

PROJECT DESCRIPTION

THIS 307.395 KWSTC PHOTOVOLTAIC (PV) SYSTEM (67.275KW ROOF MOUNTED & 240.12KW GROUND MOUNTED) IS TO BE INSTALLED AT THE RETREAT CENTER IN ANDOVER, NEW JERSEY. THE ENERGY PRODUCED BY THE PV SYSTEM SHALL BE INTERCONNECTED WITH THE UTILITY GRID THROUGH THE EXISTING ON-SITE ELECTRICAL EQUIPMENT VIA A SUPPLY SIDE CONNECTION IN THE MAIN SERVICE PANEL. THIS PROJECT DOES NOT INCLUDE STORAGE BATTERIES.

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SCOPE OF WORK

- (195) ROOF MOUNTED PV MODULES (TOTAL: 4,188 SQ. FT.)
- (696) GROUND MOUNTED PV MODULES (TOTAL: 14,949 SQ. FT.)
- (7) 30.0 kW INVERTERS
- (1) 20.0 kW INVERTER
- (448) SOLAREEDGE POWER OPTIMIZERS
- (400) ATTACHMENT POINTS @ 41" O.C. MAX.
- (1) AC DISCONNECT, 480 VAC, NEMA 3R
- (1) AC DISCONNECT, 240 VAC, NEMA 3R
- (2) AC COMBINER PANELS, 480 VAC, NEMA 3R
- (1) PV METER, 240 VAC, NEMA 3R
- (1) TRANSFORMER, 300 kVA, NEMA 3R,
- PV-SIDE: 277/480 VAC, UTILITY-SIDE: 120/208 VAC

SITE SPECIFICATIONS

- OCCUPANCY CATEGORY: II
- DESIGN WIND SPEED: 115 MPH
- EXPOSURE CATEGORY: B
- GROUND SNOW LOAD: 25 PSF

GOVERNING CODES

- 2014 NATIONAL ELECTRICAL CODE
- 2015 IBC (AS AMENDED BY STATE)
- 2015 INTERNATIONAL ENERGY CONSERVATION CODE
- 2015 INTERNATIONAL MECHANICAL CODE
- 2015 INTERNATIONAL FIRE CODE
- UNDERWRITERS LABORATORIES (UL) STANDARDS
- OSHA 29 CFR 1910.269

PARTS LIST

Quantity	Name
891	Hanwha Q Cells Q.Plus L-G4.2 345 PV Modules
448	SolarEdge P730 Optimizer
400	S-5I-H90 Clamp
400	Unirac L-foot
80	Unirac End Clamp
350	Unirac Mid Clamp
1310	Feet of Unirac SolarMount Rail

Project:

ANDOVER, NJ 07821

Project Details:

307.395 kWstc, 230.00 kW AC
AHJ: GREEN, TOWNSHIP

Engineering Approval:

REVISIONS

DESCRIPTION	DATE	REV
ORIGINAL	6/15/2018	A
ELECTRICAL	7/7/2018	B
LAYOUT	7/17/2018	C

Sheet Title:

COVER

Sheet Number:

T1.0

Sheet Size:

ARCH D - 36" x 24"

DESIGN & DRAFTING BY:

CLARK FLEMING

"Do not pray for an easy life, pray for the strength to endure a difficult one."
- Bruce Lee



Reviewed & Approved by:

RD



CONTRACTOR NOTES:

- 1.) THE CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND NOTIFY THE SYSTEM DESIGN ENGINEER OF ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND DRAWINGS.
- 2.) THE CONTRACTOR SHALL SUPPLY AND INSTALL ALL WORK AS SHOWN IN THE CONSTRUCTION DOCUMENTS UNLESS OTHERWISE NOTED. ALL WORK SHALL BE PERFORMED IN AN ORDERLY, WORKMAN-LIKE AND SAFE MANNER BY WORKERS SKILLED AND EXPERIENCED IN THEIR TRADES.
- 3.) THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING ALL INSPECTIONS TO BE WITNESSED BY THE AHJ AND/OR THE OWNER. THE CONTRACTOR SHALL WORK WITH THE OWNER'S INSPECTION AGENCY TO PLAN THE INSPECTIONS, AND NOTIFY ALL PARTIES INVOLVED SUFFICIENTLY IN ADVANCE TO ALLOW THE INSPECTIONS TO TAKE PLACE IN A TIMELY MANNER AND NOT DELAY THE PROGRESS OF THE WORK. THE OWNER AND SYSTEM DESIGN ENGINEER WILL NOT BE RESPONSIBLE FOR SCHEDULING, ARRANGING OR COORDINATING THE INSPECTIONS.
- 4.) THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING THE AREAS WHERE WORK IS TAKING PLACE, AS WELL AS ANY ADJOINING AREAS WHICH MAY BE AFFECTED BY THE WORK, TO PREVENT SUBJECTING THE OCCUPANTS, STRUCTURES, VEHICLES, EQUIPMENT, OR ANY OTHER PARTS OR CONTENTS OF THE SITE TO HAZARD OR DAMAGE.
- 5.) CONTRACTOR SHALL FURNISH ALL NECESSARY BOXES, OUTLETS, SUPPORTS, CONDUITS, FITTINGS, AND ACCESSORIES TO FULFILL APPLICABLE CODES, REGULATIONS, BUILDING STANDARDS, AND THE BEST PRACTICE OF THE TRADE FOR THE INSTALLATION OF ELECTRICAL WORK.
- 6.) THE CONTRACTOR SHALL, AT ALL TIMES DURING THE WORK, MAINTAIN ACCESSIBILITY FROM THE STREET TO ALL FIRE HYDRANTS, POWER OR LIGHT POLES, AND SIMILAR UTILITY AND PUBLIC SERVICE ITEMS WITHIN OR ADJACENT TO THE CONSTRUCTION SITE.
- 7.) WORK SHALL NOT RESTRICT CLEAR AND UNOBSTRUCTED ACCESS TO ANY WATER OR POWER DISTRIBUTION FACILITIES (POWER POLES, PULLBOXES, TRANSFORMERS, VAULTS, PUMPS, VALVES, METERS, APPURTENANCES, ETC.) OR TO THE LOCATION OF THE HOOKUP.
- 8.) THE OWNERS AND THE AHJ SHALL BE NOTIFIED IN WRITING IN ADVANCE OF ANY REQUIRED CONSTRUCTION OPERATION THAT WILL INVOLVE INTERRUPTION OF THE HEATING, WATER, FIRE PROTECTION SYSTEMS, TELEPHONE, GAS OR ELECTRICAL SERVICES TO THE OTHER BUILDINGS AND AREAS OF THE SITE. THE CONTRACTOR SHALL COORDINATE ANY REQUIRED SHUTDOWN OF THE UTILITIES WITH THE OWNERS, THE AHJ, AND THE UTILITY COMPANY.
- 9.) UPON REVIEW OF ELECTRICAL DRAWINGS, THE ELECTRICAL CONTRACTOR SHALL INFORM THE SYSTEM DESIGN ENGINEER OF ANY DISCREPANCIES OR REQUEST CLARIFICATION, IF NECESSARY, CONCERNING THE INTENT OF THE PLANS AND SPECIFICATIONS TO PROVIDE A COMPLETE ELECTRICAL INSTALLATION.
- 10.) THE CONTRACTOR SHALL COORDINATE HIS WORK WITH OTHER CONTRACTORS WHOSE WORK MIGHT AFFECT THIS INSTALLATION. CONTRACTORS SHALL ARRANGE ALL PARTS OF THIS WORK AND EQUIPMENT IN PROPER RELATION TO THE WORK AND EQUIPMENT OF OTHERS AND WITH BUILDING CONSTRUCTION AND ARCHITECTURAL FINISH SO THAT IT WILL HARMONIZE IN SERVICE AND APPEARANCE.
- 11.) THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING WITH THE OWNER'S INSPECTION AGENCY TO ARRANGE FOR INSPECTIONS RELATED TO ALL SPECIAL INSPECTIONS IN A TIMELY MANNER, AND SHALL BE PRESENT AS REQUIRED AT THE INSPECTIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSURING THAT THE APPROPRIATE SUBCONTRACTORS ARE PRESENT DURING TESTS AND INSPECTIONS OF THE SYSTEMS FOR WHICH THE SUBCONTRACTORS ARE RESPONSIBLE.
- 12.) WHERE SNOW AND ICE SHEDDING FROM THE PV ARRAY OR BALANCE OF SYSTEM COMPONENTS MAY CAUSE A HAZARD TO OCCUPANTS BELOW, PROTECTIVE SNOW & ICE GUARDS SHALL BE INSTALLED.

PHOTOVOLTAIC NOTES:

- 1.) ALL ASPECTS OF WORK RELATED TO THE SOLAR PHOTOVOLTAIC (PV) SYSTEM SHALL BE IN ACCORDANCE WITH ALL STATE AND LOCAL CODES, UTILITY REQUIREMENTS AND THE NEC, ESPECIALLY ARTICLE 690.
- 2.) SOLAR PV MODULE FRAMES SHALL BE BONDED TO RACKING RAIL OR BARE COPPER E.G.C. PER THE MODULE MANUFACTURER'S LISTED INSTRUCTION SHEET.
- 3.) SOLAR PV SYSTEMS SHALL BE GROUNDED IN ACCORDANCE WITH NEC 690 PART V. GROUNDING.
- 4.) COMBINER BOXES, FUSING, WIRE SIZES, QUANTITIES AND CONDUIT SIZES BETWEEN SOLAR ARRAYS AND INVERTERS TO BE VERIFIED BY CONTRACTOR WITH SOLAR MODULE AND INVERTER MANUFACTURERS BEFORE INSTALLATION.
- 5.) ALL PV SOURCE CIRCUIT CONDUCTORS AND CONNECTORS SHALL BE SUPPORTED AND SECURED WITHOUT EXCESSIVE STRESS. NO WIRING SHALL BE PERMITTED TO TOUCH THE ROOF SURFACE.
- 6.) PV SOURCE CIRCUIT CONDUCTORS EXPOSED BETWEEN ARRAYS SHALL BE SECURED ON BOTH SIDES, AND BE PROTECTED FROM PHYSICAL DAMAGE AND ABRASION, INCLUDING FROM EDGES OF RACKING, CHANNEL EDGES, WIRE TRAYS, ETC.
- 7.) ANY CABLE TIES USED SHALL BE HEAT STABILIZED (-40C TO 105C), UV STABILIZED AND OUTDOOR RATED, SUITABLE AND DURABLE FOR THE ENVIRONMENT AND LIFE OF THE PV SYSTEM.
- 8.) WHERE EXPOSED TO SUNLIGHT, CONDUCTORS SHALL BE LISTED AND MARKED AS SUNLIGHT RESISTANT.
- 9.) ALL EQUIPMENT GROUND CONDUCTORS SMALLER THAN AWG #6 SHALL BE PROTECTED FROM PHYSICAL DAMAGE BY AN IDENTIFIED RACEWAY OR CABLE ARMOR UNLESS INSTALLED WITHIN THE HOLLOW SPACES OF THE FRAMING MEMBERS OF BUILDINGS OR STRUCTURES AND WHERE NOT SUBJECT TO PHYSICAL DAMAGE.
- 10.) MODULE/OPTIMIZER AND HOMERUN CONDUCTOR BEND RADIUS SHALL NOT BE LESS THAN 8 TIMES THE CONDUCTOR DIAMETER, UNLESS OTHERWISE SPECIFIED BY THE MANUFACTURER.
- 11.) DO NOT STEP ON, OR DROP PV MODULES (EVEN A FEW INCHES). MAINTAIN SPACING BETWEEN TWO MODULES AT MINIMUM PER MANUFACTURER'S REQUIREMENTS. DO NOT INSTALL MODULES SUCH THAT THEY ARE SUBJECTED TO MECHANICAL STRESS OR TORSION.
- 12.) ALL PV ARRAY WIRING SHALL BE SECURED WITH UV RESISTANT SUPPORT METHODS AT FREQUENT INTERVALS SUCH THAT NO CONDUCTORS ARE HANGING. SPLIT LOOM OR EQUIVALENT, CONDUIT SLEEVES WITH PROTECTIVE FITTING OR BELL ENDS, AND/OR METALLIC CONDUIT SHALL BE USED TO PROTECT ALL PV CONDUCTORS AND CONNECTORS, WHERE EXPOSED TO POSSIBLE DAMAGE.








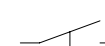
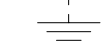










EQUIPMENT NOTES:

- 1.) ALL MATERIALS, SUPPLIES, AND EQUIPMENT SHALL BE LISTED, USED, AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND INSTRUCTIONS, AND APPLICABLE NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) REQUIREMENTS.
- 2.) ALL EQUIPMENT SHALL BE RATED FOR THE ENVIRONMENT IN WHICH IT IS INSTALLED.
- 3.) WORKING SPACE AROUND ELECTRIAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- 4.) THE EXACT LOCATION AND ELEVATION OF ALL SWITCHES, JUNCTION BOXES, RECEPTACLES, ETC. SHALL BE DETERMINED FROM THE SYSTEM DESIGN ENGINEER'S DRAWINGS.
- 5.) ALL JUNCTION BOXES, COMBINER BOXES, AND DISCONNECTS SHALL BE INSTALLED IN AN ACCESSIBLE LOCATION.
- 6.) PROVIDE NEMA 3R RATED EQUIPMENT OR BETTER WHERE EXPOSED TO OUTDOORS.
- 7.) WHERE SIZES OF RACEWAYS OR BOXES ARE NOT INDICATED ON THE DRAWINGS, THE CONTRACTOR SHALL SIZE THESE ITEMS AS REQUIRED FOR THE INSTALLATION.
- 8.) ALL VERTICAL RUNS OF CONDUIT OR TUBING TERMINATING IN THE BOTTOM OF WALL BOXES OR CABINETS OR SIMILAR LOCATIONS, SHALL BE PROTECTED FROM THE ENTRANCE OF FOREIGN MATERIAL PRIOR TO THE INSTALLATION OF CONDUCTORS.
- 9.) METAL RACEWAYS, METAL ENCLOSURES OF ELECTRICAL DEVICES AND EQUIPMENT, MODULE FRAMES, AND OTHER EQUIPMENT SHALL BE COMPLETELY GROUNDED IN ACCORDANCE WITH THE NEC.
- 10.) PROPER HARDWARE FOR A COMPLETE GROUNDING AND BONDING SYSTEM SHALL BE INSTALLED BY THE CONTRACTOR, IF NECESSARY.
- 11.) GROUNDING RODS SHALL HAVE A RESISTANCE TO GROUND OF 25 OHMS OR LESS AND SHALL BE 5/8" x 8' MIN, COPPER-BONDED STEEL. ALL GROUND CLAMPS USED SHALL BE UL 467 LISTED.
- 12.) ALL PVC CONDUIT EXPOSED TO SUNLIGHT SHALL BE SCHEDULE 80 AND MARKED AS SUNLIGHT RESISTANT. ALL UNDERGROUND PVC CONDUIT SHALL BE SCHEDULE 40 OR 80.
- 13.) ALL CONDUIT SHALL BE MOUNTED AT A MINIMUM OF 1 INCHES ABOVE THE ROOF SURFACE.






ELECTRICAL NOTES:

- 1.) ELECTRICAL POWER MUST BE SHUT OFF PRIOR TO THE CONTRACTOR PERFORMING ANY WORK IN RACEWAYS WITH LIVE ELECTRICAL CIRCUITS OR ANY OTHER EQUIPMENT. WHEN SWITCHES OR CIRCUIT BREAKERS ARE OPENED FOR WORK ON ELECTRICAL EQUIPMENT OR WIRING, SIGNS OR TAGS SHOULD BE INSTALLED AT THE SWITCH OR BREAKER STATING THAT WORK IS BEING PERFORMED ON THEM. INCLUDE THE TIME, DATE, AND CONTRACTOR'S NAME ON THE SIGN OR TAG. IF DEVICE IS LOCKABLE, IT SHOULD BE PADLOCKED.
- 2.) THE ELECTRICAL WORK SHALL COMPLY WITH THE REQUIREMENTS OF THE AHJ, NATIONAL FIRE PROTECTION AGENCY (NFPA), NATIONAL ELECTRICAL CODE (NEC), AND OSHA.
- 3.) PHASING OF NEW CONDUCTORS TO MATCH EXISTING CONDUCTORS. IF INSTALLATING A NEW CIRCUIT, THEN CONTRACTOR SHALL FOLLOW THE PHASING SCHEMES PROVIDED IN THE ELECTRICAL DIAGRAM.
- 4.) ALL CONDUCTORS SHALL BE COPPER, RATED FOR 90°C WET ENVIRONMENT, AND 1000 VOLTS DC OR 600 VOLTS AC, UNLESS OTHERWISE NOTED.
- 5.) GROUNDING ELECTRODE CONDUCTOR (G.E.C.) SHALL BE CONTINUOUS AND/OR IRREVERSIBLY SPLICED/WELDED.
- 6.) FLEXIBLE, FINE-STRANDED CABLES SHALL BE TERMINATED ONLY WITH TERMINALS, LUGS, DEVICES, OR CONNECTORS THAT ARE IDENTIFIED AND LISTED FOR SUCH USE PER NEC 690.31(F).
- 7.) ALL WIRES SHALL BE IDENTIFIED BY CIRCUITS IN ALL CABINETS, BOXES, WIRING TROUGHs, AND OTHER ENCLOSURES, AND AT ALL TERMINAL POINTS, I.E., RECEPTACLES, MECHANICAL LUGS, COMPRESSION FITTINGS. THE CIRCUIT DESIGNATIONS SHALL BE AS SHOWN ON THE CONTRACT DRAWINGS OR AS DIRECTED BY THE SYSTEM DESIGN ENGINEER. LABELS OR TAGS SHALL BE APPLIED TO WIRES SO THAT THEY WILL BE READILY VISIBLE.
- 8.) FUSES FOR SWITCHES SHALL BE CURRENT-LIMITING TYPE WITH A MINIMUM INTERRUPTING CAPACITY OF 200,000 AMPERES RMS (UNLESS OTHERWISE NOTED) AND OF THE CONTINUOUS CURRENT RATINGS AS INDICATED ON THE DRAWINGS OR AS RECOMMENDED BY THE MANUFACTURER.






ELECTRICAL LEGEND

-  = CIRCUIT CONDUCTORS
-  = EQUIPMENT GROUNDING CONDUCTORS
-  = TERMINAL BLOCK
-  = FUSE
-  = CIRCUIT BREAKER
-  = THROW SWITCH (KNIFE-BLADE)
-  = RECLOSING CIRCUIT BREAKER
-  = RECLOSING DISCONNECT/RELAY
-  = GROUNDING ELECTRODE SYSTEM
-  = PV MODULE
-  = INVERTER
-  = MICROINVERTER
-  = POWER OPTIMIZER
-  = METER/MONITORING DEVICE
-  = TRANSFORMER
-  = GENERATOR
-  = TRANSFER SWITCH
-  = BATTERY
-  = CURRENT TRANSFORMER (CT)


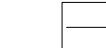

ELEC. LEGEND - 208 VAC

-  = LINE 1 TERMINAL (PHASED BLACK)
-  = LINE 2 TERMINAL (PHASED RED)
-  = LINE 3 TERMINAL (PHASED BLUE)
-  = NEUTRAL TERMINAL (PHASED WHITE)
-  = GROUND TERMINAL (PHASED GREEN)




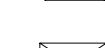


ELEC. LEGEND - 480 VAC

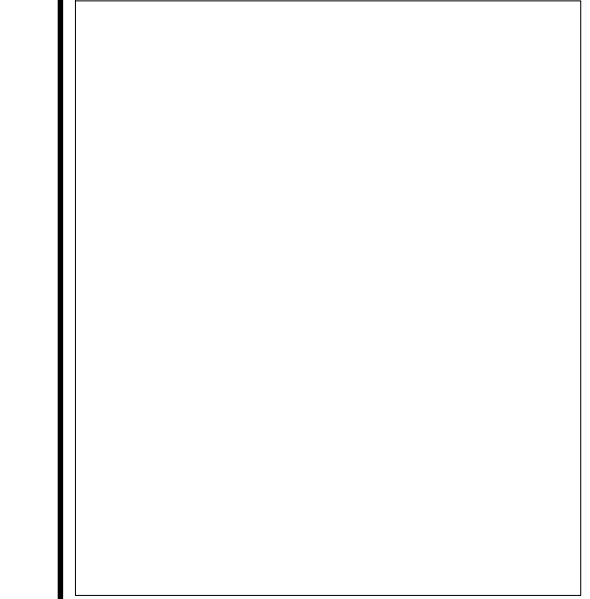
-  = LINE 1 TERMINAL (PHASED BROWN)
-  = LINE 2 TERMINAL (PHASED ORANGE)
-  = LINE 3 TERMINAL (PHASED YELLOW)
-  = NEUTRAL TERMINAL (PHASED WHITE)
-  = GROUND TERMINAL (PHASED GREEN)

ELECTRICAL LEGEND - DC

-  = POSITIVE TERMINAL (PHASED RED)
-  = NEGATIVE TERMINAL (PHASED BLACK)
-  = GROUND TERMINAL (PHASED GREEN)

SITE/ARRAY PLAN LEGEND

-  = CONDUIT ROUTES
-  = CONDUIT ROUTES (UGND OR INDOORS)
-  = PV MODULE
-  = PV EQUIPMENT
-  = RAFTER/TRUSS
-  = STANDING SEAM
-  = VENT
-  = CHIMNEY
-  = SKYLIGHT
-  = HVAC UNIT
-  = ROOF HATCH
-  = PV ATTACHMENT FLASHING
-  = RACKING RAIL
-  = SETBACKS/PATHWAYS
-  = SWINGING DOOR
-  = TREE/BUSH



Project:
ANDOVER, NJ 07821

Project Details:
307,395 kWh_{ac}, 230.00 kW AC
AHJ: GREEN, TOWNSHIP

Engineering Approval:

REVISIONS		
DESCRIPTION	DATE	REV
ORIGINAL	6/15/2018	A
ELECTRICAL	7/7/2018	B
LAYOUT	7/17/2018	C

Sheet Title:
PROJECT NOTES

Sheet Number:
T1.1

Sheet Size:
ARCH D - 36" x 24"

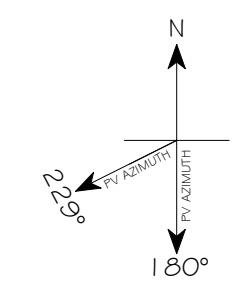
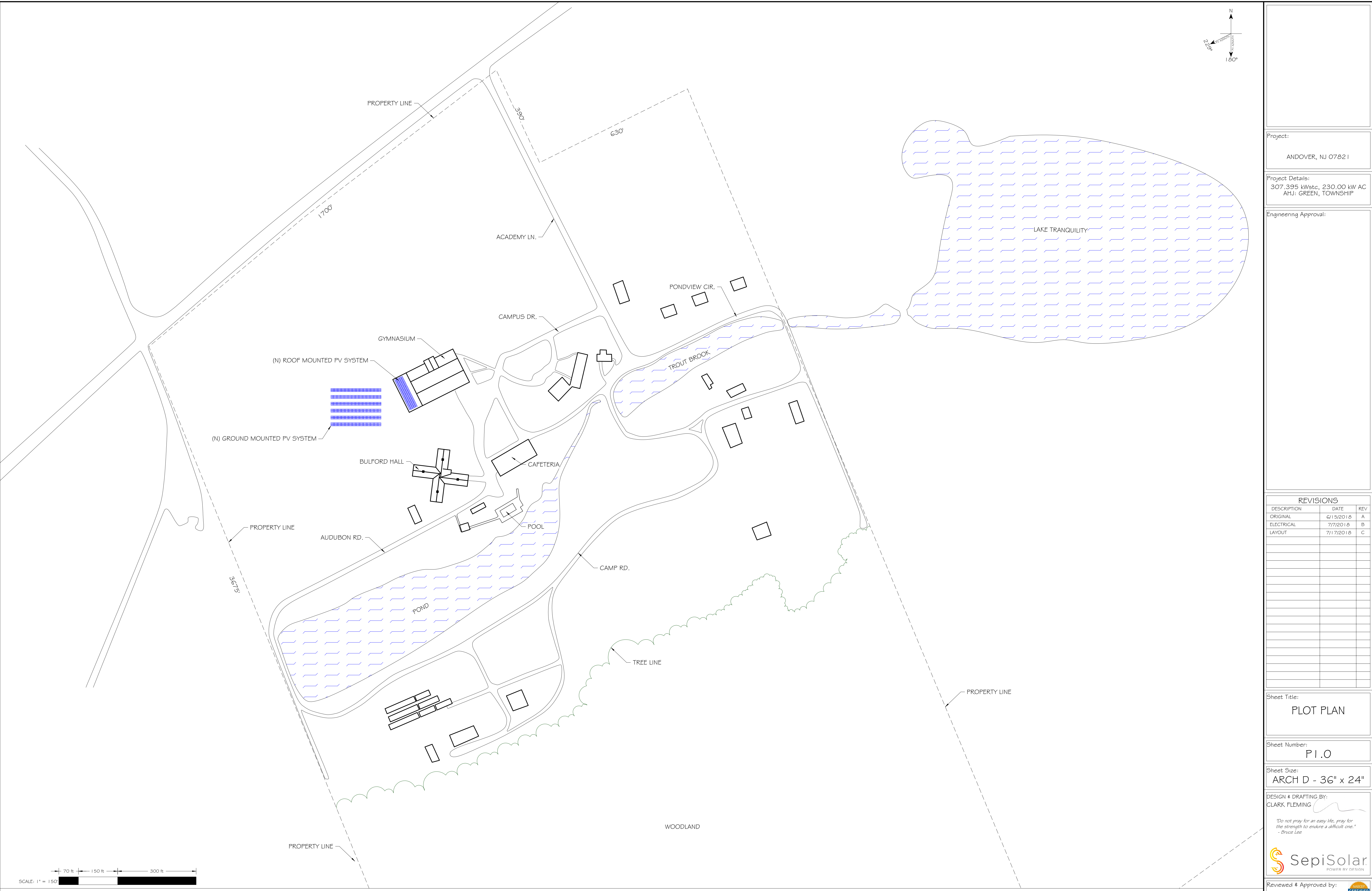
DESIGN & DRAFTING BY:
CLARK FLEMING

"Do not pray for an easy life, pray for the strength to endure a difficult one."
- Bruce Lee



Reviewed & Approved by:
RD





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Sheet Title:
PLOT PLAN

Sheet Number:
P 1.0

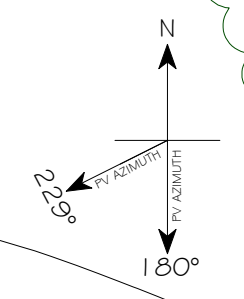
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FIELD

1
E.I.O.

1
A.I.I

230'

50'

35'

165'

ROOF MOUNTED ARRAY

GYMNASIUM

(N) TRANSFORMER

ELECTRICAL EQUIPMENT ON EXTERIOR WALL

GATE 8' WIDE

CONDUIT ON ROOF

CONDUIT IN TRENCH (APPROX. 175ft)

PARKING LOT

GROUND MOUNTED ARRAY

6' HIGH METAL FENCING

EQUIPMENT RACK FOR GROUND MOUNTED SYSTEM

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SITE PLAN

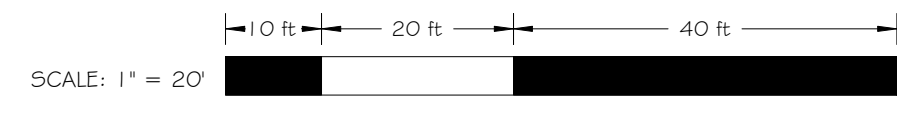
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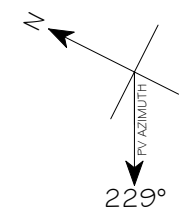
Reviewed & Approved by:
RD



SCALE: 1" = 20'

SYMBOL LEGEND		
SYMBOL	NAME	DESCRIPTION
	ROOFTOP PV MOD.	HANWHA Q-CELL QPLUS G4.2 345
	STANDING SEAM	2" HEIGHT AT 41" O.C. TYP.
	RACKING RAIL	UNIRAC SOLARMOUNT RAIL
	RACKING ATTACHMENT	S-5I-H90 CLAMP
	RACKING ATTACHMENT	UNIRAC END CLAMP AND MID CLAMP
	FIRE SETBACK	CA FIRE REQUIRED PATHWAYS 4' TYP.

