.1	1121.7	0.56%	1.08%	1.57%					
STR 2.06-XX	STR 2.06-XX	CB-2.06	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	150	245	13.1	1121.7	0.56%	0.99%	1.27%					
STR 2.07-XX	STR 2.07-XX	CB-2.07	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	177	305	13.1	1121.7	0.56%	1.07%	1.44%					
STR 2.08-XX	STR 2.08-XX	CB-2.08	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	131	235	13.1	1121.7	0.56%	0.94%	1.24%					
STR 2.09-XX	STR 2.09-XX	CB-2.09	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	156	240	13.1	1121.7	0.56%	1.01%	1.26%					
STR 2.10-XX	STR 2.10-XX	CB-2.10	2	#10 AWG	COPPER	PV 2KV	#6 AWG	COPPER	1	1-1/2"	PVC 40	8	26%	CONDUIT	640	16.70	20.87	25	40	55	0.97	0.50	26.8	40	0.97	0.70	27.3	23	136	220	13.1	1121.7	0.56%	0.95%	1.20%					
																												AVERAGE DC VD		1.04%										
																												MAXIMUM DC VD		1.72%										

COMBINER BOX OUTPUT CABLE SCHEDULE - BLOCK-1																														
GENERAL			CONDUCTOR DETAILS					EGC DETAILS		RACEWAY DETAILS				MODULE		TERMINATION AMPACITY				RACEWAY / DIRECT BURIED AMPACITY			VOLTAGE DROP CALCULATIONS							
CABLE ID	FROM	TO	QTY	SIZE	MATERIAL	INSULATION	SIZE	MATERIAL	QTY	SIZE	TYPE	FILL (%)	TYPE	COMBINER RATING (A)	SIZE (W)	# OF PARALLEL STRINGS	MAX ISC (A)	MAX ISC x 125% (A)	90°C TERM RATING (A)	90°C AMPACITY (A)	TEMP CORR.	FILL ADJUST	C.O.U. AMPACITY (A)	MODULES PER STRING	ONE-WAY LENGTH (FT)	COMBINER OUTPUT VD (%)	AVG STR & HAR VD (%)	COMBINER + AVG STR & HAR VD (%)	MAX STR & HAR VD (%)	COMBINER + MAX STR & HAR VD (%)
DC-1-01	CB-1.01	INV-1.01	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	21	350.67	438.33	560	560	0.97	0.80	436.7	23	1090	1.62%	0.98%	2.60%	1.60%	3.22%
DC-1-02	CB-1.02	INV-1.02	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	995	1.0%	0.96%	2.27%	0.96%	2.40%
DC-1-03	CB-1.03	INV-1.03	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	905	1.28%	1.09%	2.32%	1.28%	2.81%
DC-1-04	CB-1.04	INV-1.04	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	605	0.86%	1.06%	1.92%	1.52%	2.37%
DC-1-05	CB-1.05	INV-1.05	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	21	350.67	438.33	560	560	0.97	0.80	436.7	23	540	0.80%	1.06%	1.86%	1.52%	2.32%
DC-1-06	CB-1.06	INV-1.06	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	21	350.67	438.33	560	560	0.97	0.80	436.7	23	445	0.66%	1.01%	1.67%	1.46%	2.12%
DC-1-07	CB-1.07	INV-1.07	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	380	0.54%	1.06%	1.60%	1.50%	2.04%
DC-1-08	CB-1.08	INV-1.08	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	315	0.45%	1.03%	1.47%	1.52%	1.96%
DC-1-09	CB-1.09	INV-1.09	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	250	0.35%	0.98%	1.34%	1.34%	1.70%
DC-1-10	CB-1.10	INV-1.10	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	415	0.59%	1.28%	1.87%	1.63%	2.22%
TOTAL STRINGS																203														
																								AVERAGE	1.90%	MAXIMUM	3.22%			

COMBINER BOX OUTPUT CABLE SCHEDULE - BLOCK-2																																	
GENERAL			CONDUCTOR DETAILS					EGC DETAILS		RACEWAY DETAILS				MODULE	TERMINATION AMPACITY				RACEWAY / DIRECT BURIED AMPACITY				VOLTAGE DROP CALCULATIONS										
CABLE ID	FROM	TO	QTY	SIZE	MATERIAL	INSULATION	SIZE 1	MATERIAL	QTY	SIZE	TYPE	FILL (%)	TYPE		COMBINER RATING (A)	SIZE (W)	# OF PARALLEL STRINGS	MAX ISC (A)	MAX ISC x 125% (A)	90°C TERM RATING (A)	90°C AMPACITY (A)	TEMP CORR.	FILL ADJUST	C.O.U. AMPACITY (A)	MODULES PER STRING	ONE-WAY LENGTH (FT)	COMBINER OUTPUT VD (%)	AVG STR & HAR VD (%)	COMBINER + AVG STR & HAR VD (%)	MAX STR & HAR VD (%)	COMBINER + MAX STR & HAR VD (%)		
DC-2-01	CB-2-01	INV-2-01	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	21	350.67	438.33	560	560	0.97	0.80	436.7	23	145	0.22%	0.94%	1.16%	1.17%	1.38%			
DC-2-02	CB-2-02	INV-2-02	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	21	350.67	438.33	560	560	0.97	0.80	436.7	23	100	0.15%	1.10%	1.25%	1.41%	1.56%			
DC-2-03	CB-2-03	INV-2-03	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	130	0.18%	1.13%	1.32%	1.59%				
DC-2-04	CB-2-04	INV-2-04	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	21	350.67	438.33	560	560	0.97	0.80	436.7	23	185	0.27%	1.18%	1.45%	1.72%	1.99%			
DC-2-05	CB-2-05	INV-2-05	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	205	0.29%	1.08%	1.37%	1.57%	1.86%			
DC-2-06	CB-2-06	INV-2-06	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	545	0.77%	0.99%	1.76%	1.27%	2.04%			
DC-2-07	CB-2-07	INV-2-07	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	380	0.54%	1.07%	1.61%	1.44%	1.98%			
DC-2-08	CB-2-08	INV-2-08	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	625	0.88%	0.94%	1.82%	1.24%	2.13%			
DC-2-09	CB-2-09	INV-2-09	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	620	0.88%	1.01%	1.89%	1.26%	2.13%			
DC-2-10	CB-2-10	INV-2-10	2	(2) SETS OF 350 KCMIL	ALUMINUM	PV 2KV	#2 AWG	COPPER	1	4"	PVC 80	25%	STUB-UP	600	640	20	333.97	417.46	560	560	0.97	0.80	436.7	23	755	1.07%	0.95%	2.02%	1.20%	2.27%			
TOTAL STRINGS																203																	
																	AVERAGE											1.56%	MAXIMUM				2.27%

MAXIMUM CURRENT

PER 2020 NEC 690.8(A)(1)(2), THE CALCULATED MAXIMUM CURRENT OF THE PV SYSTEM WAS DETERMINED USING NREL SYSTEM ADVISOR MODEL (SAM) SOFTWARE AND SITE SPECIFIC SATELLITE WEATHER DATA FOR THE PAST 27 YEARS [1998-2024] TO DETERMINE THE MAXIMUM 3-HOUR AVERAGE SHORT-CIRCUIT CURRENT. BOTH FRONT AND REAR-SIDE IRRADIANCE WERE CONSIDERED. BELOW IS A SUMMARY OF THE RESULTS.

HELIENE 640W:

- MAX TOTAL IRRADIANCE: 1153.56 W/m²
- MAX SHORT-CIRCUIT CURRENT: 16.37 A
- SAFETY FACTOR: 2%
- DESIGN MAX CURRENT: 16.70 A

MAXIMUM VOLTAGE

PER 2020 NEC 690.7(A)(3), THE CALCULATED MAXIMUM VOLTAGE OF THE PV SYSTEM WAS DETERMINED USING NREL SYSTEM ADVISOR MODEL (SAM) SOFTWARE AND SITE SPECIFIC SATELLITE WEATHER DATA FOR THE PAST 27 YEARS [1998-2024] TO DETERMINE THE MAXIMUM SYSTEM VOLTAGE. BOTH FRONT AND REAR-SIDE IRRADIANCE WERE CONSIDERED. BELOW IS A SUMMARY OF THE RESULTS.

HELIENE 640W:

- STRING LENGTH: 23
- MAX OPEN-CIRCUIT VOLTAGE: 1450.36 V
- SAFETY FACTOR: 2%
- DESIGN MAX VOLTAGE: 1479.37 V

MINATOR



KNOBELSDORFF

25701 370TH STREET
GOODHUE, MN 55027

PROJECT

**138883 CEMETERY
SUN, LLC**

24638 ADAMS RD,
FREDERICK, IL 62639
40.089020°, -90.442132°

ENGINEER

STELLAVISE
SOLAR ENGINEERING

2535 CAMINO DEL RIO S, STE. 235
SAN DIEGO, CA 92108
IL DESIGN FIRM #184.009162

WWW.STELLAVISE.COM

(619) 837-5331

SEAL



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REVISIONS

#	DESCRIPTION	DATE
0	IFC	02/06/2026
1	IFC R1	02/27/2026

ISSUED FOR CONSTRUCTION
FEBRUARY 27, 2026

1138883 CEMETERY
SUN, LLC
FREDERICK, IL, 62639

SHEET TITLE

CABLE SCHEDULE & CALCULATIONS

SHEET NO

E-501

THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING

PAPER SIZE 34" X 22"

THIS EDGE INTENTIONALLY LEFT BLANK FOR BINDING

PAPER SIZE 34" X 22"

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PAPER SIZE 34" X 22"

