PERMIT NUMBER: B 23003260 **DATE ACCEPTED:**

COMMERCIAL BUILDING PERMIT APPLICATION

HOWARD COUNTY DEPARTMENT OF INSPECTIONS, LICENSES, AND PERMITS
3430 COURT HOUSE DRIVE, ELLICOTT CITY, MD 21043 - PHONE: (410) 313-2455 OPTION # 1
www.howardcountymd.gov

BUILDING SITE ADDRESS *REQUIRED*

Street Address: 3950 TEN OAKS ROAD | Unit:
City: GLENELG | State: **MD** | Zip Code: 21737
Subdivision/Village/Complex Name: | SDP/WP/BA #:
Lot: | Tax Map: | Parcel: | Grading Permit #:

DESCRIPTION OF WORK *REQUIRED*

Existing Use: FIELD | Proposed Use: SOLAR ELECTRIC | Estimated Cost: $
Trade Work to Be Completed *(Separate Permits Required)*: ☐ Mechanical (HVACR) ☑ Electrical ☐ Plumbing ☐ None

PROPERTY OWNER INFORMATION *REQUIRED*

Owner(s) Name(s) *(As it appears on tax records)*: (Glenelg Solar Farm)
Owner's Street Address:
City: GLENELG | State: MARYLAND | Zip Code:
Phone: | Email:

TENANT INFORMATION *REQUIRED*

Business Name: | Contact Name:
Street Address:
City: BALTIMORE | State: MARYLAND | Zip Code:
Phone: | Email:

APPLICANT NAME *REQUIRED - INDIVIDUAL WHO SIGNS THIS APPLICATION*

Business Name: SOLAMERICA ENERGY | Contact Name: FRANK BUCCERI
Street Address:
City: ATLANTA | State: GEORGIA | Zip Code:
Phone: | Email:

CONTRACTOR INFORMATION *REQUIRED*

Business Name: SOLAMERICA ENERGY
Licensee's Name: SOLAMERICA ENERGY | **License #:** 03120774
Street Address:
City: ATLANTA | State: GEORGIA | Zip Code:
Phone: | Email:

ARCHITECT/ENGINEER INFORMATION *REQUIRED - INDIVIDUAL WHO SIGNED PLANS*

Business Name: | Name:
Street Address:
City: MELBOURNE FL | State: FL | Zip Code:
Phone: | Email:

BUILDING CHARACTERISTICS *(PLEASE SELECT/COMPLETE ALL THAT APPLY)*

Utilities: ☑ Electric ☐ Gas | Water Supply: ☑ Public ☐ Private (Well) | Sewage Disposal: ☐ Public ☐ Private (Septic)
Heating System: ☐ Electric ☐ Natural Gas ☐ Propane ☐ Other: NONE | Roadside Tree Project: ☐ No ☐ Yes:#
Sprinkler System: ☐ NFPA 13 ☐ NFPA 13R ☑ None | Fire Alarm System: ☐ Yes ☑ No ☐ Voice Evac

ADDITIONAL COMMERCIAL INFORMATION *(PLEASE SELECT/COMPLETE ALL THAT APPLY)*

Area of Construction: sq ft | Gross Area: sq ft | Height: ft | # of Stories:
Construction Classification(s): SOLAR ELECTRIC | Use Group:
Was the tenant space previously occupied? ☐ Yes ☐ No | Shell Building Permit # *(for interior completions)*: N/A

ADDITIONAL MULTI-FAMILY INFORMATION *IF APPLICABLE*

of efficiency units (MF): | # of 1 BR (MF): | # of 2 BR (MF): | # of 3 BR (MF):
Energy Method: ☐ Performance ☐ UA Alternative ☐ ERI ☐ A 90.1 | Gross Area: sq ft | Occupiable Area: sq ft

AGREEMENT/ DISCALIMER *REQUIRED*

THE UNDERSIGNED HEREBY CERTIFIES AND AGREES AS FOLLOWS: (1) THAT HE/SHE IS AUTHORIZED TO MAKE THIS APPLICATION; (2) THAT THE INFORMATION IS CORRECT; (3) THAT HE/SHE WILL COMPLY WITH ALL REGULATIONS OF HOWARD COUNTY WHICH ARE APPLICABLE THERETO; (4) THAT HE/SHE WILL PERFORM NO WORK ON THE ABOVE REFERENCED PROPERTY NOT SPECIFICALLY DESCRIBED IN THIS APPLICATION; (5) THAT HE/SHE GRANTS COUNTY OFFICIALS THE RIGHT TO ENTER ONTO THIS PROPERTY FOR THE PURPOSE OF INSPECTING THE WORK PERMITTED AND POSTING NOTICES

APPLICANT'S ORIGINAL SIGNATURE FRANK T. BUCCERI | DATE SIGNED

FOR OFFICE USE ONLY

CHECKS PAYABLE TO: DIRECTOR OF FINANCE OF HOWARD COUNTY

AGENCIES REQUIRED/APPROVALS:

☐ PR ☐ DPZ ☐ DED ☐ Health 8/21/23 ☐ SHA ☐ CID

SUBMITTAL FEES: | PAYMENT: | ACCEPTED BY:

NEW PHOTOVOLTAIC SYSTEM

FOR

TEN OAKS SOLAR

AT

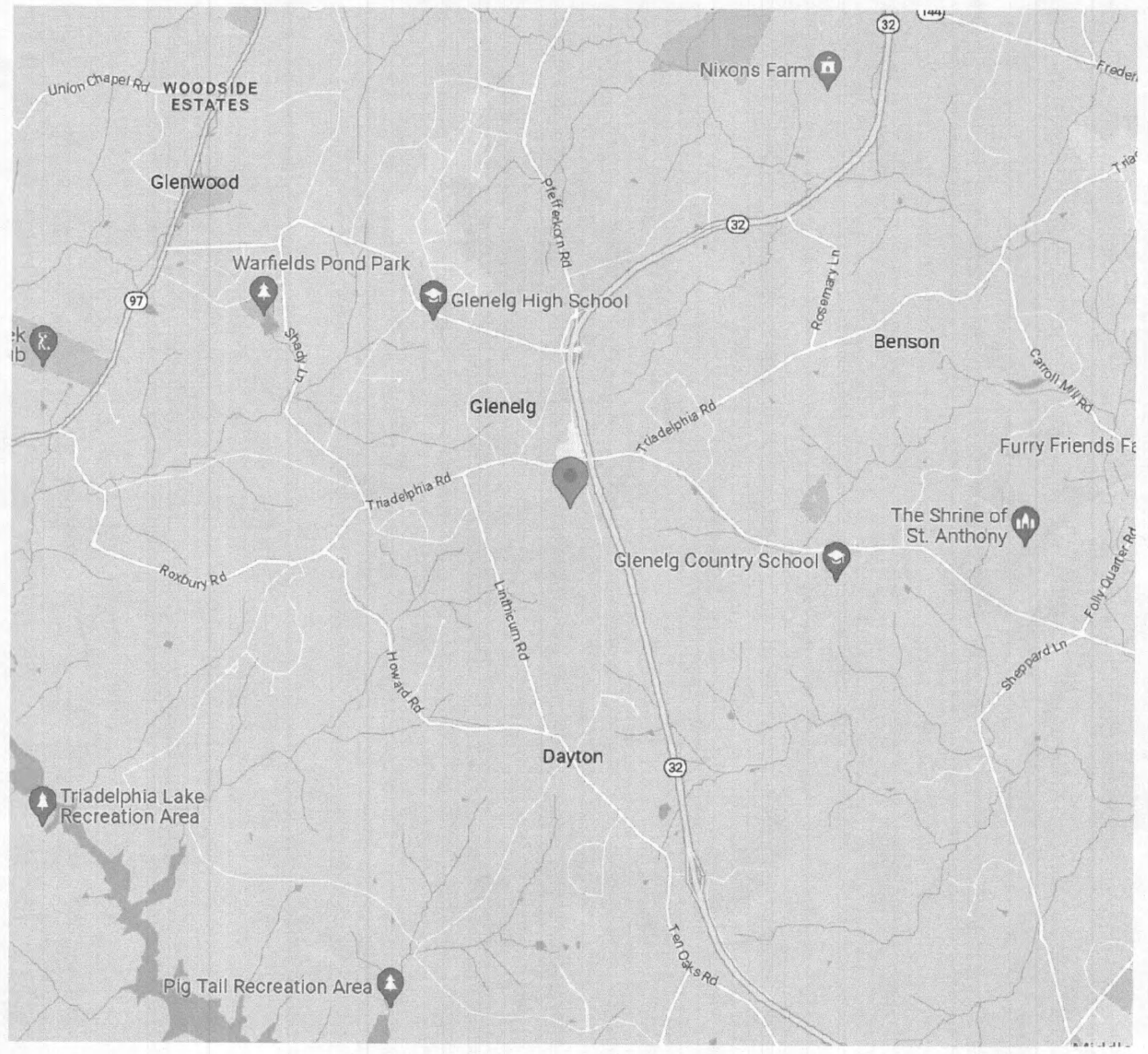
3950 TEN OAKS ROAD, GLENELG, MD 21737

DATE:

AUGUST 4, 2023

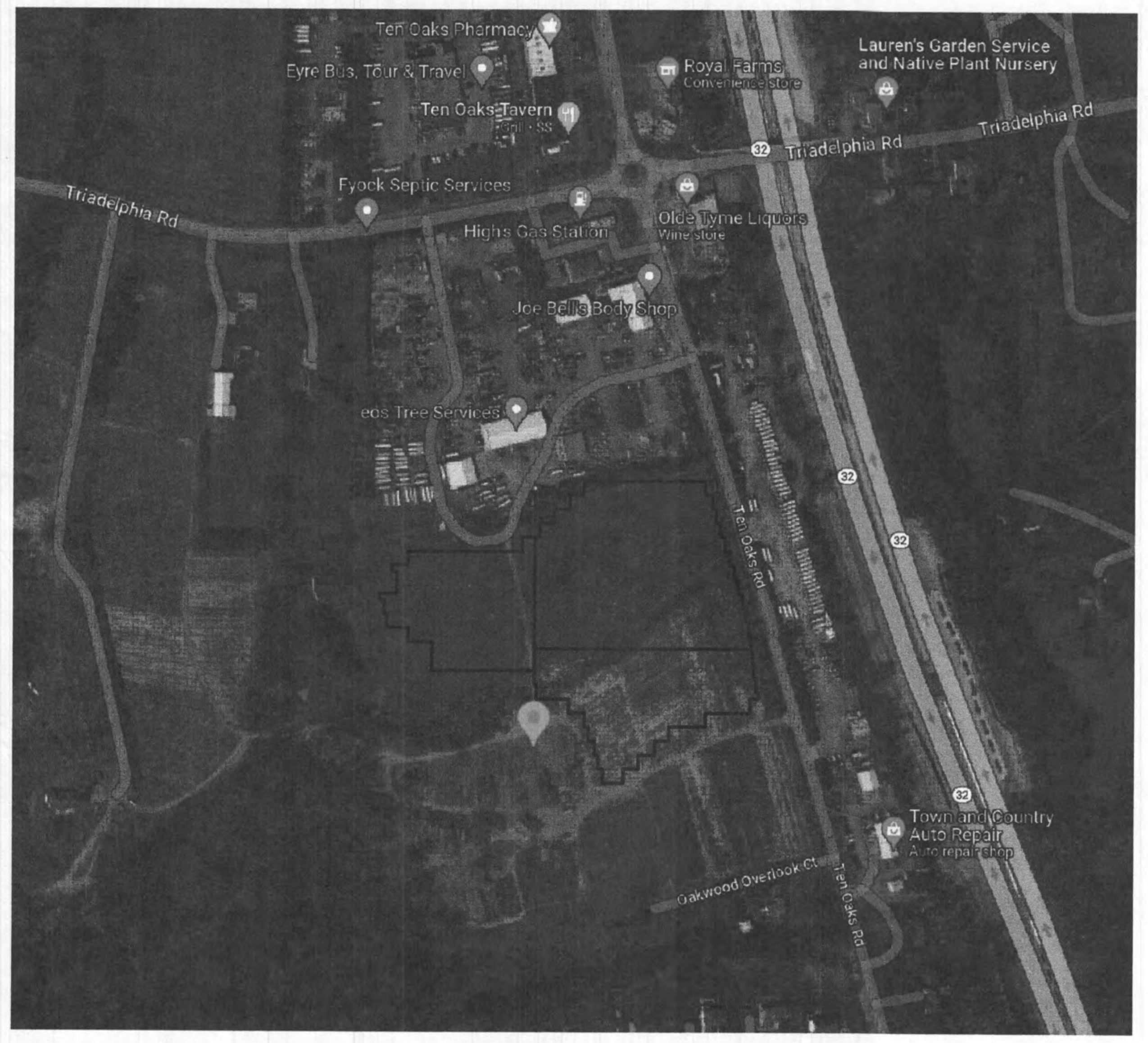
REGIONAL MAP

SCALE: N.T.S.



CITY MAP

SCALE: N.T.S.



PROJECT SITE

SCALE: N.T.S.

ALL MAPS TRUE NORTH

PROJECT INFORMATION

CLIMATE DATA:	
WEATHER DATA LOCATION:	BALTIMORE BLT-WASHINGTON INT'L
HOTTEST 2% ASHRAE DRY BULB AIR TEMP:	31.5 °C
EXTREME COLDEST ASHRAE MIN TEMP:	-13.9 °C
MODULE DATA:	
VENDOR:	QCELLS
MODEL:	Q.PEAK DUO XL-G10.3/BFG
QUANTITY:	5,760
RATED POWER @ STC (P_{MAX}):	485 W
MAX SYSTEM VOLTAGE:	1500 V
OPEN CIRCUIT VOLTAGE @ STC (V_{OC}):	53.63 V
MAX POWER VOLTAGE @ STC (V_{MP}):	45.63 V
SHORT CIRCUIT CURRENT @ STC (I_{SC}):	11.16 A
MAX POWER CURRENT @ STC (I_{MP}):	10.63 A
MODULE EFFICIENCY:	22.70 %
STRING DATA:	
DESIGN MODULES PER STRING	24
MODULE V_{OC} at T_{MIN}	59.3 V
SOURCE CIRCUIT V_{OC} at T_{MIN}	1422 V
MAX SYSTEM VOLTAGE	1500 V
RACKING DATA:	
VENDOR	TERRASMART
RACKING TYPE:	FIXED TILT (432 2X13 BLOCKS)
MODULE ORIENTATION:	PORTRAIT (2 HIGH)
RACK POST SPACING PITCH::	29'-8 1/2"
AZIMUTH:	180 °
TILT ANGLE:	25.00
GROUND COVERAGE RATIO (GCR):	0.44
***INVERTER DATA:**	
VENDOR:	SUNGROW
MODEL:	SG125HV
QUANTITY:	16
MAX INPUT VOLTAGE:	1500 V
RATED AC ACTIVE OUTPUT POWER:	125 kW
MAX AC APPARENT OUTPUT POWER:	125 kVA
OUTPUT VOLTAGE:	600 V
OUTPUT PHASE:	3Φ
MAX OUTPUT CURRENT:	120 A
INVERTER EFFICIENCY:	98.9 %
SWITCHGEAR DATA:	
VENDOR:	TBD
MODEL:	TBD
DESCRIPTION:	(1) 2500A MCB
RATING:	600V, 3Φ, 4W, NEMA 3R
OVERALL SYSTEM SIZE:	
OVERALL DC OUTPUT POWER	2,794 kW
OVERALL AC OUTPUT POWER	1,999 kVA
OVERALL DC/AC RATIO	1.40

* ONE INVERTER IS DERATED TO 124KVA

DRAWING LIST

REV#	DATE	REVISION
-	08-08-23	ISSUED FOR PERMIT ONLY

CONSTRUCTION ENGINEERING GROUP
Consulting Engineers
2651 EAU GALLIE BLVD, SUITE A
MELBOURNE, FL 32935
TEL. 321.253.1221
WWW.CEGENGINEERING.COM

TEN OAKS SOLAR
NEW PHOTOVOLTAIC SYSTEM
3950 TEN OAKS ROAD GLENELG, MD 21737

DRAWING TITLE
COVER SHEET

ENGINEER OF RECORD

STATE OF MARYLAND
DAVID E. AILEY
PROFESSIONAL ENGINEER
MARYLAND
PROFESSIONAL ENGINEER
NO. 42678

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 42678, EXPIRATION DATE: 2024-09-12.

DATE: 08-08-23

SCALE: AS NOTED

PROJ. NO. : 230120

DESIGNED BY: JNH

DRAWN BY: JNH

CHECKED BY: DEA

DRAWING NO.: PVE-1.0

SYMBOLS

Symbol	Description
----	RACEWAY CONCEALED BELOW FLOOR OR GRADE.
—///—►	CIRCUIT HOMERUN, NUMBER OF ARROWS INDICATES NUMBER OF CIRCUITS. PROVIDE GREEN INSULATED GROUNDING CONDUCTOR IN ALL WAYS, NOT SHOWN ON PLANS.
	GROUND
	PLAN NOTE
3 30/20	FUSED DISCONNECT SWITCH. 600V, HEAVY DUTY, NEMA 4X FIBERGLASS. SINGLE NUMBER INDICATES NUMBER OF POLES. TOP NUMBER INDICATES MAXIMUM AMPERAGE. BOTTOM INDICATES ACTUAL FUSING AS INDICATED OR AS DETERMINED FROM MANUFACTURER'S NAMEPLATE.
3 30/NF	NON-FUSED DISCONNECT SWITCH. 600V, HEAVY DUTY, NEMA 3R. SINGLE NUMBER INDICATES NUMBER OF POLES. TOP NUMBER INDICATES MAXIMUM AMPERAGE, NF = NON-FUSED.
	METER ENCLOSURE.
	INVERTER\COMBINER ENCLOSURE.
	277/480V ELECTRICAL PANEL AS SCHEDULED.
	120/240V ELECTRICAL PANEL AS SCHEDULED.
	PAD MOUNTED UTILITY TRANSFORMER
	INVERTER
	FUSE
	PV SUB-ARRAY
	CIRCUIT BREAKER
	PV MODULE
M	METER
	120V WEATHERPROOF GFI RECEPTACLE.