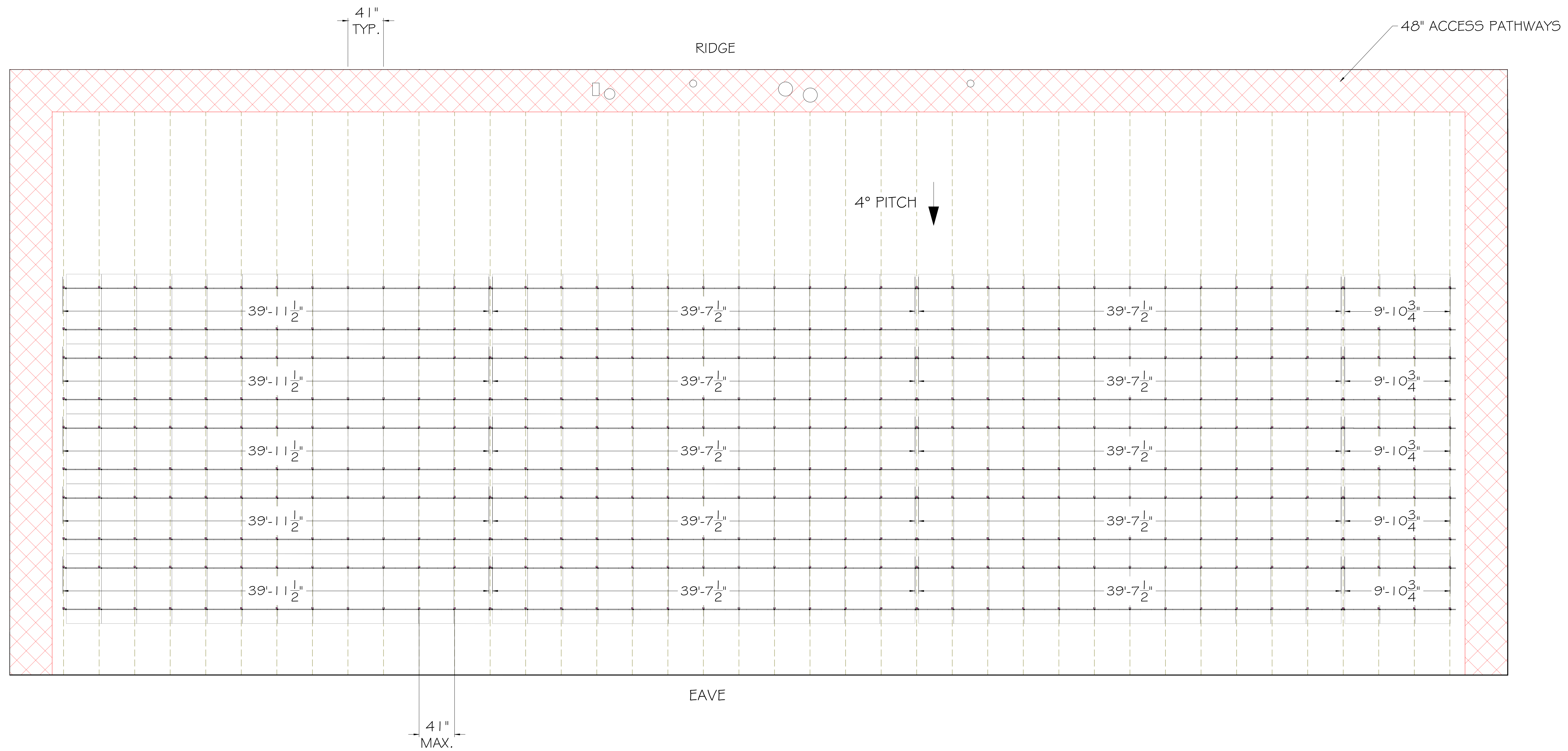
PARTS LIST	
Quantity	Name
80	Unirac End Clamp
100	SolarEdge Optimizer
195	Hanwha Q Cells Q.Plus L-G4.2 345 PV Modules
350	Unirac Mid Clamp
400	S-5I-H90 Clamp
400	Unirac L-Foot
1310	Feet of Unirac SolarMount Rail



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Sheet Title:
ROOF PV LAYOUT

Sheet Number:
A1.1

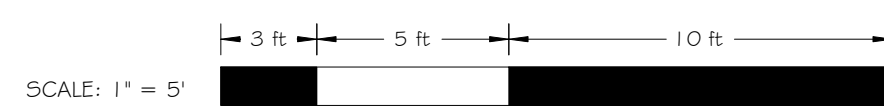
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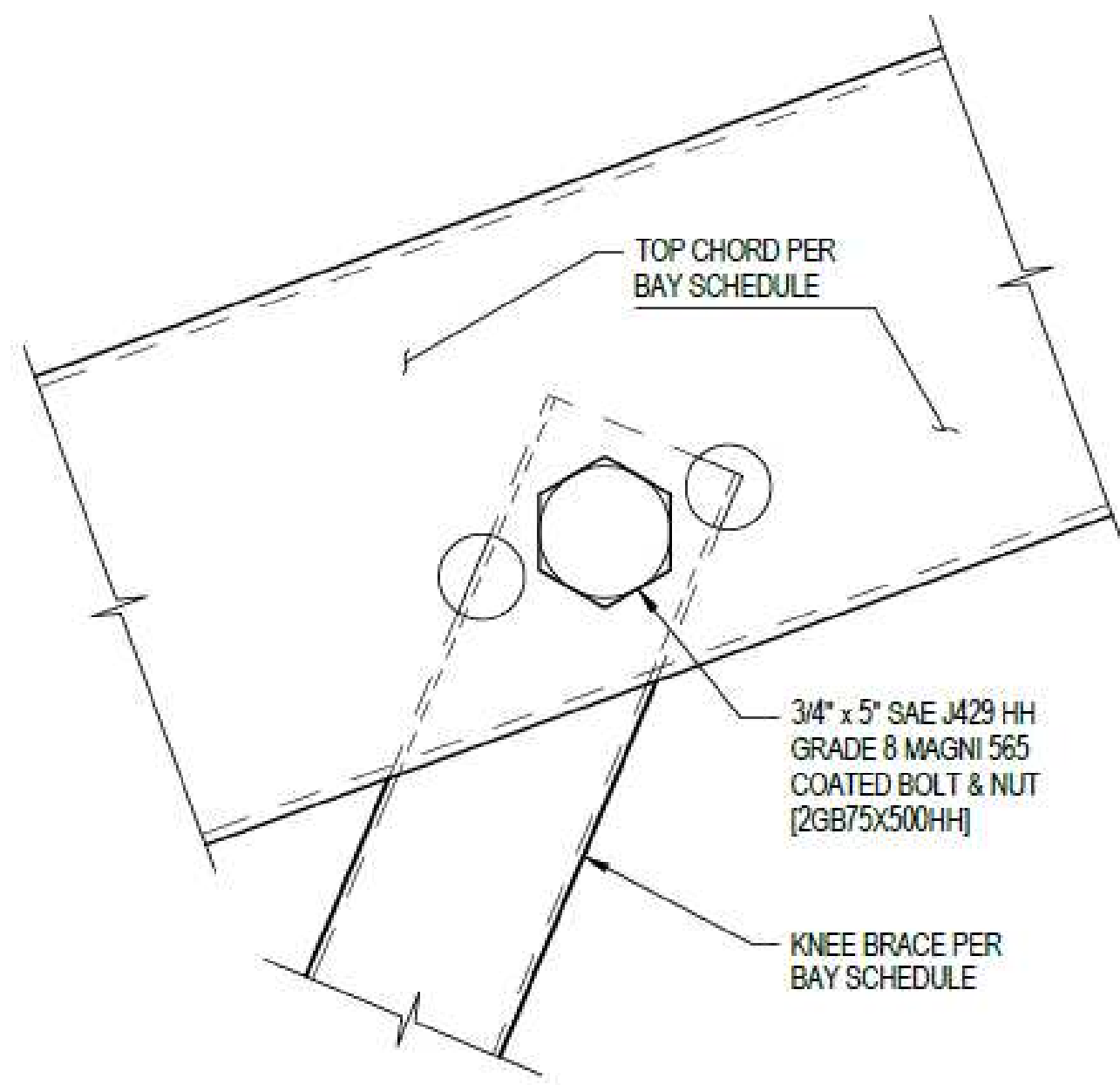
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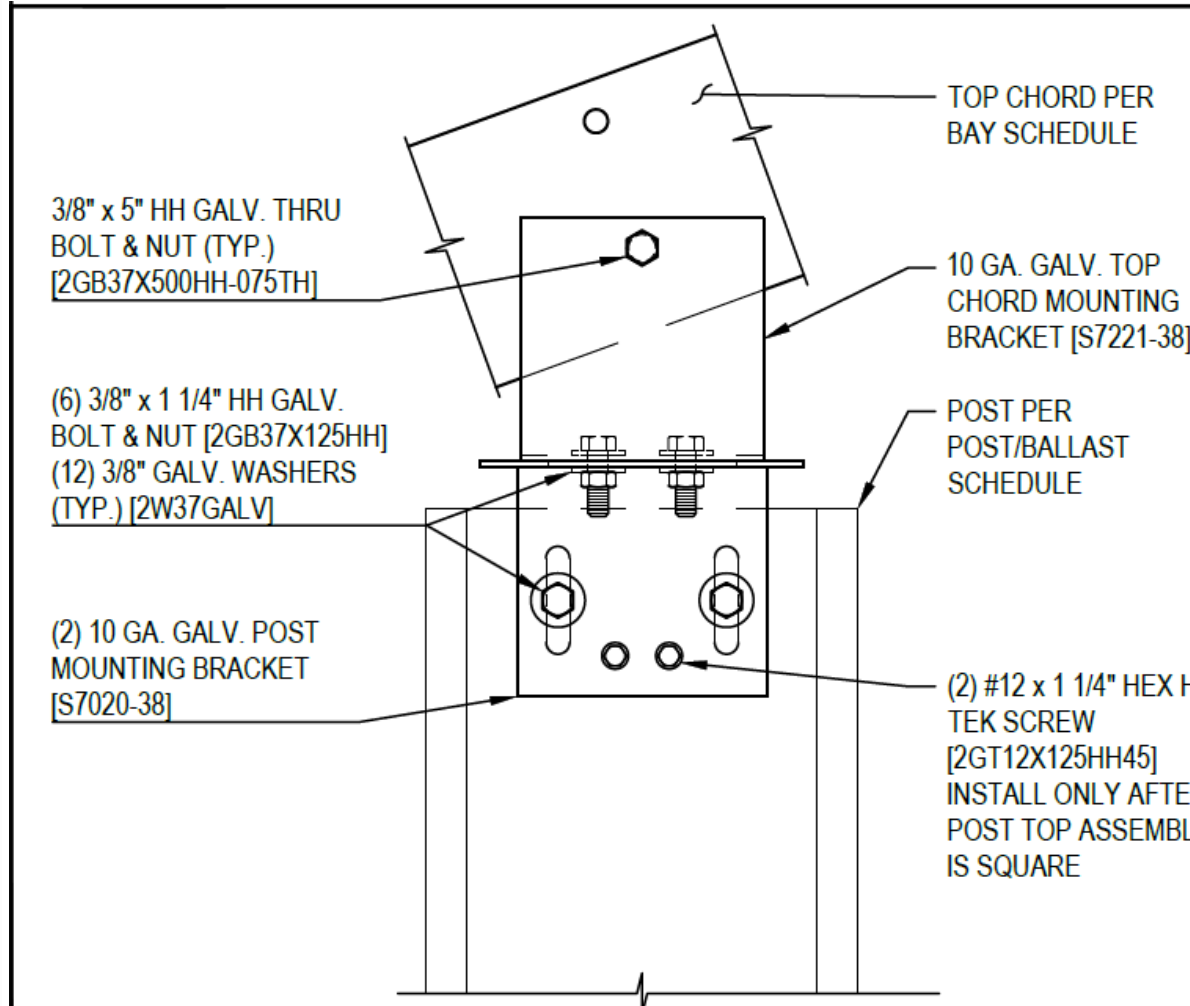


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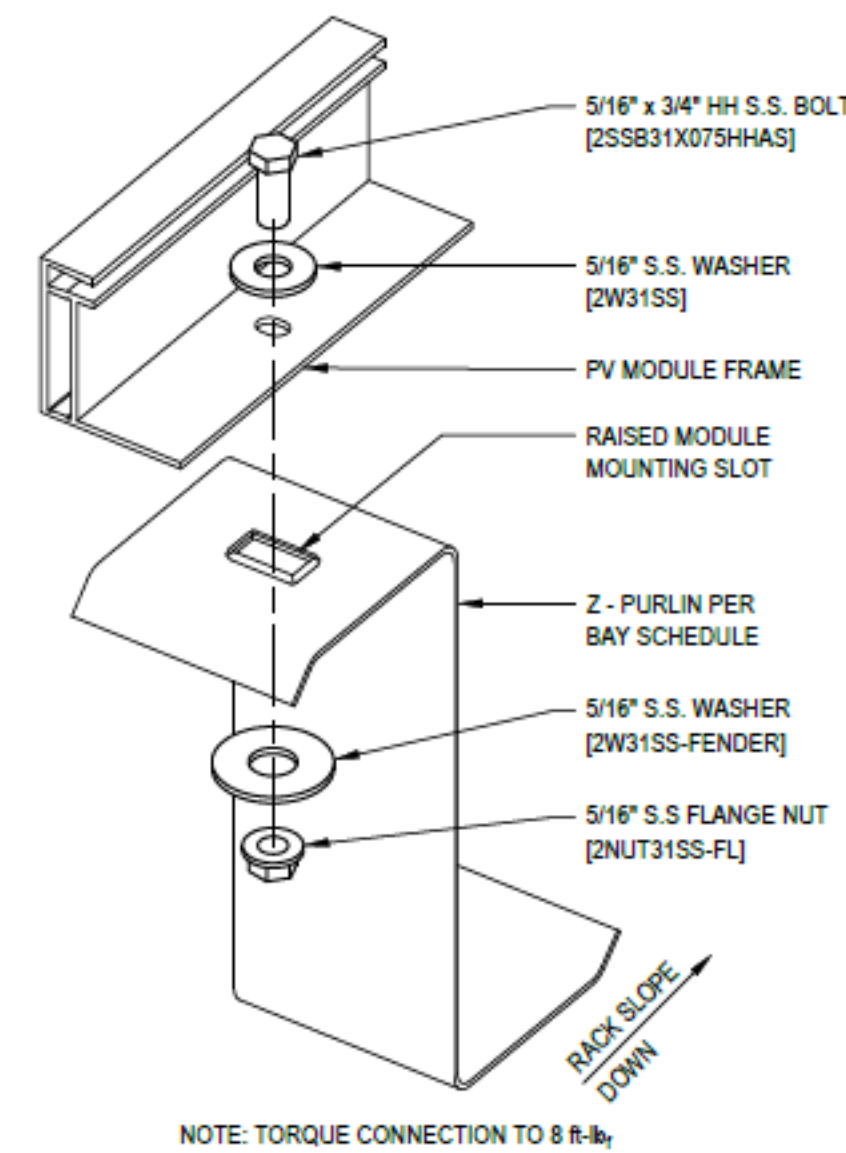




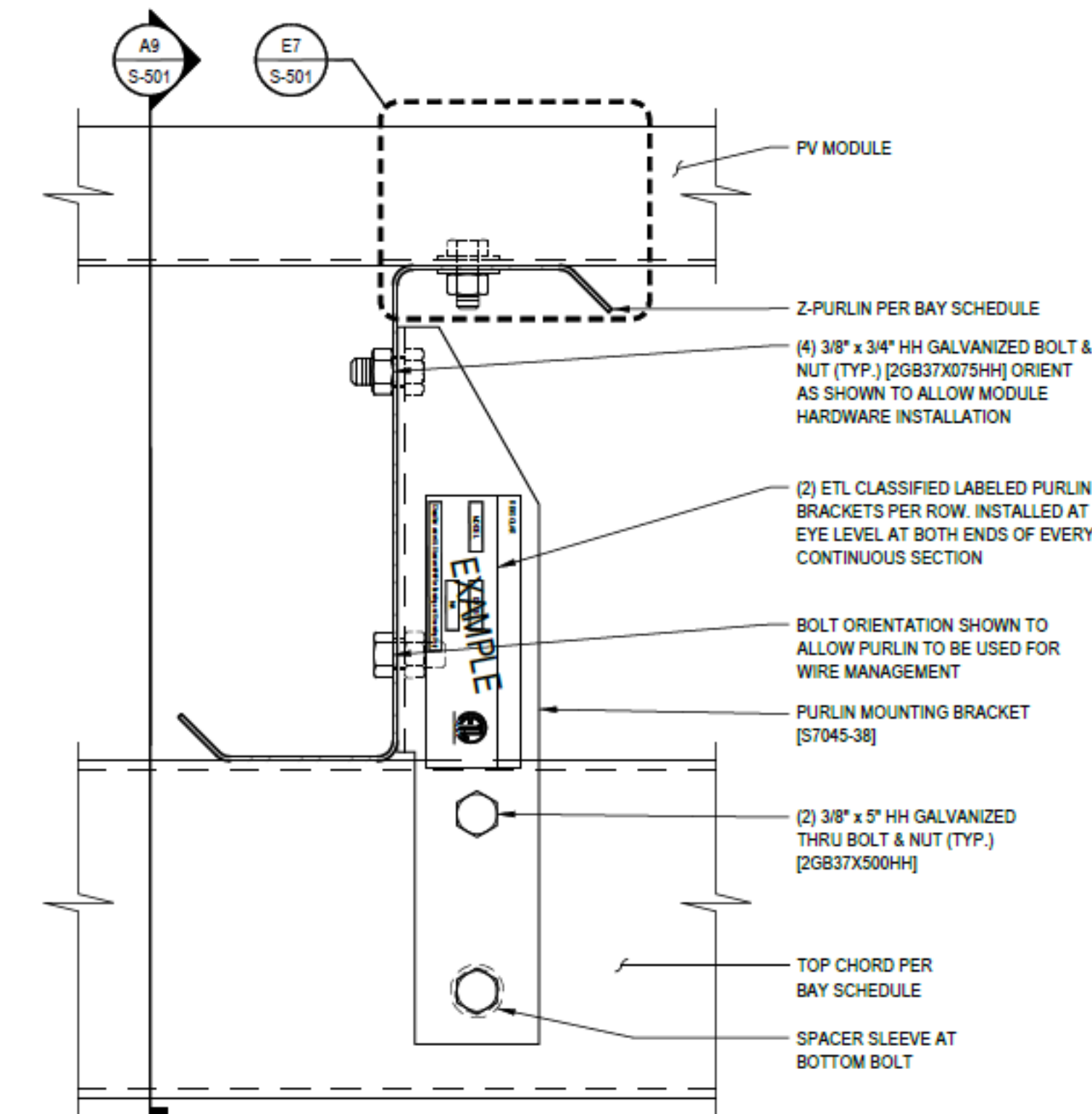
D2 UPPER KNEE BRACE TO TOP CHORD CONNECTION DETAIL
SCALE: NTS



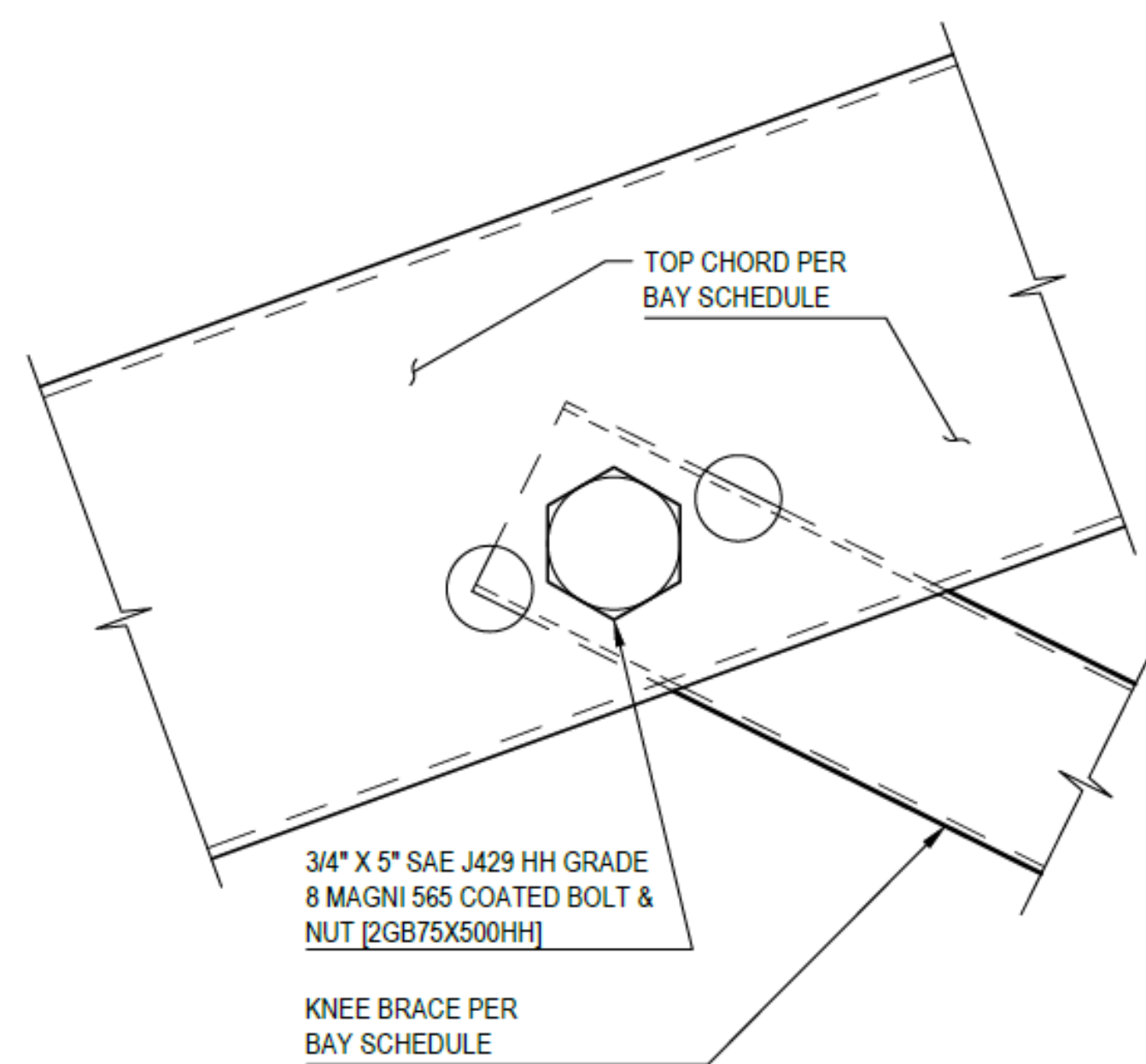
D5 TOP CHORD TO POST CONNECTION DETAIL
SCALE: NTS