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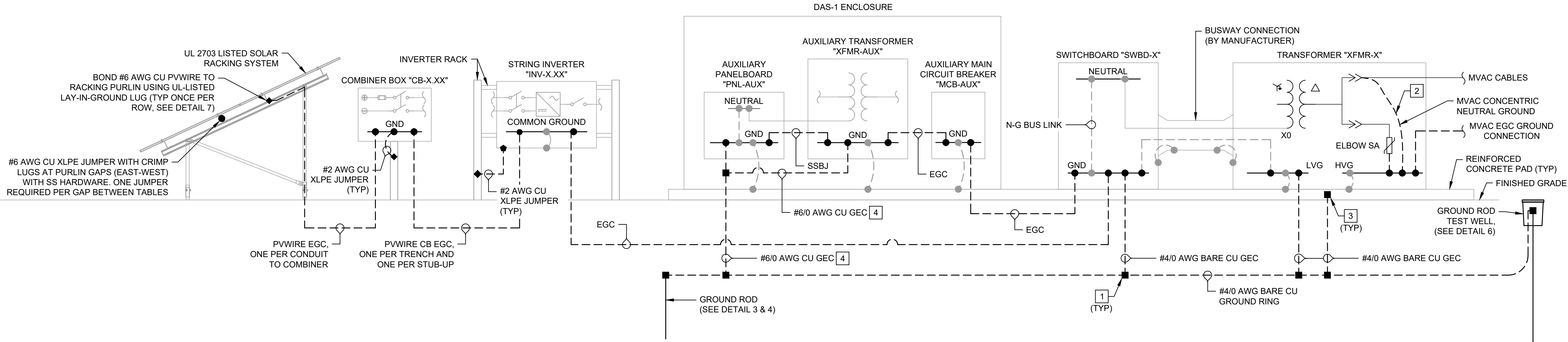
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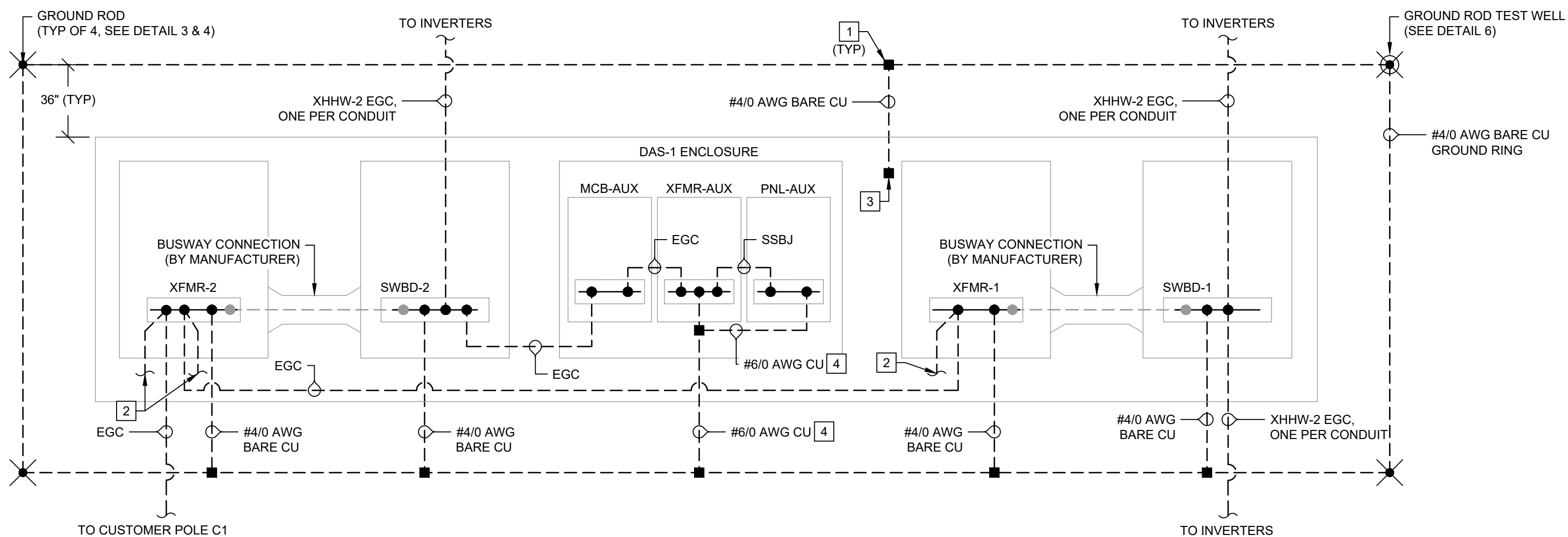
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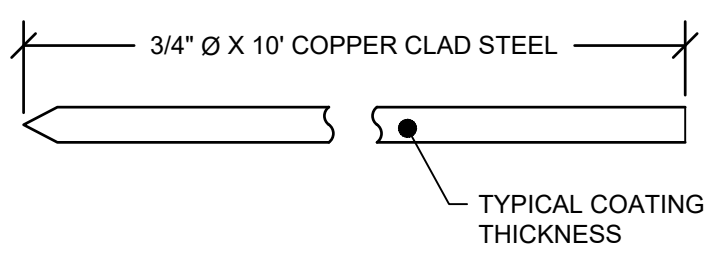
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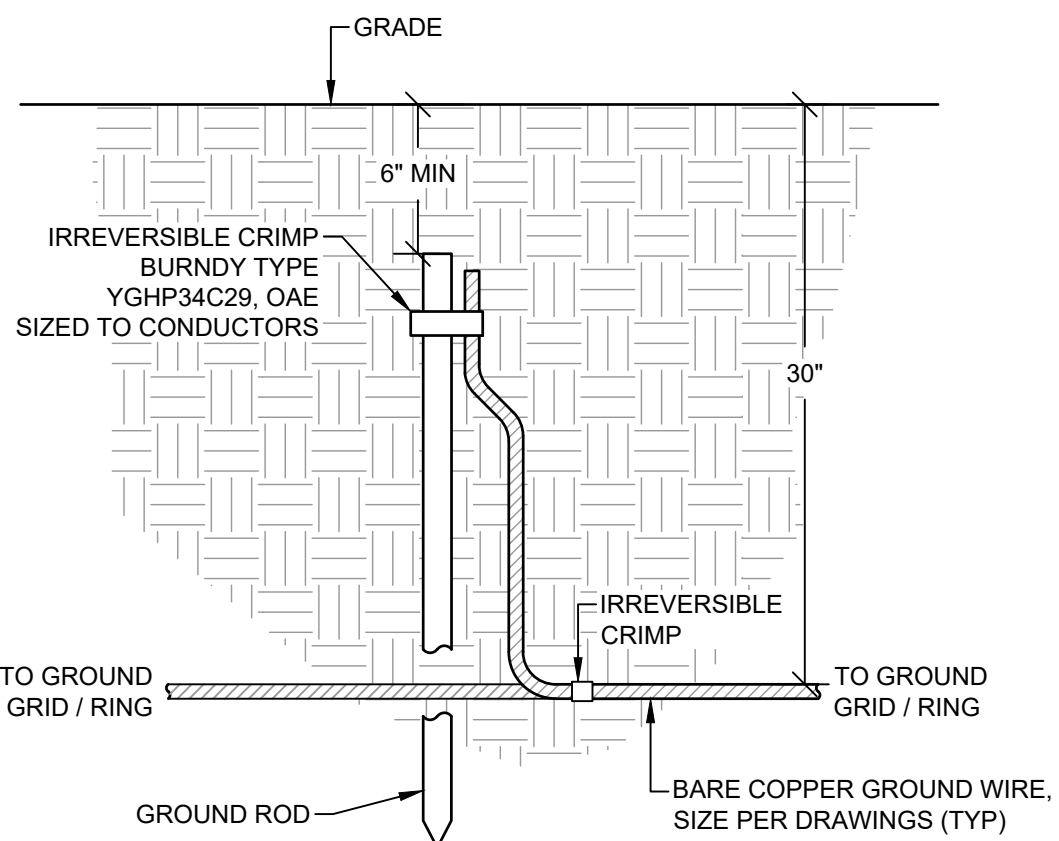
1 GROUNDING SYSTEM DIAGRAM
SCALE: NTS



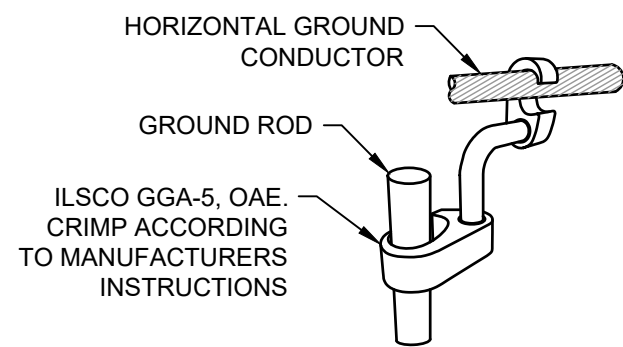
2 PAD GROUNDING DETAILS
SCALE: NTS



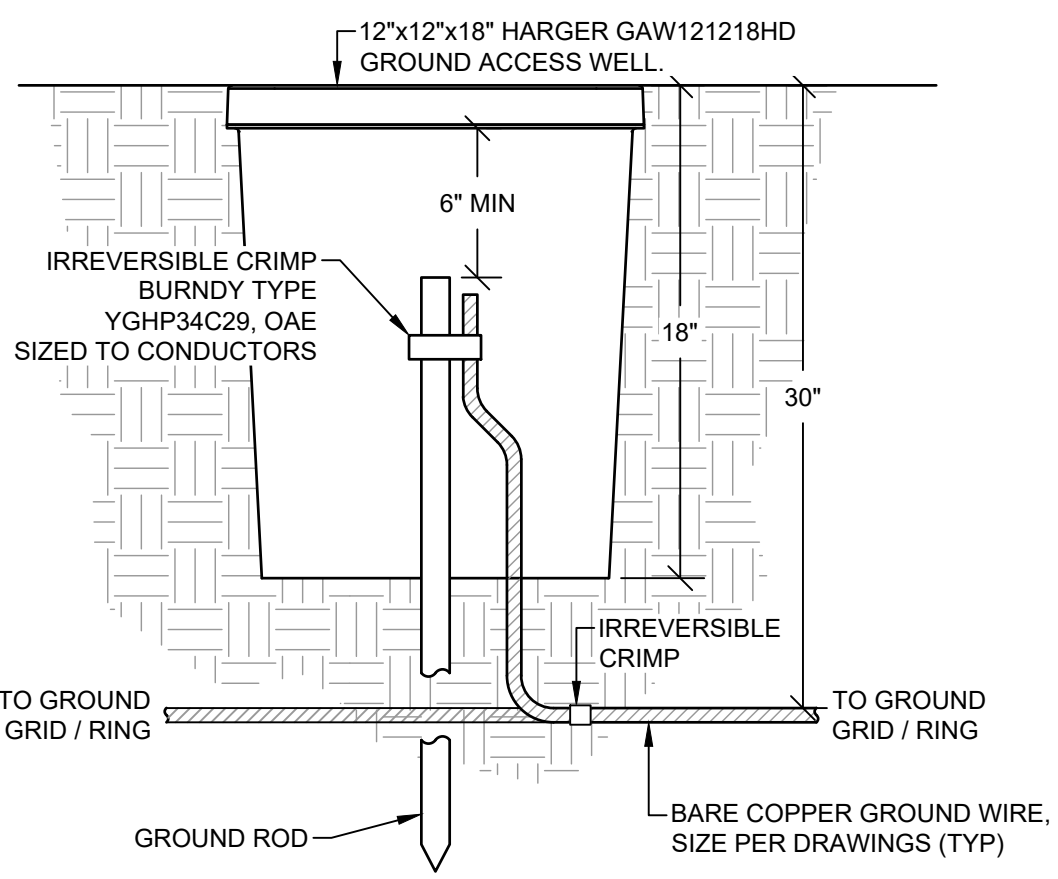
3 TYP. GROUND ROD DETAIL
SCALE: NTS



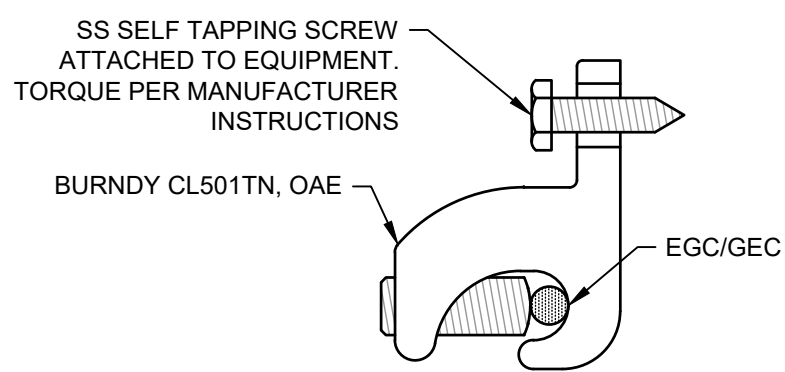
4 BURIED GROUND ROD DETAIL
SCALE: NTS



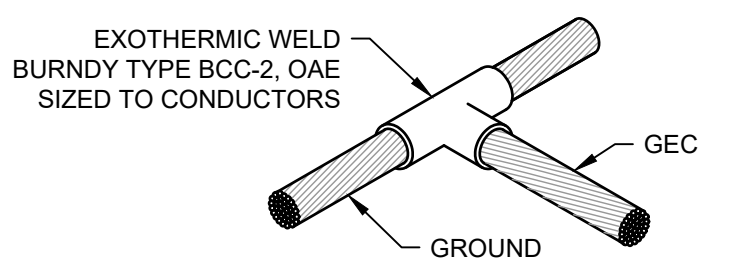
5 GROUND ROD TO CONDUCTOR CRIMP
SCALE: NTS