ABBREVIATIONS:

A	AMPERES
AC	ALTERNATING CURRENT
AFG	ABOVE FINISHED GRADE
AWG	AMERICAN WIRE GAUGE
C	CONDUIT
CU	COPPER
DAS	DATA ACQUISITION SYSTEM
DISC	DISCONNECT
ELEC	ELECTRICAL
EMT	ELECTRICAL METALLIC TUBING
FMC	FLEXIBLE METAL CONDUIT
G	GROUND
GND	GROUND
GRC	GALVANIZED RIGID CONDUIT
J	JUNCTION
KAIC	(THOUSAND) AMPERE INTERRUPTING CAPACITY
KVA	KILOVOLT AMPERES
KW	KILOWATT
KCMIL	THOUSANDS OF CIRCULAR MILS
N	NEUTRAL
NEC	NATIONAL ELECTRICAL CODE
NF	NON-FUSED
P	POLE
PNL	PANELBOARD
PVC	POLYVINYL CHLORIDE
RGM	REVENUE GRADE METER
SN	SOLID NEUTRAL
SPEC	SPECIFICATION
SS	STAINLESS STEEL
SQ	SQUARE
UG	UNDERGROUND
V	VOLTS
W	WIRE
WP	WEATHERPROOF
Y	WYE (CONNECTED)

MEDIUM VOLTAGE NOTES:

1. MEDIUM VOLTAGE CABLE SHALL BE 1/C 15KV RATED, 133% INSULATION FOR 105 DEGREE CELSIUS, CONTINUOUS OPERATING TEMPERATURE, CONFORMING TO NEMA WC 74/ICEA S-94-649. CLASS B, COMPACT ALUMINUM ALLOY 1350 CABLES. INSULATION SHALL BE ETHYLENE-PROPLENE-RUBBER (EPR). INSULATION SHALL BE SHIELDED WITH AN EXTRUDED LAYER OF SEMI-CONDUCTING THERMOSETTING MATERIAL. PROVIDE WITH CONCENTRIC NEUTRAL WITH BLACK SUNLIGHT RESISTANT POLYETHYLENE CONFORMING TO THE REQUIREMENTS SPECIFIED FOR POLYVINYL CHLORIDE JACKETS IN ICEA. THE AVERAGE THICKNESS SHALL BE IN ACCORDANCE WITH TABLE 7-3 OF ICEA. CABLES SHALL BE UL LISTED, SUITABLE FOR BOTH WET AND DRY LOCATION USE.
2. AFTER INSTALLATION, PRIOR TO ENERGIZING CABLE SHALL BE FIELD TESTED PER CABLE MANUFACTURERS WRITTEN INSTRUCTIONS. PERFORM ACCEPTANCE TEST ON NEW CABLES ARE PLACED IN SERVICE, INCLUDING TERMINATIONS AND JOINTS. ACCEPTANCE TEST ON CABLES SHALL BE VERY LOW FREQUENCY (VLF) ALTERNATING VOLTAGE WITHSTAND TESTS IN ACCORDANCE WITH IEEE 400.2. VLF TEST FREQUENCY SHALL BE 0.05 HZ MINIMUM FOR A DURATION OF 60 MINUTES USING A SINUSOIDAL WAVEFORM. TEST VOLTAGES SHALL BE 20KV RMS (PEAK) FOR 25 KV CABLES.
3. MV TERMINATIONS SHALL BE IEEE 48 CLASS 1, MOLDED PRE-STRESSED ELASTOMER, OR HEAT SHRINK ELASTOMER. ACCEPTABLE ELASTOMERS ARE TRACKORESISTANT SILICONE RUBBER OR TRACK-RESISTANT ETHYLENE PROPYLENE COMPOUNDS. TERMINATIONS MUST BE PROVIDED IN A KIT, INCLUDING SKIRTS, STRESS CONTROL TERMINATOR, GROUND CLAMP, CONNECTORS, LUGS AND COMPLETE INSTRUCTIONS FOR ASSEMBLY AND INSTALLATION. TERMINATIONS MUST BE THE PRODUCT OF ONE MANUFACTURER, SUITABLE FOR THE TYPE, DIAMETER, INSULATION CLASS AND LEVEL AND MATERIALS OF THE CABLE TERMINATED. DO NOT USE SEPARATE PARTS OF COPPER OR COPPER ALLOY IN CONTACT WITH ALUMINUM ALLOY PARTS IN THE CONSTRUCTION OR INSULATION OF THE TERMINATOR.
4. SEPARABLE INSULATED CONNECTOR TYPE SHALL BE PROVIDED WITH STEEL REINFORCED HOO-STICK EYE, GROUNDING EYE TEST POINT, AND ARC QUENCHING CONTACT MATERIAL.. PROVIDE CONNECTORS OF THE LOAD-BREAK TYPE OF SUITABLE CONSTRUCTION FOR THE APPLICATION AND THE TYPE OF CABLE CONNECTED AND THAT INCLUDE CABLE SHIELD ADAPTERS. 300A LOAD-BREAK CONNECTOR RATINGS: VOLTAGE: 15KV, 125 KV BIL, SHORT TIME RATING: 10,000 RMS SYMMETRICAL AMPERES.

ELECTRICAL NOTES

GROUNDING:

1. MODULE EQUIPMENT GROUNDING CONNECTION SHALL BE INSTALLED IN ACCORDANCE WITH SUCH MODULE MANUFACTURER'S GUIDELINES AND LISTINGS. MODULE FRAME GROUNDING HARDWARE SHALL BE LISTED TO UL1703 AND SPECIFIED BY MODULE MANUFACTURER AS ACCEPTABLE FOR USE WITH THE MODULE MODEL. WEEBS WILL BE CONSIDERED AN ACCEPTABLE MEANS OF GROUNDING BUT THEIR USE MUST BE AN APPROVED USE BY THE APPLICABLE MANUFACTURER(S). LETTER WITH SUCH APPROVAL FOR THIS SPECIFIC CASE MUST BE PROVIDED TO OWNER AND APPROVED BY OWNER, OTHERWISE A CONTINUOUS GROUND LOOP MUST BE INSTALLED.
2. ALL BRANCH AND FEEDER CIRCUITS SHALL CONTAIN A GROUNDING CONDUCTOR, UNLESS OTHERWISE NOTED, AND BE SIZED AND BONDED IN ACCORDANCE WITH ARTICLE 250 OF THE NATIONAL ELECTRIC CODE.
3. UNLESS OTHERWISE NOTED, GROUNDING CONDUCTORS SHALL BE COPPER. EQUIPMENT GROUNDING CONDUCTORS SHALL BE INSULATED WITH GREEN-COLORED INSULATION. UNDERGROUND CONDUCTORS SHALL BE BARE, TINNED, AND STRANDED. USE ONLY COPPER CONDUCTORS FOR BOTH INSULATED AND BARE GROUNDING CONDUCTORS IN DIRECT CONTACT WITH EARTH, CONCRETE, MASONRY, CRUSHED STONE AND SIMILAR MATERIALS. IN RACEWAYS, USE INSULATED EQUIPMENT GROUNDING CONDUCTORS.
4. INSTALL INSULATED EQUIPMENT GROUNDING CONDUCTORS WITH CIRCUIT CONDUCTORS FOR THE FOLLOWING ITEMS, IN ADDITION TO THOSE REQUIRED BY NEC. FEEDERS AND BRANCH CIRCUITS; RECEPTACLE CIRCUITS; SINGLE-PHASE MOTOR AND APPLIANCE BRANCH CIRCUITS; THREE-PHASE MOTOR AND APPLIANCE BRANCH CIRCUITS; FLEXIBLE RACEWAY RUNS
5. METHODS THAT GROUND MODULE FRAMES BY UTILIZING THE RACKING AS THE GROUNDING MEANS SHALL BE LISTED TO UL 2703.
6. ALL NON-CURRENT CARRYING EXPOSED METAL PARTS OF SYSTEM JUNCTION BOXES, EQUIPMENT, MODULE FRAMES, SUPPORT RACKING, INVERTER CASES AND APPLIANCES IN THE ENTIRE ELECTRICAL SYSTEM THAT MAY BE ACCIDENTALLY ENERGIZED SHALL BE GROUNDED PER NEC 690.43 AND 690.45 AND SIZED PER 250.122.
7. ALL EQUIPMENT GROUNDING CONDUCTORS SHALL BE PER THE NEC AND LOCAL ELECTRIC CODE AND BE STRANDED OR SOLID COPPER AND MAY BE BARE IF EXPOSED OR PROTECTED BY A CONDUIT SLEEVE AND GREEN INSULATED IF IN A RACEWAY ALONG WITH THE CIRCUIT CONDUCTORS. EXPOSED BARE EQUIPMENT GROUNDING CONDUCTORS WILL BE MINIMUM 6 AWG COPPER.
8. GROUND LUGS SHALL BE COMPRESSION CONNECTIONS AND ACCEPTABLE FOR COPPER CONDUCTOR TERMINATION. LUGS SHALL BE SELECTED SO AS TO PREVENT GALVANIC CORROSION AND DISSIMILAR THERMAL EXPANSION OF LUGS AND CONDUCTORS.
9. TIN-PLATED COPPER LAY-IN GROUND LUGS OR CONDUIT GROUND CLAMPS SHALL BE PROVIDED FOR ALL METALLIC CONDUIT CARRYING POWER CONDUCTORS. SUCH MEANS OF GROUNDING SHALL NOT BE REQUIRED FOR METALLIC CONDUIT CARRYING COMMUNICATION CONDUCTORS.
10. ALL GROUND LUGS NOT INSTALLED IN AN ENCLOSURE MUST BE UL LISTED FOR DIRECT BURIAL.
11. CABLE TRAYS SHALL BE GROUNDED IN ACCORDANCE WITH OEM AND REQUIREMENTS OF THE APPLICABLE GOVERNMENTAL AUTHORITY. CABLE TRAYS SHALL HAVE A COMMON COPPER GROUNDING WIRE INSTALLED IN THE CABLE TRAY AND CONTINUOUSLY RUN WITH CURRENT CARRYING CONDUCTORS FOR THE FULL LENGTH OF THE TRAY.
12. ALL EQUIPMENT GROUNDING CONDUCTORS (EGC) AND GROUNDING ELECTRODE CONDUCTORS (GEC) SHALL BE SIZED IN ACCORDANCE WITH THE PROPER SECTIONS OF THE NEC.
13. METALLIC CONDUIT CONTAINING A GROUNDING ELECTRODE CONDUCTOR MUST BE BONDED AT BOTH ENDS.
14. ALL INVERTERS AND INTERCONNECTION SWITCHBOARDS SHALL UTILIZE A GROUNDING ELECTRODE SYSTEM CONSISTING OF A GROUND GRID SIZED AND INSTALLED TO COMPLY WITH NEC AND IEEE STANDARDS.
15. EQUIPMENT GROUNDING CONDUCTORS SHALL BE ROUTED WITH ALL CIRCUIT AND PHASE CONDUCTORS.
16. ALL BELOW GRADE CONNECTIONS SHALL BE EXOTHERMIC OR COMPRESSION TYPE AND UL LISTED FOR DIRECT BURIAL APPLICATIONS.
17. GROUND RODS SHALL BE SECTIONAL TYPE; COPPER-CLAD STEEL, 5/8" IN DIAMETER BY 8' DRIVEN VERTICALLY.
18. PROVIDE LAY IN TYPE GROUND LUG TO STRUCTURAL STEEL, IRREVERSIBLE COMPRESSION CONNECTORS FOR UNDERGROUND CONNECTIONS. EQUIPMENT GROUNDING CONDUCTOR TERMINATIONS SHALL BE BOLTED PRESSURE CLAMPS.
19. UNDERGROUND GROUNDING CONDUCTORS SHALL BE TINNED-COPPER CONDUCTOR. BURY AT LEAST 30" BELOW GRADE OR BURY 12" ABOVE DUCT BANK WHEN INSTALLED AS PART OF THE DUCT BANK.
20. ALL EXPOSED GROUND CONNECTIONS TO EQUIPMENT SHALL BE CABLE LUGS WITH COMPRESSION CONNECTIONS.
21. USE INSULATED COPPER EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACKING SYSTEMS WHEN ALUMINUM RACKING IS USED. BOND TO RACKING WITH CU-AL RATED LUGS PER RACKING MANUFACTURER'S REQUIREMENTS.
22. FENCE SECTIONS UNDER OVERHEAD ELECTRICAL LINES SHALL BE GROUNDED AND ISOLATED. REFER TO FENCING PLAN (BY OTHERS) FOR FENCING LAYOUT.
23. GATES AND ADJACENT FENCE SECTIONS SHALL BE GROUNDED.
24. INSTALL #6 CU INSULATED BONDING JUMPERS BETWEEN ADJACENT RACKS AND ADJACENT ROWS PER MANUFACTURERS GROUNDING AND INSTALLATION DETAILS. BOND EACH RACKING ROW TO EQUIPMENT GROUNDING CONDUCTOR RUNNING IN CABLE TRAYS IN ORDER TO BOND ALL RACKING ROWS TOGETHER.
25. GROUNDING SCREWS SHOULD BE THREAD-FORMING OR HOT DIPPED, NOT THREAD CUTTING.
26. PROVIDE INSULATED GROUNDING BUSHINGS FOR ALL METALLIC CONDUITS.

MODULES:

1. CONTRACTOR WILL BE RESPONSIBLE FOR RECEIVING, UNLOADING AND INSTALLING ALL SOLAR PHOTOVOLTAIC MODULES. COORDINATE SPECIFIC SCOPE REQUIREMENTS DURING BIDDING.
2. MODULES SHALL BE INSTALLED, SECURED, AND MECHANICALLY GROUNDED TO THE RACKING SYSTEM PER THE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.

INVERTERS:

1. CONTRACTOR WILL BE RESPONSIBLE FOR RECEIVING, UNLOADING AND INSTALLING THE INVERTERS. COORDINATE SPECIFIC SCOPE REQUIREMENTS DURING BIDDING.
2. INVERTERS SHALL BE UTILITY GRADE AND SPECIFICALLY DESIGNED FOR PV INSTALLATIONS.
3. INVERTERS SHALL MEET THE FOLLOWING MINIMUM STANDARDS: UL 1741 – STANDARD FOR INVERTERS, CONVERTERS, CONTROLLERS AND INTERCONNECTION SYSTEM EQUIPMENT FOR USE WITH DISTRIBUTED ENERGY RESOURCES. IEEE 929-2000 – RECOMMENDED PRACTICE FOR UTILITY INTERFACE OF PHOTOVOLTAIC (PV) SYSTEMS.CONTRACTOR WILL BE RESPONSIBLE FOR INSTALLATION OF ALL SOLAR PHOTOVOLTAIC MODULES IN RELATION TO THE WORK. COORDINATE SPECIFIC SCOPE REQUIREMENTS DURING BIDDING.
4. INVERTERS SHALL BE INSTALLED, SECURED, WIRED, TESTED AND GROUNDED PER THE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.

MISCELLANEOUS:

1. OUTLET BOXES BOXES SHALL BE CAST ALLOY WITH THREADED HUBS IN WET OR DAMP LOCATIONS AND OR OF SPECIAL CONSTRUCTION TO SUIT SPECIFIC SITUATIONS.
2. ALL EXTERIOR MOUNTING HARDWARE USED SHALL BE STAINLESS STEEL, SIZED PER SYSTEM MANUFACTURER'S RECOMMENDATIONS. USE ANTI-SEIZE FOR EACH CONNECTION.
3. PANELBOARDS SHALL BE FULLY RATED TO INTERRUPT SYMMETRICAL SHORT-CIRCUIT CURRENT AVAILABLE AT TERMINALS. PANELBOARDS SHALL UTILIZE BOLT-ON CIRCUIT-BREAKER TYPE AND ALL PHASE AND GROUND BUSSES SHALL BE COPPER, NEMA 3R ENCLOSURES.