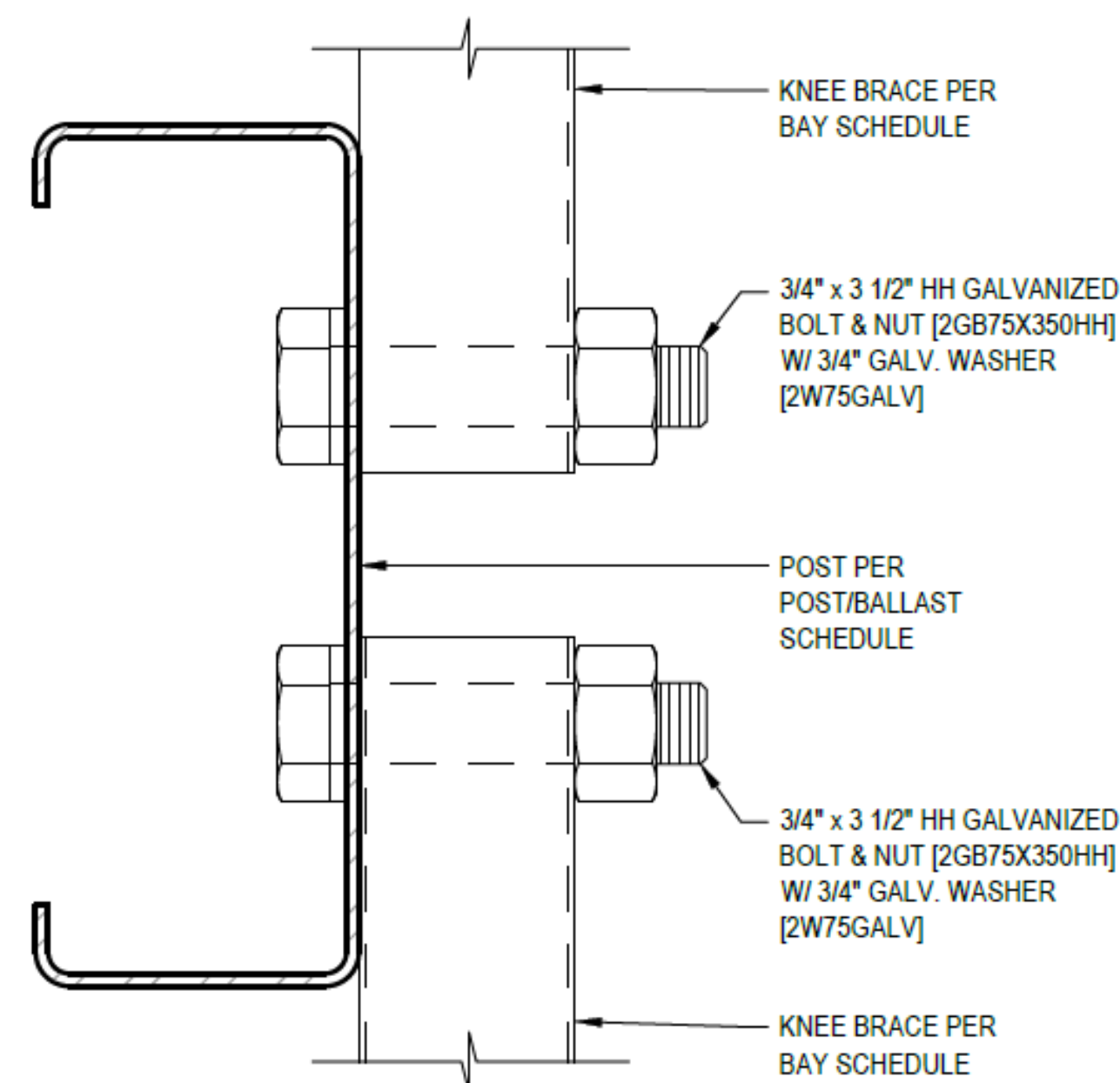
E7 PV MODULE TO PURLIN CONNECTION DETAIL
SCALE: NTS



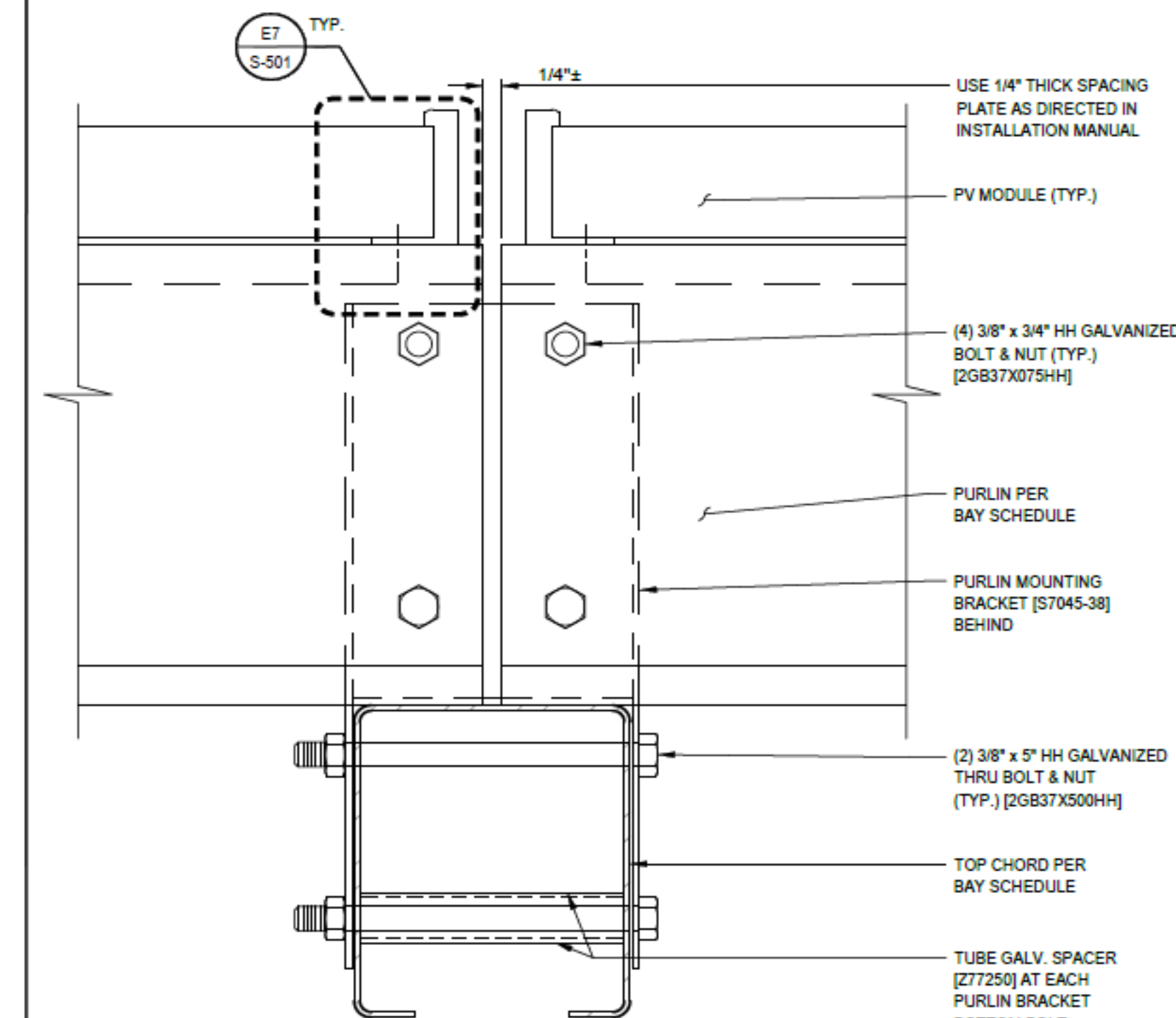
E9 TRANSVERSE PURLIN CONNECTION DETAIL
SCALE: NTS



A2 LOWER KNEE BRACE TO TOP CHORD CONNECTION DETAIL
SCALE: NTS



A5 KNEE BRACE TO POST CONNECTION DETAIL
SCALE: NTS



A9 LONGITUDINAL PURLIN CONNECTION DETAIL
SCALE: NTS

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Sheet Title:
GROUND MOUNT DETAILS

Sheet Number:
SI.1

Sheet Size:
ARCH D - 36" x 24"

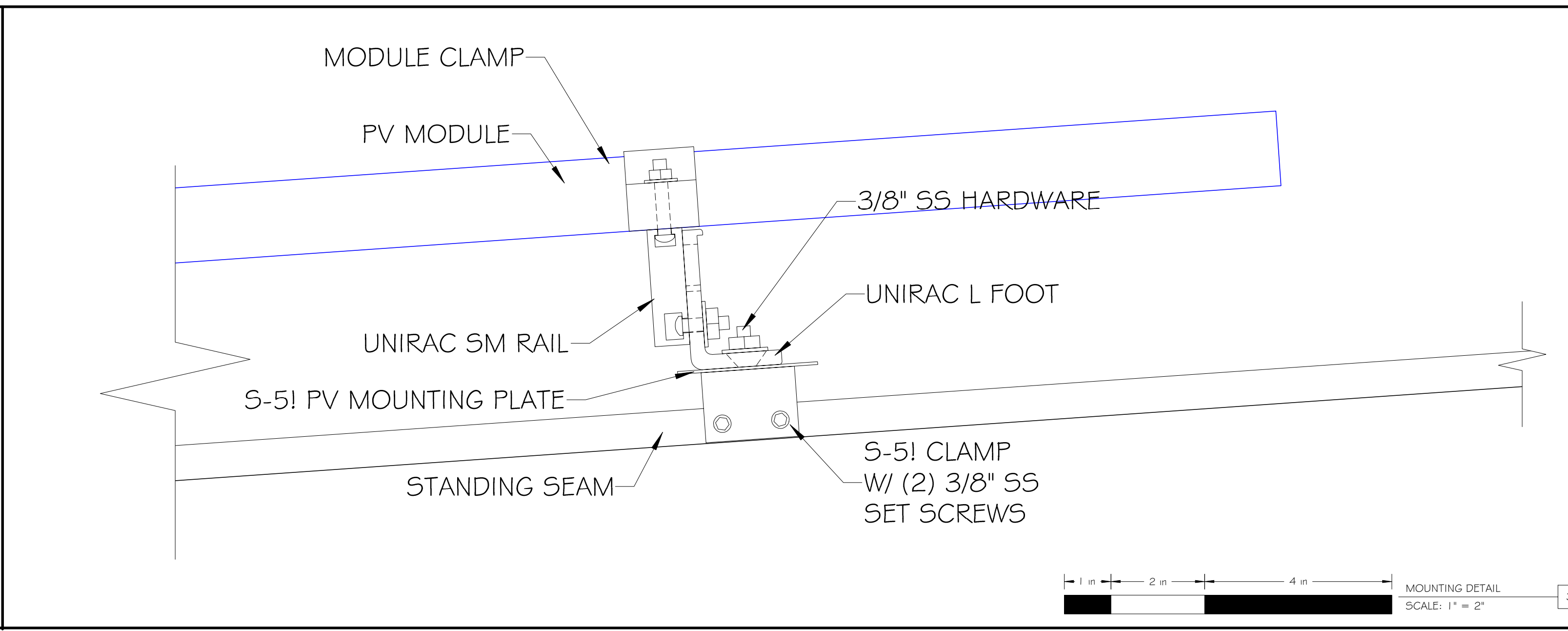
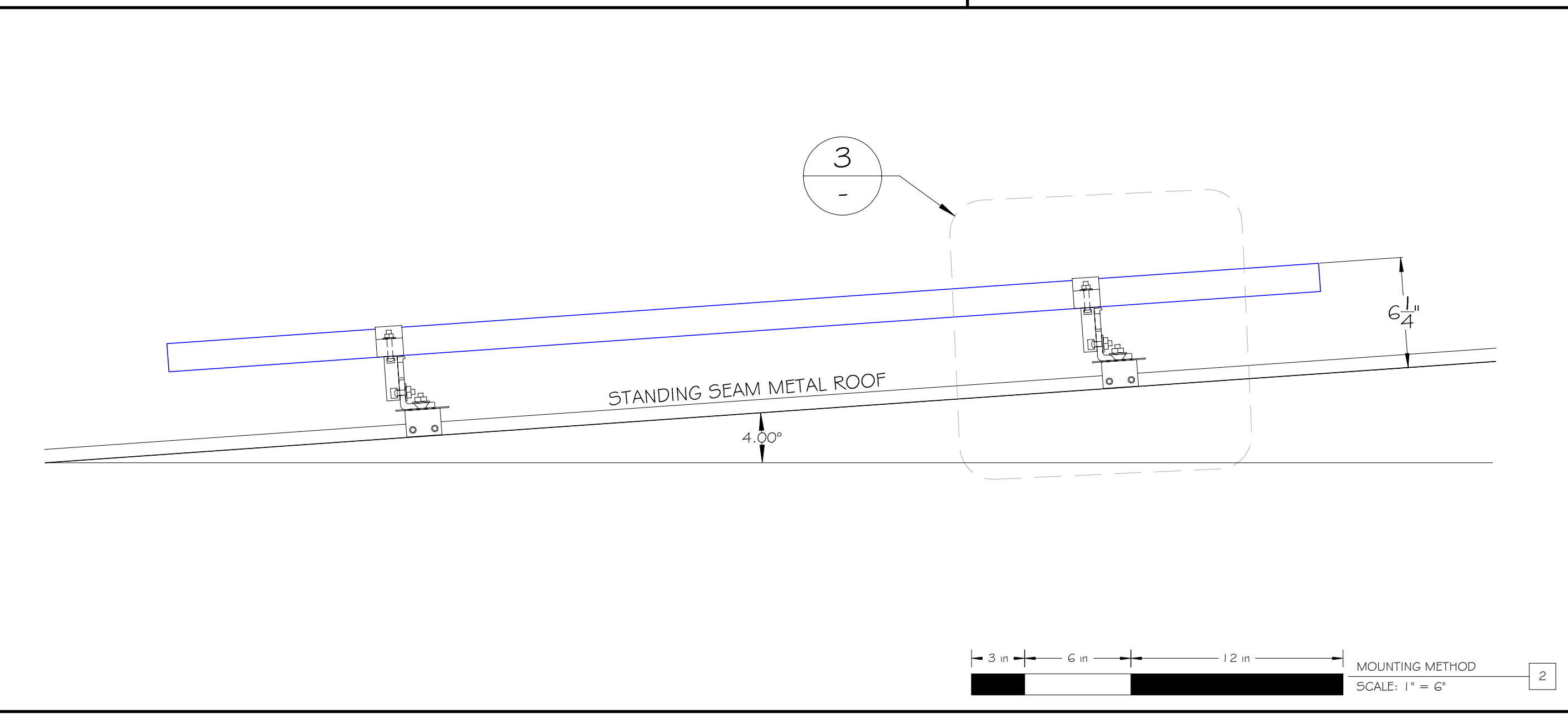
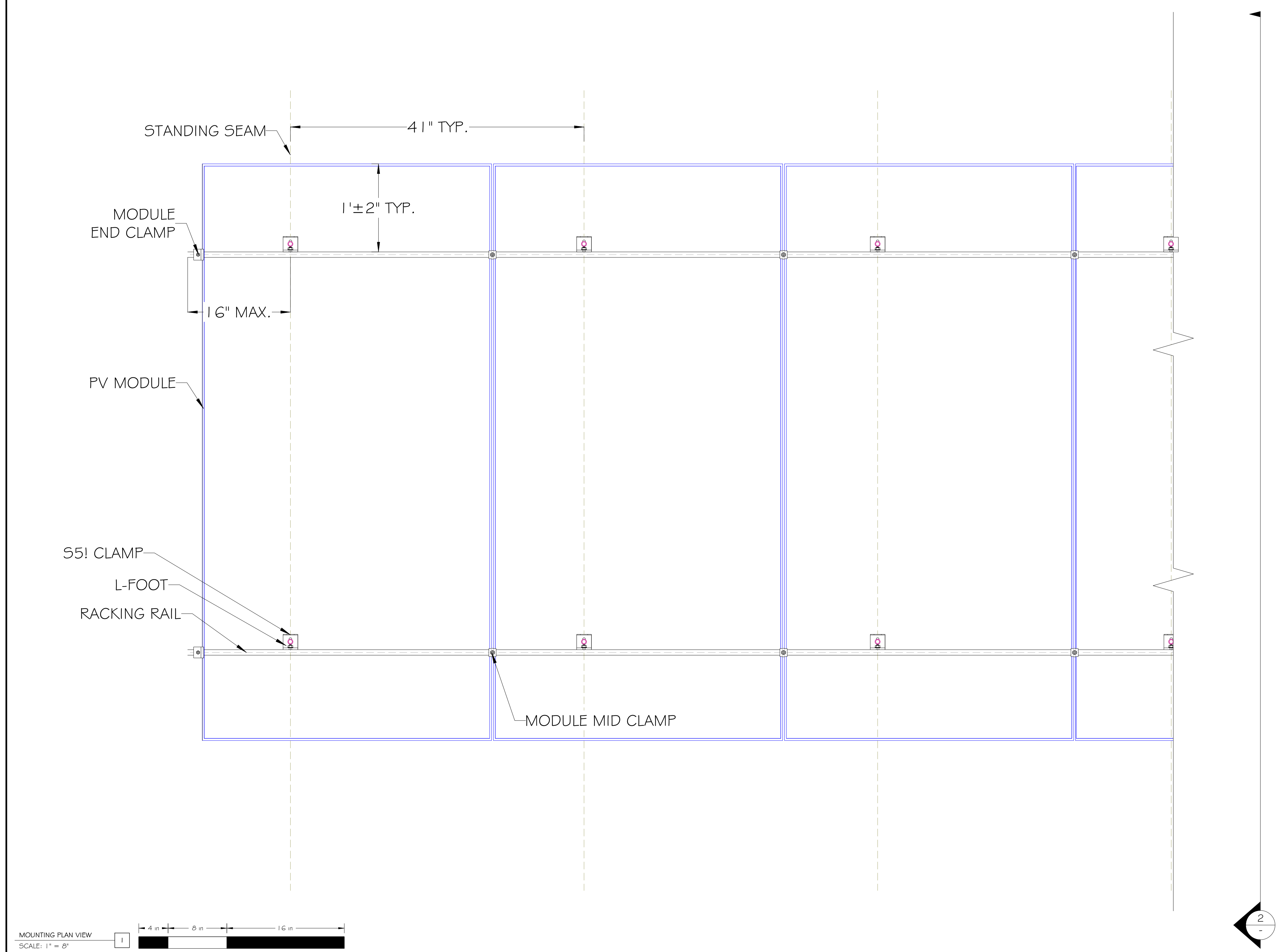
DESIGN & DRAFTING BY:
CLARK FLEMING

"Do not pray for an easy life, pray for the strength to endure a difficult one."
- Bruce Lee



Reviewed & Approved by:
RD

STRUCTURAL CALCULATIONS			
	QTY	WEIGHT EA.	TOTAL
PV MODULE	195	52.9 LBS	= 10316 LBS
RACKING RAIL	1310	0.81 LB/FT	= 1062 LBS
ATTACHMENT	400	1.50 LBS	= 600 LBS
MICRO/OPT.	100	2.34 LBS	= 234 LBS
TOTAL WEIGHT: 12212 LBS			
ARRAY AREA: 4188 SQ. FT.			
DEAD LOAD: 2.9 PSF			
POINT LOAD: 30.5 LBS			



Project:
ANDOVER, NJ 07821

Project Details:
307.395 kWdc, 230.00 kW AC
AHJ: GREEN, TOWNSHIP

Engineering Approval:

REVISIONS		
DESCRIPTION	DATE	REV
ORIGINAL	6/15/2018	A
ELECTRICAL	7/7/2018	B
LAYOUT	7/17/2018	C

Sheet Title:
ROOF MOUNTING & RACKING METHOD

Sheet Number:
S2.0

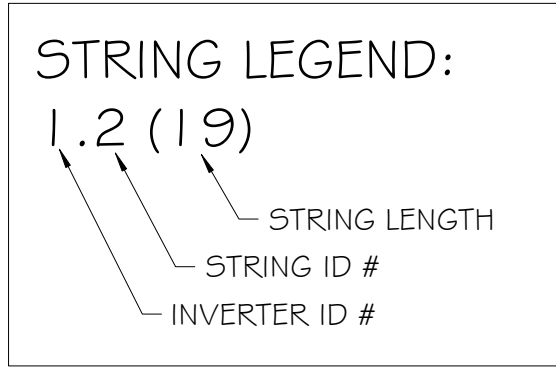
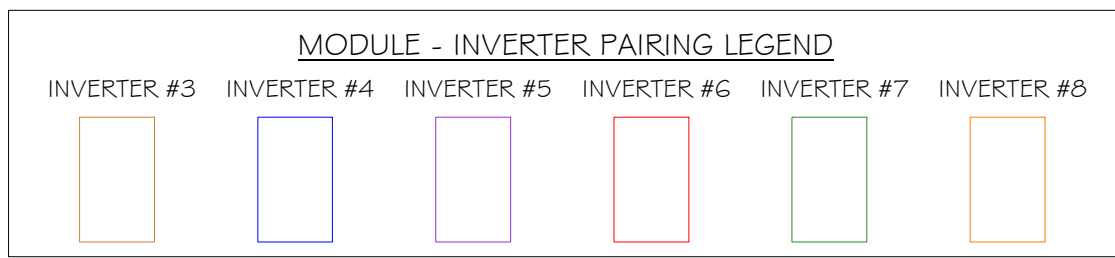
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DESIGN & DRAFTING BY:
CLARK FLEMING

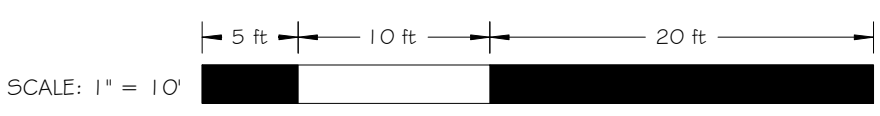
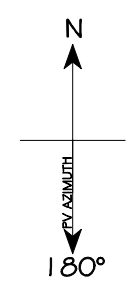
"Do not pray for an easy life, pray for the strength to endure a difficult one."
- Bruce Lee

Reviewed & Approved by:
RD

SepiSolar
POWER BY DESIGN



NOTES:
PROVIDE TRANSITION JUMPERS, AS
REQUIRED TO MATE IDENTICAL CONNECTORS



Project:
ANDOVER, NJ 07821

Project Details:
307.395 kWdc, 230.00 kW AC
AHJ: GREEN, TOWNSHIP

Engineering Approval:

REVISIONS

DESCRIPTION	DATE	REV
ORIGINAL	6/15/2018	A
ELECTRICAL	7/7/2018	B
LAYOUT	7/17/2018	C

Sheet Title:
**GROUND MOUNT
ELECTRICAL LAYOUT**

Sheet Number:
E1.0

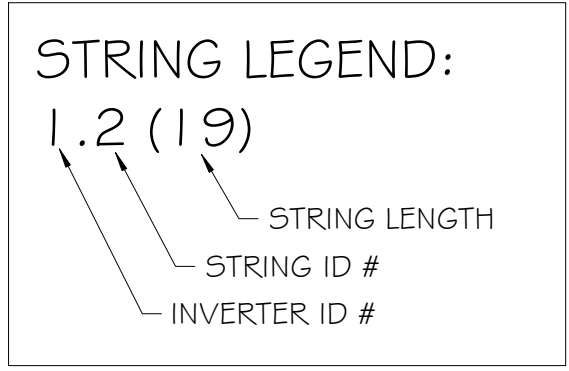
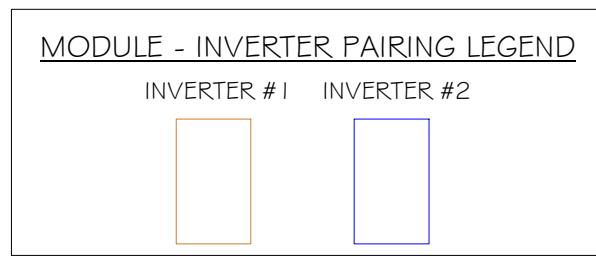
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CLARK FLEMING

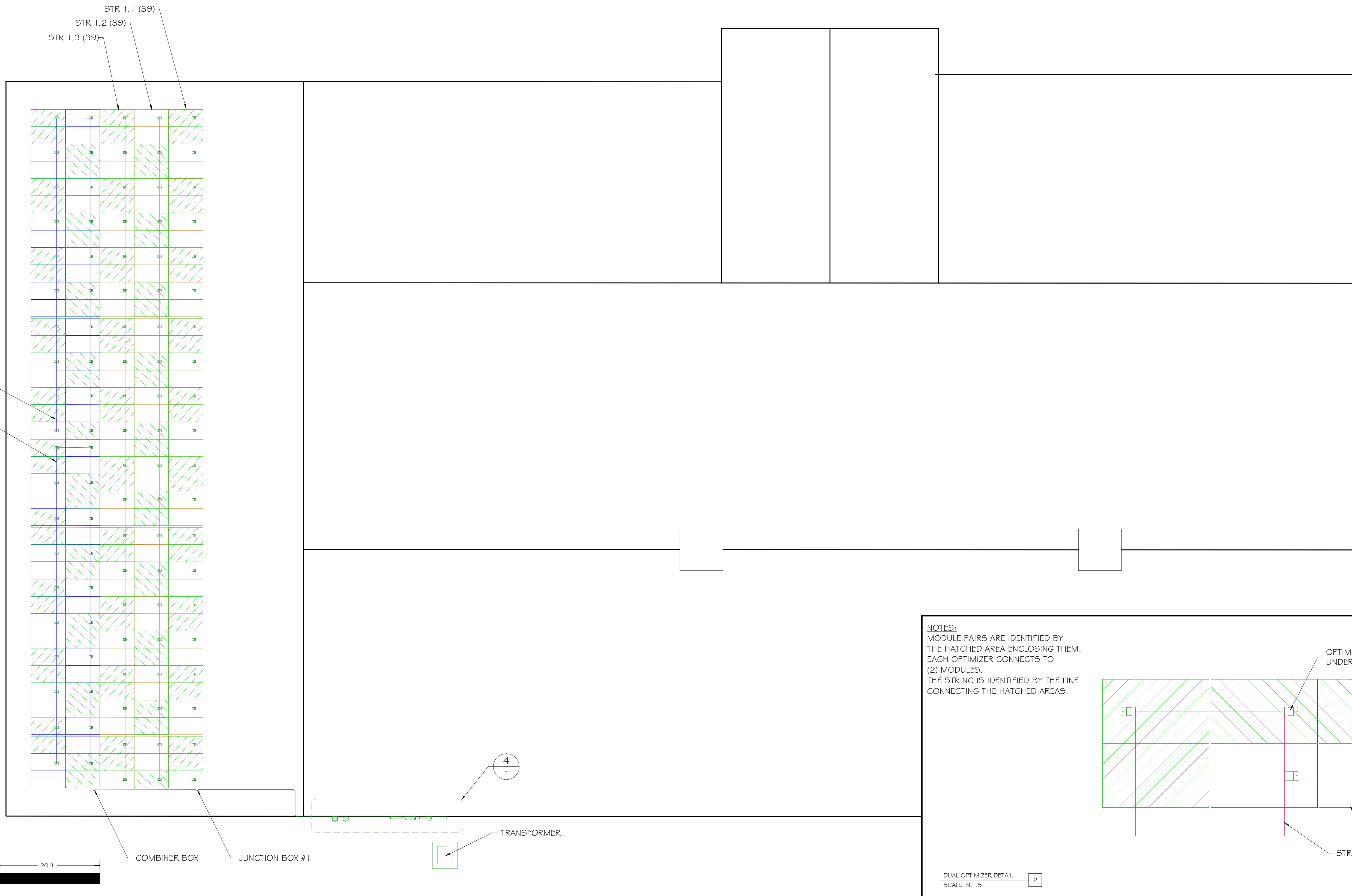
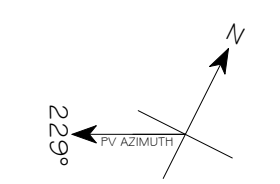
*"Do not pray for an easy life, pray for
the strength to endure a difficult one."*
- Bruce Lee



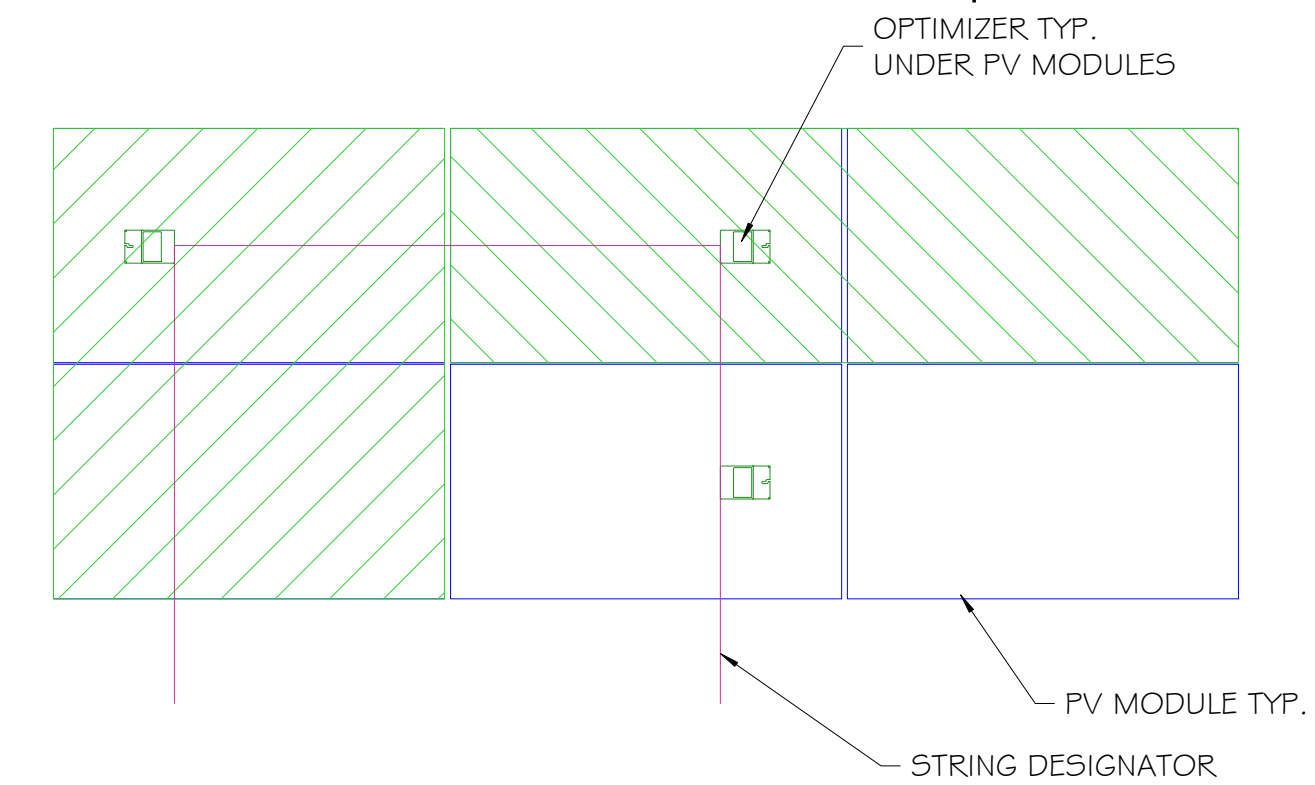
Reviewed & Approved by:
RD



NOTES:
PROVIDE TRANSITION JUMPERS, AS REQUIRED TO MATE IDENTICAL CONNECTORS



NOTES:
MODULE PAIRS ARE IDENTIFIED BY THE HATCHED AREA ENCLOSING THEM. EACH OPTIMIZER CONNECTS TO (2) MODULES. THE STRING IS IDENTIFIED BY THE LINE CONNECTING THE HATCHED AREAS.