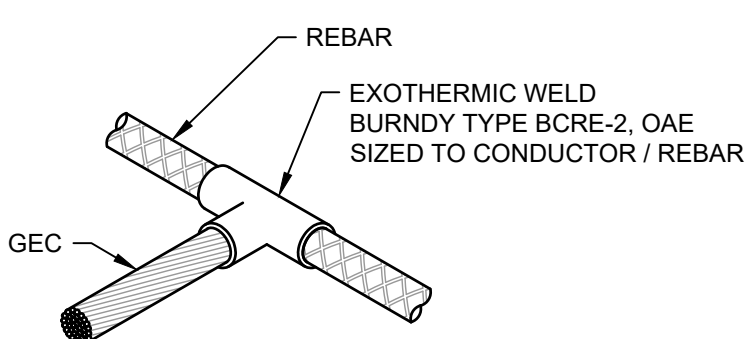
6 GROUND TEST WELL DETAIL
SCALE: NTS



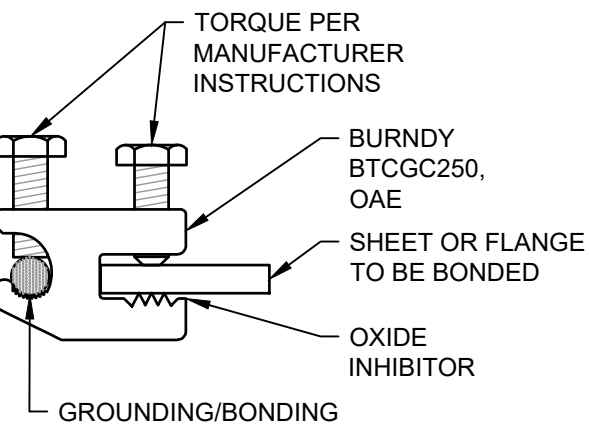
7 TYP. LAY-IN LUG DETAIL
SCALE: NTS



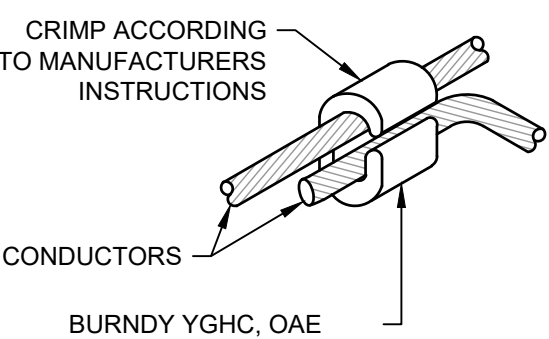
8 TYP. CONDUCTOR/CONDUCTOR WELD
SCALE: NTS



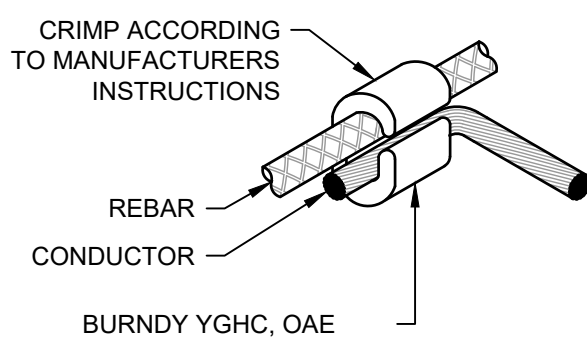
9 TYP. REBAR/CONDUCTOR WELD
SCALE: NTS



10 TYP. LUG DETAIL
SCALE: NTS



11 TYP. CONDUCTOR/CONDUCTOR CRIMP
SCALE: NTS



12 TYP. REBAR/CONDUCTOR CRIMP
SCALE: NTS

SHEET NOTES:

- DIAGRAMS DO NOT INDICATE ALL EQUIPMENT GROUNDING CONDUCTORS REQUIRED. REFER TO SINGLE LINE DIAGRAMS AND CABLE SCHEDULES FOR ADDITIONAL INFORMATION.
- GROUND RING SHALL BE BURIED 30" BELOW FINISHED GRADE AND 36" FROM EQUIPMENT PAD EDGE.
- CONTRACTOR SHALL NOT GROUND X0 AT TRANSFORMER AS THE INTENT IS FOR NEUTRAL TO BE GROUNDED AT THE LV SWITCHBOARD. REMOVE GROUND STRAP IF PRESENT.
- SEE SHEET E-404, E-501, AND E-502 FOR EGC AND SSBJ SIZES.

KEYED NOTES:

- BOND USING EXOTHERMIC WELD OR IRREVERSIBLE CRIMP. TYPICAL OF ALL CONNECTIONS TO GROUND RING.
- BOND MEDIUM VOLTAGE CONCENTRIC NEUTRAL CONDUCTORS WITH IRREVERSIBLE CRIMP.
- BOND TO EQUIPMENT PAD REBAR VIA EXOTHERMIC WELD OR IRREVERSIBLE CRIMP.
- GEC'S ABOVE GROUND SHALL BE INSULATED WITH XLPE. GEC'S EXTENDING UNDERGROUND AND NOT IN CONDUIT SHALL BE BARE AND SHALL AVOID CONTACT WITH METAL PARTS OF THE EQUIPMENT.

LEGEND:

- GROUNDING CONDUCTOR
- CONDUCTOR
- INTERNAL EQUIPMENT CONNECTION
- GROUND LUG CONNECTION
- IRREVERSIBLE CRIMP CONNECTION
- GROUND ROD
- GROUND ROD WITH TEST WELL

DESIGN COORDINATOR



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PROJECT

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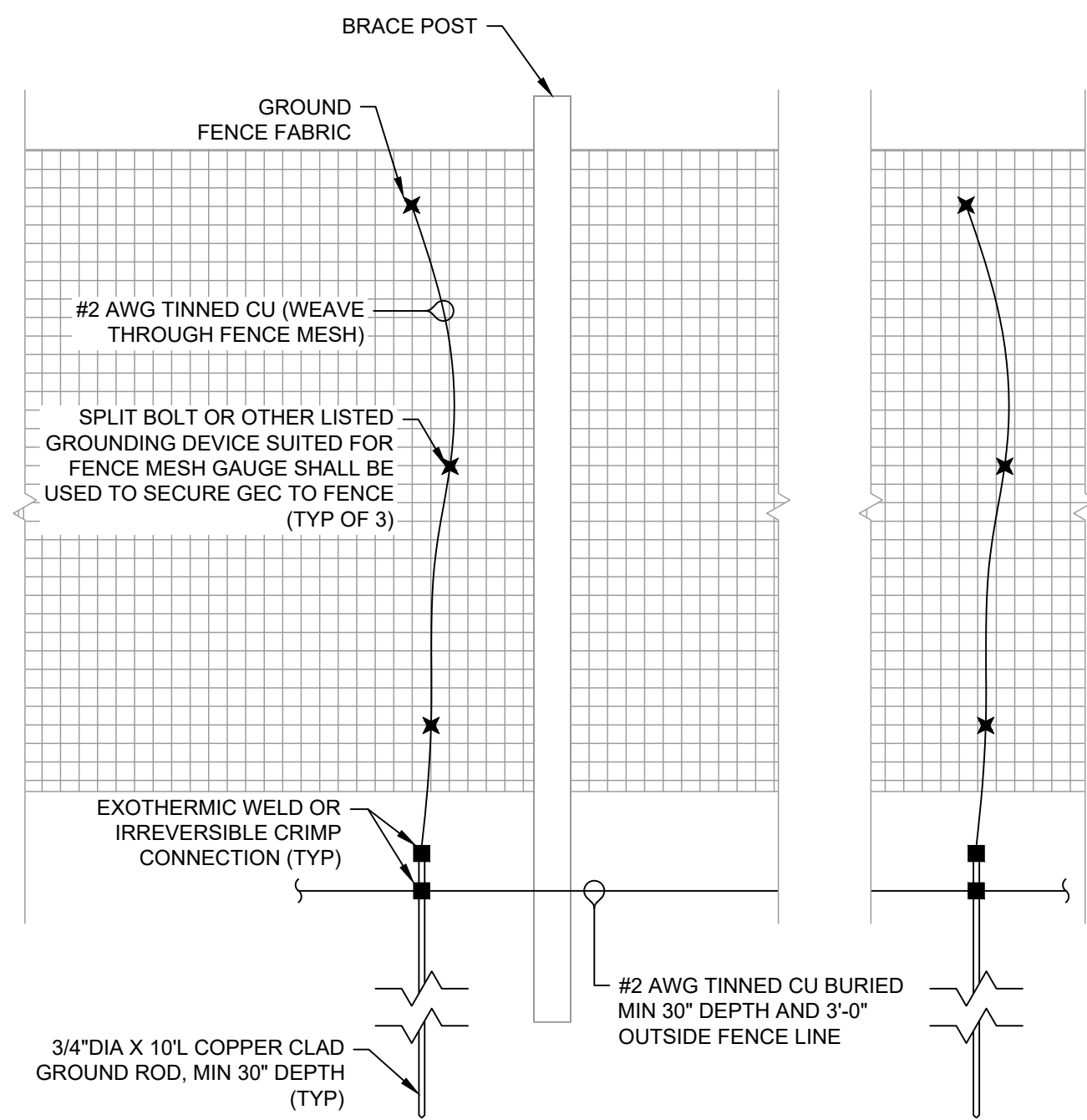
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**ELECTRICAL DETAILS -
GROUNDING**