ELECTRICAL NOTES

CONDUCTOR PROTECTION:

1. ALL ABOVEGROUND POWER CONDUCTORS SHALL BE PROTECTED IN IMC OR RMC METAL CONDUIT. FINAL CONDUIT CONNECTIONS TO COMBINERS AND INVERTERS SHALL BE LTFSC TO ALLOW FOR EXPANSION
2. UNDERGROUND WIRING SHALL BE IN RIGID POLYVINYL CHLORIDE CONDUIT (PVC) OR HIGH DENSITY POLYETHYLENE (HDPE), SCHEDULE 80, TYPE DB FOR DIRECT BURIAL, BURIED MINIMUM 24" BELOW GRADE OR AS REQUIRED BY THE APPLICABLE GOVERNMENTAL AUTHORITY, UTILITY AND ALL OTHER GOVERNMENTAL AUTHORITIES IN A CLEAN FILL MATERIAL FREE OF AGGREGATE. A DETECTABLE MARKER TAPE SHALL BE PLACED 12" BELOW GRADE IN TRENCHES CONTINUOUSLY OVER THE CONDUCTORS.
3. PULL AND JUNCTION BOXES SHALL BE PROVIDED WHERE REQUIRED TO FACILITATE THE INSTALLATION OF WIRING. BENDS IN CONDUITS BETWEEN PULL BOXES SHALL NOT EXCEED THE EQUIVALENT OF FOUR 90 DEGREE BENDS.
4. CONDUITS REQUIRING FIELD CUTTING SHALL BE CUT SQUARE AND DE-BURRED. CONDUIT END BELLS OR BUSHINGS SHALL BE PROVIDED TO PREVENT CABLE DAMAGE.
5. BENDS IN CONDUITS SHALL NOT DAMAGE RACEWAYS OR SIGNIFICANTLY CHANGE THE INTERNAL DIAMETER OF RACEWAYS (NO KINKS).
6. COMMUNICATIONS WIRING SHALL BE RUN IN SEPARATE CONDUITS FROM POWER CIRCUIT WIRING.
7. ALL BRANCH CIRCUIT WIRE SHALL BE INSTALLED IN CONDUIT, UNLESS OTHERWISE NOTED. MINIMUM HOMERUN SIZE SHALL BE 3/4".
8. ALL BENDS AND RACEWAYS PENETRATING CONCRETE SLAB SHALL BE RIGID GALVANIZED METAL CONDUIT OR SCHEDULE 80 PVC.
9. RACEWAYS SHALL BE SUPPORTED BY APPROVED TYPES OF GALVANIZED SUPPORTS. USE STAINLESS STEEL HARDWARE AND CONDUIT STRAPS OUTDOORS. PAINT ALL EXPOSED MATERIALS TO MATCH EXISTING COLORS.
10. JOB CUT THREADS SHALL BE GIVEN A COAT OR RUST RESISTANT PAINT SUCH AS ZINC CHROMATE OR EQUAL.
11. CONTINUOUS LENGTHS OF MAGNETIC IDENTIFICATION TAPE NOTING PARTICULAR SYSTEM IS TO BE PROVIDED ABOVE ALL UNDERGROUND RACEWAYS AND TAPE TO BE LOCATED 6" BELOW FINAL GRADE.
12. WIRE TERMINATIONS AND SPLICES SHALL BE COMPLETED WITH THE APPROPRIATE UL LISTED HEAVY DUTY RATCHETING TYPE JAWS AND INTERCHANGEABLE DIES FOR PROPER CRIMPING OF TERMINALS. TERMINALS SHALL BE UN-INSULATED TYPE AND CORRECTLY SIZED FOR THE WIRE USED. MECHANICAL TERMINAL BLOCKS AND TERMINAL LUGS SHALL BE LISTED FOR THE APPROPRIATE CONDUCTOR MATERIAL. MECHANICAL TERMINAL BLOCKS CANNOT BE USED FOR SPLICING OF ANY CONDUCTORS
13. AFTER INSTALLATION OF CONDUCTORS, ALL RACEWAYS SHALL BE SEALED WITH AMERICAN POLYWATER CORP FST SPRAY FOAM SEALANT OR EQUIVALENT.

LABELING AND IDENTIFICATION:

1. ALL WIRES AND CABLE SHALL HAVE UV RESISTANT, OUTDOOR RATED, WRAP-AROUND LAMINATING VINYL MACHINE PRINTED ID LABELS OR OTHER APPROVED LABELING METHOD INDICATING DESIGNATION AND POLARITY/PHASE. FOR DC STRING CIRCUITS, DESIGNATION SHALL BE THE CIRCUIT NUMBER.
2. FOR DIAGNOSTIC AND TROUBLESHOOTING PURPOSES, ALL CABLES SHALL BE UNIQUELY TAGGED AND IDENTIFIED WITH SUCH TAGGING ON THE RECORD CONSTRUCTION DRAWINGS. THESE CABLES SHALL HAVE A LABEL AFFIXED TO THE OUTER JACKET AT EACH TERMINATION OF TYPE AND REASONABLY ACCEPTABLE TO OWNER.
3. ALL DC CONDUITS SHALL BE LABELED AT ENCLOSURES, AND PULL BOXES. LABELS SHALL BE PERMANENT, HEAVY-DUTY (INDUSTRIAL), WEATHERPROOF, WITH ADHESIVE BACKING. LETTERS SHALL BE 3/4 INCH HIGH, WHITE WITH A RED BACKGROUND. LABELS SHALL READ 'SOLAR-PHOTOVOLTAIC POWER SOURCE'.
4. ALL AC CONDUITS SHALL BE LABELED AT ENCLOSURES, PULL BOXES, AND WHERE RUN IS EXPOSED IN BUILDING (AT EVERY 10 FEET). LABELS SHALL BE PERMANENT, HEAVY-DUTY (INDUSTRIAL), WEATHERPROOF, WITH ADHESIVE BACKING. LETTERS SHALL BE 3/4 INCH HIGH, WHITE WITH A RED BACKGROUND. LABELS SHALL READ 'SOLAR-PHOTOVOLTAIC AC FEEDER'.
5. ALL ELECTRICAL EQUIPMENT, PANELS, INVERTERS, AND ASSOCIATED EQUIPMENT SHALL BE CLEARLY LABELED WITH WEATHERPROOF, ENGRAVED NAMEPLATES UTILIZING OWNER SPECIFIED NAMING CONVENTIONS.
6. ALL ELECTRICAL EQUIPMENT THAT IS LIKELY TO BE SERVICED, INCLUDING BUT NOT LIMITED TO INVERTERS, DISCONNECT SWITCHES, AND SWITCHGEAR, SHALL BE CLEARLY LABELED WITH WEATHERPROOF LABELS STATING ELECTRICAL ARC HAZARD INFORMATION IN ACCORDANCE WITH THE MOST CURRENT VERSION OF NFPA 70E.
7. ENGRAVED SIGNS AND APPROPRIATE WARNING LABELS SHALL BE PROVIDED IDENTIFYING THAT A PHOTOVOLTAIC SYSTEM IS IN OPERATION AND THAT THERE MAY BE MULTIPLE POWER SOURCES ON SITE. PLAQUES OR DIRECTORIES SHOWING THE LOCATIONS OF OTHER SERVICE DISCONNECTING MEANS SHALL BE PROVIDED WHERE REQUIRED BY THE NEC. OWNER MAY REQUEST UP TO FIVE ADDITIONAL SIGNS IDENTIFYING EMERGENCY PHONE NUMBERS OR SIMILAR INFORMATION.
8. SIGNAGE SHALL INCLUDE AT A MINIMUM, THAT REQUIRED BY ARTICLE 690 OF THE NEC.
9. SYSTEM SHALL BE LABELED TO MEET ALL APPLICABLE SAFETY CODES AND REQUIREMENTS.
10. ALL PANELBOARDS, DISCONNECT SWITCHES AND SYSTEM PANELS SHALL HAVE PLASTIC LAMINATE NAMEPLATES FOR IDENTIFYING SYSTEM FUNCTION AND CHARACTERISTICS.
11. ALL RECEPTACLE FACEPLATES SHALL HAVE AN ADHESIVE LABEL INDICATING WHICH PANEL AND CIRCUIT RECEPTACLE IS FED FROM. I.E. "P-13" FOR PANEL P, CIRCUIT 13.
12. ALL PANELBOARDS SHALL TYPED DIRECTORIES REQUIRED PRIOR TO SYSTEM ACCEPTANCE.
13. ALL LABELING AND SIGNAGE SHALL BE OF UL LISTED MATERIALS.
14. SIGNAGE, ACCEPTABLE TO THE AHJ, SHALL BE INSTALLED ADJACENT TO THE MAIN DISCONNECT INDICATING THE NAME AND EMERGENCY TELEPHONE NUMBER OF THE INSTALLING CONTRACTOR AND THE OWNER'S DESIGNATED REPRESENTATIVE.

ENCLOSURES:

1. ALL ELECTRICAL EQUIPMENT ENCLOSURES SHALL BE SPECIFIED AND INSTALLED IN ACCORDANCE WITH NEMA STANDARDS AND TYPE NUMBER AND SHALL BE SUITABLE FOR THE LOCATION CONDITIONS.
2. ALL EXTERIOR ELECTRICAL EQUIPMENT ENCLOSURES SHALL BE MINIMUM TYPE NEMA 3R THIS SHALL INCLUDE BUT NOT BE LIMITED TO SWITCHGEAR, TRANSFORMERS, SWITCHBOARDS, DISTRIBUTION PANELS, CONTROL CABINETS, PULL BOXES, JUNCTION BOXES, COMBINER BOXES, ETC.
3. ALL ENCLOSURES SHALL BE PROVIDED WITH PAD LOCKING PROVISIONS OR EQUIVALENT.
4. ALL SOLAR PHOTOVOLTAIC MODULE AND OTHER MATERIALS ENCLOSURES, INCLUDING LARGE CONTRACTOR INSTALLED ELECTRICAL EQUIPMENT (INCLUDING SWITCHGEAR, TRANSFORMERS, SWITCHBOARDS, DISTRIBUTION PANELS, CONTROL CABINETS, PULL BOXES, JUNCTIONS BOXES, COMBINER BOXES, AND INVERTERS) SHALL BE ENTIRELY LOCATED AT OR ABOVE THE EQUIPMENT ELEVATION UNLESS OTHERWISE APPROVED BY OWNER. CONTRACTOR SHALL PROVIDE SAFE EGRESS IN COMPLIANCE WITH OSHA AND CUSTOMER STANDARDS TO ALLOW FOR ACCESS TO SUCH EQUIPMENT ENCLOSURES FOR OPERATIONS AND MAINTENANCE RESPONSIBILITIES. SUCH EGRESS FEATURES SHALL INCLUDE BUT NOT BE LIMITED TO STAIRS, LADDERS, HANDRAILS, TIE-OFF POINTS, ETC.

ELECTRICAL NOTES

AC SYSTEM WIRING:

1. ALL CONDUCTORS, LUGS AND CABLE ACCESSORIES SHALL BE NRTL LISTED TO APPLICABLE UL STANDARDS.
2. ALL CONDUCTORS INSTALLED BELOW THE EQUIPMENT ELEVATION (AND THEREFORE INCLUDES CONDUCTORS BELOW GRADE) MUST BE LISTED FOR USE IN WET LOCATIONS (PER NEC AND UL DEFINITIONS, INCLUDING SUBMERSION), AND BE OF A CORROSION RESISTANT DESIGN.
3. ALL CONDUCTORS SHALL BE SIZED IN ACCORDANCE WITH CURRENT NEC CODE REQUIREMENTS.
4. ALL POWER WIRING IN CABLE TRAYS (ONLY SPECIFICALLY WHERE NOTED) SHALL BE UV RESISTANT AND UL LISTED FOR USE IN CABLE TRAYS.
5. AVERAGE AC VOLTAGE DROP FROM THE HIGH VOLTAGE SIDE OF EACH PAD MOUNTED MEDIUM VOLTAGE TRANSFORMER TO THE POINT OF INTERCONNECTION SHALL NOT EXCEED 0.5% AT 1000 W/M^2 PLANE OF ARRAY IRRADIANCE AND 25 DEGREE CELL TEMPERATURE. ALL WIRES AND CABLE SHALL HAVE WRAP-AROUND LAMINATING VINYL MACHINE PRINTED ID LABELS OR OTHER APPROVED LABELING METHOD INDICATING DESIGNATION AND PHASE. CONDUCTORS SHALL HAVE INTEGRAL COLORING OR COLORED HEAT SHRINK SLEEVE AT ALL TERMINATIONS TO INDICATE GROUNDED CONDUCTORS, EQUIPMENT GROUNDING CONDUCTORS, AND AC PHASE CONDUCTORS. COLOR CODING SHALL BE AS FOLLOWS:

PHASE A	BROWN (480VAC & 600VAC), BLACK (208VAC)
PHASE B	ORANGE (480VAC & 600VAC), RED (208VAC)
PHASE C	YELLOW (480VAC & 600VAC), BLUE (208VAC)
NEUTRAL	GRAY OR WHITE
GROUND	GREEN WITH STRIPE OR BARE

6. ALL LUGS AND CONNECTORS SHALL BE LISTED AND DESIGNATED FOR USE WITH THE APPLICABLE CONDUCTOR MATERIAL THAT IS BEING CONNECTED TO THEM.
7. LUGS AND CONNECTORS USED TO TRANSITION FROM COPPER TO ALUMINUM WIRE SHALL BE LISTED AND RATED FOR SUCH USE.
8. ALL POWER CONDUCTOR TERMINATIONS SHALL BE IRREVERSIBLE, DOUBLE CRIMP, LONG BARREL, TWO BOLT COMPRESSION TYPE LUGS RATED AT 90C APPROVED BY THE EQUIPMENT MANUFACTURER OR SUPPLIER. WHERE NOT POSSIBLE, SINGLE BOLT COMPRESSION LUGS MAY BE USED. MECHANICAL SET SCREW TERMINATIONS ARE APPROVED FOR EQUIPMENT TERMINATIONS WITH FACTORY INSTALLED MECHANICAL LUGS. ALL CRIMPED CONNECTIONS MUST BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
9. PROVIDE A MAXIMUM OF TWO STACKABLE COMPRESSION LUGS WHEN MORE THAN ONE COMPRESSION LUG NEEDS TO BE TERMINATED AT A SINGLE SET OF BUS BAR HOLES.
10. WHEN TERMINATING ALUMINUM CONDUCTORS, COAT WITH OXIDE PROHIBITOR. ALUMINUM CONDUCTORS SHALL BE TERMINATED WITH COMPRESSION LUGS IN LIEU OF MECHANICAL LUGS WHERE POSSIBLE.
11. NO SPLICING OF ANY WIRES WITHOUT WRITTEN CONSENT OF OWNER. ALL UNDERGROUND WIRING SHALL BE CONTINUOUS WITHOUT SPLICES.
12. ALL AC, SMALL BRANCH CIRCUIT CONDUCTORS AND CABLES SHALL BE COPPER TYPE "THHN/THWN," SOLID FOR SIZES #10 AND #12, AND STRANDED FOR #8 AND LARGER UNLESS OTHERWISE NOTED. USE SUNLIGHT RESISTANT XHHW-2, RATED FOR AC FEEDERS OR WHERE SPECIFICALLY NOTED TO BE INSTALLED IN CABLE TRAYS.
13. ALL SINGLE PHASE POWER CIRCUITS SHALL HAVE A DEDICATED NEUTRAL.CONTRACTOR TO PROVIDE ALL LOW VOLTAGE AC WIRING FROM INVERTERS TO THE RESPECTIVE MEDIUM VOLTAGE TRANSFORMER, AND FROM THE MEDIUM VOLTAGE TO THE GRID INTERCONNECTION POINT IN ACCORDANCE WITH THE INTERCONNECTION AGREEMENT.
14. ALL CONDUCTORS INSTALLED BELOW THE EQUIPMENT ELEVATION (AND THEREFORE INCLUDES CONDUCTORS BELOW GRADE) MUST BE LISTED FOR USE IN WET LOCATIONS (PER NEC AND UL DEFINITIONS, INCLUDING SUBMERSION), AND BE OF A CORROSION RESISTANT DESIGN.
15. CONTRACTOR SHALL PROVIDE ALL UNDERGROUND CONDUITS, DUCT BANKS, EQUIPMENT PADS, AND RELATED STRUCTURES REQUIRED BY THE APPLICABLE UTILITY FOR INTERCONNECTION IN ACCORDANCE WITH SPECIFICATIONS AND DESIGNS PROVIDED BY SUCH UTILITY.
16. CLASS 1 AND CLASS 2 CONTROL CIRCUITS SHALL BE TYPE THHN-THWN, IN RACEWAY.