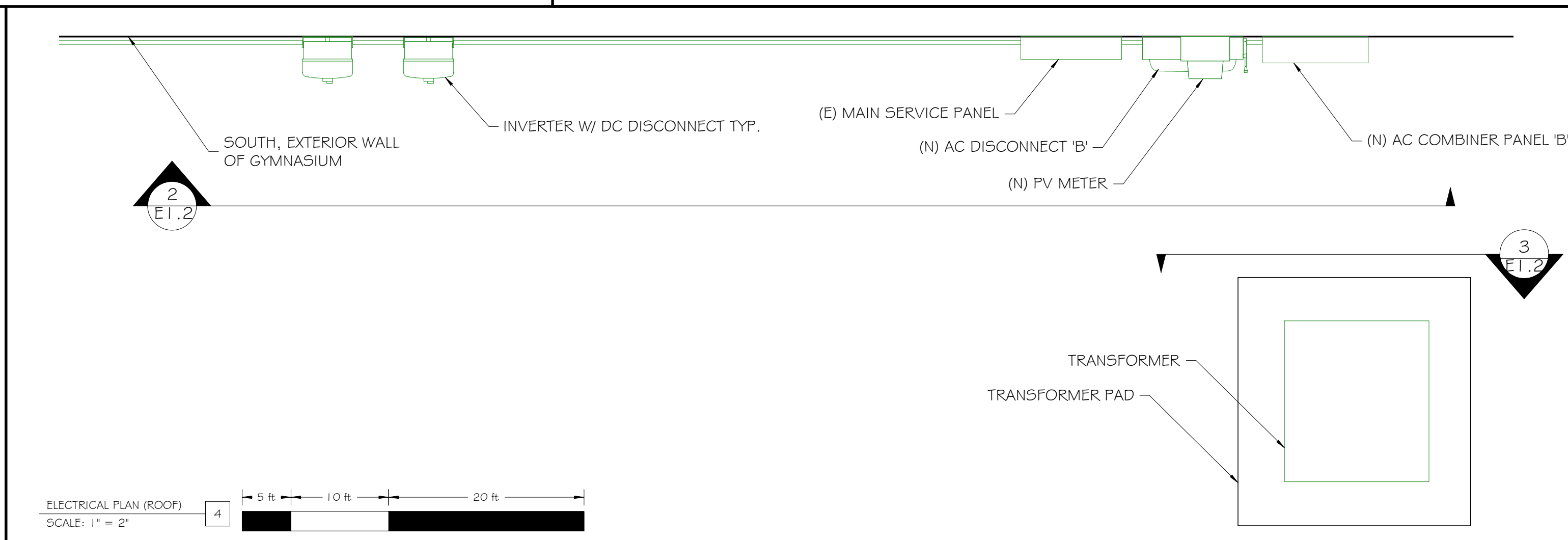
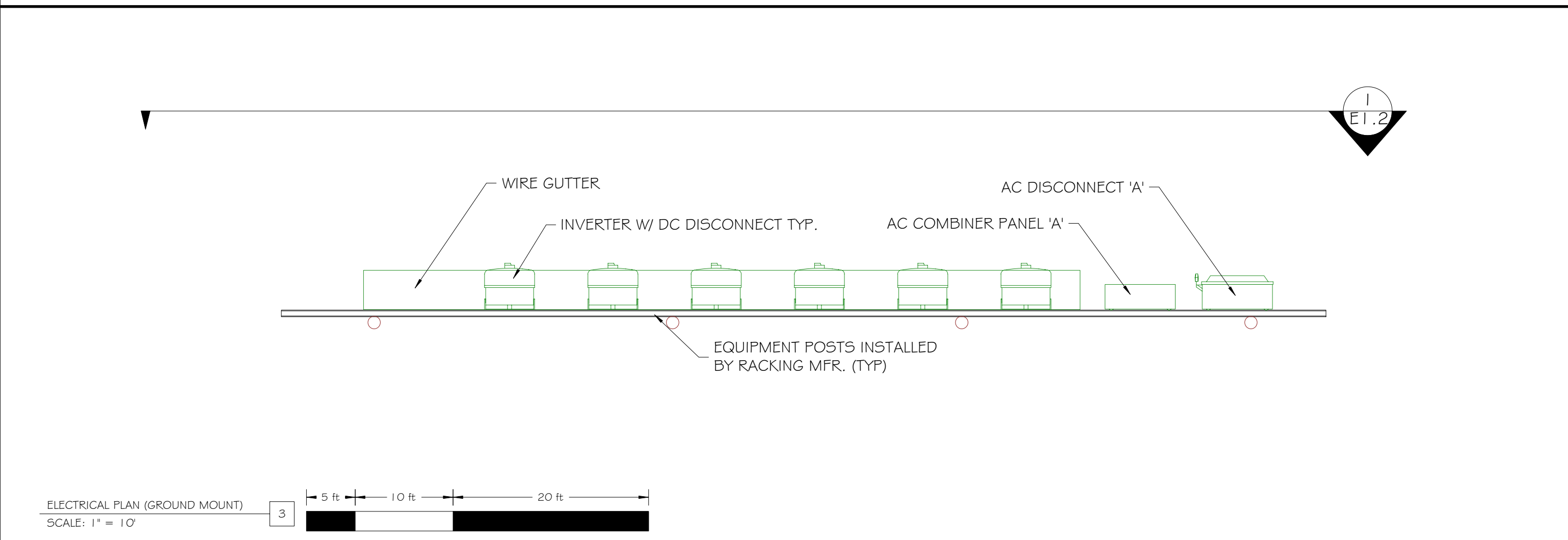
Project:
ANDOVER, NJ 07821

Project Details:
307.395 kW_{dc}, 230.00 kW_{AC}
AHJ: GREEN, TOWNSHIP

Engineering Approval:

REVISIONS

DESCRIPTION	DATE	REV
ORIGINAL	6/15/2018	A
ELECTRICAL	7/7/2018	B
LAYOUT	7/17/2018	C



Sheet Title:
ROOF MOUNT ELECTRICAL LAYOUT

Sheet Number:
E1.1

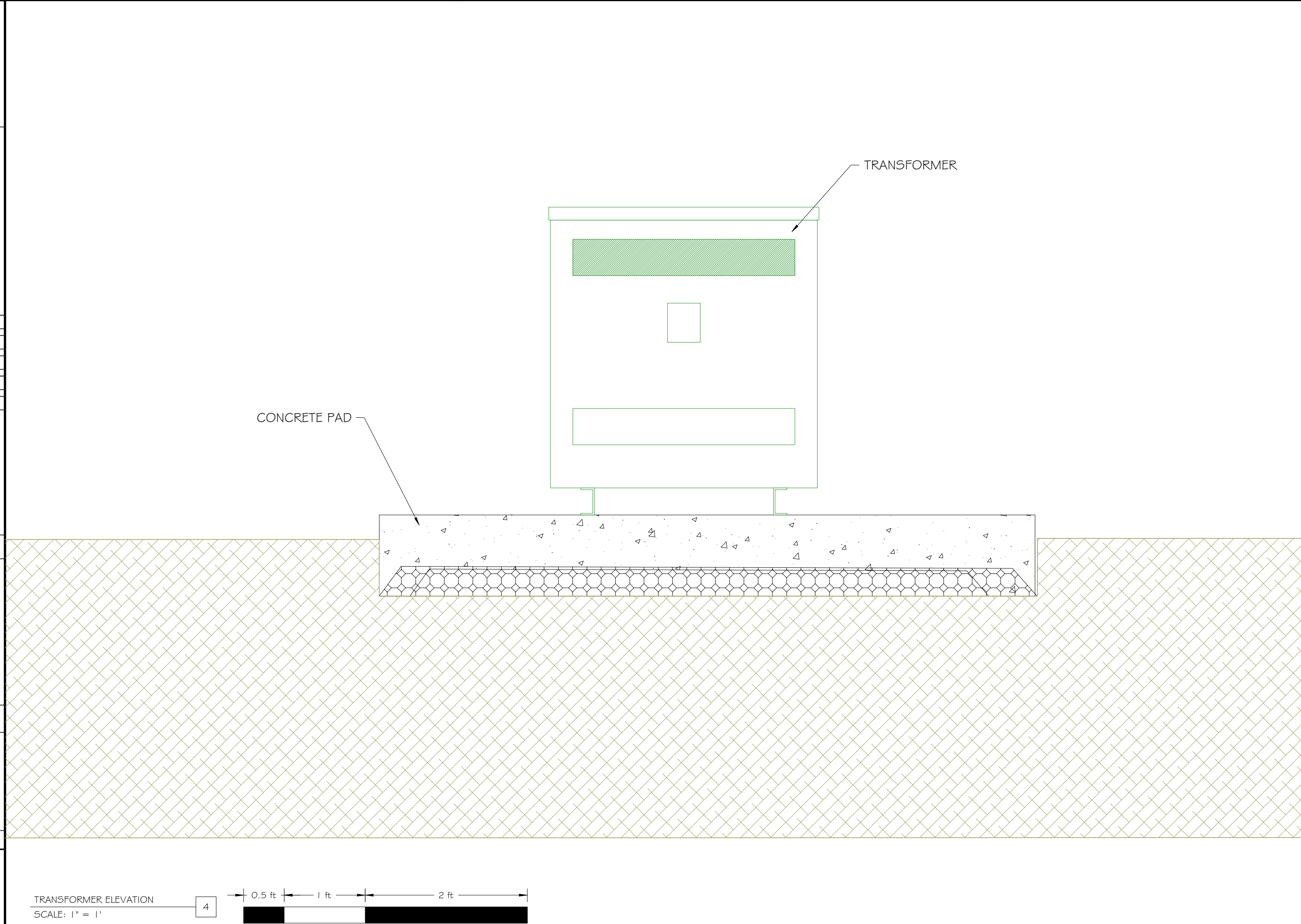
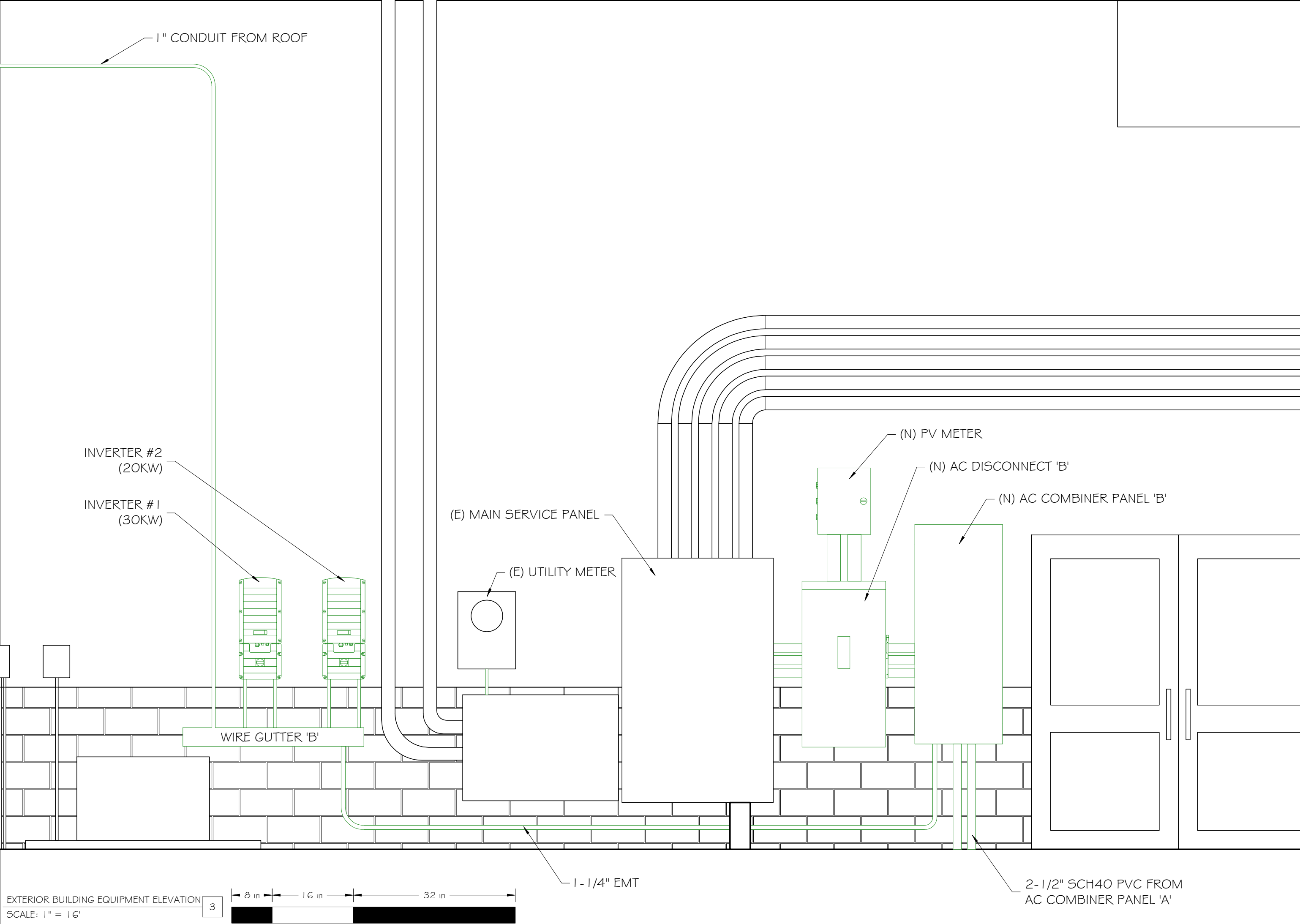
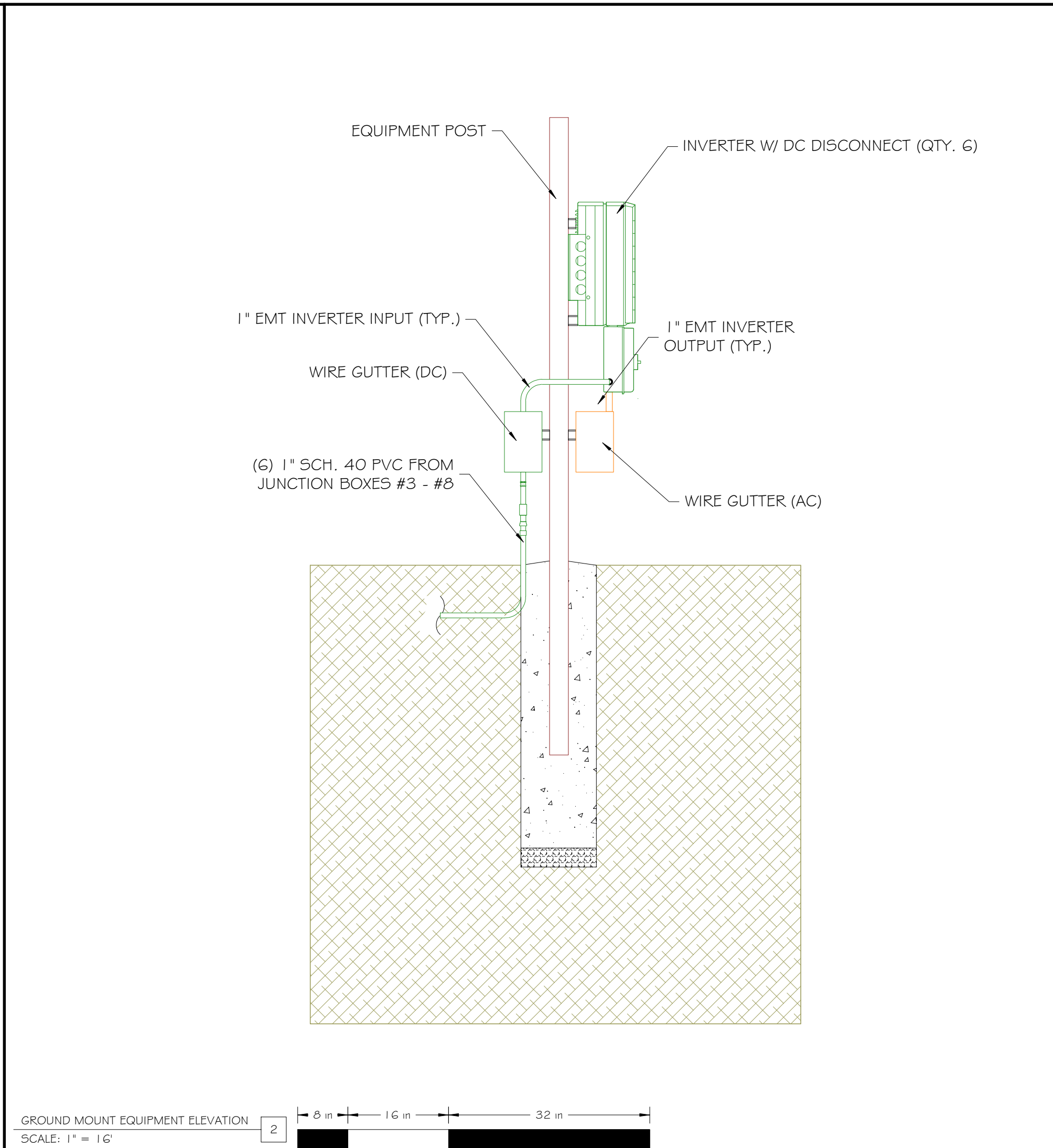
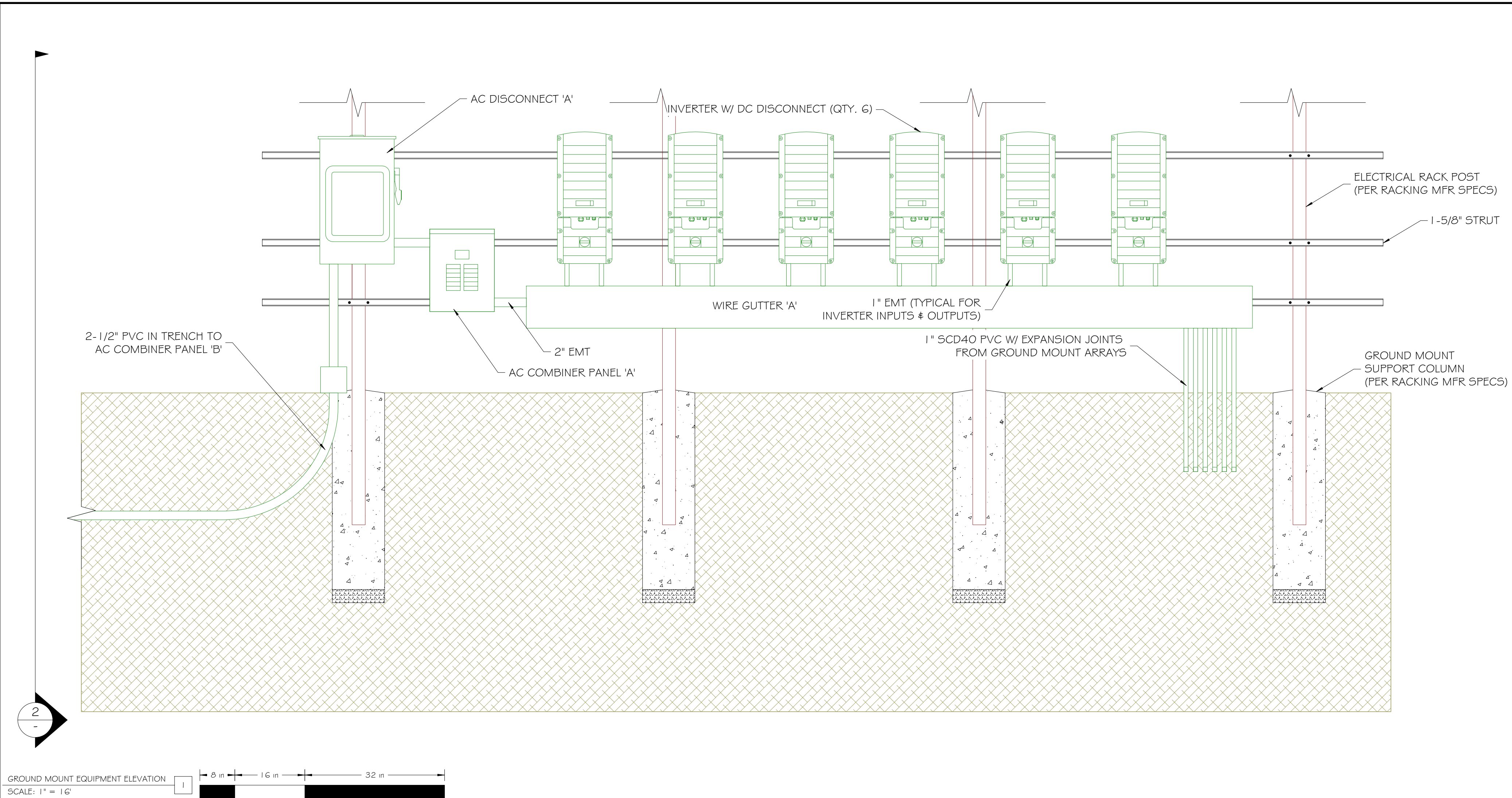
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DESIGN & DRAFTING BY:
CLARK FLEMING

"Do not pray for an easy life, pray for the strength to endure a difficult one."
- Bruce Lee

SepiSolar
POWER BY DESIGN

Reviewed & Approved by:
RD



Project:
ANDOVER, NJ 07821

Project Details:
307,395 kWdc, 230,00 kW AC
AHJ: GREEN, TOWNSHIP

Engineering Approval:

REVISIONS		
DESCRIPTION	DATE	REV
ORIGINAL	6/15/2018	A
ELECTRICAL	7/7/2018	B
LAYOUT	7/17/2018	C

Sheet Title:
ELECTRICAL ELEVATIONS

Sheet Number:
E1.2

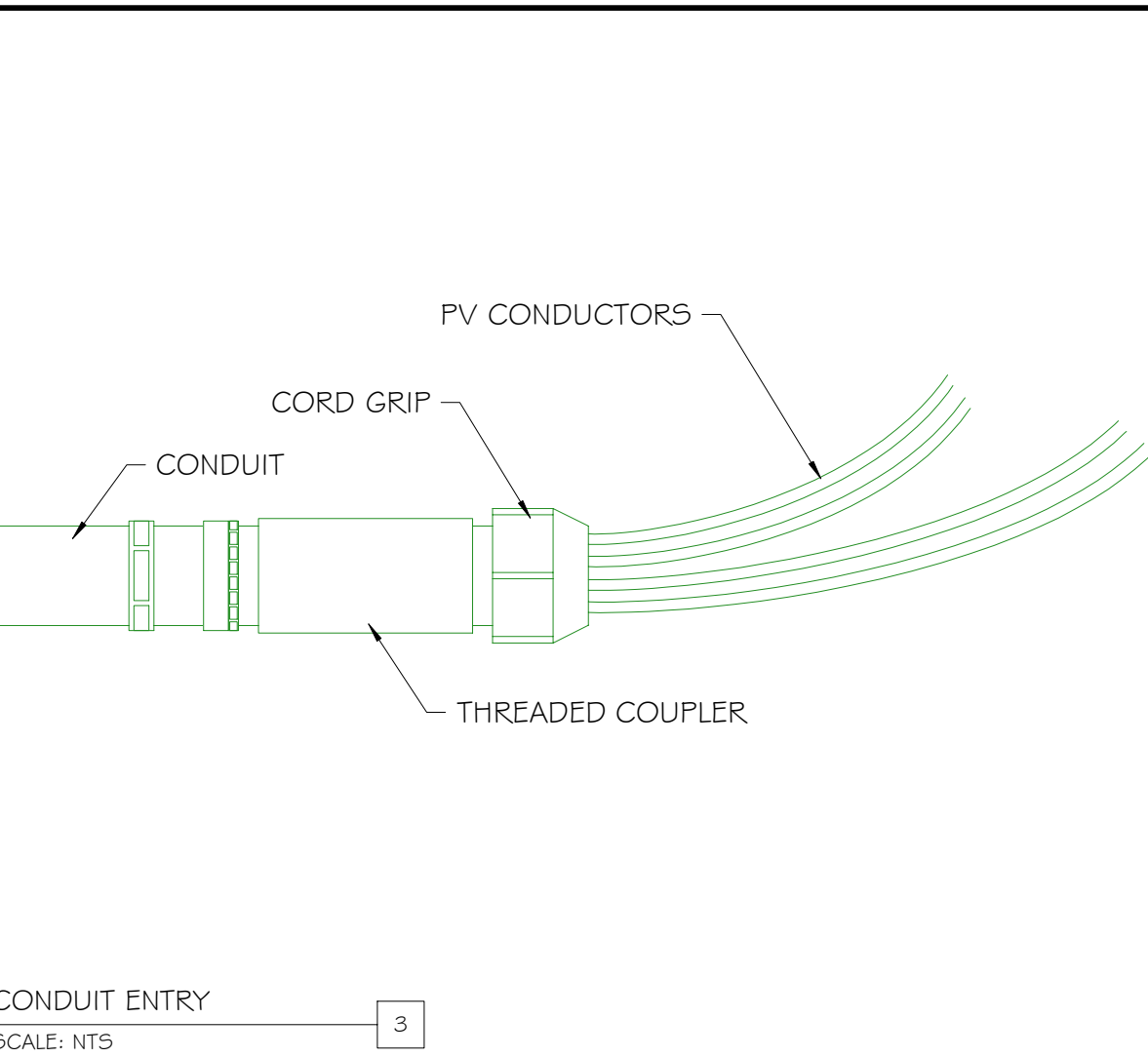
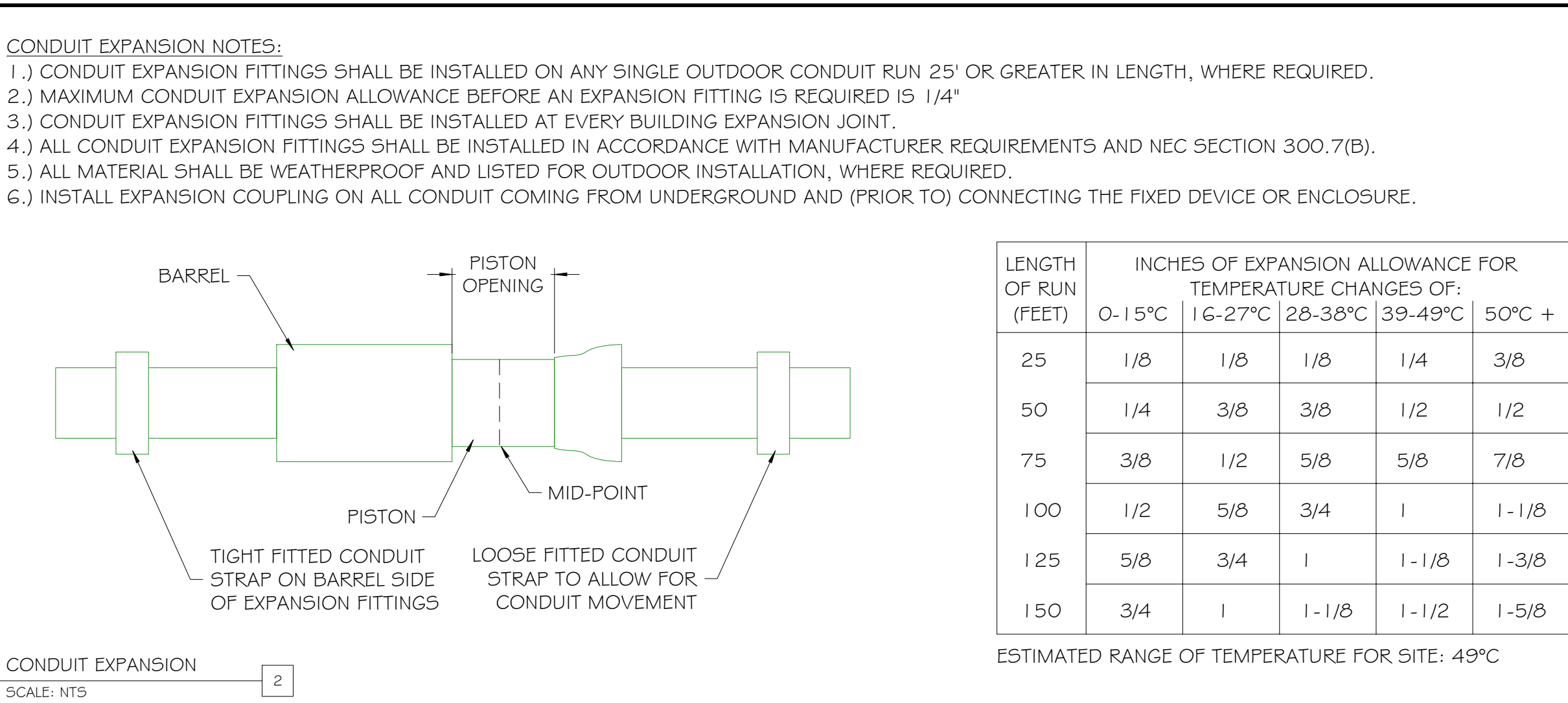
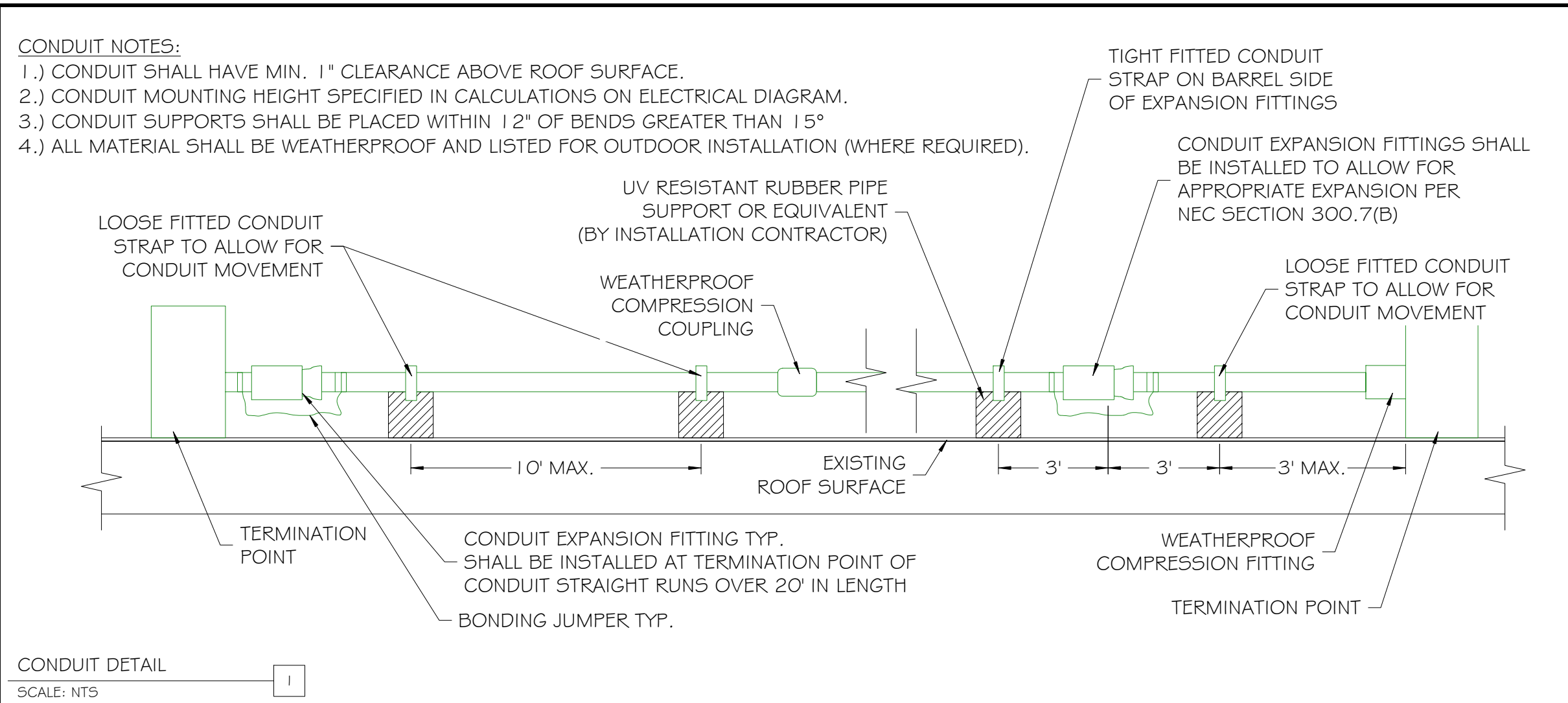
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DESIGN & DRAFTING BY:
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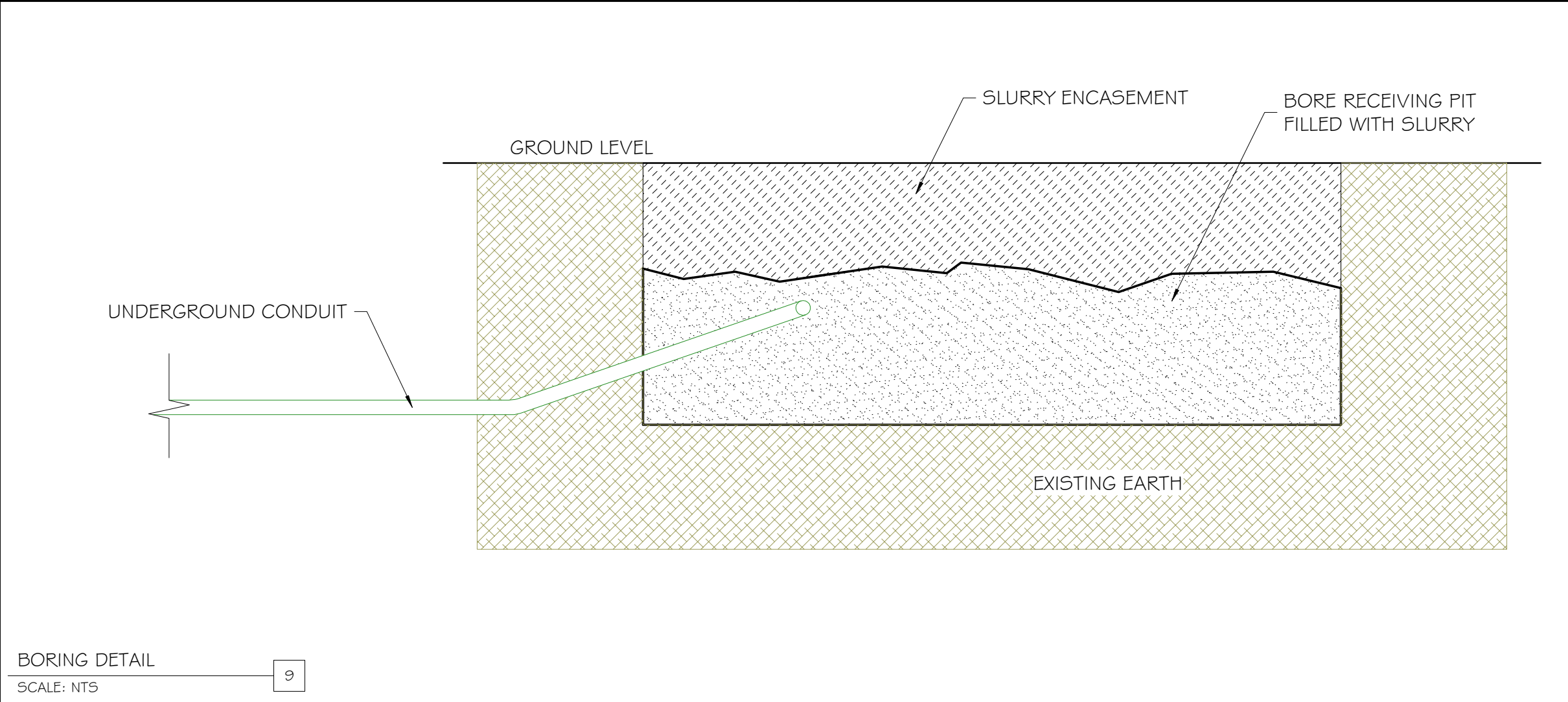
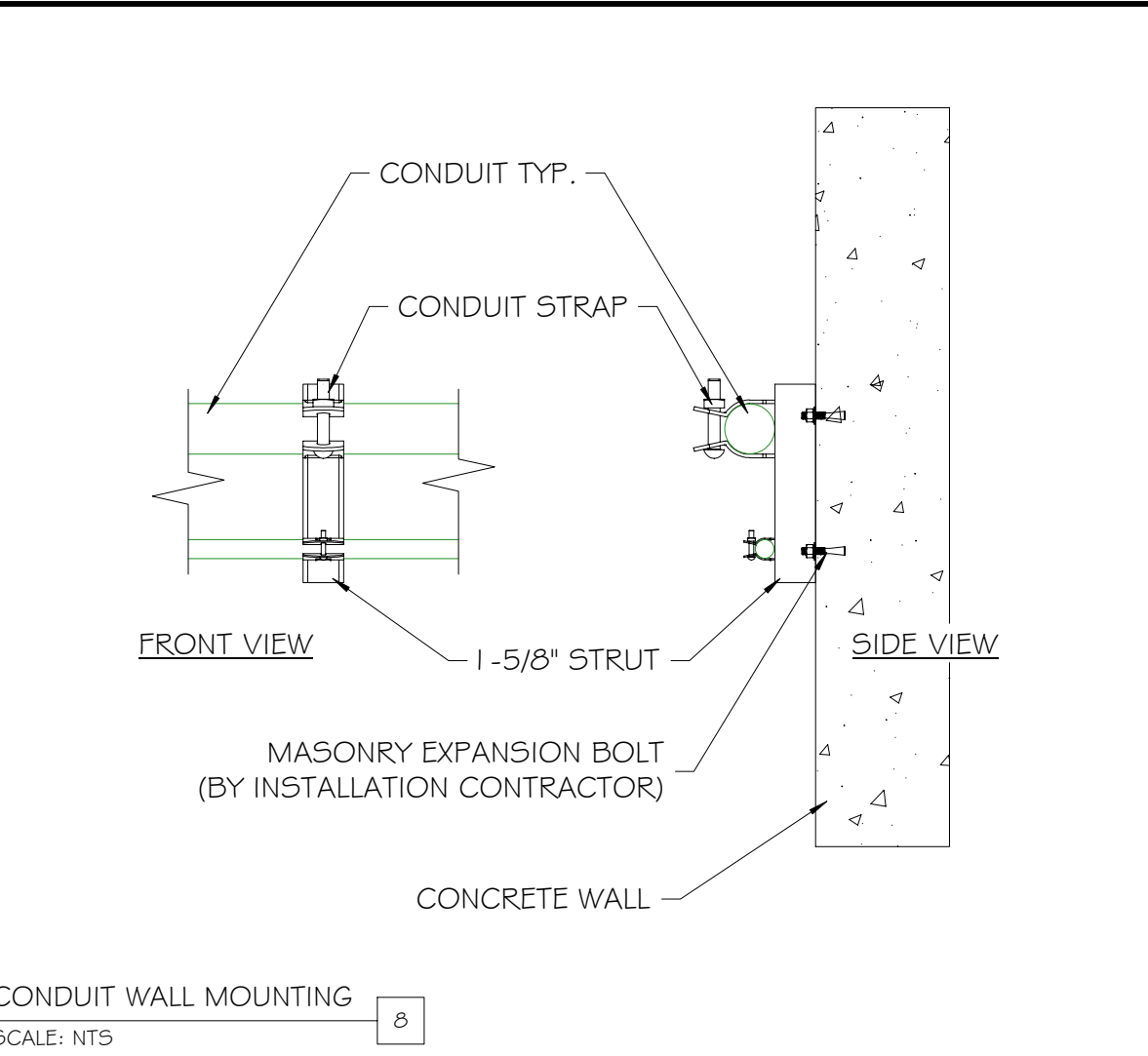
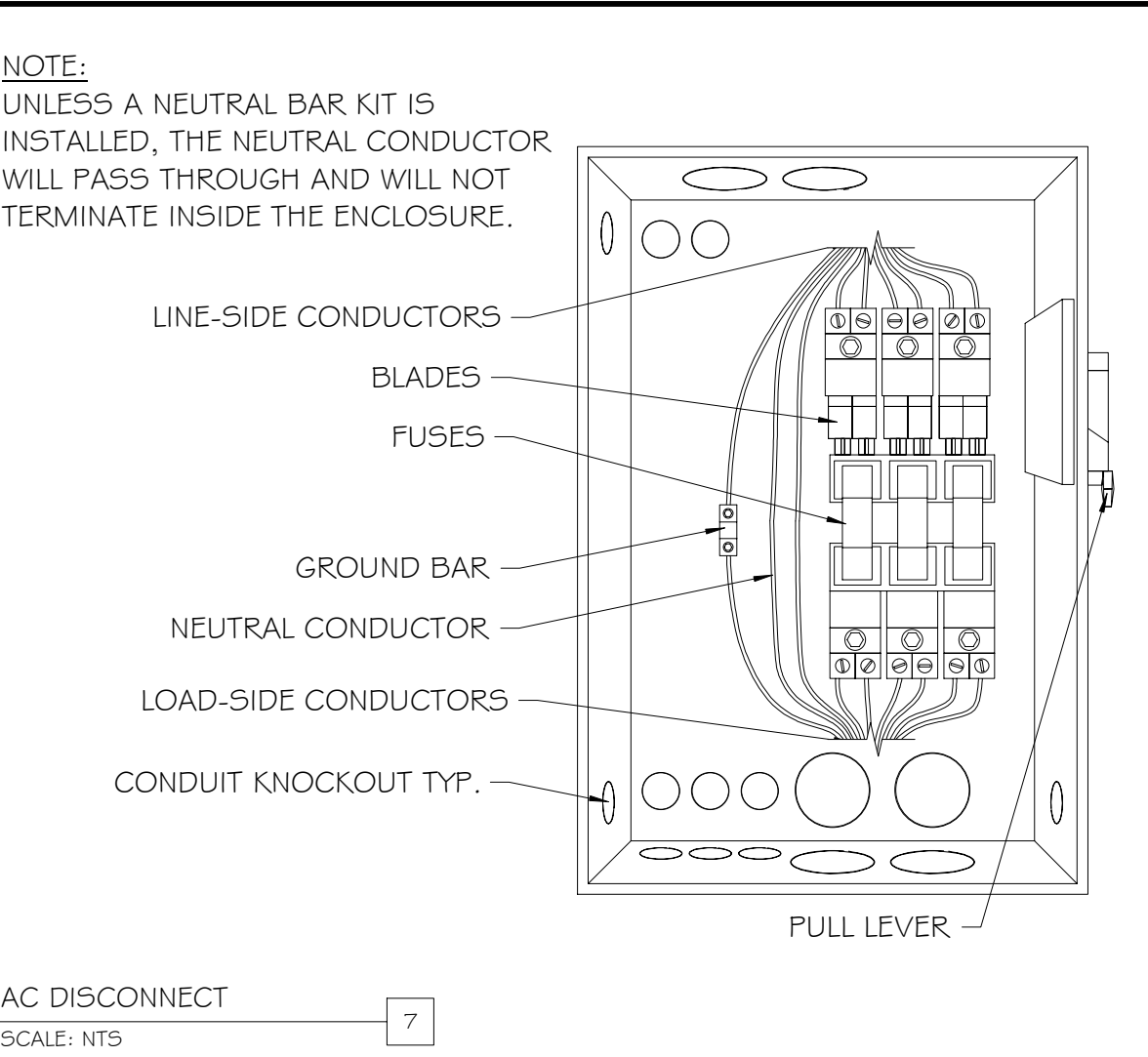
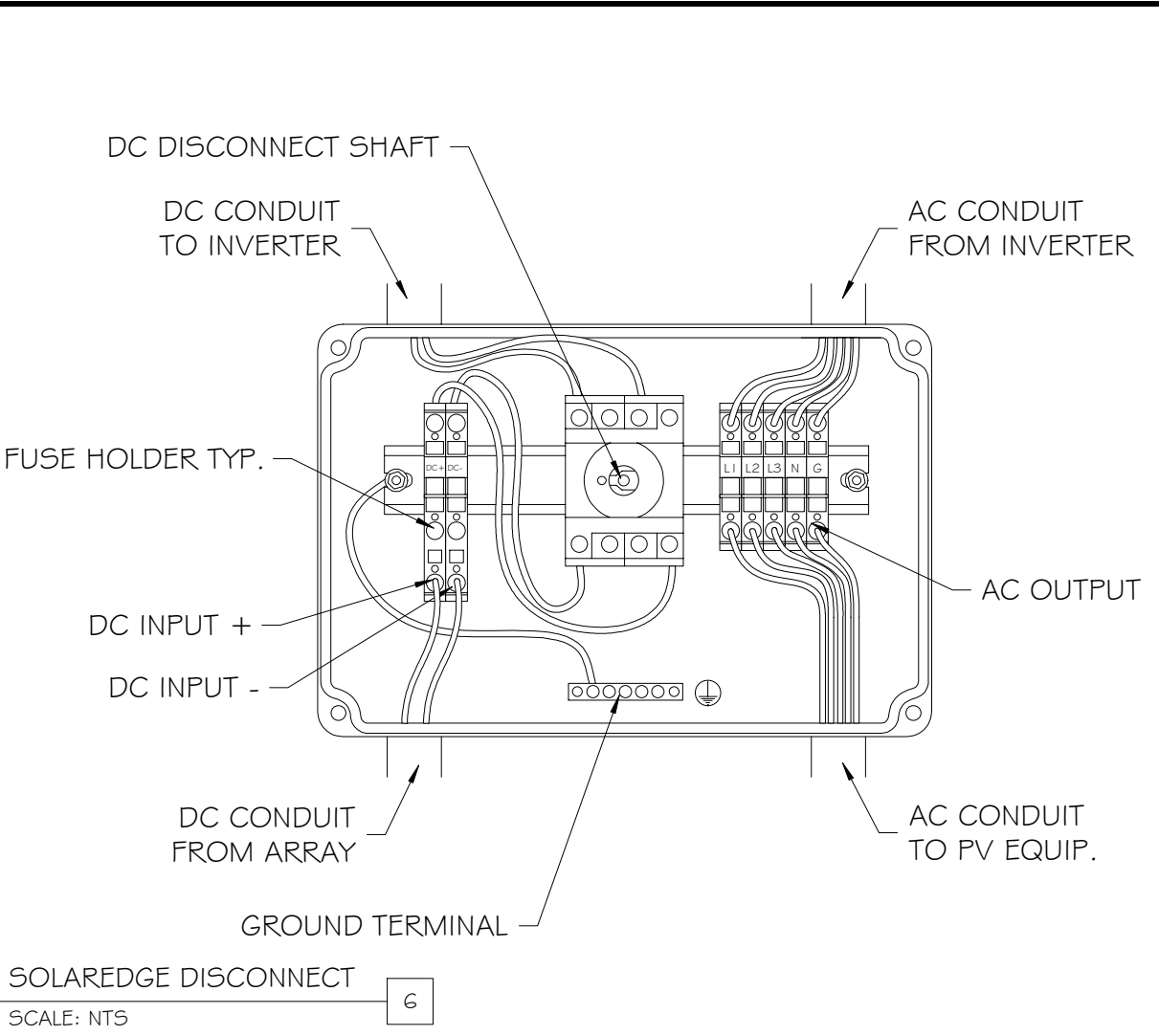
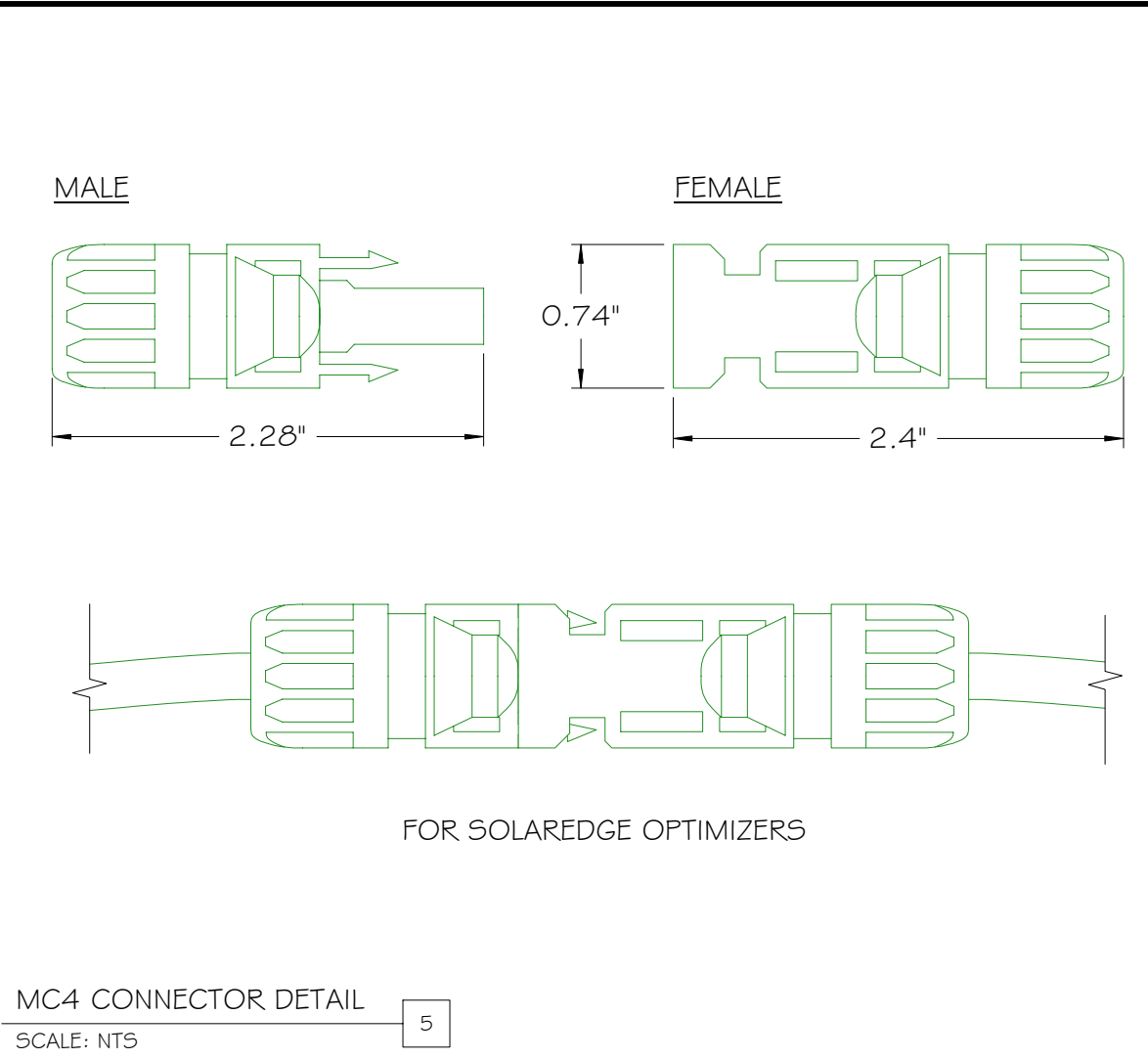
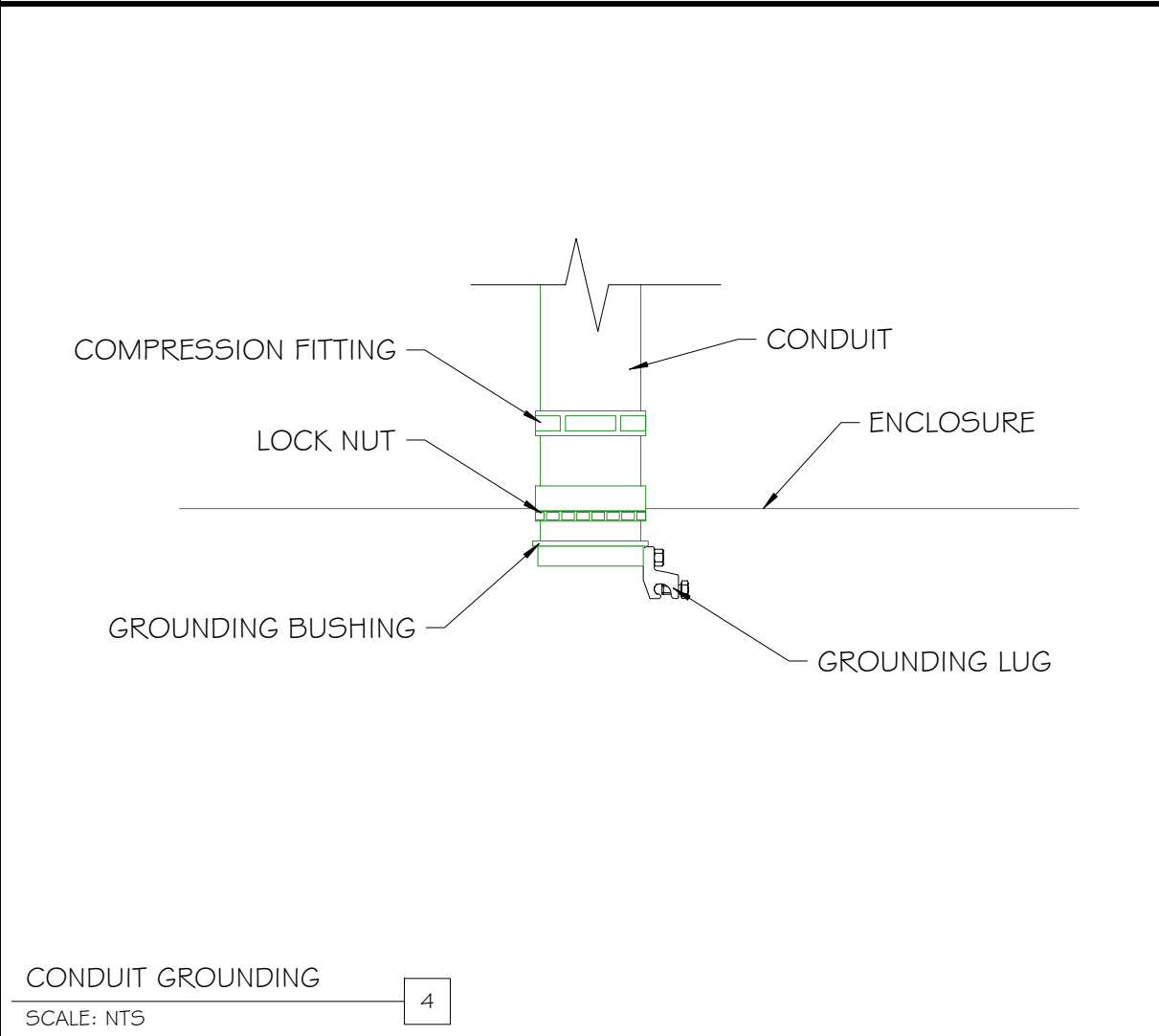
Reviewed & Approved by:
RD