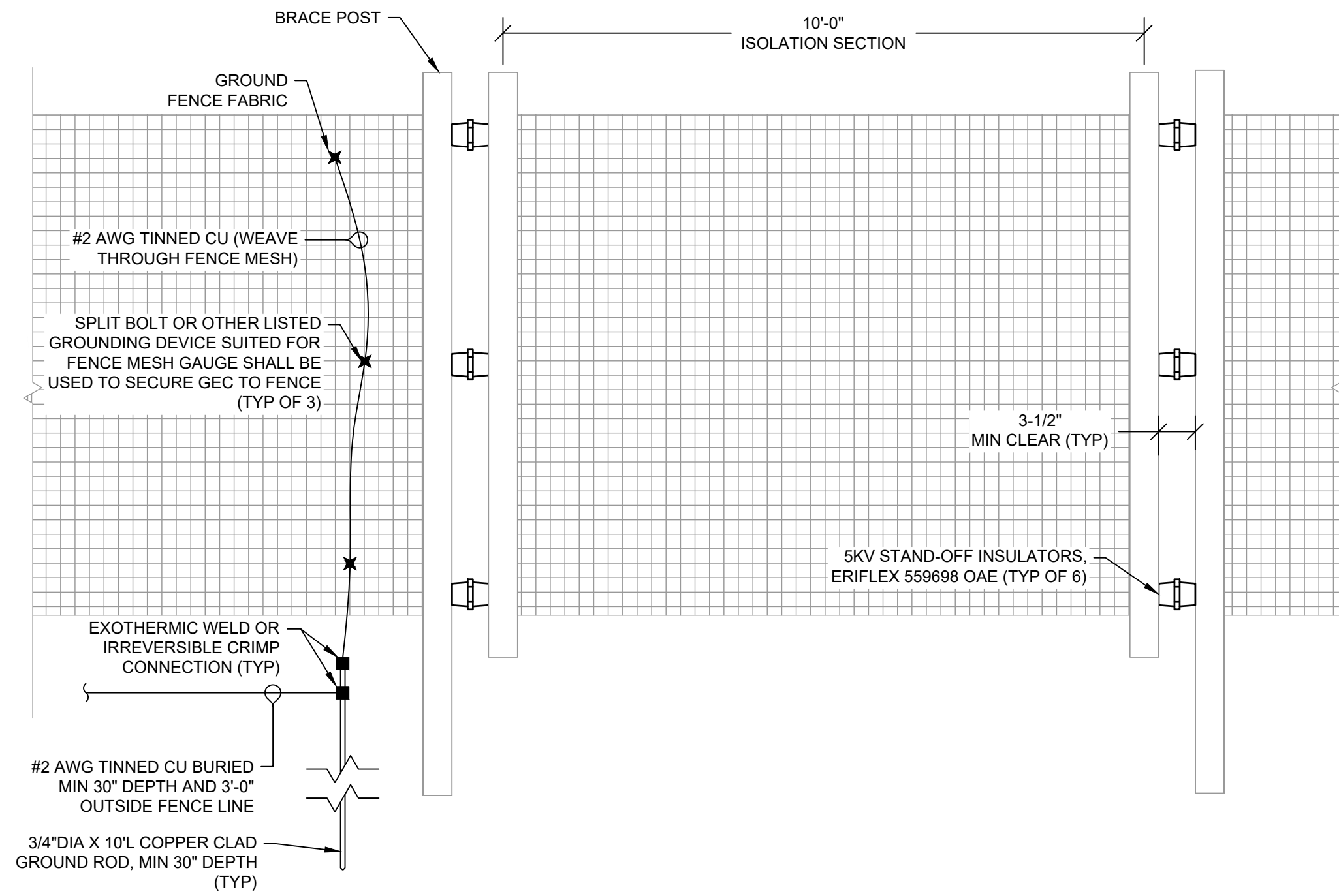
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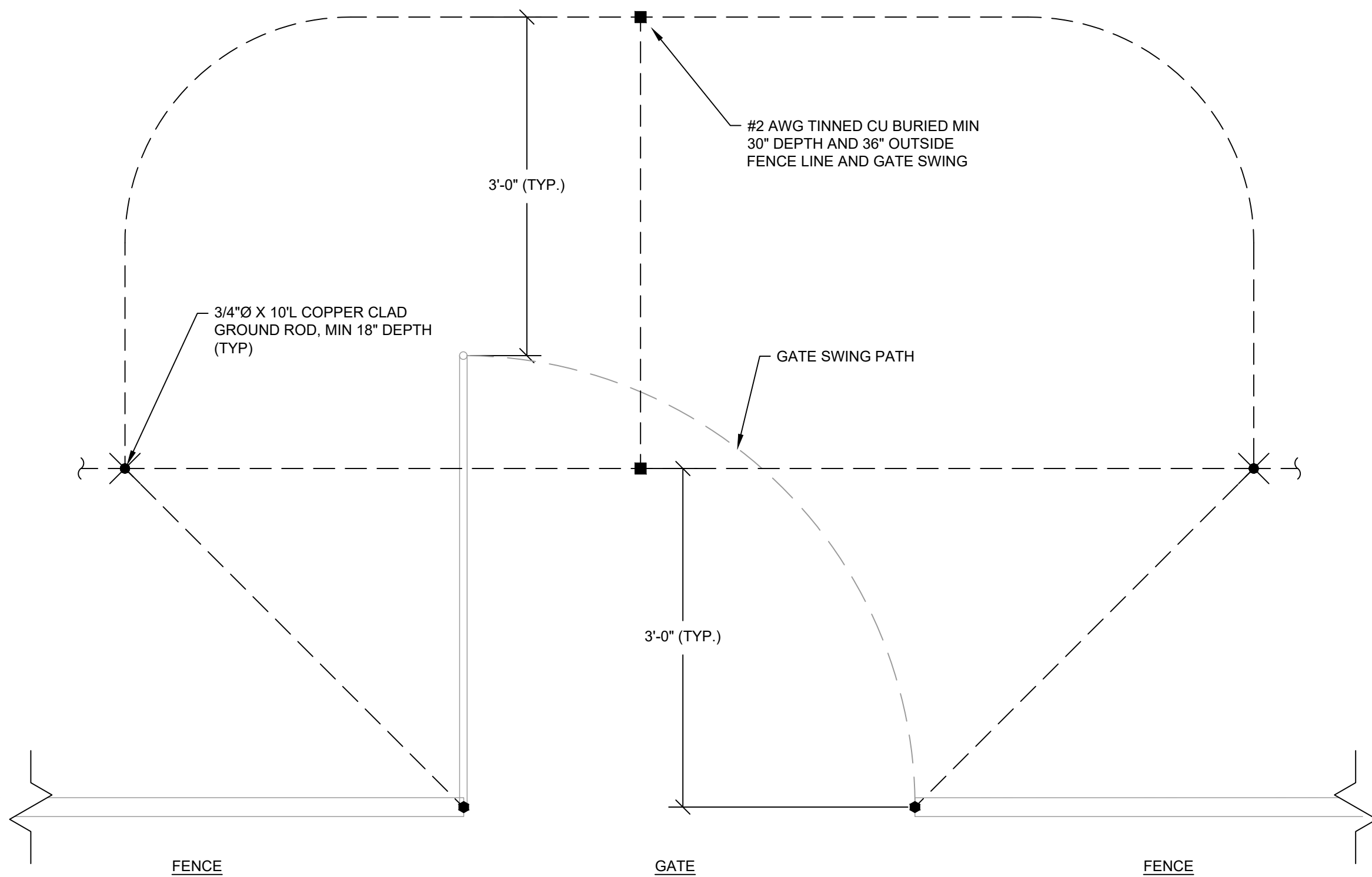
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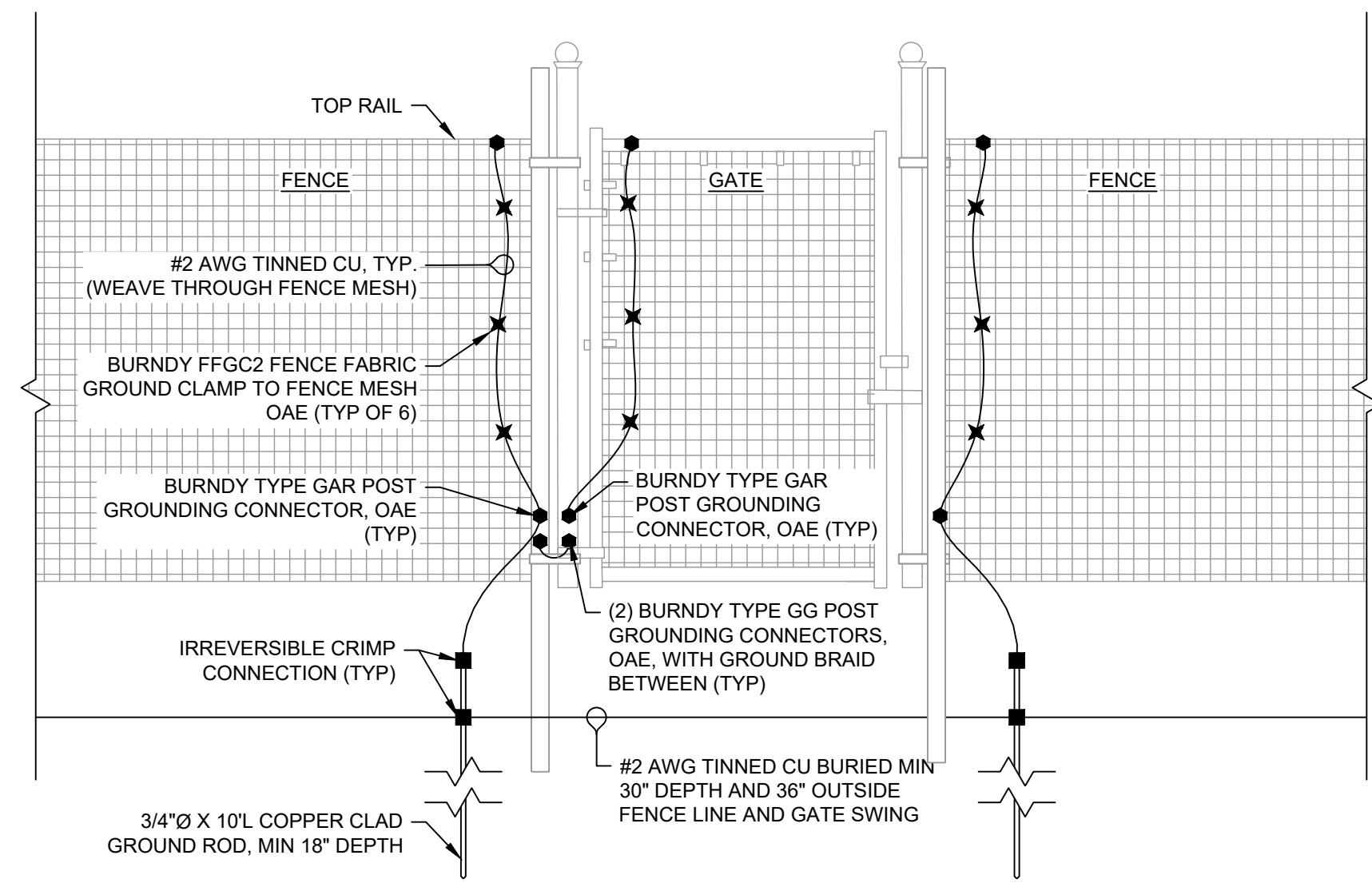
1 FENCE POST GRONDING ELEVATION
SCALE: NTS



2 ISOLATION FENCE ELEVATION
SCALE: NTS



3 4' PERSONNEL GATE GROUNDING PLAN
SCALE: NTS



4 FENCE GATE GROUNDING ELEVATION SCALE: NTS

SHEET NOTES:

1. FENCE POST SPECIFICATIONS ARE DIAGRAMMATIC AS SHOWN (MESH, POST, ETC) AND ARE DESIGNED BY OTHERS.
2. ALL FENCE SECTIONS ARE ASSUMED TO BE WOVEN. TOGETHER TO CREATE CONTINUOUS PIECE OF FENCE FABRIC AND THE BOND TO GROUND SHOULD OCCUR AT EACH END.
3. WHERE FENCE MUST BE GROUNDED CONTRACTOR SHALL GROUND FENCE CORNER POSTS, END POSTS, AND AT MAXIMUM 150FT INTERVALS OF FENCE SECTION AT THE MINIMUM. BOND ALL NON-CONTINUOUS FENCE SECTIONS WHICH ARE NOT OTHERWISE BONDED WITH #2 AWG TINNED CU.
4. DO NOT CONNECT FENCE GROUND SYSTEM TO ARRAY GROUND SYSTEM.
5. WITHIN GROUNDED FENCE SECTIONS, TO ENSURE PROPER GROUNDING OF EACH FENCE POST, CONTRACTOR TO PERFORM GROUNDING SYSTEM TEST AT 3 POINT FALL-OF-POTENTIAL METHOD. IF REQUIRED, CONTRACTOR TO BOND FENCE POST TO GROUNDED MESH SECTION USING #2 AWG TINNED CU.

LEGEND:

- EXOTHERMIC WELD OR
IRREVERSIBLE CRIMP CONNECTION
- ✱ OTHER BONDED CONNECTION

DESIGN COORDINATOR



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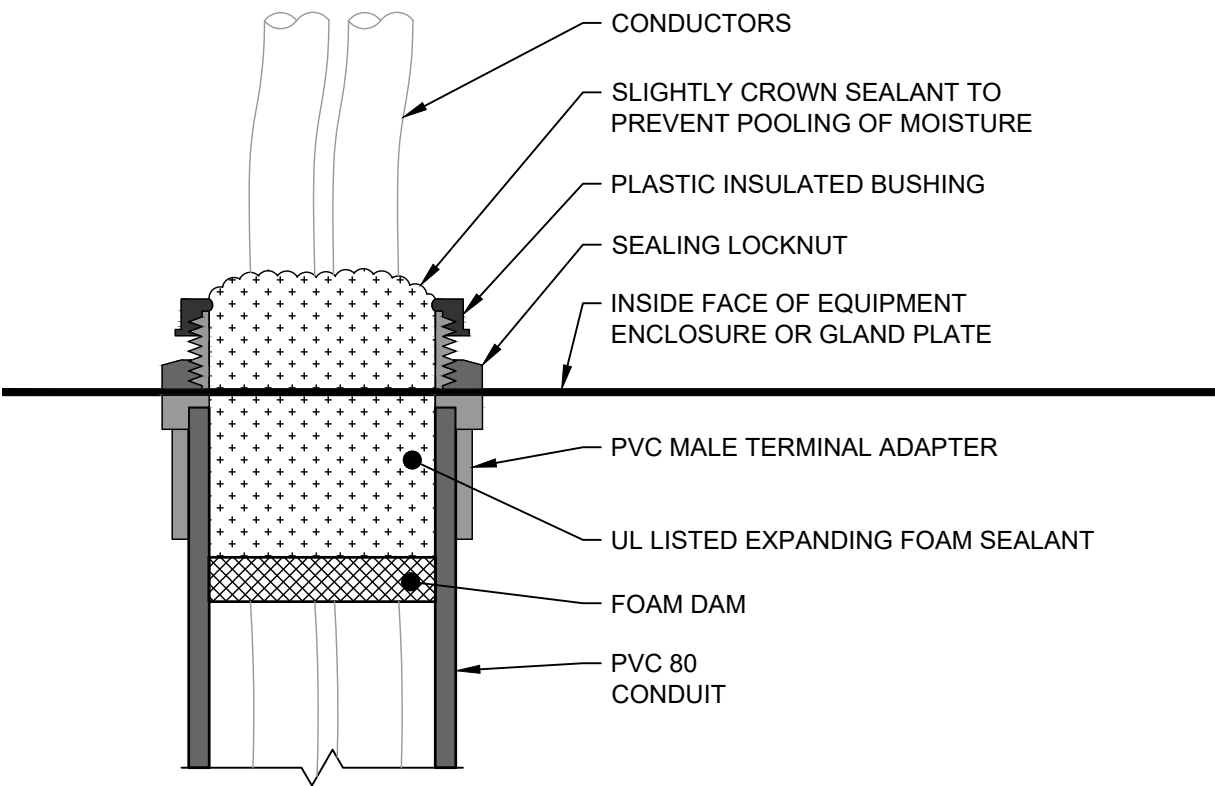
ELECTRICAL DETAILS - FENCE GROUNDING