DC SYSTEM WIRING:

1. ALL CONDUCTORS SHALL BE SIZED IN ACCORDANCE WITH CURRENT NEC CODE REQUIREMENTS, INCLUDING TEMPERATURE RATING, AND OWNER SPECIFIED VOLTAGE DROP.
2. ALL CONDUCTORS INSTALLED BELOW THE EQUIPMENT ELEVATION (AND THEREFORE INCLUDES CONDUCTORS BELOW GRADE) MUST BE LISTED FOR USE IN WET LOCATIONS (PER NEC AND UL DEFINITIONS, INCLUDING SUBMERSION), AND BE OF A CORROSION RESISTANT DESIGN.
3. ALL POWER WIRING IN CABLE TRAYS SHALL BE UV RESISTANT AND UL LISTED FOR USE IN CABLE TRAYS. ALL EXPOSED CABLES SHALL BE UV RESISTANT, OUTDOOR RATED AND COVERED FROM DIRECT SUNLIGHT. WIRE LOOM, SLEEVE, TUBING OR APPROVED ALTERNATE SHALL BE USED TO PROTECT FROM DIRECT SUNLIGHT AND SHARP EDGES.
4. MINIMUM LOW VOLTAGE CONDUCTOR SIZE SHALL BE AWG #12.
5. AVERAGE DC VOLTAGE DROP FOR THE ENTIRE PROJECT AS MEASURED FROM EACH STRING TO ITS EFFECTIVE INVERTER RECOMBINER WHEN MEASURED AT 1000 W/M^2 PLANE OF ARRAY IRRADIANCE AND 25 DEGREE CELL TEMPERATURE SHALL NOT EXCEED 2.0%. FOR THE AVOIDANCE OF DOUBT, DC VOLTAGE DROPS FOR INDIVIDUAL STRINGS MAY EXCEED 2.0%, BUT THE AVERAGE VOLTAGE DROP OF ALL STRINGS SHALL NOT EXCEED 2.0% AT THE AFOREMENTIONED ENVIRONMENTAL CONDITIONS.
6. ALL WIRES AND CABLE SHALL HAVE UV RESISTANT AND OUTDOOR RATED WRAP-AROUND LAMINATING VINYL MACHINE PRINTED ID LABELS OR OTHER APPROVED LABELING METHOD INDICATING DESIGNATION AND POLARITY. CONDUCTORS SHALL HAVE INTEGRAL COLORING OR A COLORED OUTDOOR RATED HEAT SHRINK SLEEVE AT ALL TERMINATIONS TO INDICATE GROUNDED CONDUCTORS AND EQUIPMENT. GROUNDING CONDUCTORS PER NEC REQUIREMENTS AND INDUSTRY STANDARDS.
7. SERIES STRING CONNECTIONS BETWEEN SOLAR PHOTOVOLTAIC MODULES WILL BE VIA QUICK CONNECT CONNECTORS FACTORY-SUPPLIED WITH SUCH MODULES. FIELD INSTALLED QUICK CONNECT CONNECTORS SHALL BE OF COMPATIBLE MAKE AND MODEL AS THOSE FACTORY SUPPLIED WITH THE MODULES. IF PRACTICABLE, MATING CONNECTORS SHALL BE FROM THE SAME MANUFACTURER.
8. STRING WIRING SHALL BE RATED 2000VDC 90°C (WET OR DRY), UV RESISTANT, COPPER WIRE, RATED PV-WIRE PER UL 4703.
9. EXPOSED STRING WIRING SHALL BE PROPERLY SUPPORTED TO RACKS WITH STAINLESS STEEL PV CABLE CLIPS, AND/OR OTHER OWNER-APPROVED WIRE MANAGEMENT METHOD. PV CABLE CLIPS AND WIRE MANAGEMENT METHOD MUST BE APPROVED BY OWNER BEFORE INSTALLATION. SECURED 24" ON CENTER.
10. STRING WIRING SHALL ENTER INVERTERS VIA HEYCO SOLAR MASTHEAD II CORD GRIPS THAT WILL PROPERLY SEAL THE PENETRATION AND UPHOLD THE WEATHERPROOF RATING OF THE INVERTER.
11. ON PROJECTS WITH COMBINERS, COMBINER OUTPUT FEEDERS SHALL BE COPPER, WITH THERMOSET XLPE INSULATION AND JACKET MATERIALS, NON-THERMOPLASTIC INSULATION. CABLE SHALL BE 1000V RATED, WET LOCATION, 90 C OR BETTER.
12. ALL POWER CONDUCTOR TERMINATIONS SHALL BE IRREVERSIBLE, DOUBLE CRIMP, LONG BARREL, TWO BOLT COMPRESSION TYPE LUGS RATED AT 90C WHERE APPROVED BY THE EQUIPMENT MANUFACTURER OR SUPPLIER. WHERE NOT POSSIBLE, SINGLE BOLT COMPRESSION LUGS MAY BE USED. MECHANICAL SET SCREW TERMINATIONS ARE APPROVED FOR COMBINER BOX TERMINATIONS ONLY. ALL CRIMPED CONNECTIONS MUST BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
13. ALL LUGS AND CONNECTORS SHALL BE LISTED AND DESIGNATED FOR USE WITH THE APPLICABLE CONDUCTOR MATERIAL THAT IS BEING CONNECTED TO THEM.
14. NO SPLICING OF ANY WIRES WITHOUT WRITTEN CONSENT FROM OWNER.
15. MODULE CONNECTORS SHALL BE POLARIZED AND RATED FOR THE SHORT CIRCUIT CURRENT, SHALL BE OF THE LATCHING TYPE AND SHALL BE UL 1703 LISTED. POSITIVE AND NEGATIVE TERMINALS SHALL NOT BE INTERCHANGEABLE.

SUBMITTALS:

1. SUBMIT MANUFACTURERS' CUT SHEETS AND CATALOG DATA CLEARLY INDICATING THE SPECIFIC PART OR PRODUCT CATALOG NUMBER(S) FOR APPROVAL. ITEMS REQUIRING LONG LEAD TIME SHOULD BE SUBMITTED AS SOON AS POSSIBLE. SUBMIT 1 COPY ELECTRONICALLY OF REQUESTED INFORMATION, NEATLY INDEXED PER CATEGORY FOR THE FOLLOWING ITEMS, NOT ALL RELEVANT ON ALL PROJECTS:
   - A. SWITCHGEAR INCLUDING PANELBOARDS, DISCONNECT SWITCHES.
   - B. CONDUIT AND CONDUCTORS, DC, AC AND MV.
   - C. PV INVERTERS, UNLESS OWNER PROVIDED.
   - D. PV MODULES, UNLESS OWNER PROVIDED.
   - E. METERING AND COMMUNICATIONS EQUIPMENT, UNLESS OWNER PROVIDED.
   - F. COMMUNICATIONS CABLING, FIBER, RS-485, ETC.
   - G. DC CABLE FASTENERS, CLIPS, ZIP TIES ETC.
   - H. MV EQUIPMENT, INCLUDING FUSES, ARRESTORS, POLES ETC.

ELECTRICAL NOTES

GENERAL NOTES:

1. PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, AND TOOLS TO PERFORM ALL WORK NECESSARY FOR THE COMPLETE EXECUTION OF THE ELECTRICAL WORK AS SHOWN ON THE DRAWINGS.
2. PROVIDE WORK NOT SPECIFICALLY SHOWN OR SPECIFIED, YET REQUIRED TO INSURE PROPER AND COMPLETE OPERATIONS OF ALL SYSTEMS AND TO SATISFY THE DESIGN INTENT IN THE WORK AND TO COMPLY WITH ALL APPLICABLE CODES AND REGULATIONS.
3. LABOR FOR THE INSTALLATION OF MATERIALS AND EQUIPMENT FURNISHED UNDER THE ELECTRICAL CONTRACTORS' SCOPE OF WORK SHALL BE PERFORMED BY EXPERIENCED MECHANICS OF THE PROPER TRADE AND ALL WORKMANSHIP SHALL BE FIRST CLASS AND SHALL BE IN COMPLIANCE WITH THE SPECIFIC REQUIREMENTS OF THE CONTRACT DRAWINGS.
4. ALL DISCREPANCIES ON DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER IN WRITING PRIOR TO SUBMISSION OF BIDS. SUBMISSION OF A BID CONSTITUTES ACCEPTANCE OF FIELD CONDITIONS.
5. ALL WORK SHALL BE IN ACCORDANCE WITH THE LATEST ADOPTED EDITION OF THE FOLLOWING CODES:
   - 2021 INTERNATIONAL BUILDING CODE (IBC);
   - 2021 NATIONAL FIRE PROTECTION ASSOCIATION, (NFPA);
   - 2020 NATIONAL ELECTRICAL CODE, (NEC);
   - ALL LOCAL CODES, ORDINANCES, REGULATIONS;
   - THE AUTHORITY HAVING JURISDICTION.
6. ALL MATERIALS PROVIDED BY THE CONTRACTOR SHALL BE NEW AND FREE OF DEFECTS AND SHALL BE UL LISTED FOR THE INTENDED APPLICATION. ALL ELECTRICAL MATERIALS, INSTALLATION AND SYSTEMS SHALL MEET THE REQUIREMENTS OF THE FOLLOWING STANDARDS, INCLUDING THE LATEST ADDENDA AND AMENDMENTS:
   - AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
   - INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE).
   - NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATIONS (NEMA)
   - NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
   - OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)
   - UNDERWRITER'S LABORATORIES, INC. (UL)
   - ELECTRONIC INDUSTRY ASSOCIATION (EIA)
   - TELECOMMUNICATION INDUSTRY ASSOCIATION (TIA)
   - NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION, (NECA);
7. THE ELECTRICAL DRAWINGS ARE NOT TO BE SCALED. WHERE SPECIFIC DETAILS AND DIMENSIONS FOR ELECTRICAL WORK ARE NOT SHOWN ON THE DRAWINGS, THE CONTRACTOR SHALL TAKE MEASUREMENTS AND MAKE LAYOUTS AS REQUIRED FOR FOR THE PROPER INSTALLATION AND COMPLETION OF THE WORK.
8. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, METERS, AND ARRANGE FOR ALL INSPECTIONS REQUIRED FOR HIS WORK AND PAY ALL FEES AND CHARGES INCIDENTAL THERETO.
9. CONTRACTOR SHALL INSPECT SITE FOR FIELD VERIFICATION OF ALL ASPECTS OF THE PROJECT PRIOR TO BIDDING.
10. INSTALL WORK AS REQUIRED TO FIT STRUCTURE, AVOID OBSTRUCTIONS, AVOID OR PROVIDE PROTECTION IN AREAS SUBJECT TO DAMAGE, RETAIN CLEARANCE, HEADROOM, OPENINGS AND PASSAGEWAYS.
11. ALL MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND COMPLETED IN A FIRST-CLASS WORKMANLIKE MANNER AND IN ACCORDANCE WITH THE BEST MODERN METHODS AND PRACTICE. ANY MATERIALS INSTALLED WHICH DO NOT PRESENT AN ORDERLY AND REASONABLY NEAT AND/OR WORKMANLIKE APPEARANCE, OR DO NOT ALLOW ADEQUATE SPACE FOR MAINTENANCE, SHALL BE REMOVED AND REPLACED WHEN SO DIRECTED BY THE ENGINEER.
12. START EACH ITEM OF EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS; OR WHERE NOTED UNDER EQUIPMENT SPECIFICATION, START-UP SHALL BE DONE BY A QUALIFIED REPRESENTATIVE OF THE MANUFACTURER.
13. THE CONTRACT DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF CIRCUITS AND OUTLETS, LOCATION OF SWITCHES, PANELBOARDS, CONDUITS, AND OTHER WORK. FIELD VERIFY ALL DIMENSIONS PRIOR TO INSTALLATION OF WORK.
14. THE ELECTRICAL CIRCUITS, COMPONENTS, AND CONTROLS ARE SELECTED AND SIZED FOR THE EQUIPMENT SPECIFIED AND OR SHOWN. IF SUBSTITUTIONS AND/OR EQUIVALENT EQUIPMENT ARE FURNISHED, IT SHALL BE THE RESPONSIBILITIES OF ALL PARTIES CONCERNED, INVOLVED IN AND FURNISHING THE SUBSTITUTE AND/OR EQUIVALENT EQUIPMENT TO VERIFY AND COMPARE THE ELECTRICAL CHARACTERISTICS OF THAT FURNISHED TO THAT SHOWN.
15. FIELD COORDINATE EXACT ELECTRICAL CONNECTION POINTS TO EQUIPMENT PRIOR TO ROUGH IN OF ELECTRICAL COMPONENTS.
16. THE CONTRACTOR SHALL PROVIDE ALL CHANNEL AND ANGLE SUPPORTING SYSTEMS, HANGERS, ANCHORS, SLEEVES, BRACKETS, FABRICATED ITEMS, AND HARDWARE AS REQUIRED TO PROVIDE SECURE SUPPORT, PER N.E.C., FOR ALL ELECTRICAL COMPONENTS FROM THE BUILDING STRUCTURE.
17. SPECIFIED CONDUIT RUNS ARE SHOWN DIAGRAMMATICALLY ONLY, FIELD COORDINATE ACTUAL ROUTING OF CONDUITS.
18. INSTALL ALL RACEWAYS, BOXES, ENCLOSURES, AND CABINETS AS INDICATED AND INSTALLED PER MANUFACTURES WRITTEN INSTRUCTIONS.
19. MAINTAIN ON THE JOBSITE IN GOOD CONDITION ONE SET OF UP TO DATE AS-BUILT ELECTRICAL DRAWINGS. PROGRESSIVELY, NEATLY, LEGIBLY AND EXACTLY RECORD ON THESE DRAWINGS THE LOCATION OF ALL CONCEALED CONDUIT RUNS AND ALL WORK WHICH IS INSTALLED DIFFERENTLY THAN IN THE LOCATION AND MANNER INDICATED ON THE DRAWINGS. PROVIDE A COPY OF THESE PLANS FOR THE OWNER.
20. PROVIDE A FULL ONE YEAR WARRANTY ON ALL ELECTRICAL LABOR, AND MATERIALS INSTALLED ON THIS PROJECT, STARTING FROM THE ISSUANCE OF THE OWNERS CERTIFICATE OF COMPLETION.
21. MAKE CONNECTIONS SO GALVANIC ACTION OR ELECTROLYSIS POSSIBILITY IS MINIMIZED. SELECT CONNECTORS, CONNECTION HARDWARE, CONDUCTORS, AND CONNECTION METHODS SO METALS IN DIRECT CONTACT WILL BE GALVANICALLY COMPATIBLE.
22. AFTER INSTALLATION OF ALL CONDUCTORS, CONTRACTOR SHALL COMPLETELY SEAL OFF ALL CONDUIT ENDS TO PREVENT THE POSSIBILITY OF ANY MOISTURE FROM ENTERING ANY ELECTRICAL ENCLOSURE. CONDUIT AND CABLE WINDOWS LOCATED UNDERNEATH THE INVERTERS AND TRANSFORMERS SHALL BE SEALED AFTER INSTALLATION OF CABLES AND CONDUITS TO PREVENT MOISTURE, INSECTS, ETC., FROM ENTERING THE BOTTOM OF THE EQUIPMENT ENCLOSURES.
23. NEW PHOTOVOLTAIC SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH NFPA 1, SECTION 11.10, SECTION 11.12 AND NFPA 70.

MONITORING:

1. CONTRACTOR SHALL INSTALL THE ENERGY MONITORING SYSTEM THAT MEASURES AND MONITORS AT A MINIMUM: PLANE OF ARRAY IRRADIANCE PYRANOMETER, A SINGLE CUP ANEMOMETER, A SINGLE SHIELDED AMBIENT TEMPERATURE SENSOR PLACED AT LEAST 3 FEET FROM THE NEAREST MODULE, ONE BACK OF MODULE TEMPERATURE SENSORS WHICH ARE ADHERED TO THE MODULES USING THERMALLY CONDUCTIVE SILVER APOXY, AND A SINGLE ANSI C-12.1 REVENUE GRADE METER WHICH MEASURES ENERGY OUTPUT FOR THE ENTIRE SYSTEM. ALL METEOROLOGICAL EQUIPMENT AND STATIONS SHALL BE DESIGNED TO WITHSTAND WINDS UP TO THE DESIGN WIND SPEED.
2. REFER TO THE SYSTEM SHOP DRAWINGS FOR ADDITIONAL ITEMS THAT SHALL BE INCLUDED AS PART OF THE CONTRACTORS WORK SCOPE.

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COMMISSIONING:

1. UPON COMPLETION OF INSTALLATION OF A FACILITY, IN ORDER TO ENSURE PROPER INSTALLATION, APPROPRIATE CONFIGURATION, AND THAT THE FACILITY IS IN PROPER OPERATING CONDITION, CONTRACTOR SHALL ASSIST IN PERFORMING THE COMMISSIONING PROCEDURES TO INCLUDE OPEN CIRCUIT VOLTAGE TESTS, OPERATING CURRENT TESTS, IV CURVE TESTS, AC & DC MEGGER TESTING OF CONDUCTORS. CONTRACTOR SHALL RECORD ALL MEASURED DATA AND PROVIDE OWNER WITH A DETAILED REPORT REGARDING ANY ISSUES THAT CONTRACTOR DISCOVERS DURING SUCH PERFORMANCE.
2. PROVIDE FINAL CLEANUP AND CONDUCT FIELD TESTS AFTER INSTALLATION OF ALL ELECTRICAL WORK. ADJUST ITEMS TO THE SATISFACTION OF THE OWNER, ARCHITECT, AND ENGINEER. LEAVE PANELBOARD INTERIOR CLEAN AND FREE FROM CONSTRUCTION DEBRIS. NEATLY DRESS ALL WIRING, AND RE-TIGHTEN ALL TERMINATIONS PER MANUFACTURERS' RECOMMENDATIONS.
3. AS A CONDITION OF ACHIEVING SUBSTANTIAL COMPLETION, CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLETING THE PUNCH LIST PROVIDED BY OWNERS REPRESENTATIVE.

REV#	DATE	REVISION
–	08-08-23	ISSUED FOR PERMIT ONLY

CONSTRUCTION ENGINEERING GROUP
Consulting Engineers
2651 EAU GALLIE BLVD, SUITE A
MELBOURNE, FL 32935
TEL. 321.253.1221
WWW.CEGENGINEERING.COM

TEN OAKS SOLAR
NEW PHOTOVOLTAIC SYSTEM
3950 TEN OAKS ROAD GLENELG, MD 21737

DRAWING TITLE
SPECIFICATIONS

ENGINEER OF RECORD

STATE OF MARYLAND
DAVID E. ALLEY
NO. 42678
PROFESSIONAL ENGINEER

MARYLAND
PROFESSIONAL ENGINEER
NO. 42678

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 42678, EXPIRATION DATE: 2024-09-12.