Project:
ANDOVER, NJ 07821

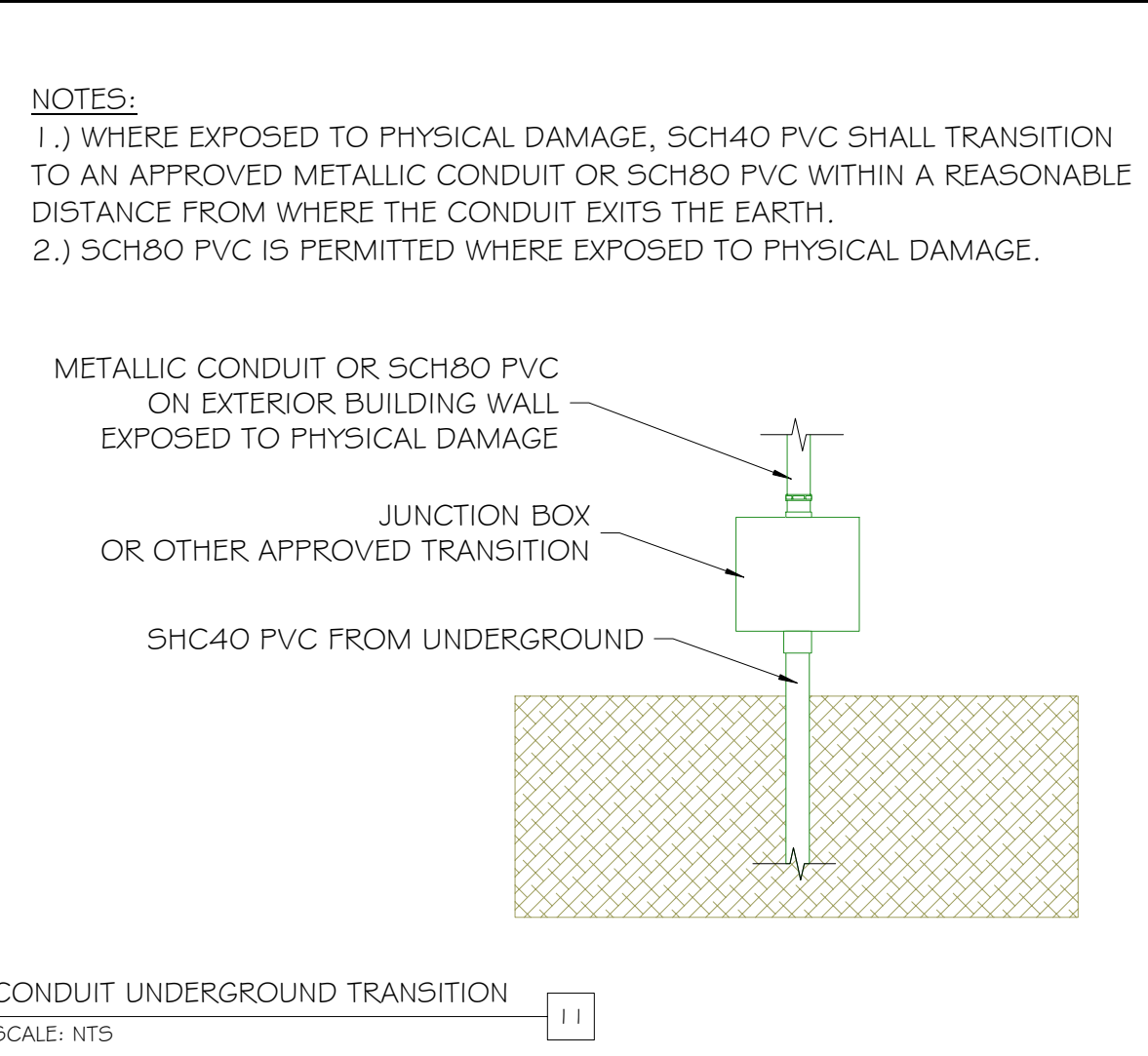
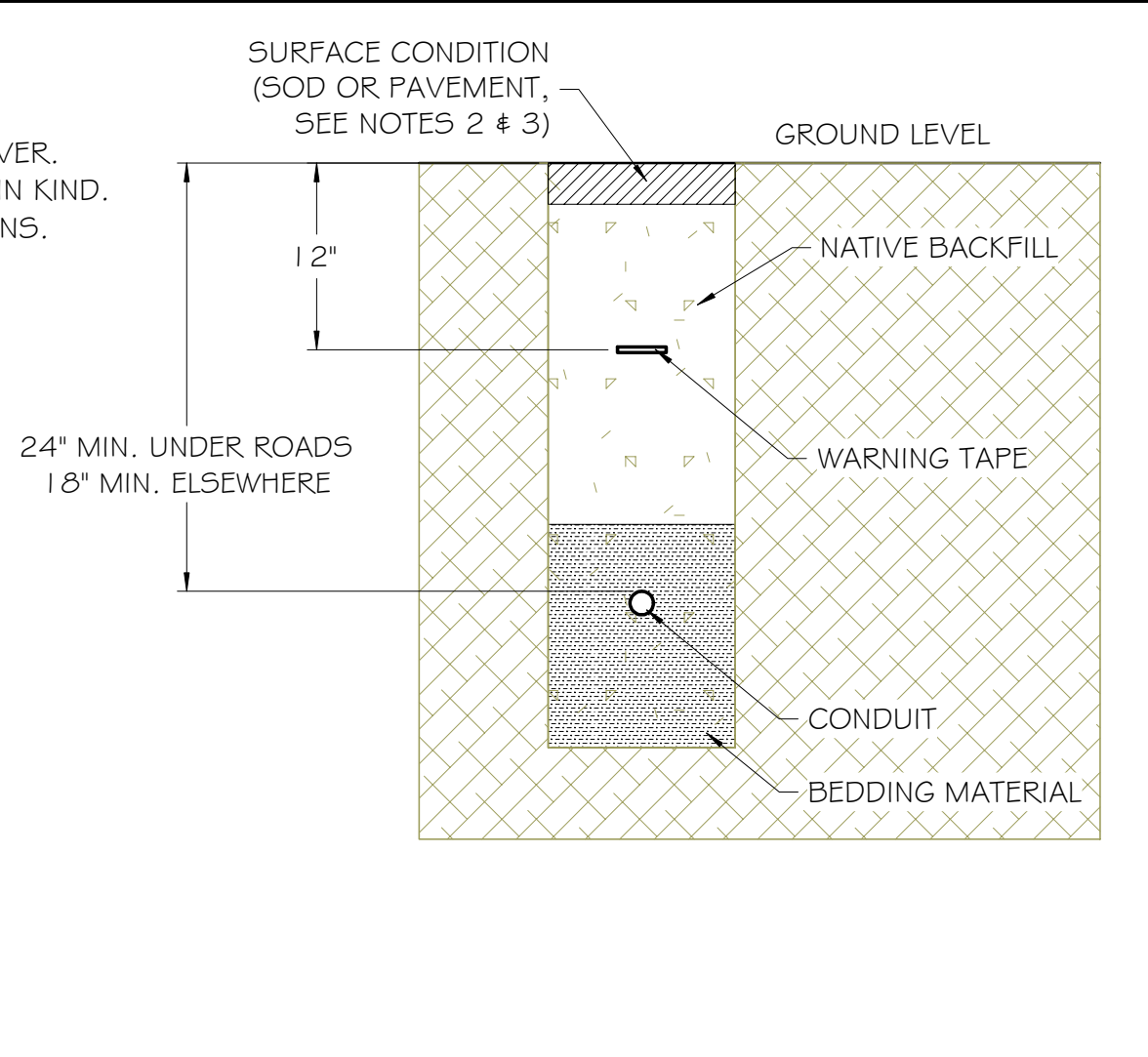
Project Details:
307.395 kWdc, 230.00 kW AC
AHJ: GREEN, TOWNSHIP

Engineering Approval:



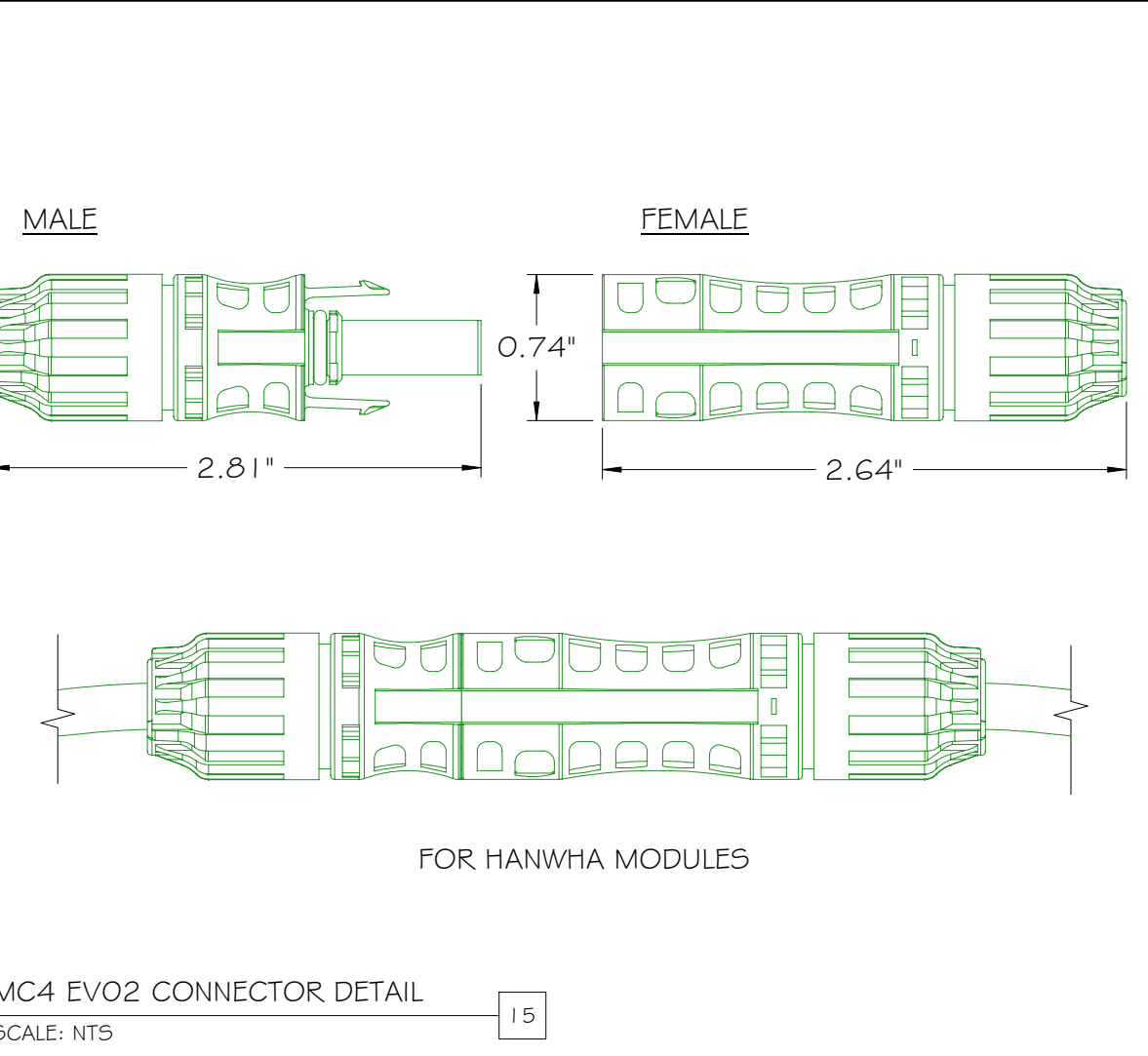
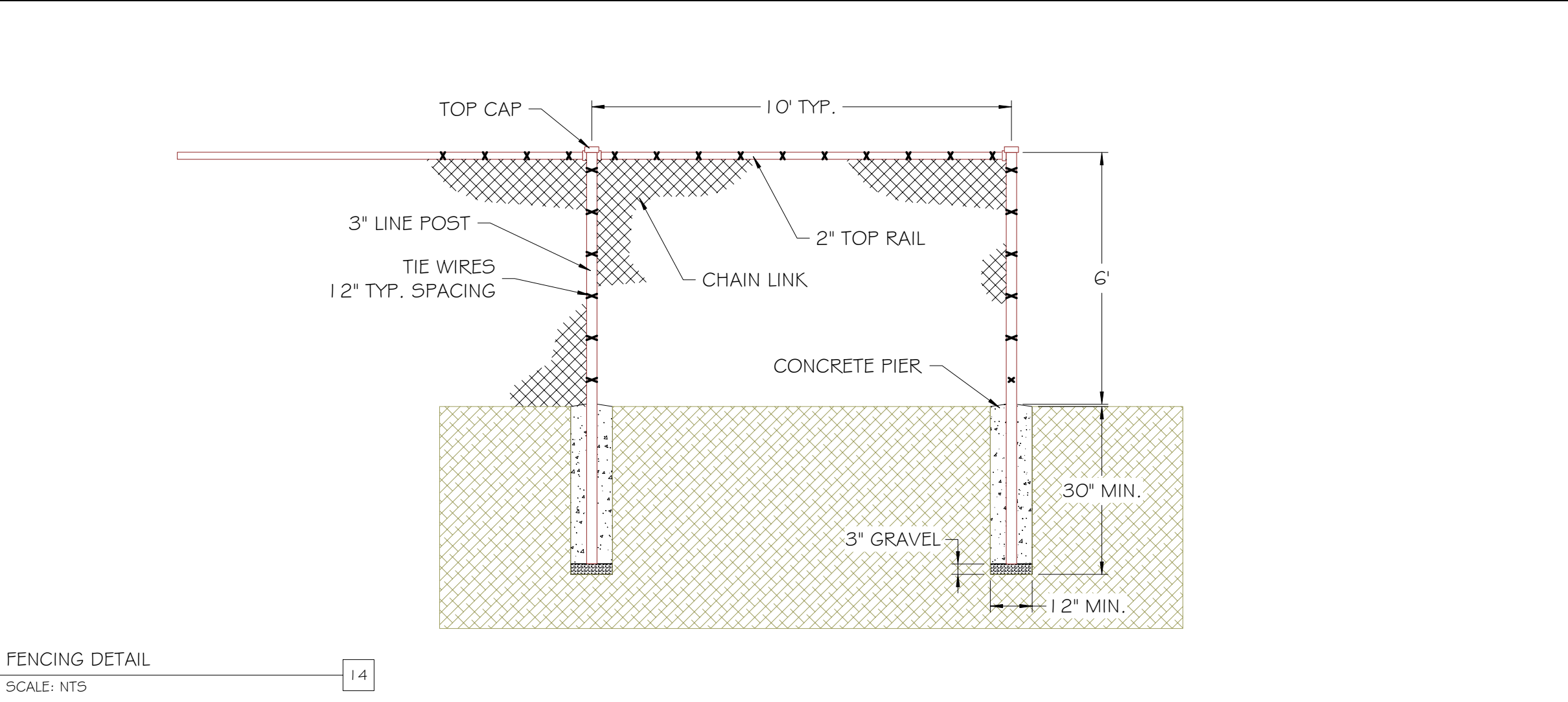
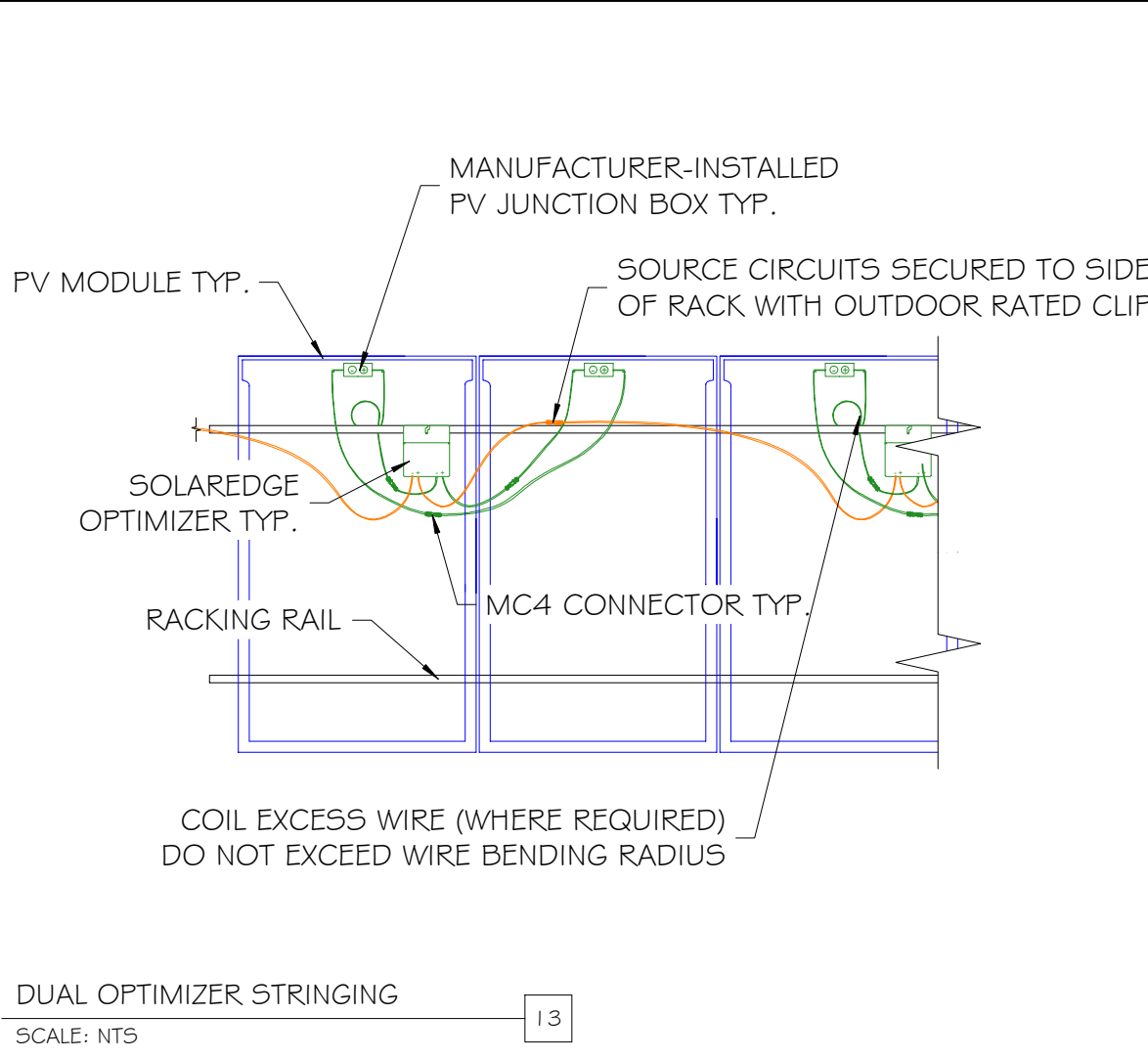
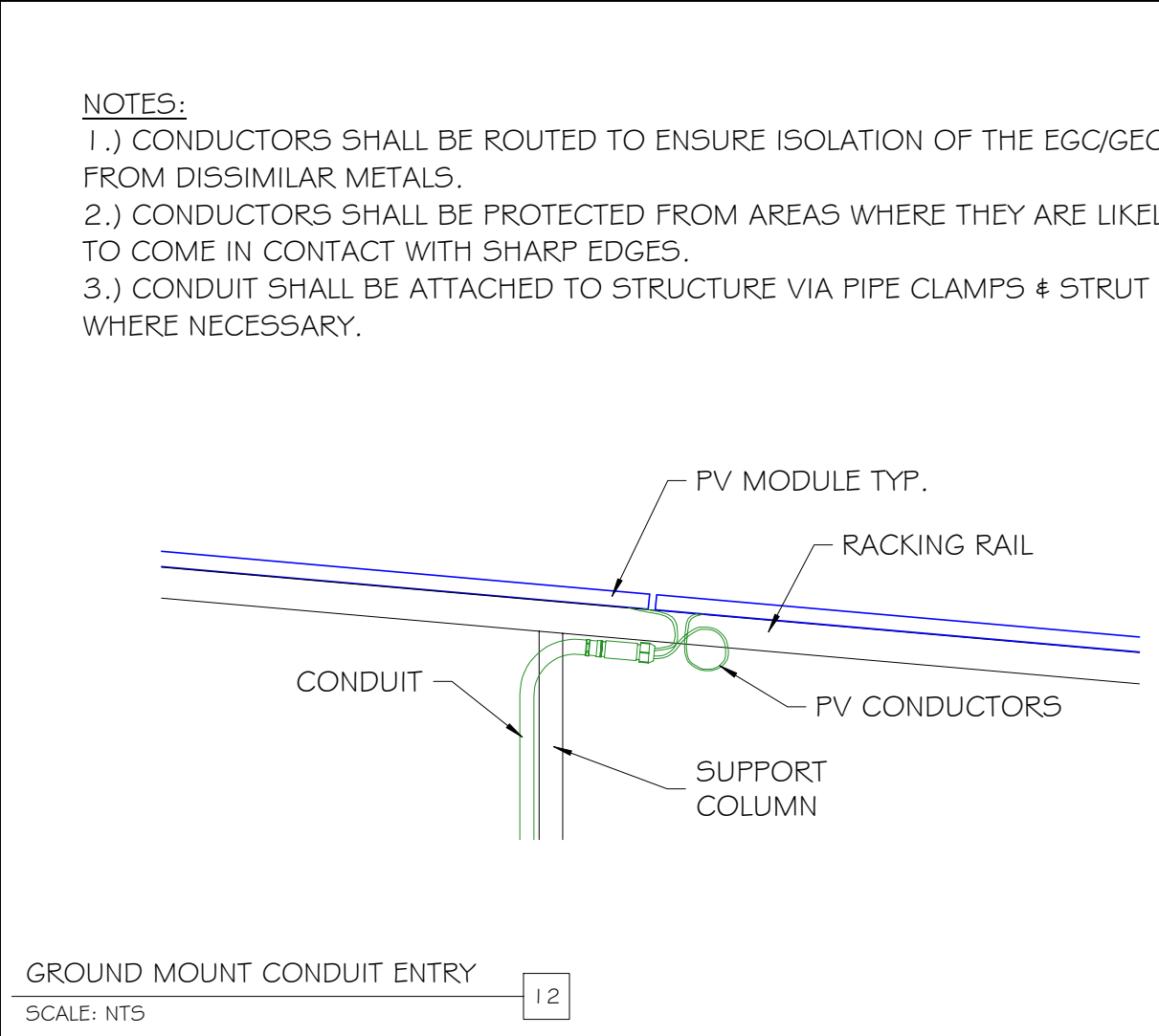
NOTES:
 1.) BACKFILL WITH NATIVE MATERIAL IN COMPLIANCE WITH NEC 300.5(F). NATIVE MATERIAL SHALL BE APPROVED BY THE OWNERS REP. PRIOR TO USE. IF NOT ACCEPTABLE, USE FINE GRANULAR MATERIAL FOR BEDDING AND SIDE/TOP COVER.
 2.) ASPHALT TO BE SAWCUT PRIOR TO TRENCHING. PAVEMENT SHALL BE REPLACED IN KIND.
 3.) UNPAVED SURFACES SHALL BE RESTORED IN KIND TO MATCH EXISTING CONDITIONS.
 4.) DETECTABLE WARNING TAPE SHALL BE INSTALLED 12" BELOW GRADE.
 5.) REFER TO ELECTRICAL DRAWINGS FOR SIZE AND TYPE OF CONDUIT.
 6.) NOTIFY UTILITY COMPANY PRIOR TO DIGGING PER "DIG SAFE" REQUIREMENTS.