SHEET NO

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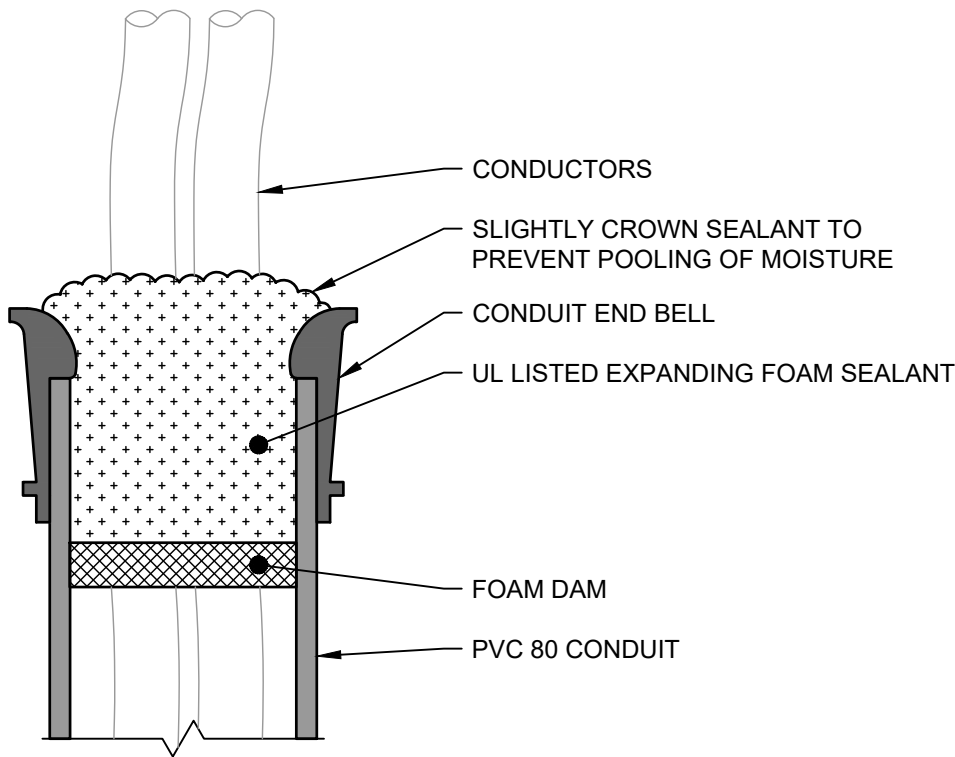
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- DETAIL NOTES:
1. SEALANT SHALL BE UL LISTED FOR THE APPLICATION.
 2. APPLY SEALANT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
 3. POSITION AND SPACE CONDUITS TO ALLOW FOR INSTALLATION OF FITTINGS AND ALLOW WIRE BENDING RADII TO BE MAINTAINED.



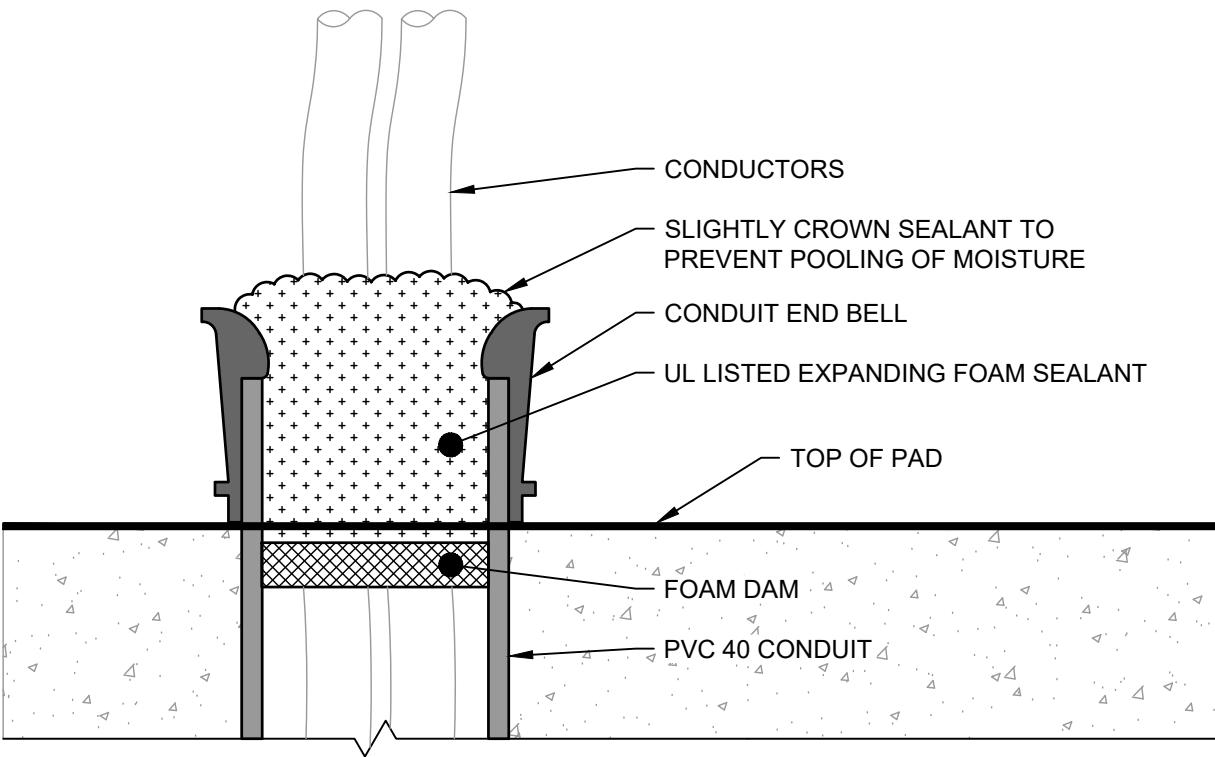
1 PVC CONDUIT TERMINATION DETAIL - EQUIPMENT ENCLOSURE ON A RACK
SCALE: NTS

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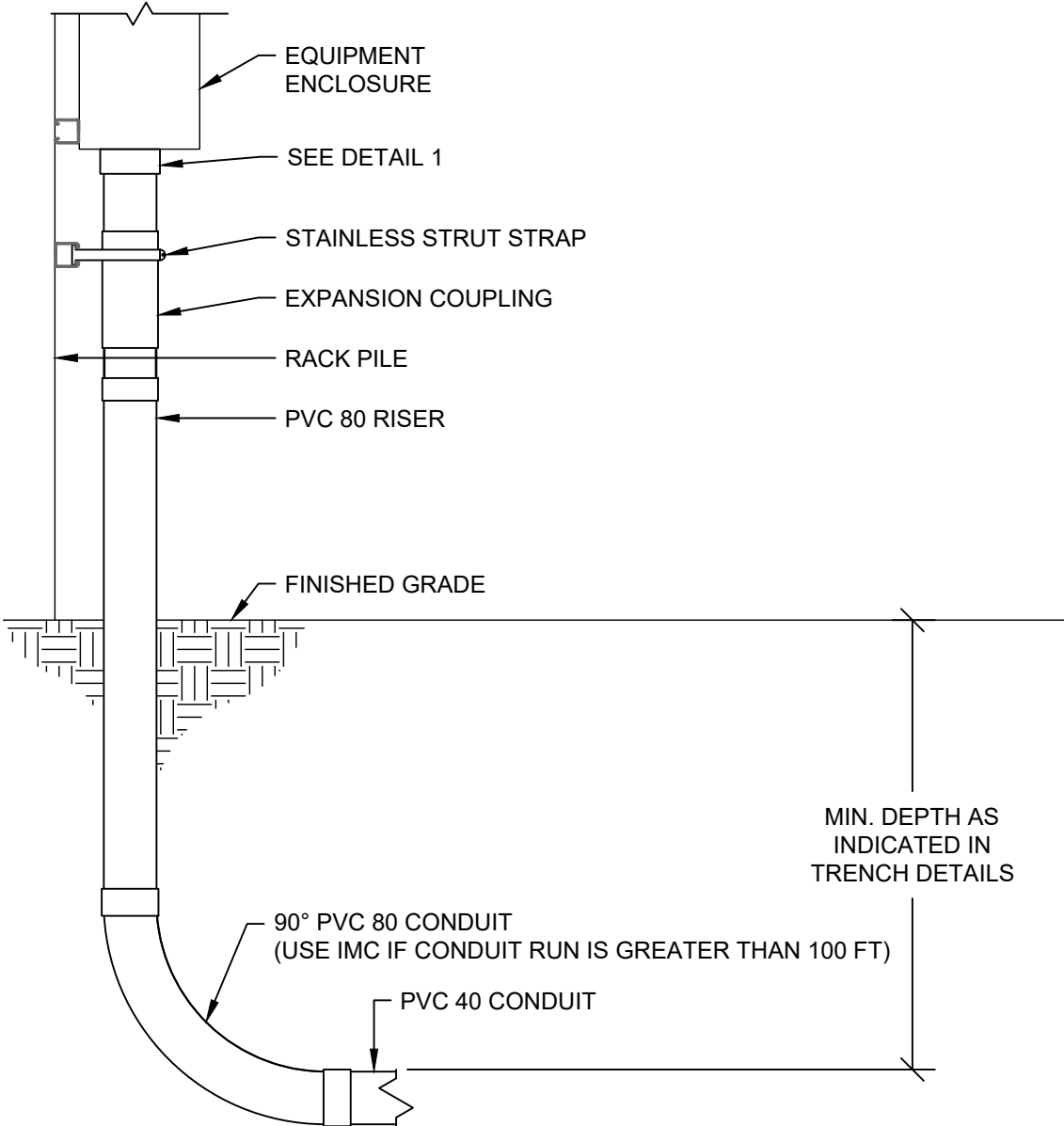