DATE:	08-08-23
SCALE:	AS NOTED
PROJ. NO. :	230120
DESIGNED BY:	JNH
DRAWN BY:	JNH
CHECKED BY:	DEA
DRAWING NO.:	PVE-1.1

PV SYSTEM SUMMARY

SYSTEM	INVERTER TYPE	MODULE TYPE	NUMBER OF STRINGS PER INVERTER	MODULES PER STRING	NUMBER OF MODULES	MODULE PEAK POWER	TOTAL DC POWER	MAX INVERTER AC OUTPUT POWER	NUMBER OF INVERTERS	TOTAL AC POWER	DC/AC RATIO
1	SG125HV	Q.PEAK DUO XL-G10.3/BFG	15	24	5,760	485 W	2794 kW	125 kVA	15	1999 kVA	1.40
			15	24				124 kVA	1		
TOTALS		-	-	-	5,760	-	2.79 MW	-	16	1.999 MVA	1.40

OVERALL SITE PLAN

SCALE 1" = 40'

PLAN NOTES:

1. ALL GATES THAT IMPEDE FIRE DEPARTMENT ACCESS TO A SITE MUST BE EQUIPPED WITH EITHER A KNOX BOX OR A SIREN-OPERATED SYSTEM. REFER TO CIVIL DRAWINGS FRO ADDITIONAL INFORMATION.
2. MODULE RACKING SUPPORT STRUCTURE. REFER TO RACKING SHOP DRAWINGS FOR ADDITIONAL RACKING DETAILS. INSTALL MODULES ON RACKING PER RACKING AND MODULE MANUFACTURERS WRITTEN INSTRUCTIONS.
3. TYPICAL PV STRING COMBINER. INSTALL VERTICALLY BESIDE ARRAY SUPPORT STRUCTURE ON SUPPORT FRAME. REFER TO MOUNTING DETAILS ON DRAWING PVE-6.3 FOR ADDITIONAL INFORMATION.
4. PROPOSED TRENCH LINE FOR U.G. COMBINER DC OUTPUT CIRCUITS BETWEEN COMBINER AND INVERTER, REFER TO FEEDER SCHEDULE ON PVE-5.3.
5. TYPICAL PV STRING INVERTER. INSTALL VERTICALLY ON CUSTOM RACKING FRAME. REFER TO MOUNTING DETAILS ON DRAWING PVE-6.3 FOR ADDITIONAL INFORMATION.
6. PROPOSED TRENCH LINE FOR U.G. INVERTER AC OUTPUT CIRCUITS BETWEEN INVERTER AND SWITCHBOARD, REFER TO FEEDER SCHEDULE ON PVE-5.3.
7. PROPOSED LOCATION OF PAD-MOUNTED AC SWITCHBOARD. REFER TO SINGLE-LINE DIAGRAM ON PVE-4.2 AND ENLARGED PLANS ON SHEET PVE-2.1 AND PVE-6.1 FOR ADDITIONAL INFORMATION.
8. PROPOSED LOCATION OF PAD MOUNTED TRANSFORMER. REFER TO SINGLE-LINE DIAGRAM ON PVE-4.1 FOR ADDITIONAL INFORMATION.
9. PROPOSED LOCATION OF PAD MOUNTED MV SWITCHGEAR. REFER TO SINGLE-LINE DIAGRAM ON PVE-4.1 FOR ADDITIONAL INFORMATION.
10. PROPOSED LOCATION OF BGE PAD-MOUNTED EQUIPMENT.
11. PROPOSED ROUTING OF U.G. MV FEEDER TO RISER POLE. REFER TO SINGLE-LINE DIAGRAM ON PVE-4.1 FOR ADDITIONAL INFORMATION.

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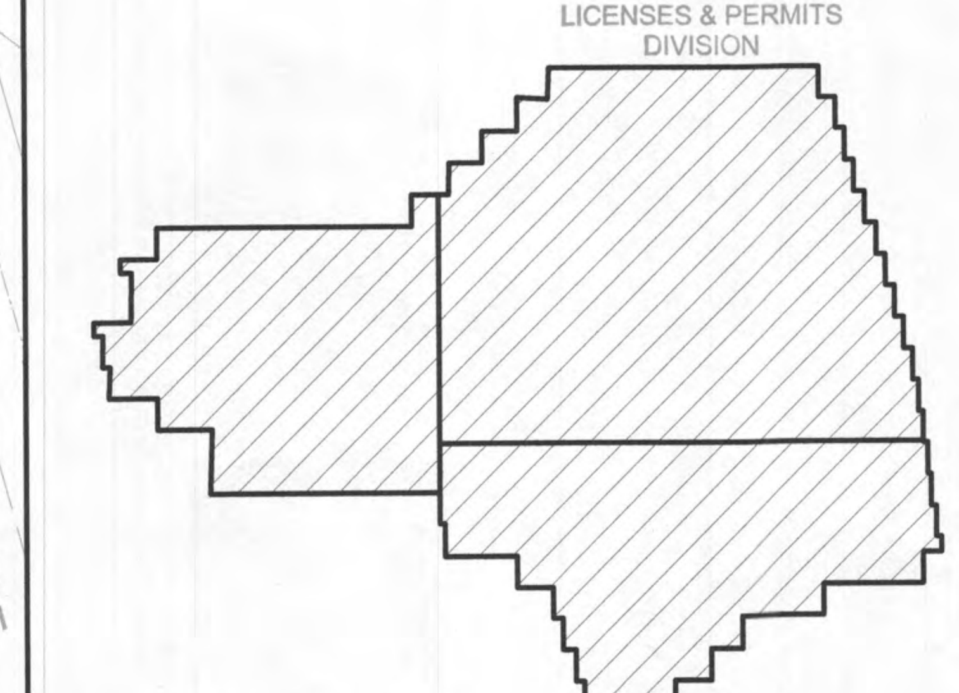

KEY PLAN

SCALE: NTS

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DRAWING TITLE
OVERALL SITE PLAN

ENGINEER OF RECORD
STATE OF MARYLAND DAVID E. ALLEY No. 42678 PROFESSIONAL ENGINEER
MARYLAND PROFESSIONAL ENGINEER NO. 42678

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 42678, EXPIRATION DATE: 2024-09-12.

DATE: 08-08-23
SCALE: AS NOTED
PROJ. NO.: 230120
DESIGNED BY: JNH
DRAWN BY: JNH
CHECKED BY: DEA
DRAWING NO.: PVE-2.0

UG 291-3 — 2 OF 3 — 13 kV EQUIPMENT PADS

FLAT PAD USAGE

FLAT PAD FOR 1Ø TRANSFORMERS

1617755 13 kV 1Ø DEAD-FRONT TRANSFORMERS (25-167 kVA)
1618208 13 kV 1Ø DEAD-FRONT TRANSFORMERS (250 kVA)

FLAT PAD FOR 3Ø TRANSFORMERS

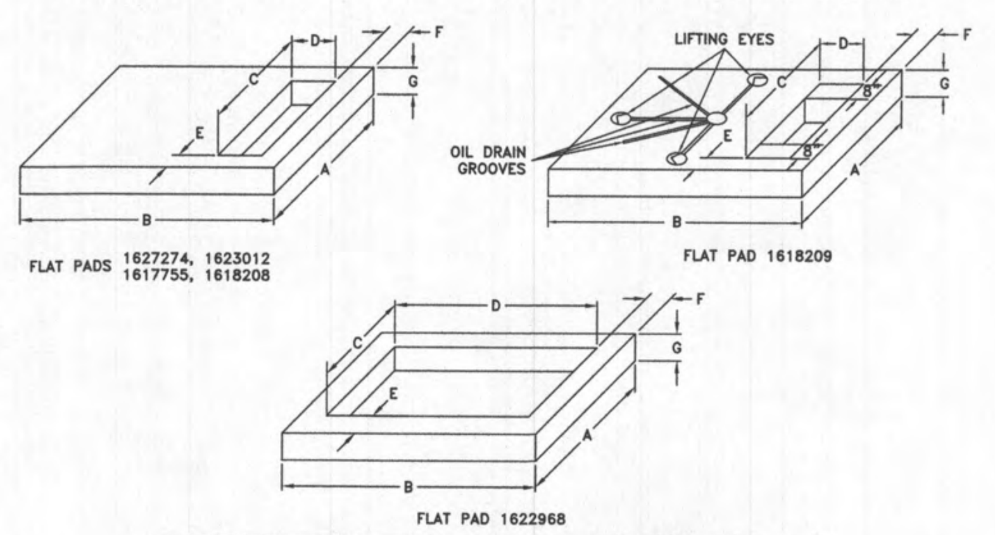
1623012 13 kV 3Ø DEAD-FRONT TRANSFORMERS (75-500 kVA)
1618209 13 kV 3Ø DEAD-FRONT TRANSFORMERS (750-2500 kVA) - NOTE: THIS FLAT PAD HAS 8 IN. KNOCKOUTS TO INCREASE THE SIZE OF THE CABLE ACCESS OPENING. THIS PAD ALSO HAS OIL DRAIN GROOVES AND A DRAIN HOLE FOR OIL RETENTION.

FLAT PAD FOR PAD-MOUNTED CAPACITORS

1627274 {13 kV 3Ø CAPACITOR ENCLOSURE / 13 kV 3Ø DEFERRAL CAPACITOR ENCLOSURE}

SPECIAL PAD

12-124 EQUIPMENT PAD USED TO SUPPORT S&C LIVE-FRONT SWITCHGEAR
1622968 USED IN CONJUNCTION WITH 1627271 BOX PAD FOR 13 kV AIR-INSULATED DEAD-FRONT SWITCHGEAR



FLAT PADS 1627274, 1623012, 1617755, 1618208

FLAT PAD 1618209

FLAT PAD 1622968

CAT ID	1627274	1622968	1623012	1617755	1618208	1618209
SUBSTANCE	CONCRETE	CONCRETE	CONCRETE	PLASTIC	FIBERCRETE	CONCRETE
WEIGHT	2200#	1000#	2050#	40#	60#	5935#
A	62"	80"	78"	42"	48"	100"
B	64"	76"	66"	42"	48"	84"
C	50"	64"	50"	26"	28"	50"-66"
D	9"	60"	18"	12"	10"	18"
E	6'	8"	14"	8"	10"	17"-25"
F	6"	8"	6"	6"	6"	8"
G	6"	5"	6"	4"	4"	8"

SHADED AREA INDICATES ITEMS THAT ARE NO LONGER IN STOCK.

BGE UNDERGROUND CONSTRUCTION STANDARDS — LATEST REVISION: ADDED CAT ID'S — APP. DATE: 06/28/19 — APPROVAL: DLB

13 kV EQUIPMENT PADS — UG 291-3 — 1 OF 3

BOX PAD USAGE

NOTE: ALL FIBERGLASS BOX PADS ARE INSTALLED IN EARTH ONLY.

BOX PAD FOR SWITCHGEAR

1617771 13 kV 3Ø DEAD-FRONT AIR-INSULATED SWITCHGEAR - BOTH MANUAL AND AUTOMATIC TYPE

BOX PAD FOR RECLOSER

1636259 13 kV 3Ø INTELLIRUPTER PULSECLOSER (1636355)

BOX PAD FOR SECTIONALIZING ENCLOSURE

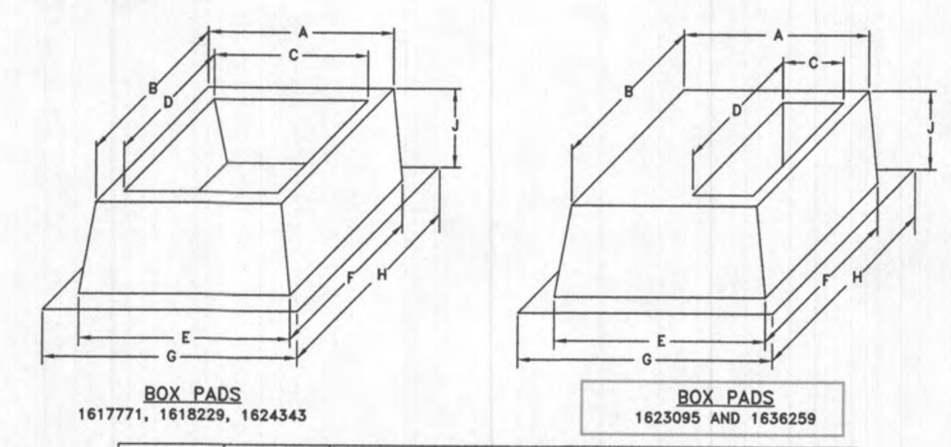
1624243 13 kV 1Ø SECTIONALIZING ENCLOSURE 1624233 FOR THE 200 AMP 3 POSITION 1618161 OR 4 POSITION 1627302 MODULE
1618229 13 kV 3Ø SECTIONALIZING ENCLOSURE 1617785 FOR THE 200 AMP 3 POSITION 1618161, 4 POSITION 1627302 MODULE, OR THE 600 AMP 2 POSITION 1617778 MODULE

BOX PAD FOR MODULES

1618229, 1624343

BOX PAD FOR MODULE/MVI

1668429, 1668430



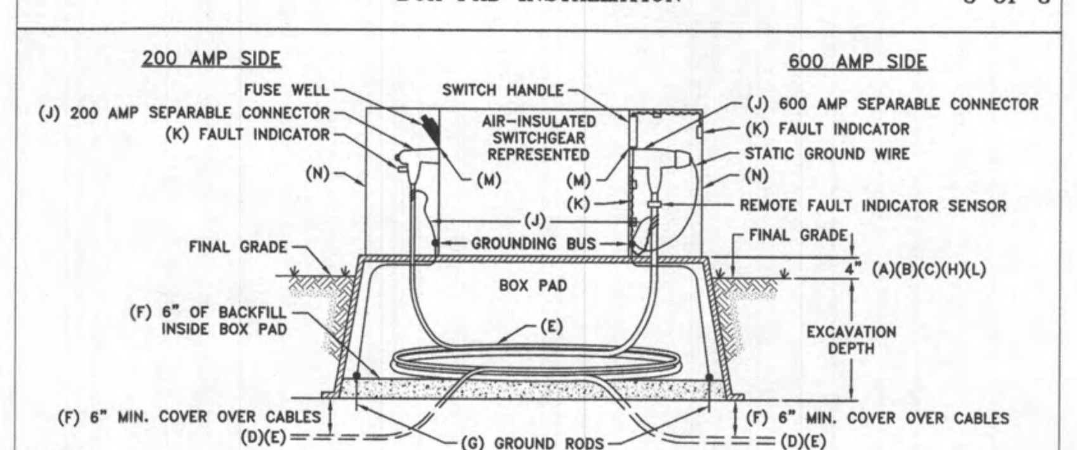
BOX PADS
1617771, 1618229, 1624343

BOX PADS
1623095 AND 1636259

CAT ID	1668429	1668430	1617771	1618229	1624343	1636259
SUBSTANCE	FIBERGLASS	FIBERGLASS	FIBERGLASS	FIBERGLASS	REINF FIBER	REINF FIBER
WEIGHT	190#	105#	260#	63#	290#	335#
A	30"	36"	78"	23"	74"	73-1/2"
B	85"	41-1/2"	78"	68"	76"	77-1/4"
C	20"	26"	61"	16"	60"	45"
D	75"	32"	67"	61"	62"	61-3/4"
E	38"	48"	86"	29-1/2"	83-1/2"	83-1/2"
F	93"	42-1/2"	86"	74-1/2"	87-1/2"	87-1/2"
G	45"	50"	96"	35"	91-1/2"	91-1/2"
H	100"	55-1/2"	96"	80"	93-1/2"	95-1/2"
J	30"	32"	36"	18"	36"	36-1/4"

BGE UNDERGROUND CONSTRUCTION STANDARDS — LATEST REVISION: ADDED CAT ID'S — APP. DATE: 06/28/19 — APPROVAL: DLB

13 kV EQUIPMENT PADS BOX PAD INSTALLATION — UG 291-3 — 3 OF 3



GENERAL

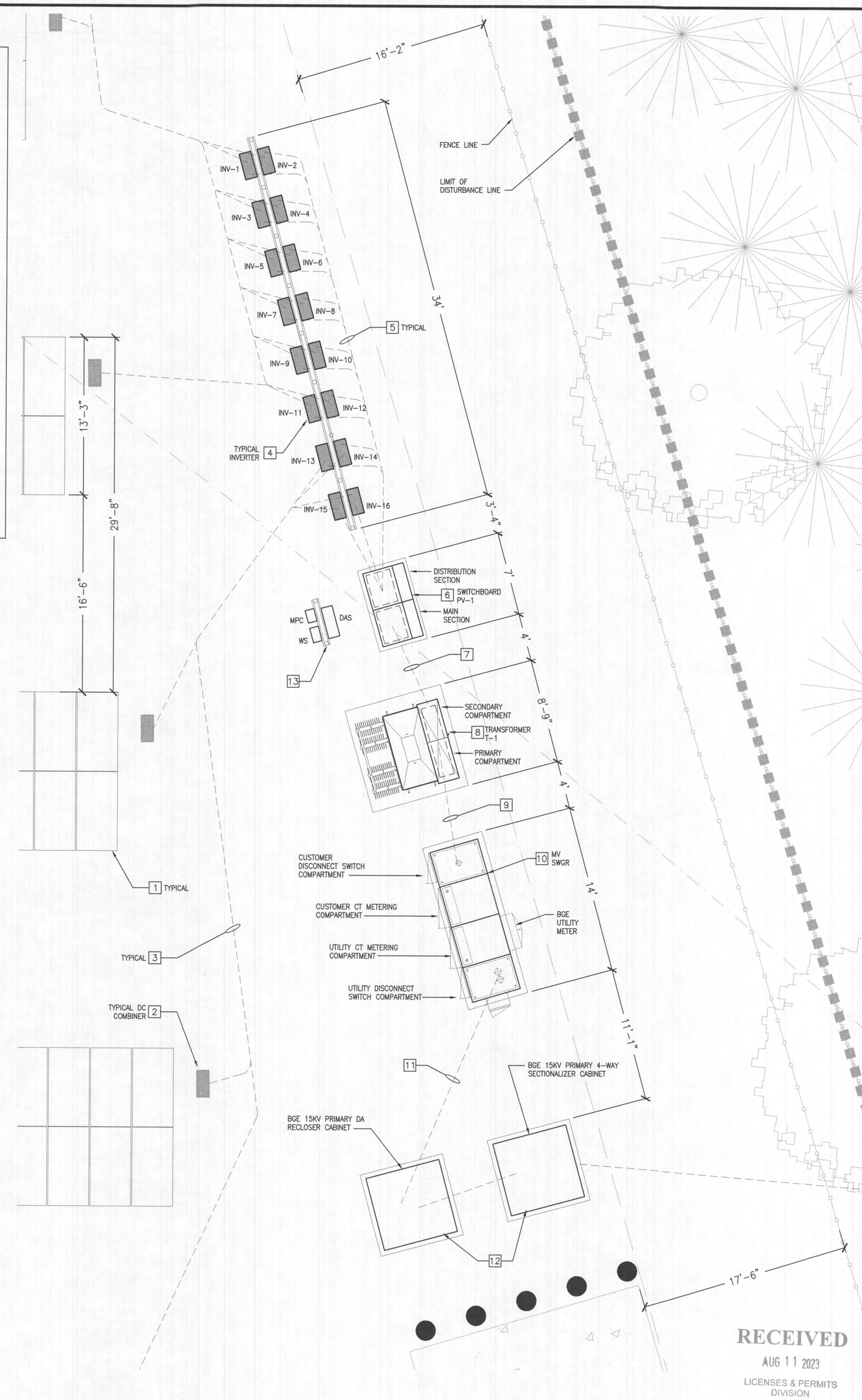
BOX PADS SHALL BE USED AS A SUPPORT FOR ALL PAD-MOUNTED SWITCHGEAR, SECTIONALIZING ENCLOSURES, AND DA RECLOSERS.