TRENCH SECTION
SCALE: NTS



REVISIONS

DESCRIPTION	DATE	REV
ORIGINAL	6/15/2018	A
ELECTRICAL	7/7/2018	B
LAYOUT	7/17/2018	C



Sheet Title:
CONSTRUCTION DETAILS

Sheet Number:
E1.3

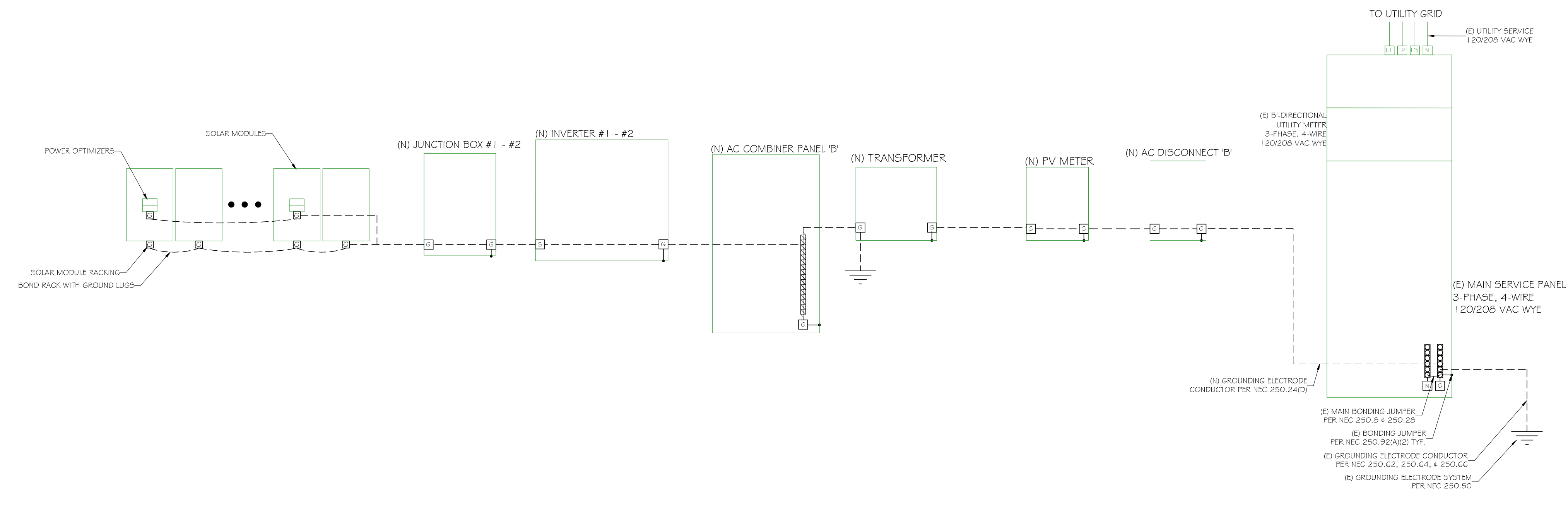
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DESIGN & DRAFTING BY:
CLARK FLEMING

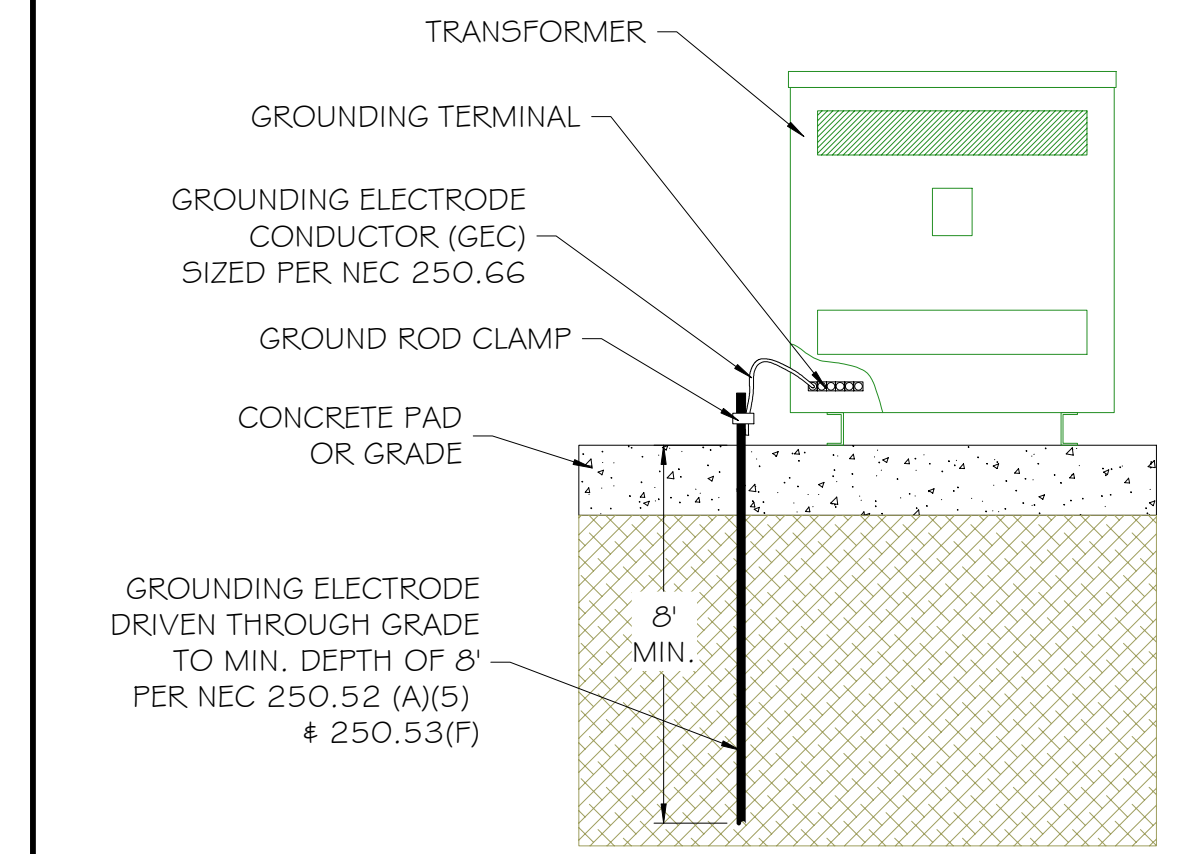
"Do not pray for an easy life, pray for the strength to endure a difficult one."
- Bruce Lee

Reviewed & Approved by:
RD

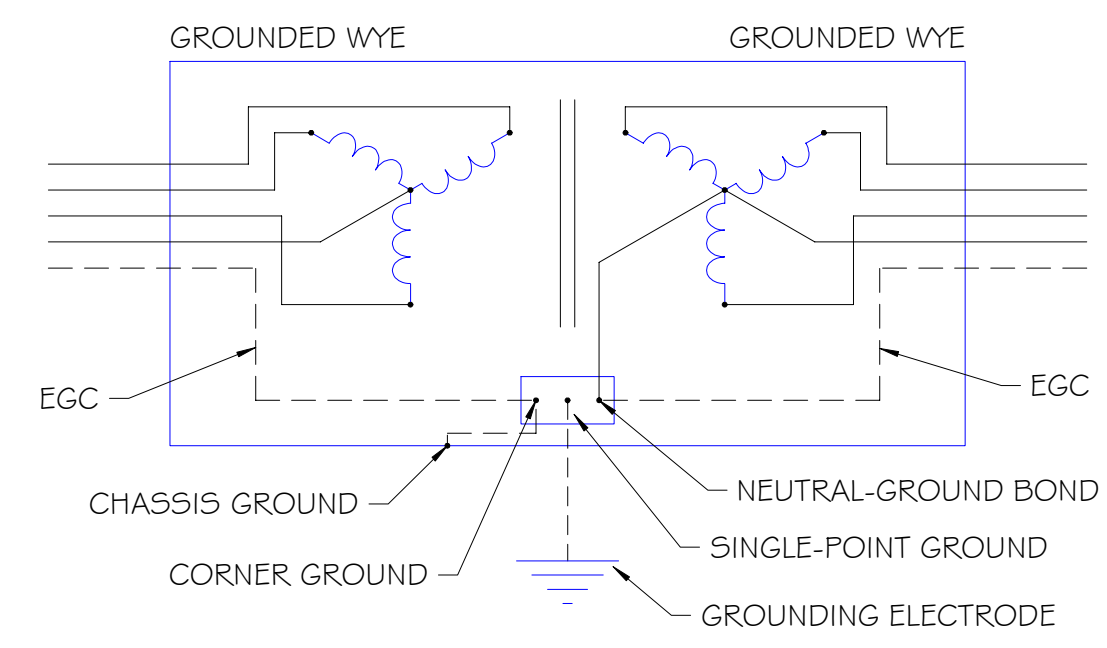
SepiSolar
POWER BY DESIGN



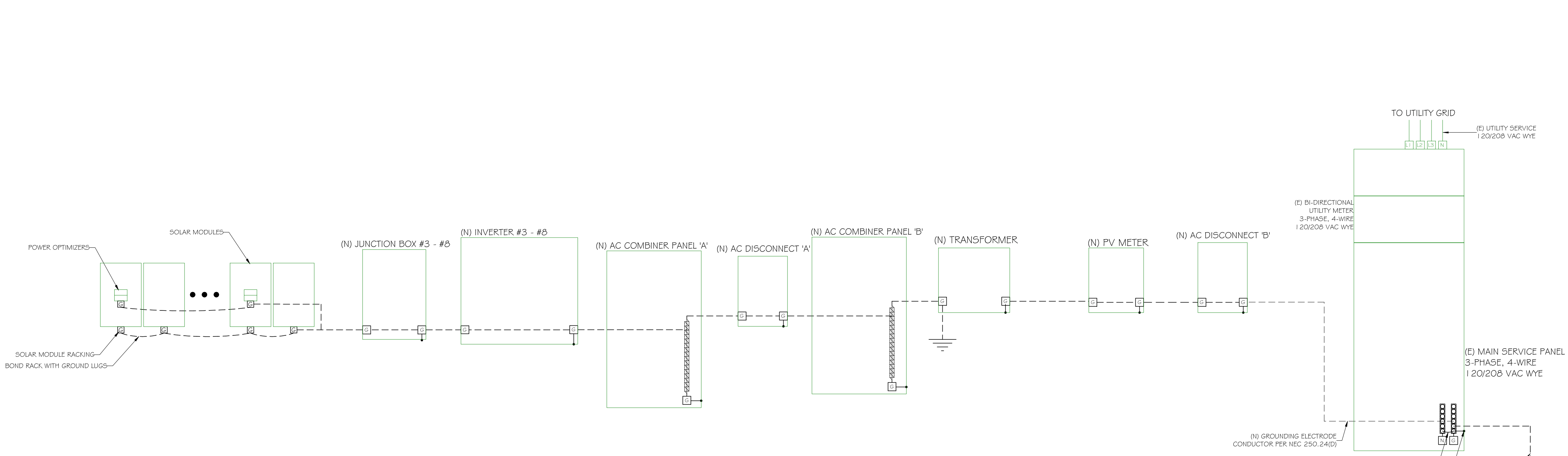
GROUNDING DETAIL (ROOF MOUNT) 1
SCALE: NTS



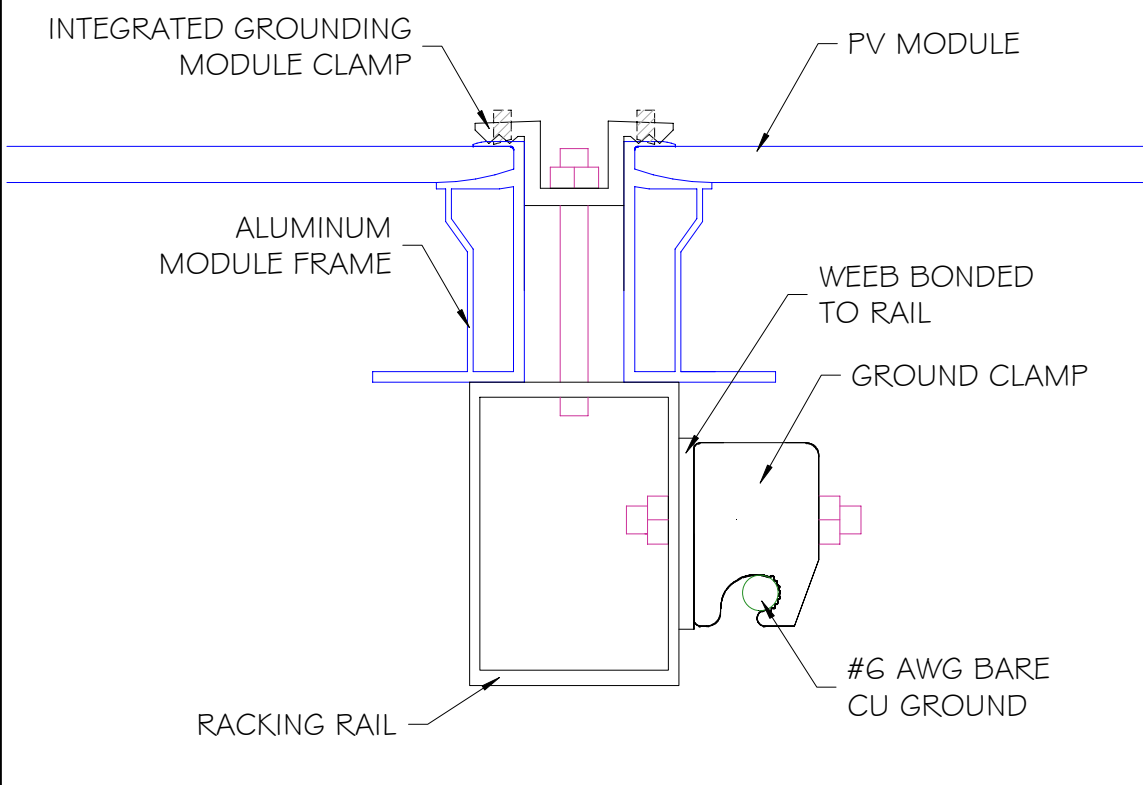
TRANSFORMER GROUNDING DETAIL 2
SCALE: NTS



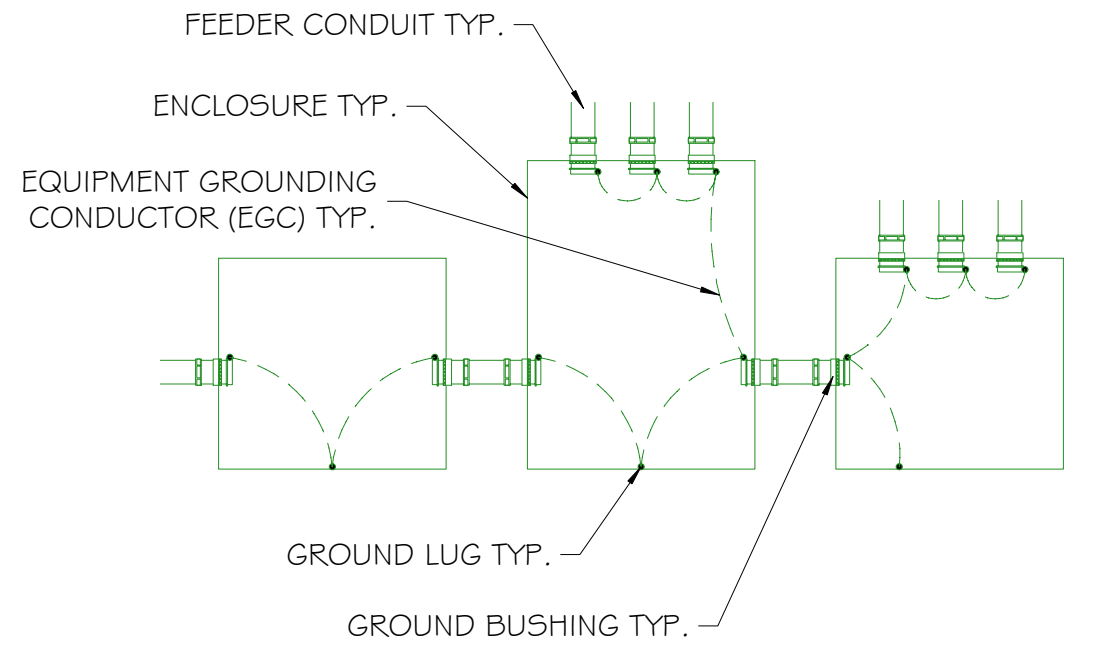
TRANSFORMER GROUNDING DETAIL 3
SCALE: NTS



GROUNDING DETAIL (GROUND MOUNT) 4
SCALE: NTS



MODULE GROUNDING DETAIL 5
SCALE: NTS



EQUIPMENT GROUNDING 6
SCALE: NTS

Project:
ANDOVER, NJ 07821

Project Details:
307,395 kW_{dc}, 230.00 kW AC
AHJ: GREEN, TOWNSHIP

Engineering Approval:

REVISIONS

DESCRIPTION	DATE	REV
ORIGINAL	6/15/2018	A
ELECTRICAL	7/7/2018	B
LAYOUT	7/17/2018	C

Sheet Title:
**ELECTRICAL
DETAILS**

Sheet Number:
E1.4

Sheet Size:
ARCH D - 36" x 24"

DESIGN & DRAFTING BY:
CLARK FLEMING

"Do not pray for an easy life, pray for
the strength to endure a difficult one."
- Bruce Lee



Reviewed & Approved by:
RD

480V --- EQUIP. GROUNDING CONDUCTOR --- CIRCUIT CONDUCTOR --- FUSE --- CIRCUIT BREAKER (N) = NEW EQUIP. (E) = EXISTING EQUIP. L1 = LINE 1 (BROWN) L2 = LINE 2 (ORANGE) L3 = LINE 3 (YELLOW) N = NEUTRAL (WHITE) G = GROUND (GREEN) + = POSITIVE (RED) - = NEGATIVE (BLACK)

PV Module Specifications	
Model Number:	HANWHA Q CELLS Q.PLUS L-G4.2 345
Weight (lbs):	52.9
Dimensions (in):	78.5 x 39.4 x 1.4
Power @ STC (W):	345
Voc (VDC):	47.5
Vmp (VDC):	37.9
Isc (A):	9.64
Imp (A):	9.09
Voc Temp Coeff (%/°C):	-0.29
Max Voltage (VDC):	1,500
Module Quantity:	891

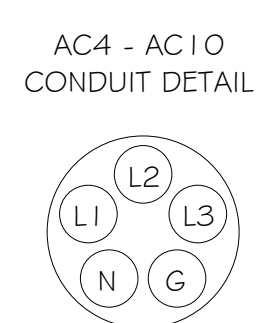
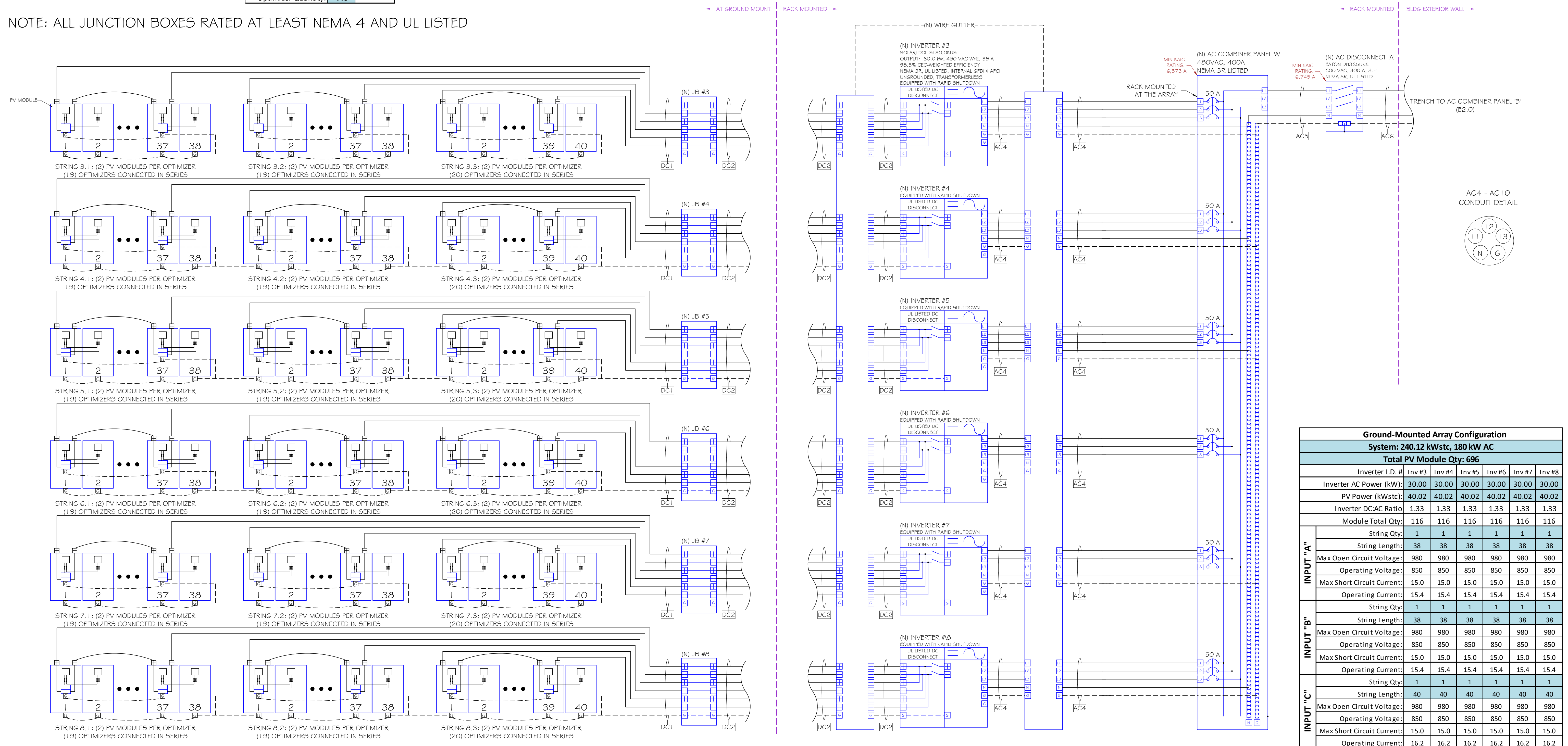
Power Optimizer Specifications	
Model Number:	SolarEdge P730
Max Input Power (W):	730
Max Input Voc (VDC):	125
Max Input Isc (A):	11.0
Output Current (A):	15
Output Voltage (VDC):	85
Min String Length:	26 Modules
Max String Length:	60 Modules
Max String Power (W):	15000
Optimizer Quantity:	446

Inverter #3 - #8 Specifications	
Model Number:	SolarEdge SE30KUS
Power Rating (kW AC):	30.00
Nominal AC Voltage (V):	480 (3/N/PE)
Max Output Current (A):	36.5
CEC Weighted Efficiency:	98.5%
Maximum DC Voltage (V):	980
Operating DC Voltage (V):	850
Inv. Quantity:	6

PV System Maximum Voltage Calculation per NEC 690.7(A)	
Local Record Low Temp:	-16 °C
25°C - Record Low Temp. + 1 = Correction Factor	1.119
Voc	47.5
Max # of Modules in Series	2
Temperature Corrected Open Circuit Voltage	106.2
0.29%/°C x 41°C + 1 =	1.119
1.119 x 47.5 x 2 =	106.2

TAG	# OF PARALLEL SETS	PHASE CONDUCTOR QTY, SIZE AND TYPE PER CONDUIT	NEUTRAL CONDUCTOR QTY, SIZE AND TYPE PER CONDUIT	GROUND CONDUCTOR QTY, SIZE AND TYPE PER CONDUIT	# OF PARALLEL CONDUITS	CONDUIT SIZE	CONDUIT TYPE	EST. DIST.
DC1	(1)	2/STRING AWG #10 PV-WIRE	N/A	N/A	(1)	N/A	N/A	20
DC2	(1)	6 AWG #10 PV-WIRE	N/A	N/A	(1)	1"	SCH40 PVC	100
AC4	(1)	3 AWG #6 THWN-2	1 AWG #6 THWN-2	1 AWG #8 THWN-2	(1)	1"	EMT	20
AC5	(2)	6 AWG #2/0 THWN-2	1 AWG #2/0 THWN-2	1 AWG #4 THWN-2	(1)	2-1/2"	EMT	10
AC6	(2)	6 AWG #2/0 THWN-2	1 AWG #2/0 THWN-2	1 AWG #4 THWN-2	(3)	2-1/2"	SCH40 PVC	175

NOTE: ALL JUNCTION BOXES RATED AT LEAST NEMA 4 AND UL LISTED



Ground-Mounted Array Configuration	
System: 240.12 kWstc, 180 kW AC	
Total PV Module Qty: 696	
Inverter I.D. #	Inv #3 Inv #4 Inv #5 Inv #6 Inv #7 Inv #8
Inverter AC Power (kW):	30.00 30.00 30.00 30.00 30.00 30.00
PV Power (kWstc):	40.02 40.02 40.02 40.02 40.02 40.02
Inverter DC:AC Ratio	1.33 1.33 1.33 1.33 1.33 1.33
Module Total Qty:	116 116 116 116 116 116
String Qty:	1 1 1 1 1 1
String Length:	38 38 38 38 38 38
Max Open Circuit Voltage:	980 980 980 980 980 980
Operating Voltage:	850 850 850 850 850 850
Max Short Circuit Current:	15.0 15.0 15.0 15.0 15.0 15.0
Operating Current:	15.4 15.4 15.4 15.4 15.4 15.4
String Qty:	1 1 1 1 1 1
String Length:	38 38 38 38 38 38
Max Open Circuit Voltage:	980 980 980 980 980 980
Operating Voltage:	850 850 850 850 850 850
Max Short Circuit Current:	15.0 15.0 15.0 15.0 15.0 15.0
Operating Current:	15.4 15.4 15.4 15.4 15.4 15.4
String Qty:	1 1 1 1 1 1
String Length:	40 40 40 40 40 40
Max Open Circuit Voltage:	980 980 980 980 980 980
Operating Voltage:	850 850 850 850 850 850
Max Short Circuit Current:	15.0 15.0 15.0 15.0 15.0 15.0
Operating Current:	16.2 16.2 16.2 16.2 16.2 16.2

Project: ANDOVER, NJ 07821
 Project Details: 307.395 kWstc, 230.00 kW AC AHJ: GREEN, TOWNSHIP

Engineering Approval:

REVISIONS		
DESCRIPTION	DATE	REV
ORIGINAL	6/15/2018	A
ELECTRICAL	7/17/2018	B
LAYOUT	7/17/2018	C

Sheet Title: GROUND MOUNT ELECTRICAL DIAGRAM

TAG	CIRCUIT ORIGIN	CIRCUIT DESTINATION	MATERIAL	CONN. TEMP. RATING	TRADE SIZE	AMPCAPY PER 310.15(B)(16) & 310.15(B)(17)
DC1	PV STRING	JUNCTION BOX #2 - #6	COPPER	90°C	AWG #10	55 Amps
DC2	JUNCTION BOX #2 - #6	WIRE GUTTER 'A'	COPPER	75°C	AWG #10	35 Amps

TAG	CIRCUIT ORIGIN	CIRCUIT DESTINATION	MATERIAL	TERM. TEMP. RATING	TRADE SIZE	NUMBER OF PARALLEL CONDUCTORS	AMPCAPY PER 310.15(B)(16) & 310.15(B)(17)
AC4	INVERTER #3 - #8	AC COMBINER PANEL 'A'	COPPER	75°C	AWG #6	1	95 Amps
AC5	AC COMBINER PANEL 'A'	AC DISCONNECT 'A'	COPPER	75°C	AWG #2/0	2	350 Amps
AC6	AC DISCONNECT 'A'	AC COMBINER PANEL 'B'	COPPER	75°C	AWG #2/0	2	350 Amps
AC7	AC COMBINER PANEL 'B'	TRANSFORMER	COPPER	75°C	AWG #2/0	2	350 Amps
AC8	TRANSFORMER	PV METER	COPPER	75°C	300 kcmil	3	855 Amps
AC9	PV METER	AC DISCONNECT 'B'	COPPER	75°C	300 kcmil	3	855 Amps
AC10	AC DISCONNECT 'B'	MAIN SERVICE PANEL	COPPER	75°C	300 kcmil	3	855 Amps

TAG	CIRCUIT ORIGIN	CIRCUIT DESTINATION	MATERIAL	TERM. TEMP. RATING	TRADE SIZE	NUMBER OF PARALLEL CONDUCTORS	AMPCAPY PER 310.15(B)(16) & 310.15(B)(17)
AC4	INVERTER #3 - #8	AC COMBINER PANEL 'A'	COPPER	75°C	AWG #6	1	95 Amps
AC5	AC COMBINER PANEL 'A'	AC DISCONNECT 'A'	COPPER	75°C	AWG #2/0	2	350 Amps
AC6	AC DISCONNECT 'A'	AC COMBINER PANEL 'B'	COPPER	75°C	AWG #2/0	2	350 Amps
AC7	AC COMBINER PANEL 'B'	TRANSFORMER	COPPER	75°C	AWG #2/0	2	350 Amps
AC8	TRANSFORMER	PV METER	COPPER	75°C	300 kcmil	3	855 Amps
AC9	PV METER	AC DISCONNECT 'B'	COPPER	75°C	300 kcmil	3	855 Amps
AC10	AC DISCONNECT 'B'	MAIN SERVICE PANEL	COPPER	75°C	300 kcmil	3	855 Amps

TAG	CIRCUIT ORIGIN	CIRCUIT DESTINATION	MATERIAL	CONN. TEMP. RATING	TRADE SIZE	AMPCAPY PER 310.15(B)(16) & 310.15(B)(17)
DC1	PV STRING	JUNCTION BOX #2 - #6	COPPER	90°C	AWG #10	55 Amps
DC2	JUNCTION BOX #2 - #6	WIRE GUTTER 'A'	COPPER	75°C	AWG #10	35 Amps

Sheet Number: E2.0

Sheet Size: ARCH D - 36" x 24"

DESIGN & DRAFTING BY: CLARK FLEMING

480V	---- = EQUIP. GROUNDING CONDUCTOR	--- = CIRCUIT CONDUCTOR	⎓ = FUSE	⎓ = CIRCUIT BREAKER	(N) = NEW EQUIP.	(E) = EXISTING EQUIP.	L1 = LINE 1 (BROWN)	L2 = LINE 2 (ORANGE)	L3 = LINE 3 (YELLOW)	N = NEUTRAL (WHITE)	G = GROUND (GREEN)	⊕ = POSITIVE (RED)	⊖ = NEGATIVE (BLACK)
208V	---- = EQUIP. GROUNDING CONDUCTOR	--- = CIRCUIT CONDUCTOR	⎓ = FUSE	⎓ = CIRCUIT BREAKER	(N) = NEW EQUIP.	(E) = EXISTING EQUIP.	L1 = LINE 1 (BLACK)	L2 = LINE 2 (RED)	L3 = LINE 3 (BLUE)	N = NEUTRAL (WHITE)	G = GROUND (GREEN)	⊕ = POSITIVE (RED)	⊖ = NEGATIVE (BLACK)