2 PVC CONDUIT TERMINATION DETAIL - OPEN AIR
SCALE: NTS

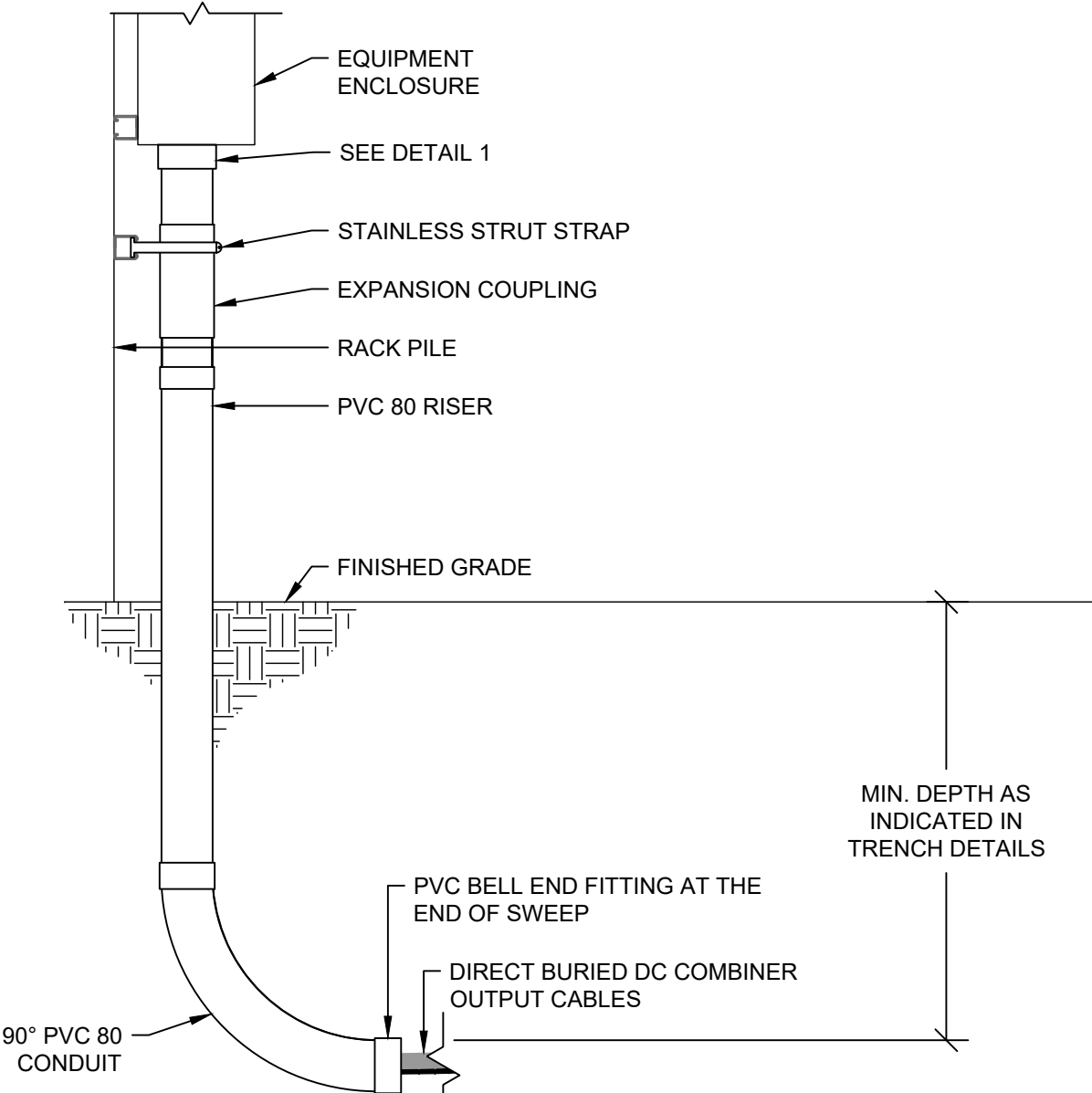
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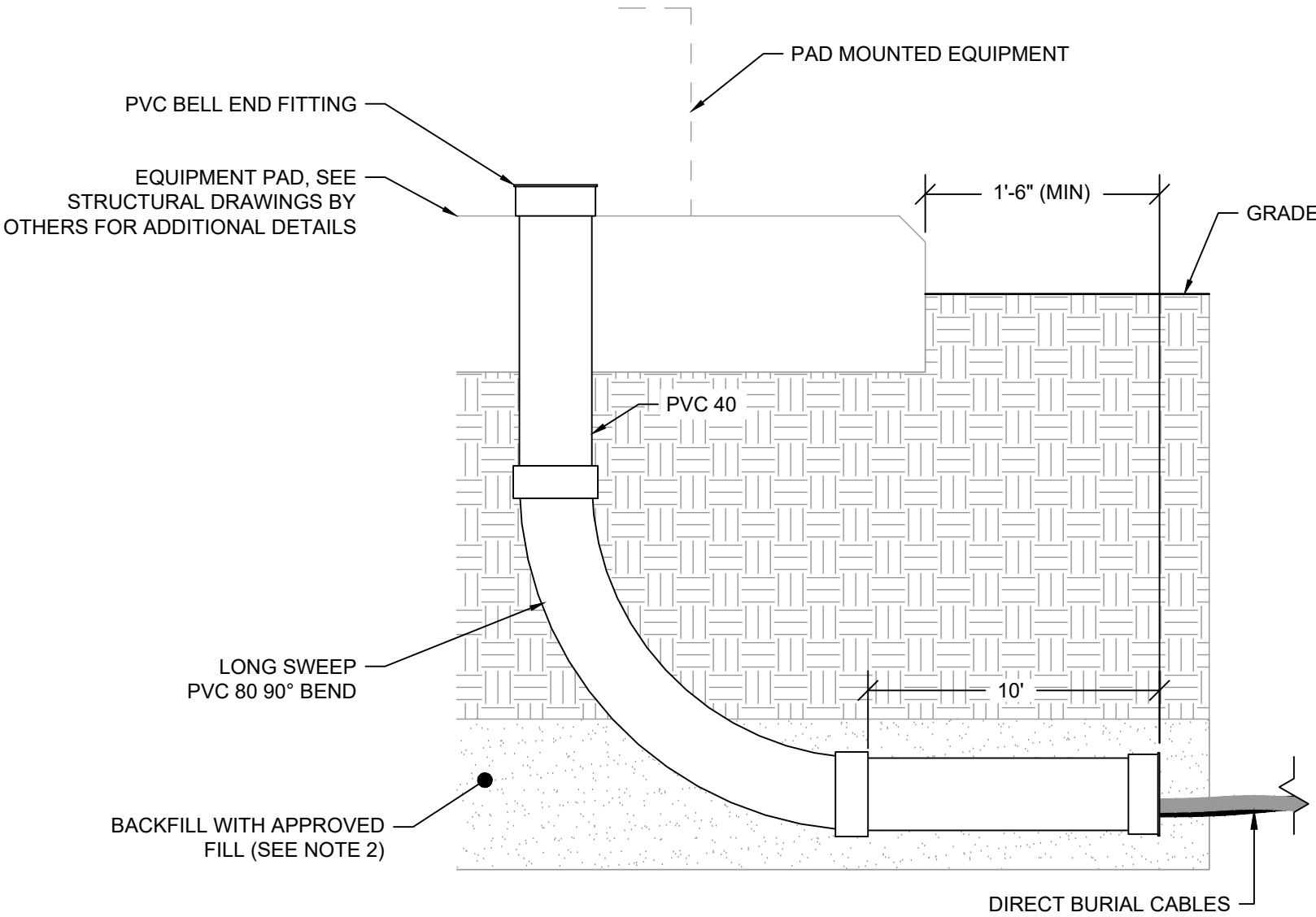
3 PVC CONDUIT TERMINATION DETAIL - EQUIPMENT PAD
SCALE: NTS



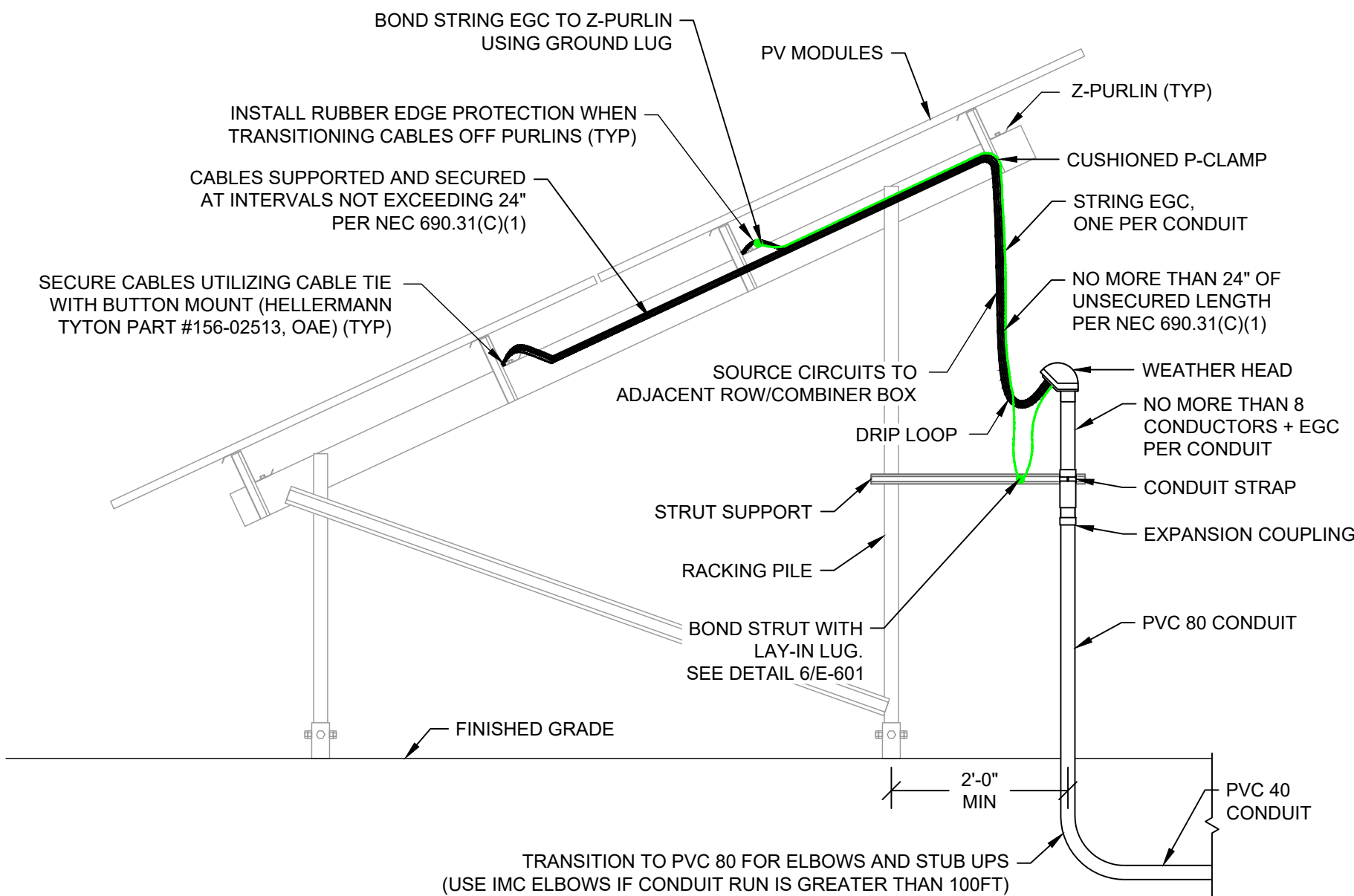
4 TYPICAL CONDUIT TRANSITION DETAIL
SCALE: NTS



5 CONDUIT TRANSITION DETAIL (DC COMBINER OUTPUT)
SCALE: NTS



6 EQUIPMENT PAD TO DIRECT BURIAL TRANSITION
SCALE: NTS



7 ELEVATION - STRING HOMERUNS TO UNDERGROUND
SCALE: NTS

SHEET NOTES:

1. REFER TO SINGLE LINE DIAGRAM AND CABLE SCHEDULES FOR CONDUIT QUANTITIES AND SIZES.
2. SAND OR SCREENED NATIVE BACKFILL BEDDING SHALL BE FREE OF ICE, CLAY, ORGANIC MATTER, ROCKS GREATER THAN 0.5" IN DIAMETER, OR OTHER OBJECTIONABLE MATERIAL, AND SHALL CONFORM TO GRADATION PER ASTM C136.