NOTE: WHERE POSSIBLE, PLAN TO HAVE FAULT INDICATOR WINDOWS FACE NEAREST STREET OR ROAD.

INSTALLATION INSTRUCTIONS

(A) A CRITICAL STEP WHEN INSTALLING THE EQUIPMENT BOX PAD IS TO HAVE IT PERFECTLY LEVEL. IF THE BOX PAD IS NOT LEVEL, THE EQUIPMENT DOORS WILL BE OUT-OF-ALIGNMENT AND WILL NOT OPEN AND CLOSE PROPERLY.
(B) EXCAVATE FOR THE BOX PAD. EXCAVATE AN AREA SUITABLE FOR THE SIZE OF THE BOX PAD BEING INSTALLED. THE EXCAVATION DEPTH MUST ALLOW THE BOX PAD TO EXTEND 4 IN. ABOVE FINAL GRADE.
(C) THE AREA SURROUNDING THE BOX PAD SHALL BE LEVEL AND CLEAR OF OBSTRUCTIONS. THIS LEVEL AREA SHALL BE 4 IN. BELOW THE TOP OF THE BOX PAD AND SHALL EXTEND A MINIMUM OF 8 FT. FROM THE SIDES WITH DOORS TO PROVIDE FOR STICK OPERATIONS AND 4 FT. ON ALL SIDES THAT HAVE CONTROL OR OPERATING COMPARTMENTS. ON ALL OTHER SIDES, A 2 FT. MINIMUM CLEARANCE IS REQUIRED.
(D) DIG THE CABLE TRENCHES TO THE EXCAVATION.
(E) INSTALL THE CABLES. WHEN TERMINATING THE CABLES, LOOP THE CABLES AT THE BOTTOM OF THE BOX PAD EXCAVATED AREA TO PROVIDE CABLE SLACK. BACKFILL THE CABLE TRENCHES AND TAMP AS REQUIRED.
(F) INSTALL THE BOX PAD. THE PAD MUST NOT REST ON THE CABLES BUT RATHER ON 6 IN. OF COMPACTED EARTH. IF THE PAD IS TO BE INSTALLED ON BACKFILL, THOROUGHLY TAMP THE EARTH IN INDIVIDUALLY COMPACTED LAYERS NOT IN EXCESS OF 8 IN. BEFORE INSTALLING THE PAD. AFTER INSURING THAT THE PAD IS LEVEL, BACKFILL EVENLY AROUND THE OUTSIDE OF THE PAD TO A DEPTH OF 8 IN.. ADD 6 IN. OF SELECT BACKFILL OR SAND TO THE INSIDE OF THE BOX PAD BOTTOM. THIS WILL EQUALIZE THE PRESSURE ON THE BOX PAD.
(G) WHEN INSTALLING GROUND RODS IN BOX PAD OPENINGS, USE EXTREME CAUTION TO AVOID DAMAGING BURIED CABLE. GROUND RODS SHALL BE DRIVEN AT LEAST 7 FT.-6 IN. IN EARTH, SOIL PERMITTING.
(H) POSITION THE EQUIPMENT EVENLY ON THE BOX PAD AND DRILL ONE 3/4 IN. HOLE THROUGH THE FIBERGLASS BOX PAD FLANGE AT EACH CORNER OF THE PAD. INSTALL HOLD DOWN CLAMPS WITH 5/8 IN. X 2-3/4 IN. SQUARE HEAD BOLTS AND NUTS (CAT ID 1631957) AND WASHERS (CAT ID 1622902). NOTE: BOLTS, NUTS, AND WASHERS ARE SUPPLIED WITH SWITCHGEAR. ONCE THE EQUIPMENT IS SECURED TO THE BOX PAD, COMPLETE BACKFILLING ON THE OUTSIDE OF THE BOX PAD. HAND TAMP 6 IN. LAYERS ONLY, AROUND THE SIDES OF THE BOX PAD UNTIL REACHING FINAL GRADE.
(J) WHEN TERMINATING CABLES ON THE EQUIPMENT, ALLOW SUFFICIENT SLACK IN THE CONCENTRIC NEUTRAL WIRES TO CONNECT THEM TO THE GROUNDING BUS AND TO PERMIT THE ELBOWS TO BE MOVED FREELY FROM THE MAIN BUSHING TO THE PARKING BUSHING.
(K) INSTALL FAULT INDICATORS, INSULATING CAPS OR ELBOW ARRESTERS AS REQUIRED. INSTALL THE FAULT INDICATOR LEADS (ON THE 600 AMP SIDE) NEATLY SO AS NOT TO INTERFERE WITH ELBOW OPERATION. RUN THE LEADS DOWN THE FACE OF THE GEAR BEHIND THE GROUNDING BUS, TAPING EACH 3Ø SET TOGETHER EVERY 6 IN. WITH PLASTIC TAPE (CAT ID 1628799). USE CABLE TIES (CAT ID 1623036) TO ATTACH THE LEADS TO THE WIRE RETAINING CLIPS PROVIDED ON THE SWITCHGEAR.
(L) IN AREAS WHERE HEAVY CONSTRUCTION EQUIPMENT COULD BE USED IN THE VICINITY OF THE BOX PAD, INSTALL 2 FT. TO 3 FT. HIGH STAKES 3 FT. FROM ITS PERIMETER AND RUN BARRICADE TAPE (CAT ID 1618128) BETWEEN THEM. THIS PROTECTS THE BOX PAD FROM EXCESSIVE SIDEWALL PRESSURES. AFTER THE HAZARD IS GONE, REMOVE THE STAKES AND TAPE.
(M) BEFORE ENERGIZING OIL-INSULATED SWITCHGEAR, CHECK THAT THE OIL LEVEL IS AT A NORMAL LEVEL. IF THE OIL LEVEL IS FOUND AT OR NEAR THE LOW OIL INDICATION OR IS NOT VISIBLE AT ALL, DO NOT ENERGIZE THE GEAR. CONTACT THE EQUIPMENT DIAGNOSTIC AND REPAIR UNIT, RUTHERFORD BUSINESS CENTER.
(N) MAKE SURE ALL PENTAHEAD BOLTS ARE IN PLACE, PROPERLY ALIGNED AND SECURED. INSURE THE GEAR IS PROPERLY PADLOCKED BEFORE LEAVING THE JOB.

BGE UNDERGROUND CONSTRUCTION STANDARDS — LATEST REVISION: ADDED CAT ID'S — APP. DATE: 06/28/19 — APPROVAL: DLB



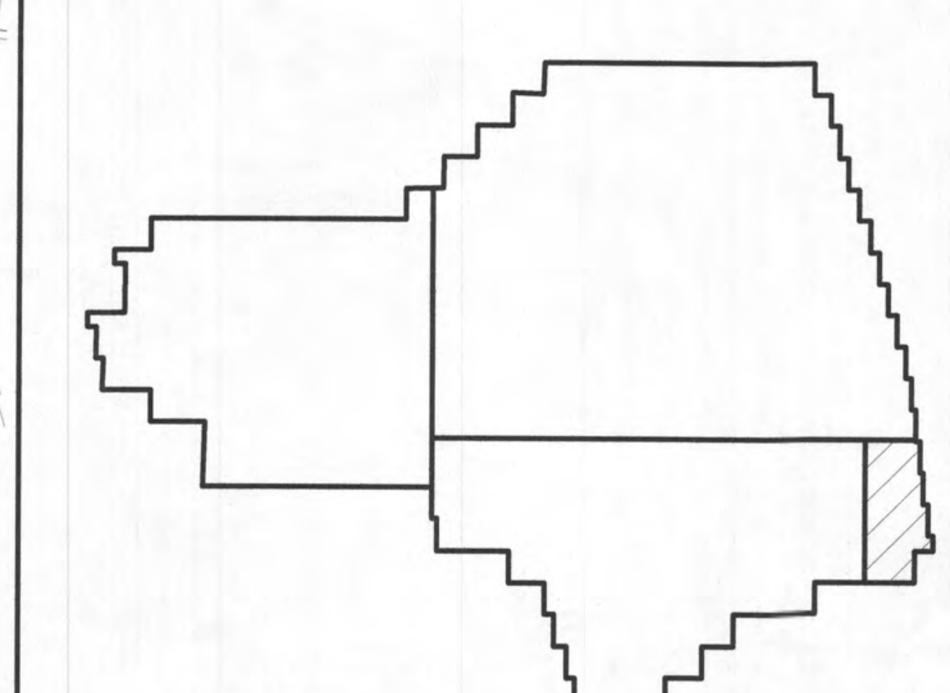
RECEIVED
AUG 11 2023
LICENSES & PERMITS DIVISION

A 2.0 2.1 ENLARGED PLAN

0 2'-8" 5'-4" 10'-8" 16'
SCALE 3/16" = 1'-0"

PLAN NOTES:

1. MODULE RACKING SUPPORT STRUCTURE. REFER TO RACKING SHOP DRAWINGS FOR ADDITIONAL RACKING DETAILS. INSTALL MODULES ON RACKING PER RACKING AND MODULE MANUFACTURERS WRITTEN INSTRUCTIONS.
2. TYPICAL PV STRING COMBINER. INSTALL VERTICALLY BESIDE ARRAY SUPPORT STRUCTURE ON SUPPORT FRAME. REFER TO MOUNTING DETAILS ON DRAWING PVE-6.3 FOR ADDITIONAL INFORMATION. REFER TO SCHEDULE ON PVE-5.2 AND PVE-9.1 FOR DATA SHEETS.
3. PROPOSED TRENCH LINE FOR U.G. COMBINER DC OUTPUT CIRCUITS BETWEEN COMBINERS AND RESPECTIVE INVERTER. REFER TO FEEDER SCHEDULE ON PVE-5.2.
4. TYPICAL PV STRING INVERTER. INSTALL VERTICALLY ON SUPPORT FRAME. REFER TO MOUNTING DETAILS ON DRAWING PVE-6.3 FOR ADDITIONAL INFORMATION. REFER TO SCHEDULE ON PVE-5.3 AND PVE-9.1 FOR DATA SHEETS.
5. PROPOSED TRENCH LINE FOR U.G. INVERTER AC OUTPUT CIRCUITS BETWEEN INVERTER AND SWITCHBOARD, REFER TO FEEDER SCHEDULE ON PVE-5.3.
6. PROPOSED LOCATION OF PAD-MOUNTED AC CONSOLIDATION SWITCHBOARD. REFER TO SINGLE-LINE DIAGRAM ON PVE-4.2 AND PVE-4.3 FOR SWITCHBOARD SCHEDULE.
7. PROPOSED TRENCH LINE FOR U.G. FEEDER FROM AC CONSOLIDATION SWITCHBOARD. REFER TO AC DISTRIBUTION OUTPUT FEEDER SCHEDULE ON PVE-5.2 AND SINGLE-LINE DIAGRAM ON PVE-4.2 FOR ADDITIONAL INFORMATION.
8. PROPOSED LOCATION OF PAD-MOUNTED TRANSFORMER. REFER TO MV SINGLE-LINE DIAGRAM ON PVE-4.1 FOR ADDITIONAL INFORMATION.
9. PROPOSED U.G. PRIMARY BETWEEN TRANSFORMER AND MV SWITCHGEAR. REFER TO MV SINGLE-LINE ON PVE-4.1 FOR ADDITIONAL INFORMATION.
10. PROPOSED LOCATION OF MV PAD-MOUNTED SWITCHGEAR. REFER TO MV SINGLE-LINE DIAGRAM ON PVE-4.1 FOR ADDITIONAL INFORMATION.
11. PROPOSED U.G. PRIMARY BETWEEN MV SWITCHGEAR AND UTILITY PAD-MOUNTED RECLOSER. REFER TO MV SINGLE-LINE ON PVE-4.1 FOR ADDITIONAL INFORMATION
12. PROPOSED PAD-MOUNTED UTILITY EQUIPMENT. REFER TO MV SINGLE-LINE ON PVE-4.1 FOR ADDITIONAL INFORMATION.
13. PROPOSED AUXILIARY EQUIPMENT RACK FOR DAS, POWER CENTER, ETC. REFER TO ENLARGED PLANS ON PVE-6.1 AND ELEVATIONS ON PVE-6.3 FOR ADDITIONAL INFORMATION.



KEY PLAN
SCALE: NTS

REV#	DATE	REVISION
-	08-08-23	ISSUED FOR PERMIT ONLY

CONSTRUCTION ENGINEERING GROUP
Consulting Engineers
2651 EAU GALLIE BLVD, SUITE A
MELBOURNE, FL 32935
TEL 321.253.1221
WWW.CEGENGINEERING.COM

TEN OAKS SOLAR
NEW PHOTOVOLTAIC SYSTEM
3950 TEN OAKS ROAD GLENELG, MD 21737

DRAWING TITLE
ENLARGED SITE PLAN

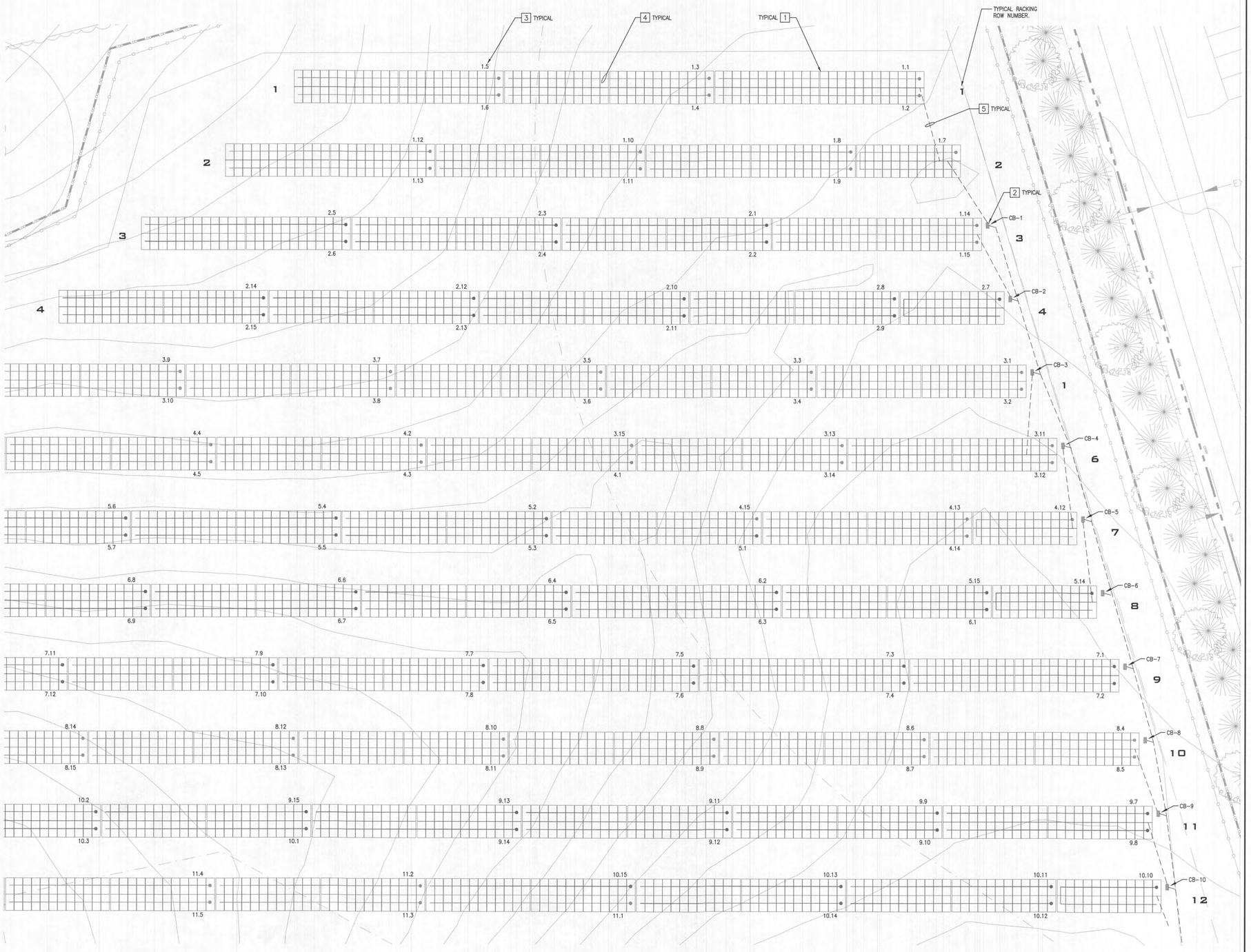
ENGINEER OF RECORD

STATE OF MARYLAND DAVID E. ALLEY PROFESSIONAL ENGINEER No. 42678

MARYLAND PROFESSIONAL ENGINEER NO. 42678

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 42678, EXPIRATION DATE: 2024-09-12.

DATE:	08-08-23
SCALE:	AS NOTED
PROJ. NO.:	230120
DESIGNED BY:	JNH
DRAWN BY:	JNH
CHECKED BY:	DEA
DRAWING NO.:	PVE-2.1



PARTIAL STRINGING PLAN

SCALE 1" = 20'

RECEIVED
AUG 11 2023
LICENSES & PERMITS DIVISION

PLAN NOTES:

1. MODULE RACKING SUPPORT STRUCTURE. REFER TO RACKING SHOP DRAWINGS FOR ADDITIONAL RACKING DETAILS. INSTALL MODULES ON RACKING PER RACKING AND MODULE MANUFACTURERS WRITTEN INSTRUCTIONS.
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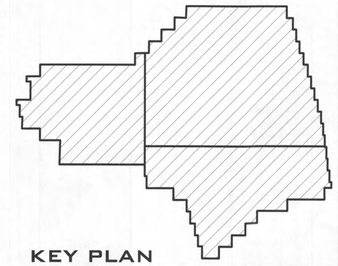
3. SOURCE CIRCUIT STRING IDENTIFICATION LABEL. FIRST NUMBER INDICATES WHICH INVERTER THE STRING IS CONNECTED TO, THE LAST NUMBER INDICATES THE STRING NUMBER. PROVIDE PERMANENT UV RESISTANT TYPED WIRE LABEL AT BOTH ENDS.
4. SOURCE CIRCUIT STRING OF 24 MODULES PER STRING CONNECTED IN SERIES. REFER TO STRING WIRING DETAIL ON PVE-4.2 FOR ADDITIONAL INFORMATION. NEATLY SECURE STRING INTERCONNECTS AND HOMERUNS TO RACKING STRUCTURE WITH STAINLESS STEEL CABLE CLIPS. ROUTE HOMERUNS TO STRING INVERTER UNDER MODULES AND SECURED TO RACKING STRUCTURE WHERE POSSIBLE. IN SOME CASES THE FACTORY INTERCONNECTS MAY NOT BE LONG ENOUGH TO REACH THE ADJACENT MODULE INTERCONNECT AND FIELD JUMPERS WILL BE REQUIRED. COMPLETE A SINGLE STRING DEMONSTRATING WIRING AND SECURING METHODS FOR OWNER APPROVAL PRIOR TO COMPLETING THE REMAINING STRINGS.
5. PROVIDE 1-1/2" CONDUITS FROM RACKING ROWS TO COMBINER FOR DC STRING HOME RUNS (6 STRINGS MAX PER CONDUIT). ROUTE #6 CU EGC IN EACH RACEWAY AND BOND COMBINER SUPPORT STRUCTURES AND MODULE RACKING STRUCTURES TO FORM A CONTINUOUSLY GROUNDED SYSTEM. FIELD COORDINATE ACTUAL LOCATIONS AND QUANTITIES AND ADJUST AS NEEDED.



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DRAWING TITLE
PARTIAL STRINGING PLAN

ENGINEER OF RECORD

STATE OF MARYLAND
DAVID E. ALLEY
PROFESSIONAL ENGINEER

MARYLAND
PROFESSIONAL ENGINEER
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DESIGNED BY:	JNH
DRAWN BY:	JNH
CHECKED BY:	DEA
DRAWING NO.:	PVE-3.1

PLAN NOTES:

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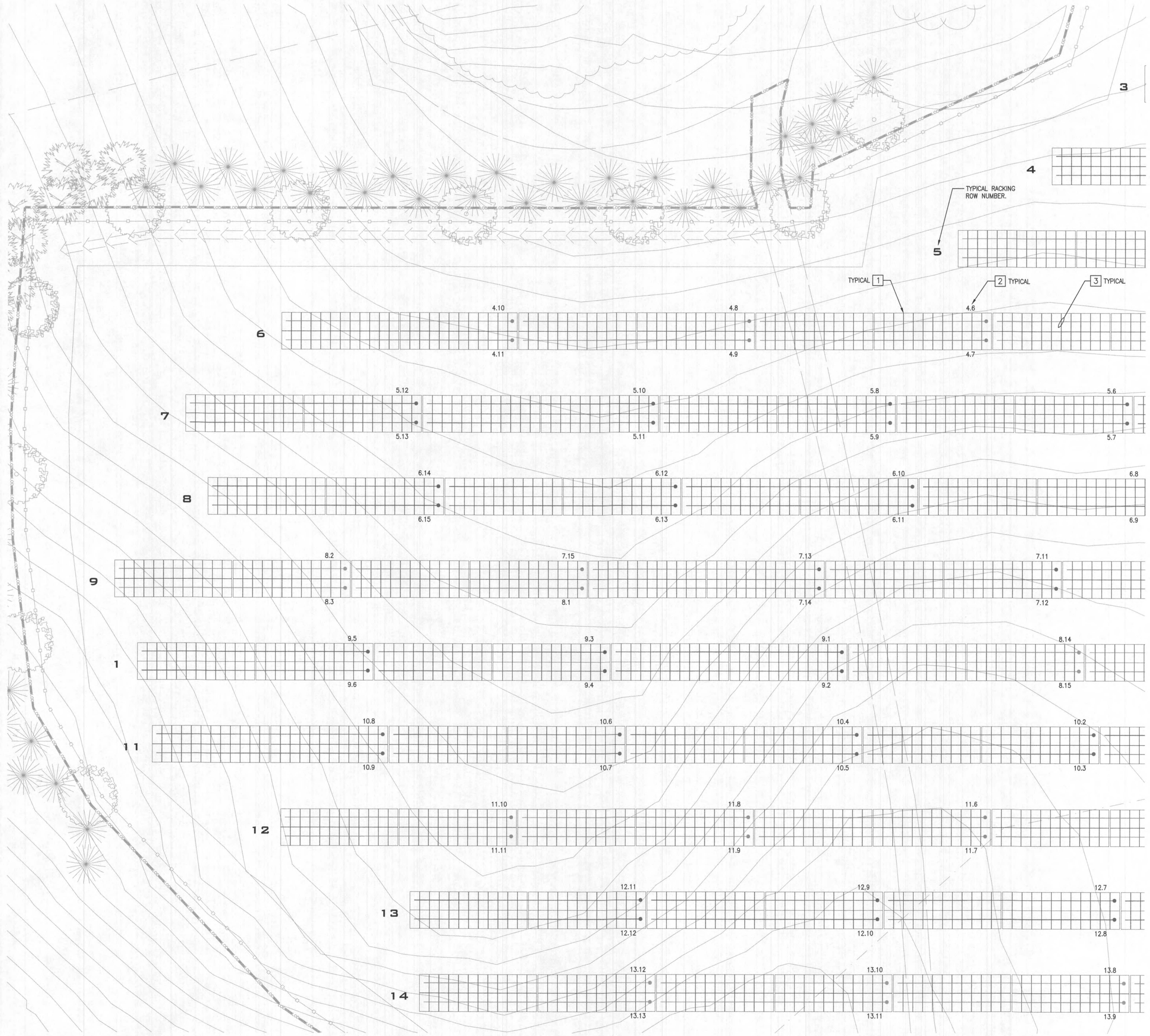
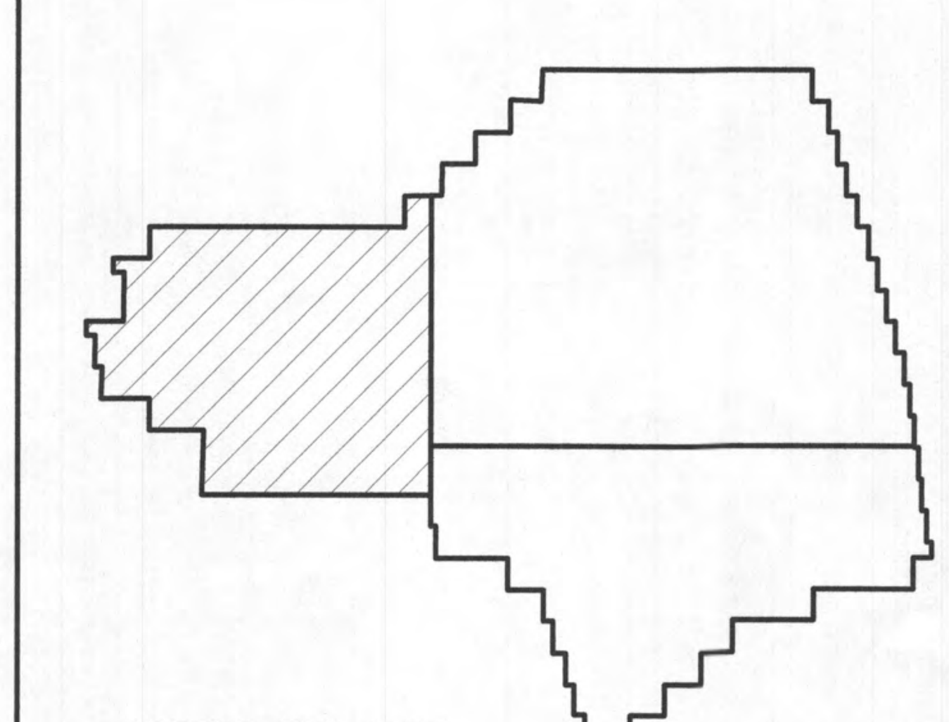


PARTIAL STRINGING PLAN

0 10' 20' 40' 60'
SCALE 1" = 20'



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DRAWING TITLE
PARTIAL STRINGING PLAN

ENGINEER OF RECORD
STATE OF MARYLAND
DAVID E. ALLEY
No. 42678
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PROJ. NO.:	230120
DESIGNED BY:	JNH
DRAWN BY:	JNH
CHECKED BY:	DEA
DRAWING NO.:	PVE-3.2

PLAN NOTES:

1. MODULE RACKING SUPPORT STRUCTURE. REFER TO RACKING SHOP DRAWINGS FOR ADDITIONAL RACKING DETAILS. INSTALL MODULES ON RACKING PER RACKING AND MODULE MANUFACTURERS WRITTEN INSTRUCTIONS.
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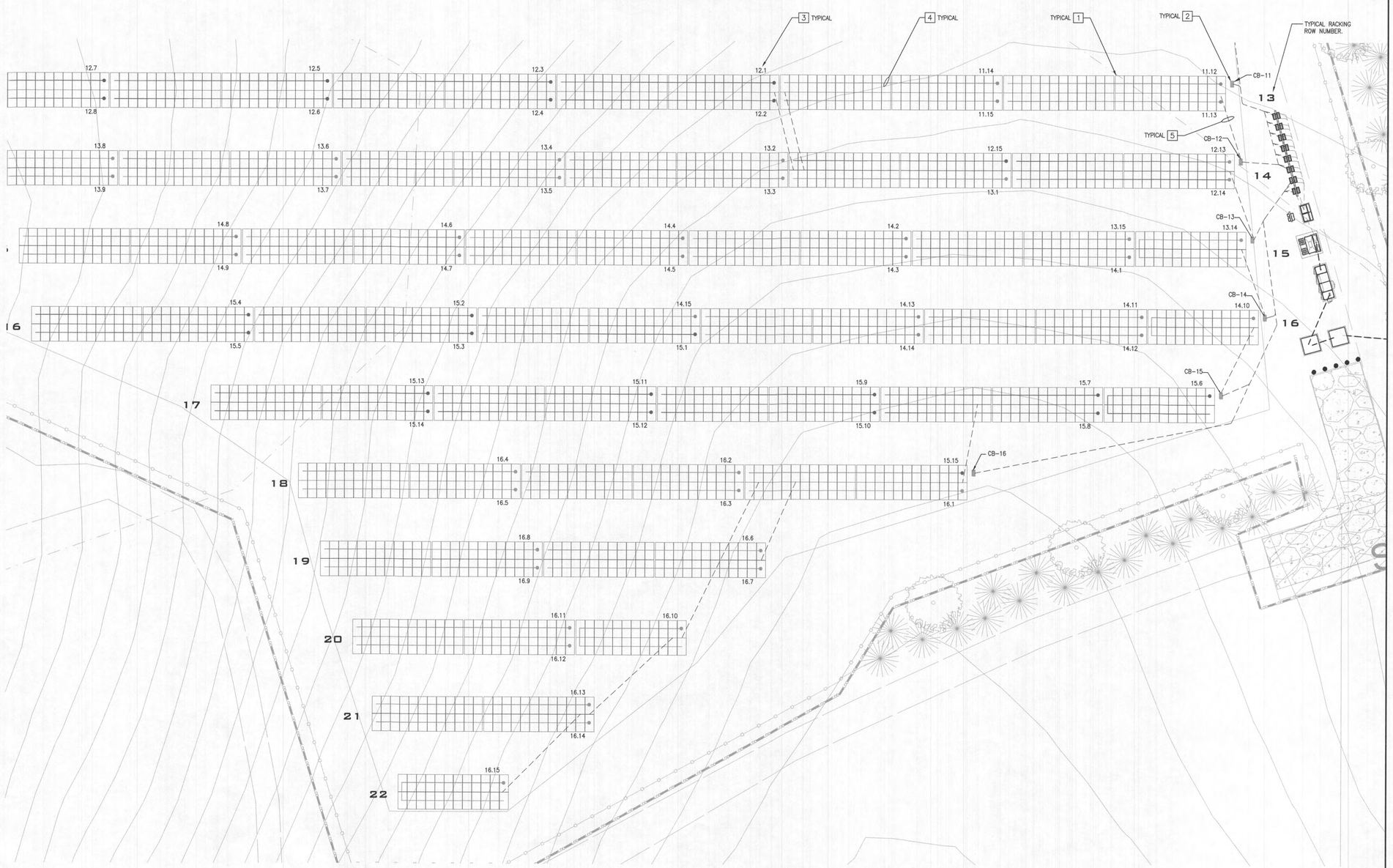

PARTIAL STRINGING PLAN

SCALE 1" = 20'

RECEIVED
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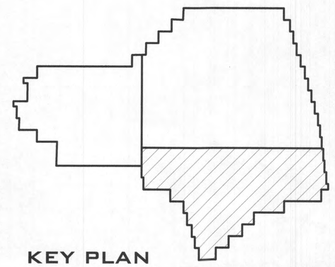
LICENSES & PERMITS DIVISION



KEY PLAN

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DRAWING TITLE
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ENGINEER OF RECORD

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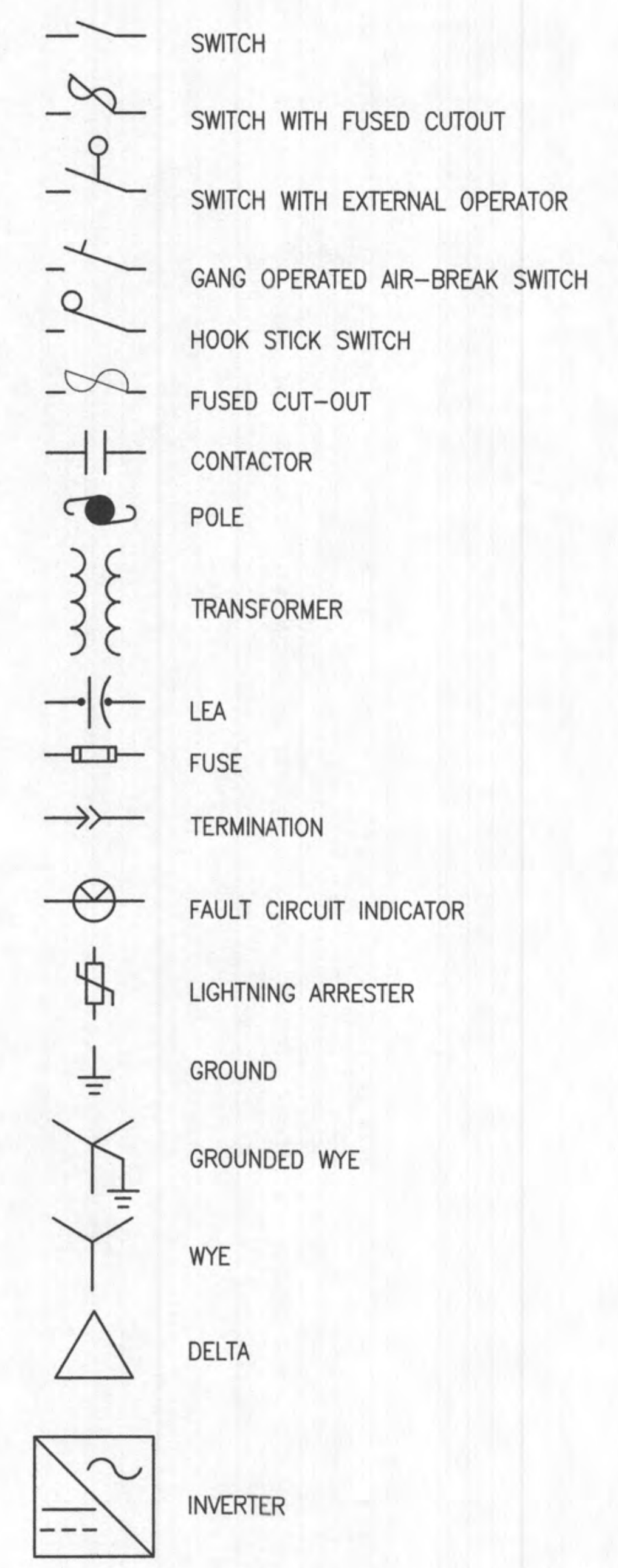
SCALE:	AS NOTED
PROJ. NO. :	230120
DESIGNED BY:	JNH
DRAWN BY:	JNH
CHECKED BY:	DEA
DRAWING NO.:	PVE-3.3