DESIGN COORDINATOR



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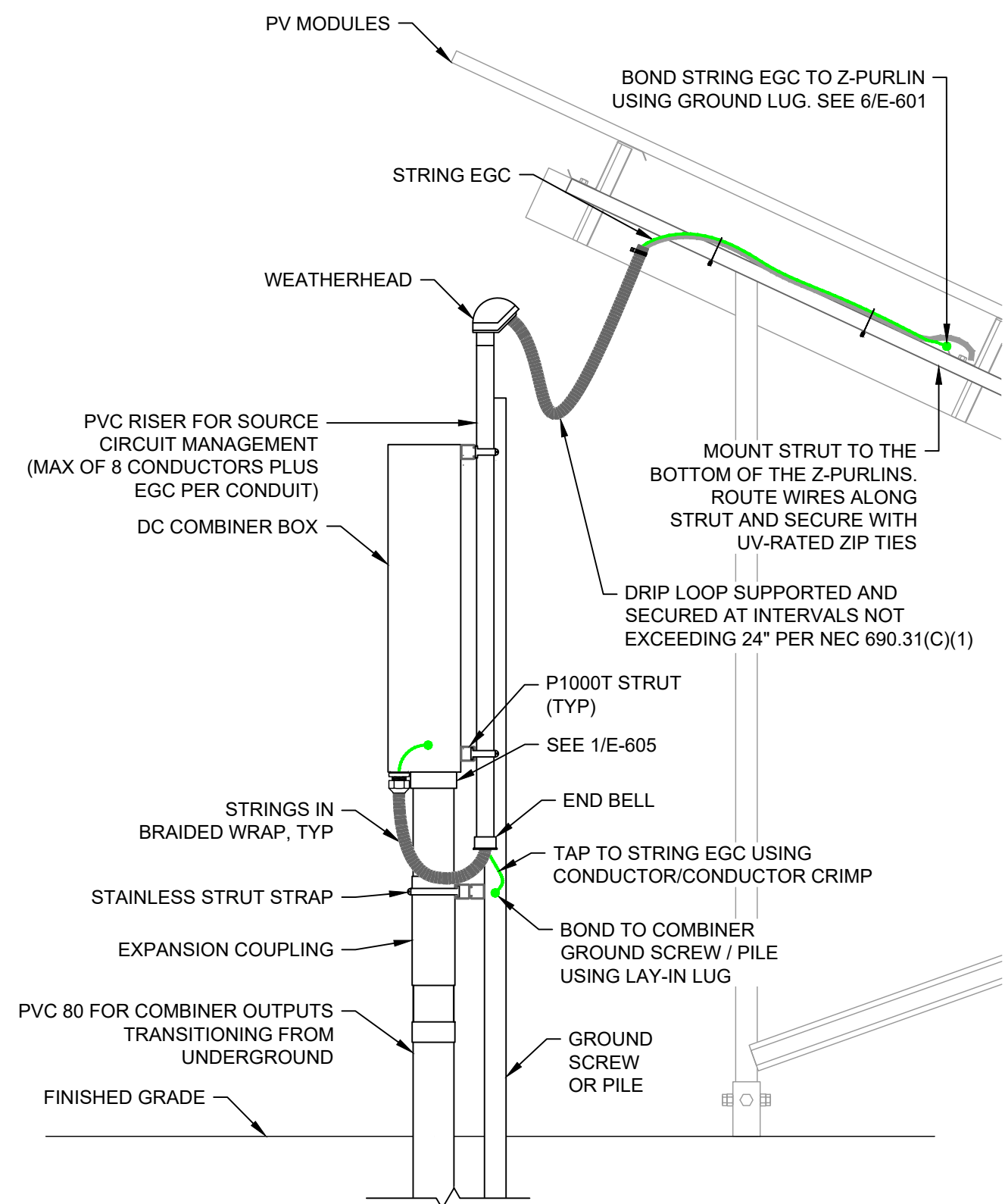
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ELECTRICAL DETAILS -
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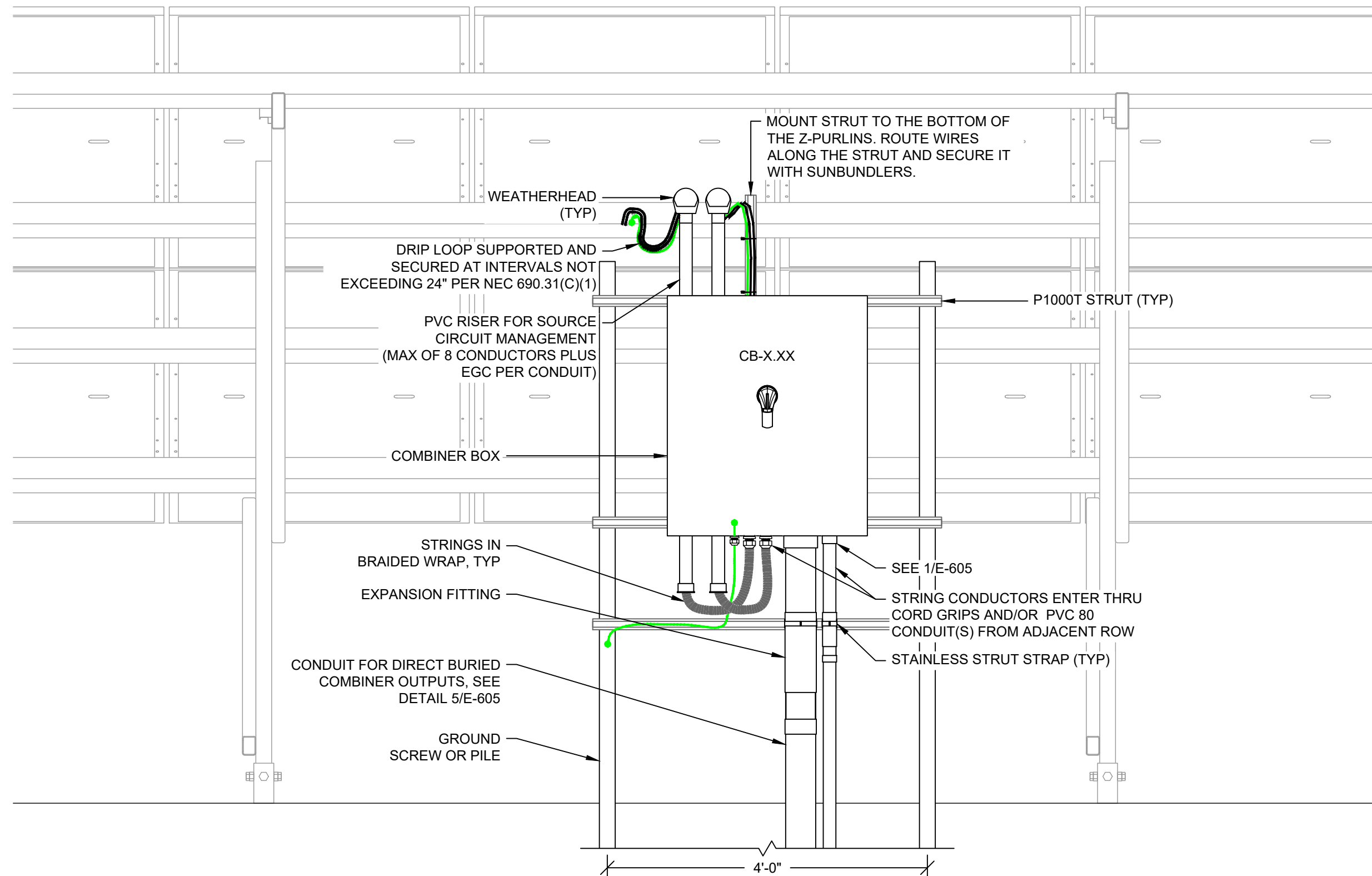
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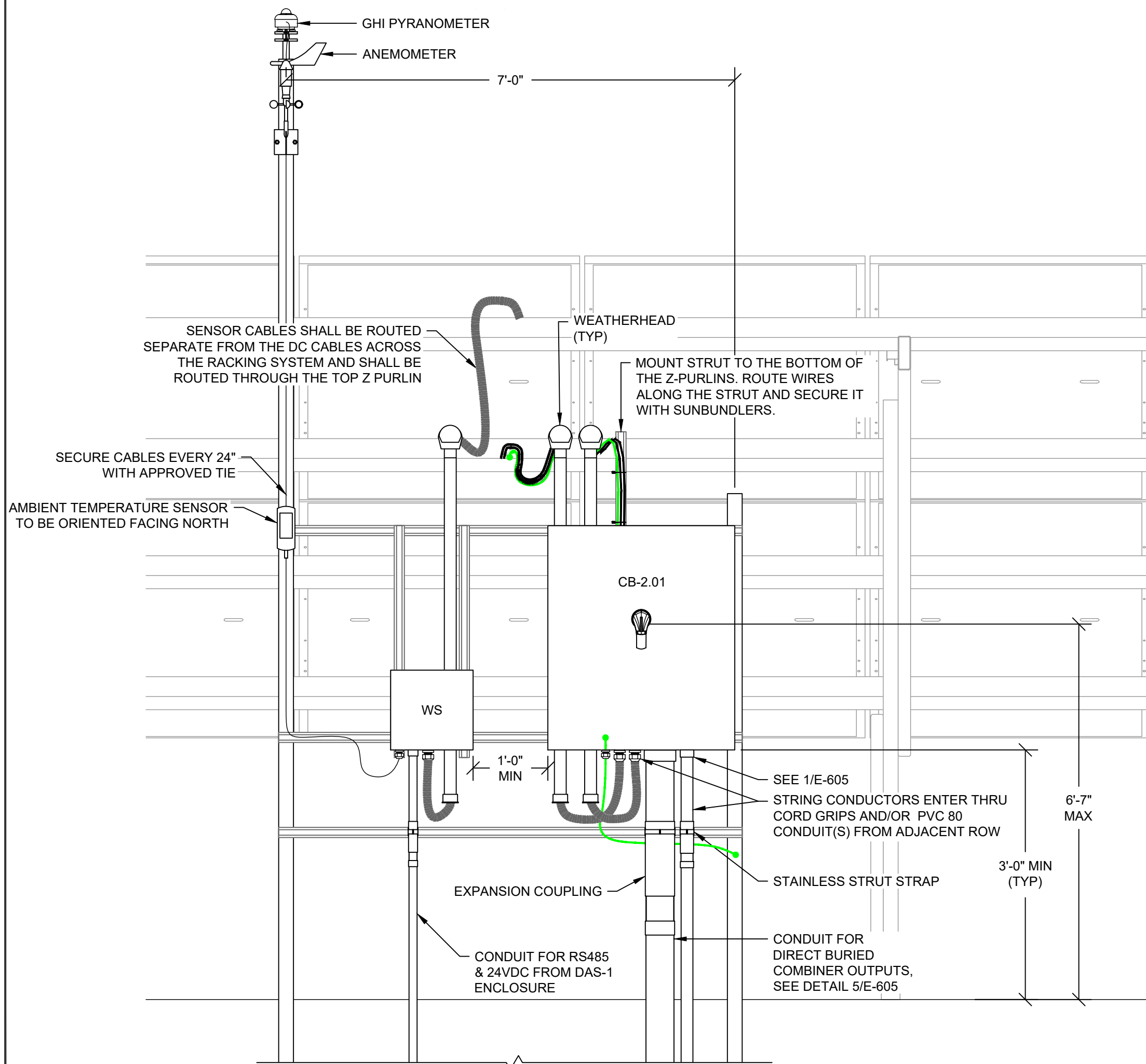
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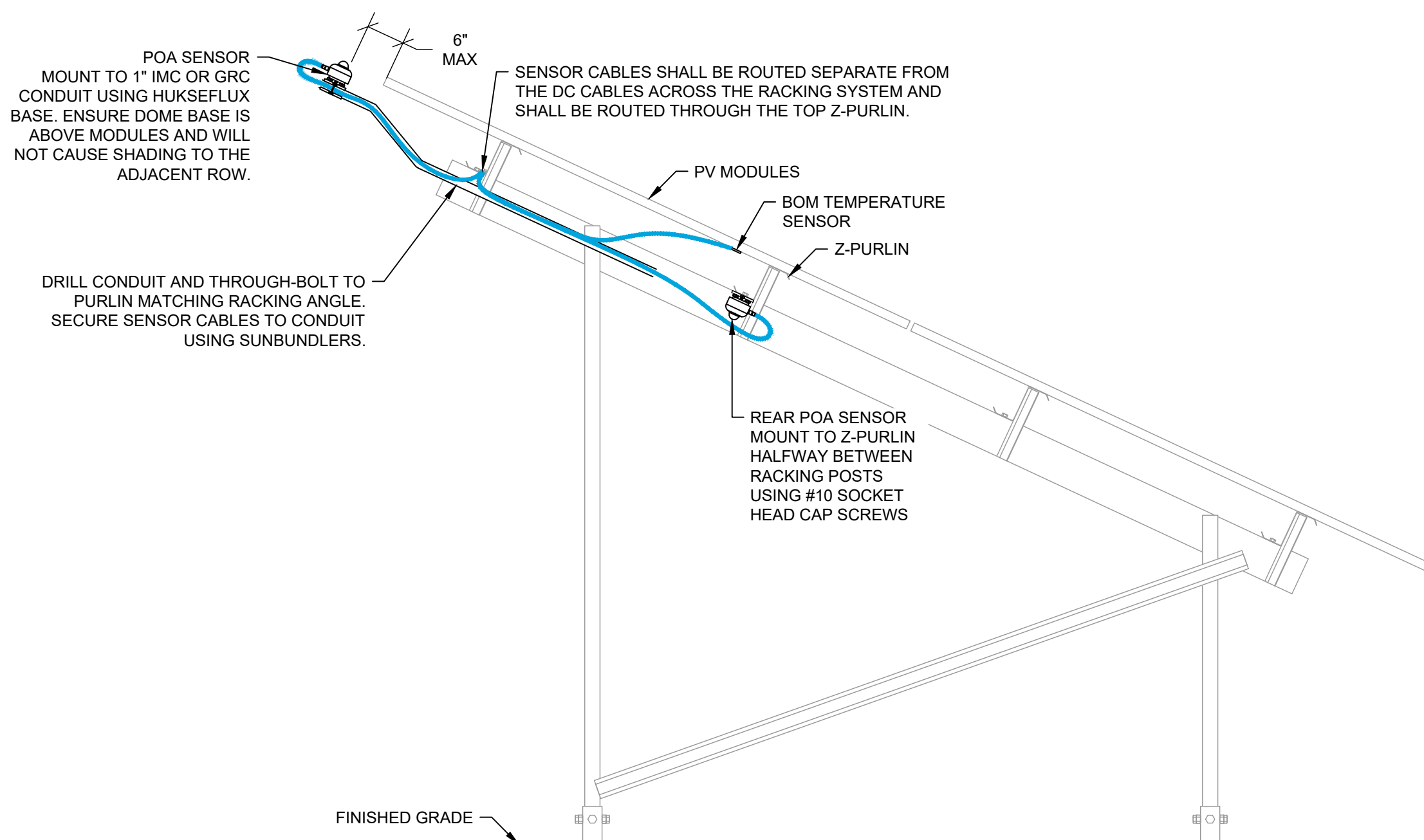
1 COMBINER RACK SIDE ELEVATION
SCALE: NTS