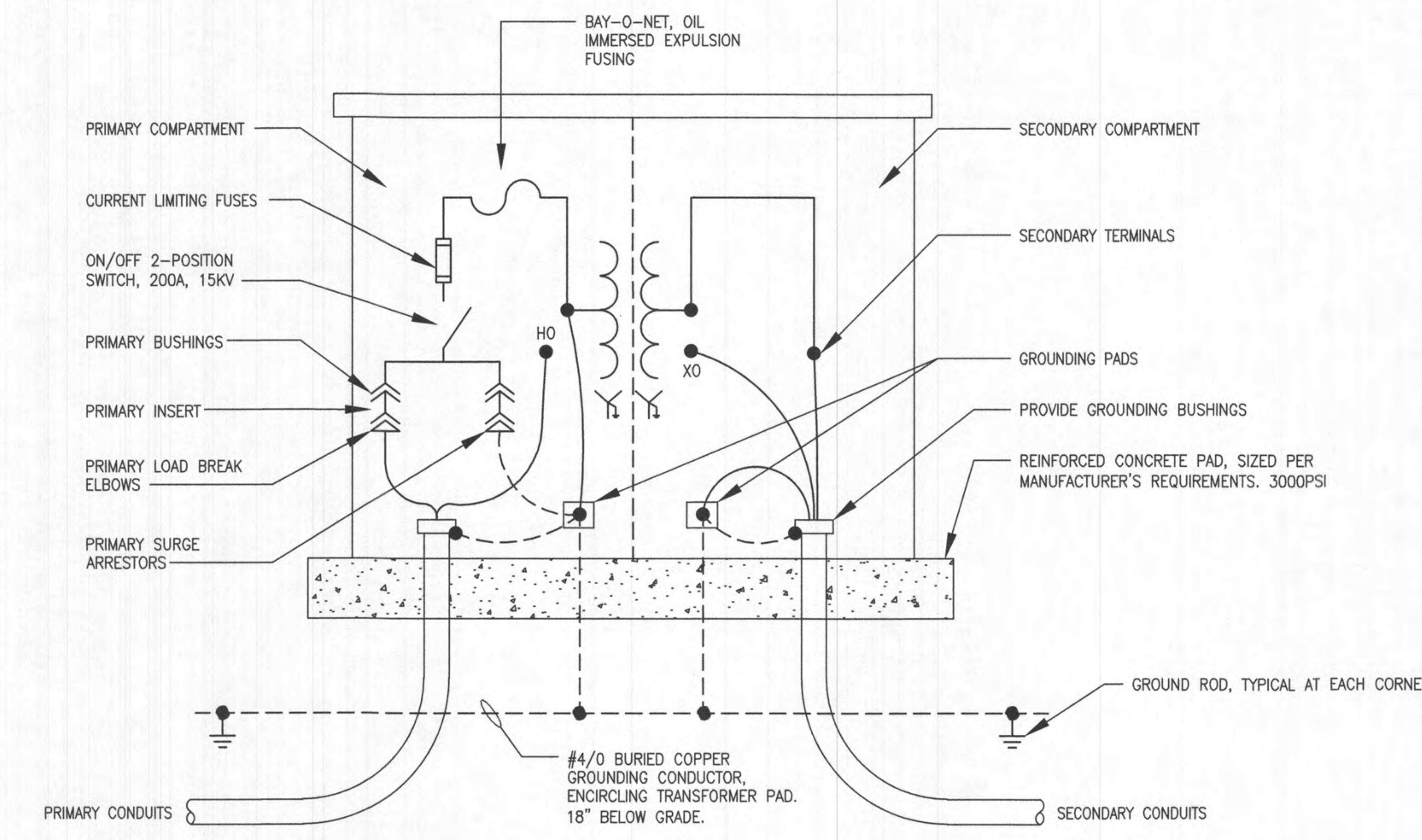
MV TRANSFORMER SPEC

SIZE:	2200KVA, THREE PHASE PAD MOUNT TRANSFORMER, UL LISTED, RATED FOR STEP UP SOLAR DUTY OPERATION.
CLASS:	15 KV
FREQUENCY:	60HZ NOMINAL AND SHALL BE TOLERANT OF CONTINUOUS FREQUENCIES BETWEEN 57.0HZ AND 60.5HZ
TEMP RISE:	65 DEGREE C TEMPERATURE RISE, BASED UPON 30 DEG C AVERAGE AND 40 DEGREE C MAX
HIGH VOLTAGE:	13,200Y/7,620V
LOW VOLTAGE:	600Y/346V
WINDINGS:	TRANSFORMERS SHALL HAVE TWO WINDINGS; ONE 2200KVA SECONDARY WINDING AND ONE 2200KVA PRIMARY WINDING.
CONFIGURATION:	THE LOW-VOLTAGE WINDING CONFIGURATION SHALL BE 600/346V NOMINAL, GROUNDED WYE. THE HIGH VOLTAGE WINDING CONFIGURATION SHALL BE 13,200Y/7,620V GROUNDED WYE. FIVE LEGGED CORE DESIGN.
BIL:	HIGH VOLTAGE: 95KV, LOW VOLTAGE 30KV
WINDING:	ALUMINUM
IMPEDANCE:	NOMINAL 5.5%
TAPS:	(2) – 2.5% ABOVE AND BELOW IN HV
CONFIGURATION:	DEADFRONT, LOOP FEED, SIX HV BUSHINGS, STAGGERED LV BUSHINGS
PROTECTION:	BAYONET EXP. FUSE, PARTIAL RANGE CURRENT LIMITING FUSES, DUAL SENSING EXPULSION FUSES
SWITCHING:	LOAD BREAK, 2 POSITION, 600A, 15 KV
ARRESTERS:	8.4KV MCOV ELBOW ARRESTOR, 15KV INTERFACE X 3
COOLING:	TYPE KNAN, 125 KV BIL
INSULATING FLUID:	ENVIRO–TEMP FR3
SOUND LEVEL:	NEMA TR1
ENCLOSURE:	18 INCH DEEP CABINET, TEMP. RISE: 65C, GREEN COLOR WITH TOUCH–UP PAINT
EFFICIENCY:	>99% AT 50% LOAD
PRIMARY BUSHINGS:	200 AMP HV BUSHING WELLS X 6, 15 KV CLASS
SECONDARY BUSHINGS:	12 HOLES NEMA SPADE TERMINALS X 4, THREADED STUD
NEUTRAL BUSHING:	XO NEUTRAL (ISOLATED FROM HO) HO NEUTRAL, BONDED EXTERNALLY TO TANK MV COMPARTMENT
INSERTS:	LOAD BREAK INSERTS X 6
ELECTROSTATIC SHIELD:	TRANSFORMERS RATED 2200KVA WITH TWO WINDINGS SHALL INCLUDE ELECTROSTATIC SHIELDING BETWEEN THE LOW AND HIGH VOLTAGE WINDINGS. THE SHIELDING MUST BE GROUNDED EXTERNALLY TO THE LV COMPARTMENT TO THE TRANSFORMER TANK.
TANK GROUNDING:	CLAMP–TYPE TANK GROUNDING CONNECTIONS SHALL BE PROVIDED FOR PAD MOUNT DISTRIBUTION TRANSFORMERS IN ACCORDANCE WITH ANSI C57.12.26
MISCELLANEOUS ITEMS:	BOLTED COVER, HINGED DOORS, PENTA–HEAD CABINET DOOR BOLTS, LOCKABLE LIQUID LEVEL GAUGE STANDARD PRESSURE RELIEF VALVE THERMOMETER, DIAL TYPE VACUUM PRESSURE GAUGE 1INCH DRAIN VALVE WITH 3/8 INCH SAMPLER IN EXTERNAL, LOCKABLE ENCLOSURE TEMPORAL DECAL WITH SERIAL NUMBER BARCODE AND DESCRIPTION WARNING DECALS, DANGER DECALS STANDARD NAMEPLATE FLAPPER VALVE GROUND CONNECTOR PLUG NITROGEN BLANKET JACKING FACILITIES DOOR GASKET SHRADDER VALVE GROUNDING PADS, IEEE STANDARD TWO–HOLE, 3 EACH HV AND LV FUSE STENCILS FUSE MODEL NUMBERS PRINTED ON NAMEPLATE LOCKABLE EXTERNAL GAUGE ENCLOSURE
FACTORY TESTING:	IEEE, RESISTANCE, TURNS RATIO, POLARITY, PHASING, EXCITATION, IMPEDANCE, POTENTIAL, LEAK TEST

PV SYSTEM SUMMARY

SYSTEM	INVERTER TYPE	MODULE TYPE	NUMBER OF STRINGS PER INVERTER	MODULES PER STRING	NUMBER OF MODULES	MODULE PEAK POWER	TOTAL DC POWER	MAX INVERTER AC OUTPUT POWER	NUMBER OF INVERTERS	TOTAL AC POWER	DC/AC RATIO
1	SG125HV	Q.PEAK DUO XL-G10.3/BFG	15	24	5,760	485 W	2794 kW	125 kVA	15	1999 kVA	1.40
			15	24				124 kVA	1		
TOTALS		-	-	-	**5,760**	-	**2.79 MW**	-	**16**	**1.999 MVA**	**1.40**





2 **TRANSFORMER DETAIL**

SCALE: N.T.S.

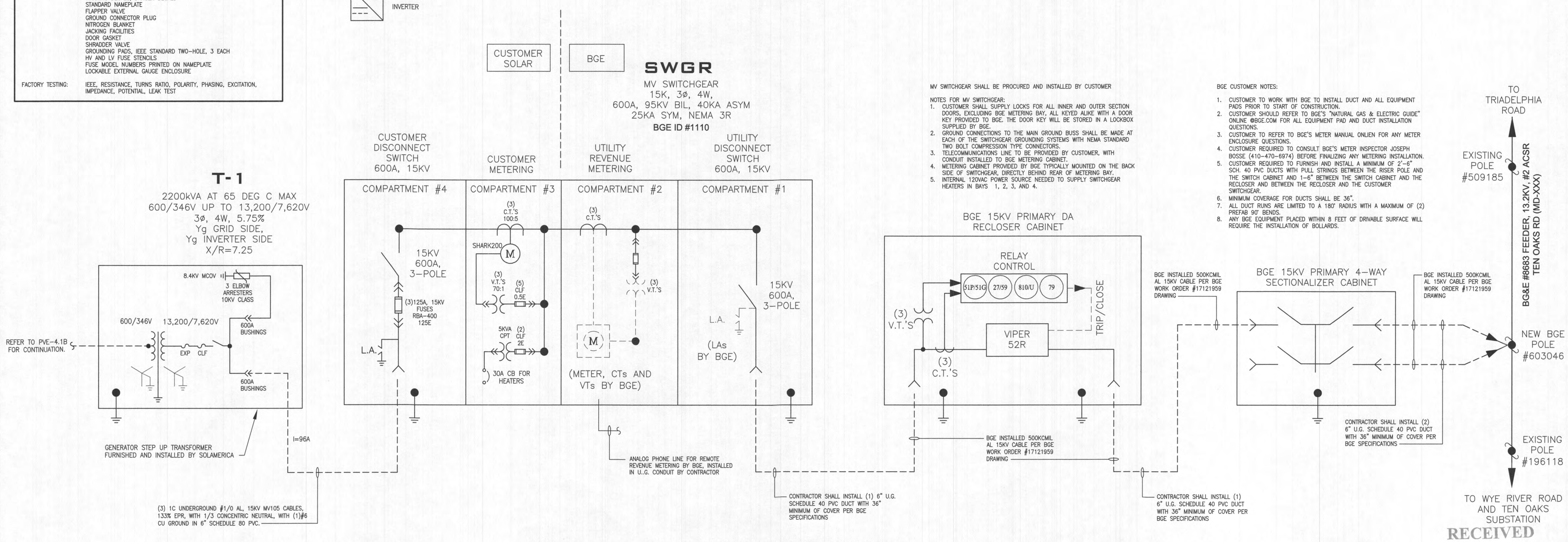
MV SWITCHGEAR SHALL BE PROCURED AND INSTALLED BY CUSTOMER

NOTES FOR MV SWITCHGEAR:

1. CUSTOMER SHALL SUPPLY LOCKS FOR ALL INNER AND OUTER SECTION DOORS, EXCLUDING BGE METERING BAY, ALL KEYED ALIKE WITH A DOOR KEY PROVIDED TO BGE. THE DOOR KEY WILL BE STORED IN A LOCKBOX SUPPLIED BY BGE.
2. GROUND CONNECTIONS TO THE MAIN GROUND BUSS SHALL BE MADE AT EACH OF THE SWITCHGEAR GROUNDING SYSTEMS WITH NEMA STANDARD TWO BOLT COMPRESSION TYPE CONNECTORS.
3. TELECOMMUNICATIONS LINE TO BE PROVIDED BY CUSTOMER, WITH CONDUIT INSTALLED TO BGE METERING CABINET.
4. METERING CABINET PROVIDED BY BGE TYPICALLY MOUNTED ON THE BACK SIDE OF SWITCHGEAR, DIRECTLY BEHIND REAR OF METERING BAY.
5. INTERNAL 120VAC POWER SOURCE NEEDED TO SUPPLY SWITCHGEAR HEATERS IN BAYS 1, 2, 3, AND 4.

BGE CUSTOMER NOTES:

1. CUSTOMER TO WORK WITH BGE TO INSTALL DUCT AND ALL EQUIPMENT PADS PRIOR TO START OF CONSTRUCTION.
2. CUSTOMER SHOULD REFER TO BGE'S "NATURAL GAS & ELECTRIC GUIDE" ONLINE @BGE.COM FOR ALL EQUIPMENT PAD AND DUCT INSTALLATION QUESTIONS.
3. CUSTOMER TO REFER TO BGE'S METER MANUAL ONLIEN FOR ANY METER ENCLOSURE QUESTIONS.
4. CUSTOMER REQUIRED TO CONSULT BGE'S METER INSPECTOR JOSEPH BOSSE (410–470–6974) BEFORE FINALIZING ANY METERING INSTALLATION.
5. CUSTOMER REQUIRED TO FURNISH AND INSTALL A MINIMUM OF 2'–6" SCH. 40 PVC DUCTS WITH PULL STRINGS BETWEEN THE RISER POLE AND THE SWITCH CABINET AND 1–6" BETWEEN THE SWITCH CABINET AND THE RECLOSER AND BETWEEN THE RECLOSER AND THE CUSTOMER SWITCHGEAR.
6. MINIMUM COVERAGE FOR DUCTS SHALL BE 36".
7. ALL DUCT RUNS ARE LIMITED TO A 180' RADIUS WITH A MAXIMUM OF (2) PREFAB 90' BENDS.
8. ANY BGE EQUIPMENT PLACED WITHIN 8 FEET OF DRIVABLE SURFACE WILL REQUIRE THE INSTALLATION OF BOLLARDS.



1 **MV SINGLE LINE DIAGRAM**

SCALE: NTS

RECEIVED
AUG 11 2023
LICENSES & PERMITS DIVISION

REV#	DATE	REVISION
-	08-08-23	ISSUED FOR PERMIT ONLY

CONSTRUCTION ENGINEERING GROUP
Consulting Engineers
2651 EAU GALLIE BLVD, SUITE A
MELBOURNE, FL 32935
TEL. 321.253.1221
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TEN OAKS SOLAR
NEW PHOTOVOLTAIC SYSTEM
3950 TEN OAKS ROAD GLENELG, MD 21737

DRAWING TITLE
MV SINGLE-LINE DIAGRAM

ENGINEER OF RECORD

STATE OF MARYLAND
DAVID E. ALLEN
PROFESSIONAL ENGINEER
MARYLAND
PROFESSIONAL ENGINEER
NO. 42678

I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 42678, EXPIRATION DATE: 2024-09-12.

DATE:	08-08-23
SCALE:	AS NOTED
PROJ. NO.:	230120
DESIGNED BY:	JNH
DRAWN BY:	JNH
CHECKED BY:	DEA
DRAWING NO.:	PVE-4.1