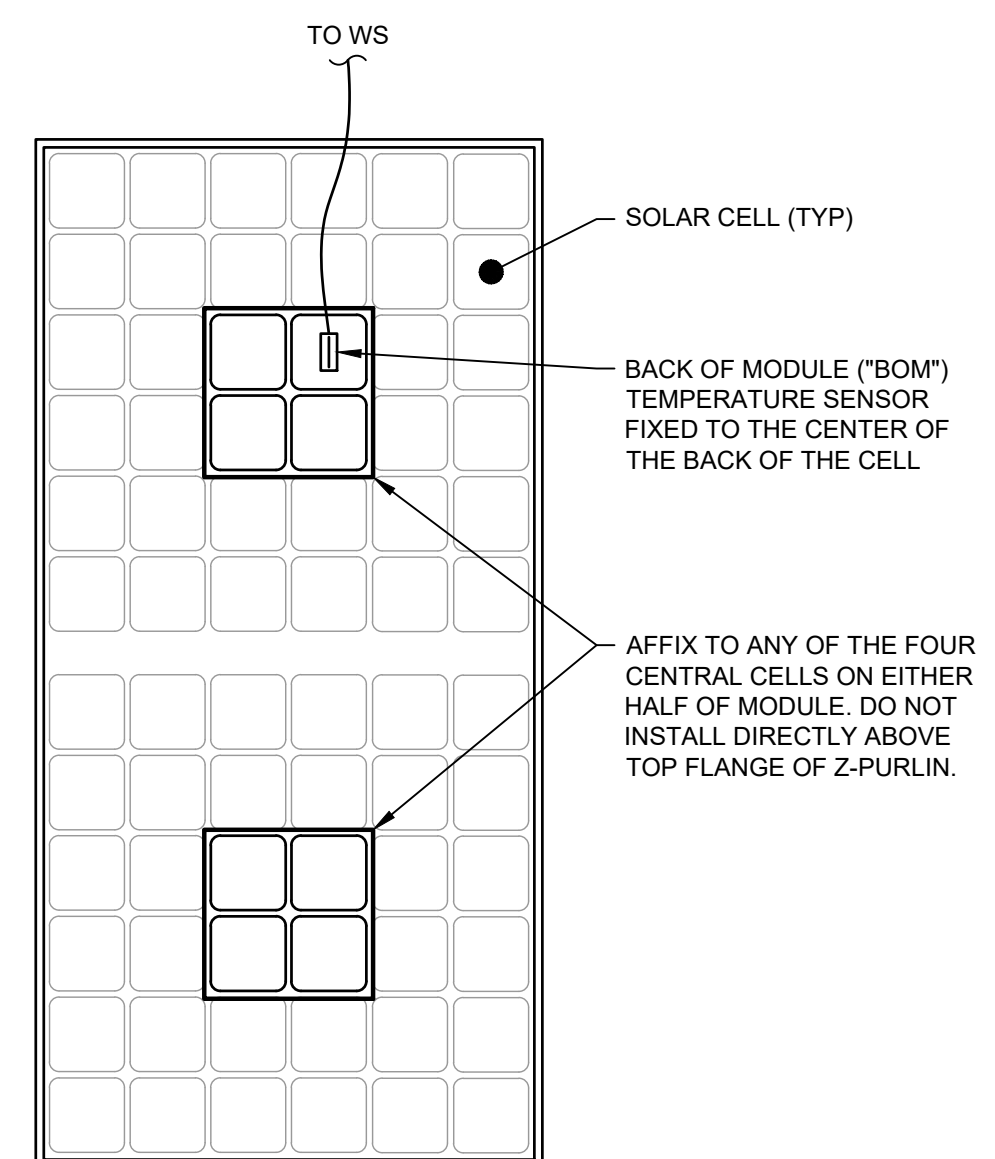
2 COMBINER RACK FRONT ELEVATION
SCALE: NTS



3 COMBINER & WS RACK FRONT ELEVATION
SCALE: NTS



4. SENSOR EQUIPMENT ELEVATION



5 BOM TEMPERATURE SENSOR MOUNTING DETAIL
SCALE: NTS

SHEET NOTES:

1. CONTRACTOR SHALL VERIFY WHERE PV CONDUCTORS TRANSITION FROM RACKING TO CONDUIT. THE CONDUCTORS SHALL BE ORIENTED SUCH THAT THEY ARE NOT PINCHED AND MINIMUM BENDING RADII ARE NOT VIOLATED.
2. CONTRACTOR SHALL PROVIDE PROTECTION TO CONDUCTORS AT ANY LOCATION WHERE ABRASION MAY OCCUR DUE TO MOVEMENT OR OTHER FORCES.
3. COMBINER BOX SHALL BE LOCATED ON NORTH SIDE OF RACKING SYSTEM PER SITE PLANS.
4. STRUCTURAL DESIGN OF EQUIPMENT RACKS AND PILES BY OTHERS.
5. WORKING CLEARANCES TO BE PROVIDED FOR ALL EQUIPMENT PER NEC 110.26 AND 110.34 BASED ON VOLTAGE AND CONDITIONS AS REQUIRED.
6. PROVIDE WORK LOOP IN ALL CONDUCTORS TERMINATED IN WEATHER STATIONS TO ALLOW SPACE FOR FLUKE CLAMP-ON METER.
7. CONTRACTOR SHALL PROVIDE THE APPROPRIATE SIZED ILSCO COMPRESSION RING LUGS FOR TERMINATION OF CONDUCTORS IN WEATHER STATIONS PER MANUFACTURER SPECIFICATIONS.
8. WEATHER STATION MOISTURE CONTROL DEVICES (TYPICALLY DESIGN BAGS, SUPPLIED BY NEXAMP) SHALL BE INSTALLED PRIOR TO MOUNTING PER MANUFACTURER SPECIFICATIONS AND PROCEDURES, IF NOT FACTORY INSTALLED.
9. ALL CONDUIT ENTRIES TO WEATHER STATIONS SHALL BE MADE WITH GASKETED, RAIN-TIGHT FITTINGS.
10. BACK-OF-MODULE TEMP SENSOR TO BE MOUNTED IN THE CENTER OF A MODULE CELL (OR HALF-CELL DEPENDING ON MODULE TYPE). SENSOR MUST BE AT LEAST 6" OFFSET FROM THE MODULE NAMEPLATE AND JUNCTION BOXES. SECURE SENSOR VIA OMEGABOND 200 OR AN APPROVED EQUAL RATED FOR 180° F.
11. ALL PYRANOMETERS SHALL BE INSTALLED SUCH THAT THEIR WIRE PORTS ARE ORIENTED TOWARDS TRUE NORTH.
12. MOUNT AMBIENT TEMPERATURE SENSOR ON TOP EDGE OF SUPPORT RACK.
13. EACH PYRANOMETER SHALL BE INSTALLED SUCH THAT THE DOME IS NOT SHADED BY ANY HARDWARE OR STRUCTURAL COMPONENTS. THE REVERSE POA PYRANOMETER SHALL BE INSTALLED SUCH THAT THERE ARE NO PHYSICAL OBSTRUCTIONS BETWEEN THE SENSOR'S FIELD OF VIEW AND THE GROUND.
14. PYRANOMETERS SHALL ALWAYS BE INSTALLED SOUTH OF THE WEATHER STATION ASSEMBLY.
15. ANEMOMETER SHALL BE MOUNTED SUCH THAT EQUIPMENT IS ORIENTED TOWARDS THE NORTH AND IS ABOVE THE TOP PLANE OF THE MODULES.

DETAIL NOTES:

1. FOLLOW SENSOR MANUFACTURER'S INSTALLATION INSTRUCTIONS.

DESIGN COORDINATOR



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ISSUED FOR CONSTRUCTION
FEBRUARY 27, 2026

138883 CEMETERY
SUN, LLC
FREDERICK, IL, 62639

SHEET TITLE

ELECTRICAL DETAILS - COMBINER & WEATHER SENSORS

SHEET NO.

E-606

DC Combiners



Terrasmart Combiners are used for DC aggregation before the input of an inverter or charge controller. They provide a convenient location for O&M and disconnecting means. Combiners are highly configurable to fit any application.

Product features

- Listed to UL-1741
- Up to 36 input circuits
- Rated for 1000 or 1500 VDC
- 275, 320, 400, and 600 Amp load break disconnects
- 75/90°C Al/Cu output terminals
- NEMA-3R, 4 & 4X enclosures
- Rated for continuous duty

Available options

- Mechanical lugs
- Provisions for compression lugs
- Isolating / grounded / floating configurations
- Touch safe protective cover
- Custom layouts
- Pre-terminated input conductors
- 10kA SCCR and greater
- Battery and energy storage
- Transient surge suppression
- Breather and drain vents
- Pad-lockable enclosures
- Lockout / tagout provision



Floating Disconnect Combiner, 1500VDC, 275A disconnect, 15 input circuits, transient surge protection, NEMA-4X fiberglass enclosure

Specifications

Voltage (Vdc)	1000 / 1500
Disconnect Ampacity	None / 275 / 320 / 400 600
Number of Input Circuits	1 to 36
Input Conductor Size (AWG)	#14 - 8 / #12-4
Fuse Size (Amps)	4 to 32 / 35 to 65
Number of Output Conductors Per Polarity	1 or 2
Output Conductor Size Range (MCM)	#6-350 / #2-600 / 300-800
Enclosure Dimensions (Inches)*	24"x24"x8 / 30"x24"x8 / 30"x30"x8
Enclosure NEMA Ratings	3R / 4 / 4X

*Other options available upon request. Please note dimensions and weight may vary for any custom solutions. Contact us for details.



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DESIGN COORDINATOR



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PROJECT

**138883 CEMETERY
SUN, LLC**

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STELLAVISE
SOLAR ENGINEERING

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IL DESIGN FIRM #184.009162

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SEAL



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REVISIONS

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EQUIPMENT SPECIFICATIONS

SHEET NO.

E-802