Roof-Mounted Array Configuration		
System: 67.62 kWstc, 50 kW AC		
Total PV Module Qty: 196		
Inverter I.D. #	Inv #1	Inv #2
Inverter AC Power (kW):	30.00	20.00
PV Power (kWstc):	40.71	26.91
Inverter DC:AC Ratio	1.36	1.35
Module Total Qty:	118	78
String Qty:	1	1
String Length:	39	38
Max Open Circuit Voltage:	980	980
Operating Voltage:	850	850
Max Short Circuit Current:	15.0	15.0
Operating Current:	15.8	15.4
String Qty:	1	1
String Length:	39	40
Max Open Circuit Voltage:	980	980
Operating Voltage:	850	850
Max Short Circuit Current:	15.0	15.0
Operating Current:	15.8	16.2
String Qty:	1	
String Length:	40	
Max Open Circuit Voltage:	980	
Operating Voltage:	850	
Max Short Circuit Current:	15.0	
Operating Current:	16.2	

Utility-side AC System Summary	
NOMINAL SYSTEM VOLTAGE:	208 Volts AC
MAX CURRENT PER 690.8(A):	640 Amps
MAX CURRENT PER 690.8(B):	800 Amps

PV-side AC System Summary	
NOMINAL SYSTEM VOLTAGE:	480 Volts AC
MAX CURRENT PER 690.8(A):	277 Amps
MAX CURRENT PER 690.8(B):	347 Amps

PV Module Specifications	
Model Number:	HANWHA Q CELLS Q.PLUS L-G4.2 345
Weight (lbs):	52.9
Dimensions (in):	78.5 x 39.4 x 1.4
Power @ STC (W):	345
Voc (VDC):	47.5
Vmp (VDC):	37.9
Isc (A):	9.64
Imp (A):	9.09
Voc Temp Coeff (%/°C):	-0.29
Max Voltage (VDC):	1,500
Module Quantity:	891

Power Optimizer Specifications	
Model Number:	SolarEdge P730
Max Input Power (W):	730
Max Input Voc (VDC):	125
Max Input Isc (A):	11.0
Output Current (A):	15
Output Voltage (VDC):	85
Min String Length:	26 Modules
Max String Length:	60 Modules
Max String Power (W):	12750
Optimizer Quantity:	446

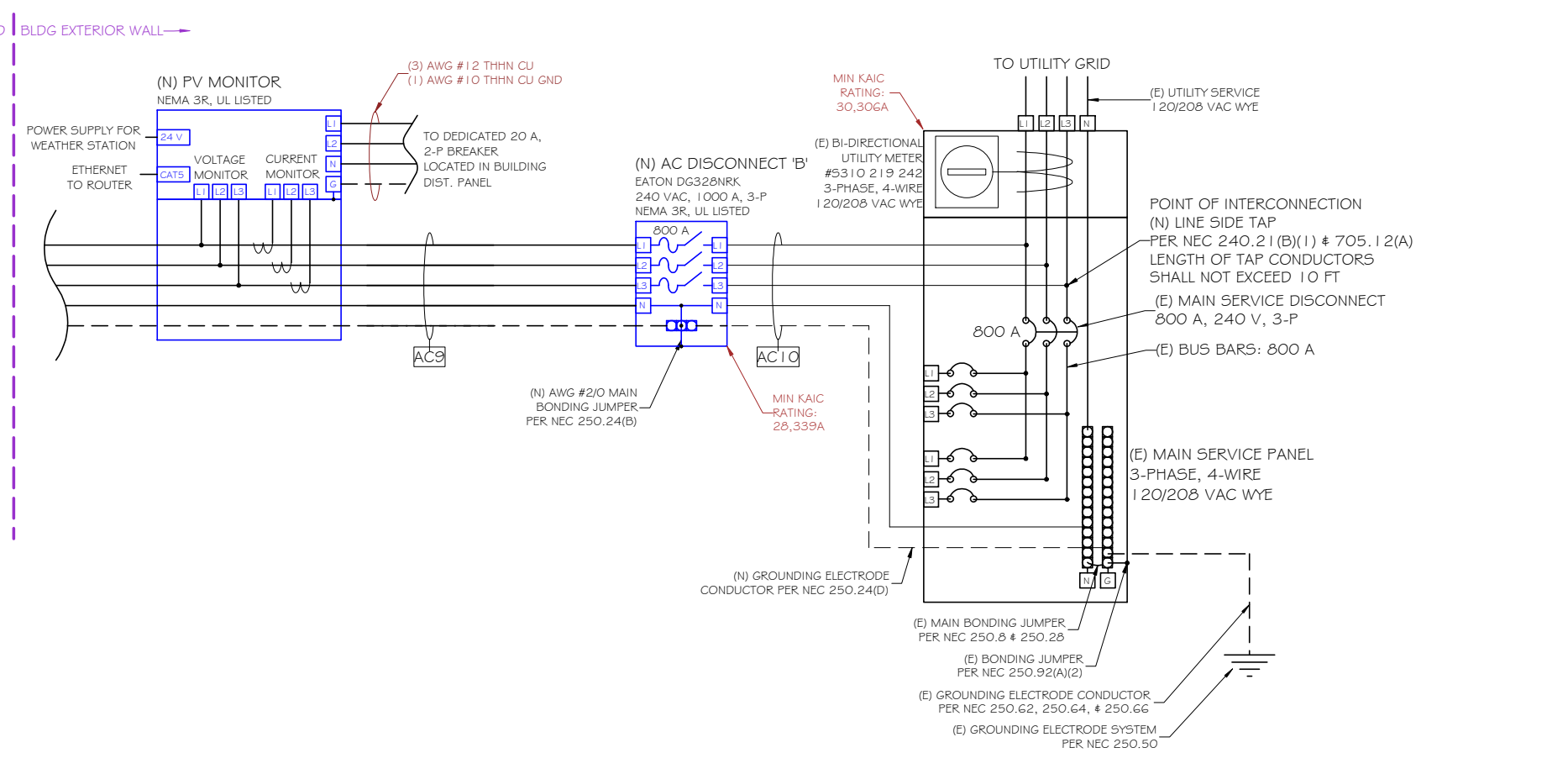
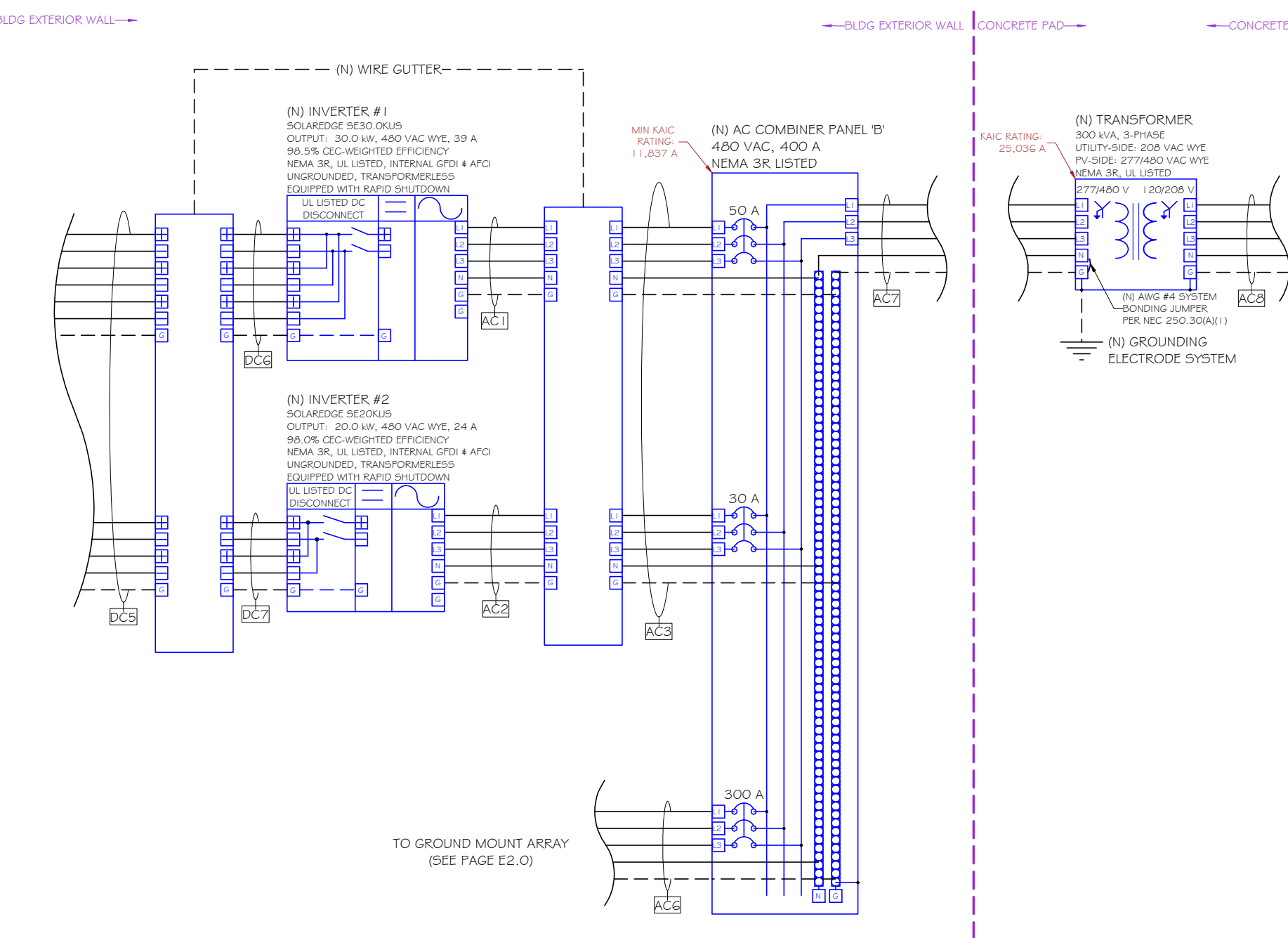
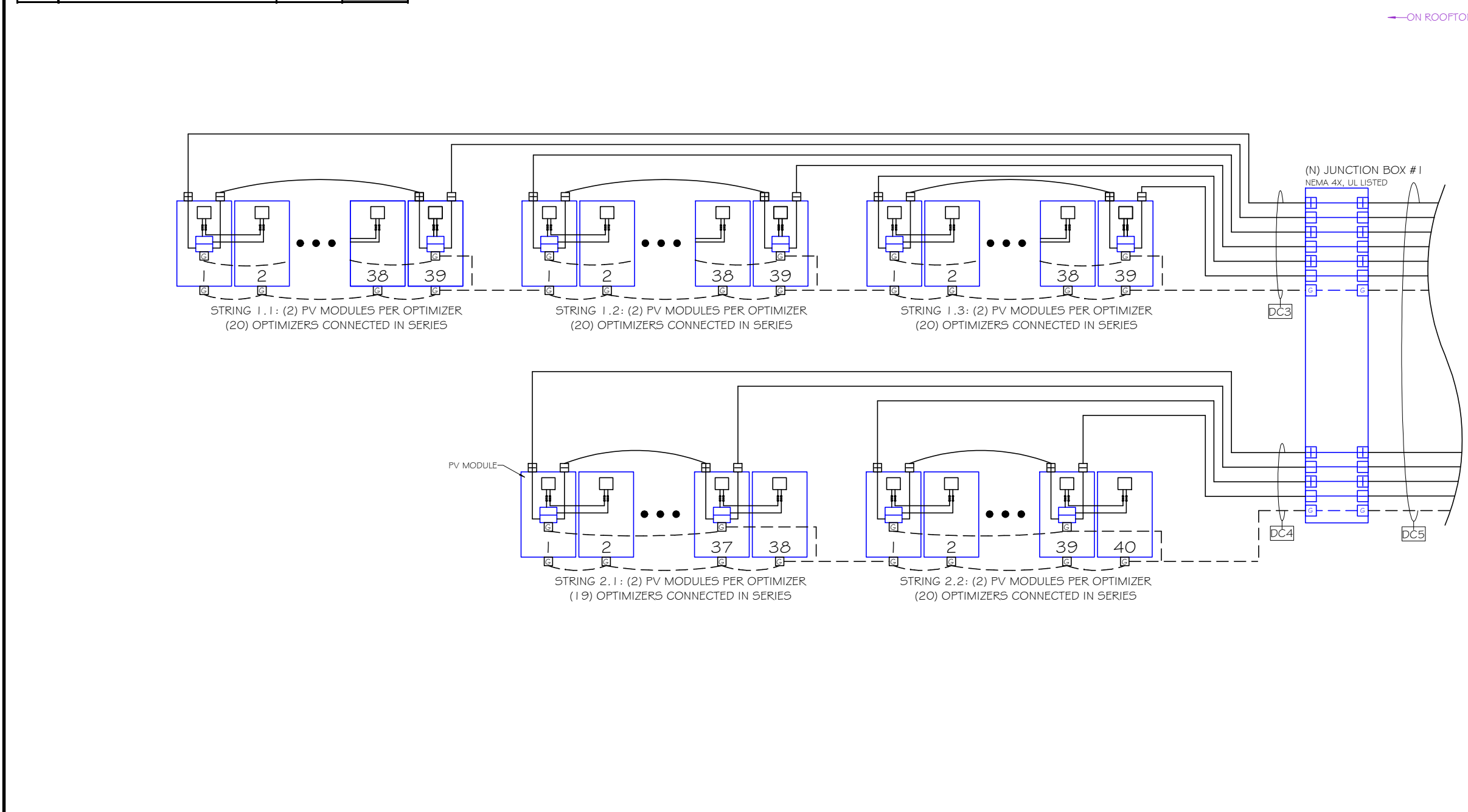
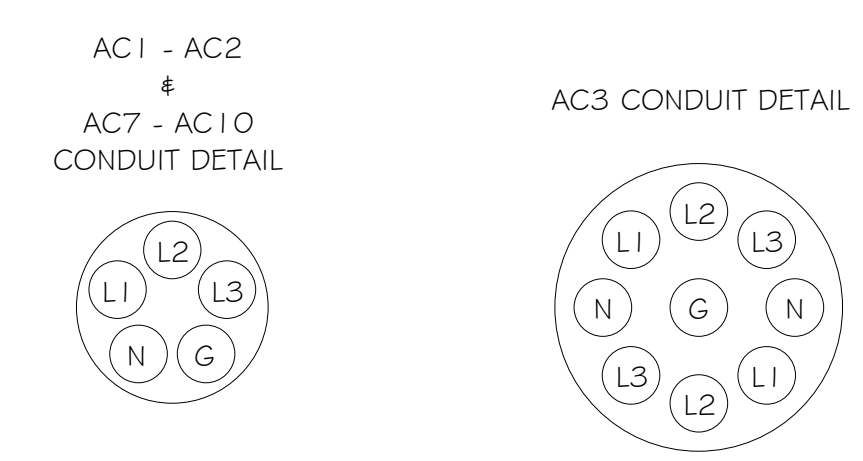
PV System Maximum Voltage Calculation per NEC 690.7(A)			
Local Record Low Temp:	-16 °C	Data Source:	TETERBORO AIRPORT
Voc Temp Coefficient	25°C -	Voc	Max # of Temperature
Correction Factor	x Record Low + 1 =	Correction Factor	x Voc x Modules in = Corrected Open Circuit Voltage
0.29%/°C x 41°C + 1 =	1.119	1.119 x 47.5 x 2 =	106.2 Volts DC

Transformer Calculations			
PV Voltage:	480 VAC	Util. Voltage:	208 VAC
PV Current:	280 Amps	Util. Current:	645 Amps
Minimum Transformer kVA Rating:		300.0	kVA

Inverter #1 Specifications	
Model Number:	SolarEdge SE30KUS
Power Rating (kW AC):	30.00
Nominal AC Voltage (V):	480 (3/N/PE)
Max Output Current (A):	36.5
CEC Weighted Efficiency:	98.5%
Maximum DC Voltage (V):	980
Operating DC Voltage (V):	850
Inv. Quantity:	1

Inverter #2 Specifications	
Model Number:	SolarEdge SE20KUS
Power Rating (kW AC):	20.00
Nominal AC Voltage (V):	480 (3/N/PE)
Max Output Current (A):	24.0
CEC Weighted Efficiency:	98.0%
Maximum DC Voltage (V):	980
Operating DC Voltage (V):	850
Inv. Quantity:	1

NOTE: INVERTER #1 OUTPUT IS BEING LIMITED TO 34.4A
PLACE PLACARD ON INVERTER THAT STATES THIS REQUIRED LIMITATION



NOTE: ALL JUNCTION BOXES RATED AT LEAST NEMA 4 AND UL LISTED

WIRE AND CONDUIT SCHEDULE												
TAG	# OF PARALLEL SETS	PHASE CONDUCTOR QTY, SIZE AND TYPE PER CONDUIT	NEUTRAL CONDUCTOR QTY, SIZE AND TYPE PER CONDUIT	GROUND CONDUCTOR QTY, SIZE AND TYPE PER CONDUIT	# OF PARALLEL CONDUITS	CONDUIT SIZE	CONDUIT TYPE	EST. DIST.				
DC3	(1)	N/A	AWG #10 PV-WIRE	N/A	N/A	1	AWG #12 PV-WIRE	(1)	N/A	N/A	15	
DC4	(1)	4	AWG #6 PV-WIRE	N/A	N/A	1	AWG #12 PV-WIRE	(1)	1-1/4"	EMT	15	
DC5	(1)	6	AWG #6 PV-WIRE	N/A	N/A	1	AWG #12 PV-WIRE	(1)	1-1/2"	EMT	50	
DC6	(1)	4	AWG #6 PV-WIRE	N/A	N/A	1	AWG #12 PV-WIRE	(1)	1-1/4"	EMT	5	
AC1	(1)	3	AWG #6 THWN-2	1	AWG #6 THWN-2	1	AWG #8 THWN-2	(1)	1"	EMT	10	
AC2	(1)	3	AWG #6 THWN-2	1	AWG #6 THWN-2	1	AWG #8 THWN-2	(1)	1"	EMT	10	
AC3	(1)	6	AWG #6 THWN-2	1	AWG #6 THWN-2	1	AWG #8 THWN-2	(1)	1-1/4"	EMT	35	
AC7	(2)	3	AWG #2/0 THWN-2	1	AWG #2/0 THWN-2	1	AWG #3 THWN-2	(3)	2"	SCH40 PVC	20	
AC8	(3)	3	300 kcmil THWN-2	1	300 kcmil THWN-2	1	AWG #2/0 THWN-2	(3)	3"	SCH40 PVC	20	
AC9	(3)	3	300 kcmil THWN-2	1	300 kcmil THWN-2	1	AWG #2/0 THWN-2	(3)	2-1/2"	EMT	15	
AC10	(3)	3	300 kcmil THWN-2	1	300 kcmil THWN-2	1	AWG #2/0 THWN-2	(3)	2-1/2"	EMT	15	

TAG	CIRCUIT ORIGIN	CIRCUIT DESTINATION	CONDUCTOR SPECIFICATIONS			REQUIRED CONDUCTOR AMPACITY			AMPACITY CHECK #1		CONDUCTOR TEMPERATURE DERATING			CONDUIT FILL DERATING		CORRECTED AMPACITY CALCULATION			AMPACITY CHECK #2		VOLTAGE DROP				
			MATERIAL	CONN. TEMP. RATING	TRADE SIZE	AMPACITY PER 310.15(B)(16) & 310.15(B)(17)	INVERTER OUTPUT	# OF PARALLEL STRINGS	MAX CURRENT PER 690.8(A)(1)	125% PER 690.8(B)(1)	MAX CURRENT PER 690.8(B)(1)	CIRCUIT ENVIRONMENT	LOCAL 2% AVG. HIGH TEMP (°C)	HEIGHT ABOVE ROOF (in)	TEMP. DERATE PER 310.15(B)(3)(c)	OPERATING TEMP (°C)	AMPACITY CORRECTION 310.15(B)(2)(a)	# OF UNGROUNDED CONDUCTORS	AMPACITY CORRECTION 310.15(B)(3)(a)	90°C CONDUCTOR AMPACITY	TEMP DERATE	CONDUIT FILL DERATE	DERATED CORRECTED AMPACITY	MAX CURRENT PER 690.8(B)(2)	DERATED CONDUCTOR AMPACITY
DC3	PV STRING	JUNCTION BOX #1	COPPER	90°C	AWG #10	55 Amps	15.0	15.0	18.8	18.8 Amps < 55.0 Amps	ROOFTOP, FREE AIR	33	1	22	55	0.76	N/A	1.00	55	x 0.76	x 1.00	= 41.8 Amps	15.0 Amps < 41.8 Amps	15 ft	0.07%
DC4	JUNCTION BOX #1	WIRE GUTTER 'B'	COPPER	75°C	AWG #6	65 Amps	15.0	15.0	18.8	18.8 Amps < 65.0 Amps	EXT. BLDG. WALL (+15°C)	33	-	N/A	48	0.82	10	0.50	75	x 0.82	x 0.50	= 30.8 Amps	15.0 Amps < 30.8 Amps	50 ft	0.09%
DC5	WIRE GUTTER 'B'	INVERTER #1	COPPER	75°C	AWG #6	65 Amps	15.0	15.0	18.8	18.8 Amps < 65.0 Amps	EXT. BLDG. WALL (+15°C)	33	-	N/A	48	0.82	6	0.80	75	x 0.82	x 0.80	= 49.2 Amps	15.0 Amps < 49.2 Amps	50 ft	0.09%
DC6	WIRE GUTTER 'B'	INVERTER #2	COPPER	75°C	AWG #6	65 Amps	15.0	15.0	18.8	18.8 Amps < 65.0 Amps	EXT. BLDG. WALL (+15°C)	33	-	N/A	48	0.82	4	0.80	75	x 0.82	x 0.80	= 49.2 Amps	15.0 Amps < 49.2 Amps	5 ft	0.01%
AC1	INVERTER #1	WIRE GUTTER 'B'	COPPER	75°C	AWG #6	1	34.4	34.4	43.0	43.0 Amps < 65 Amps	EXT. BLDG. WALL (+15°C)	33	48	0.82	3	1.00	3	1.00	75	x 0.82	x 1.00	= 61.5 Amps	34.4 Amps < 61.5 Amps	10 ft	0.06%
AC2	INVERTER #2	WIRE GUTTER 'B'	COPPER	75°C	AWG #6	1	24.0	24.0	30.0	30.0 Amps < 65 Amps	EXT. BLDG. WALL (+15°C)	33	48	0.82	3	1.00	3	1.00	75	x 0.82	x 1.00	= 61.5 Amps	24.0 Amps < 61.5 Amps	10 ft	0.04%
AC3	WIRE GUTTER 'B'	AC COMBINER PANEL 'B'	COPPER	75°C	AWG #6	1	VARIABLE	34.4	43.0	43.0 Amps < 95 Amps	FREE AIR (+15°C)	33	48	0.82	6	0.80	105	x 0.82	x 0.80	= 68.9 Amps	34.4 Amps < 68.9 Amps	35 ft	0.21%		
AC7	AC COMBINER PANEL 'B'	TRANSFORMER	COPPER	75°C	AWG #2/0	2	279.5	279.5	349.4	349.4 Amps < 350 Amps	UNDERGROUND (+0°C)	33	33	0.96	3	1.00	390	x 0.96	x 1.00	= 374.4 Amps	279.5 Amps < 374.4 Amps	20 ft	0.23%		
AC8	TRANSFORMER	PV METER	COPPER	75°C	300 kcmil	3	806.3	806.3	855 Amps	806.3 Amps < 855 Amps	UNDERGROUND (+0°C)	33	33	0.96	3	1.00	960	x 0.96	x 1.00	= 921.6 Amps	645.0 Amps < 921.6 Amps	20 ft	0.15%		
AC9	PV METER	AC DISCONNECT 'B'	COPPER	75°C	300 kcmil	3	806.3	806.3	855 Amps	806.3 Amps < 855 Amps	EXT. BLDG. WALL (+15°C)	33	48	0.82	3	1.00	960	x 0.82	x 1.00	= 787.2 Amps	645.0 Amps < 787.2 Amps	15 ft	0.12%		
AC10	AC DISCONNECT 'B'	MAIN SERVICE PANEL	COPPER	75°C	300 kcmil	3	806.3	806.3	855 Amps	806.3 Amps < 855 Amps	EXT. BLDG. WALL (+15°C)	33	48	0.82	3	1.00	960	x 0.82	x 1.00	= 787.2 Amps	645.0 Amps < 787.2 Amps	15 ft	0.12%		

REVISIONS		
DESCRIPTION	DATE	REV
ORIGINAL	6/15/2018	A
ELECTRICAL	7/17/2018	B
LAYOUT	7/17/2018	C

Sheet Title:
ROOF MOUNT ELECTRICAL DIAGRAM

Sheet Number:
E2.1

Sheet Size:
ARCH D - 36" x 24"

DESIGN & DRAFTING BY:
CLARK FLEMING

Do not pray for an easy life, pray for the strength to endure a difficult one.
- Bruce Lee

SepiSolar
POWER BY DESIGN

Reviewed & Approved by:
RD

WARNING: PHOTOVOLTAIC POWER SOURCE

WARNING
ELECTRIC SHOCK HAZARD. THE DC CONDUCTORS OF THE PV SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED.

PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN

PHOTOVOLTAIC SYSTEM DISCONNECT
AC CURRENT: 219 A
VOLTAGE: 480 VAC

PHOTOVOLTAIC SYSTEM DISCONNECT
AC CURRENT: 645 A
VOLTAGE: 208 VAC

INVERTER #1

INVERTER #2

REQ'D BY: NEC 690.31(E)(3)
APPLY TO:
JUNCTION BOXES, RACEWAYS, CABLE TRAYS, CONDUIT BODIES WITH AVAILABLE OPENINGS, EVERY 10', WITHIN 1' OF TURNS/PENETRATIONS

REQ'D BY: NEC 690.35(F)
APPLY TO:
JUNCTION & COMBINERS BOXES, DC DISCONNECTS, OTHER SERVICEABLE DEVICES

REQ'D BY: NEC 690.56(C)
APPLY TO:
PV SYSTEM MAIN AC DISCONNECT

REQ'D BY: NEC 690.54
APPLY TO: AC DISCONNECT 'A'

REQ'D BY: NEC 690.54
APPLY TO: AC DISCONNECT 'B'

3" x 1" PLACARD QTY: 1
APPLY TO:
INVERTER: #1

3" x 1" PLACARD QTY: 1
APPLY TO:
INVERTER: #2

INVERTER #3

INVERTER #4

INVERTER #5

INVERTER #6

INVERTER #7

INVERTER #8

3" x 1" PLACARD QTY: 1
APPLY TO:
INVERTER: #3

3" x 1" PLACARD QTY: 1
APPLY TO:
INVERTER: #4

3" x 1" PLACARD QTY: 1
APPLY TO:
INVERTER: #5

3" x 1" PLACARD QTY: 1
APPLY TO:
INVERTER: #6

3" x 1" PLACARD QTY: 1
APPLY TO:
INVERTER: #7

3" x 1" PLACARD QTY: 1
APPLY TO:
INVERTER: #8

PHOTOVOLTAIC SYSTEM DC DISCONNECT

OPERATING CURRENT: 39 A
OPERATING VOLTAGE: 840 VDC
MAX SYSTEM VOLTAGE: 980 VDC
SHORT CIRCUIT CURRENT: 45 A

STRING WIRING CONFIGURATION:
STRING 1 & 2 - 38 MODULES (19) OPTIMIZERS
STRING 3 - 40 MODULES (20) OPTIMIZERS

WARNING:
ELECTRIC SHOCK HAZARD

4" x 3" PLACARD (QTY. 6)
APPLY TO:
DC DISCONNECT @ INVERTER #3 - #8

PHOTOVOLTAIC SYSTEM DC DISCONNECT

OPERATING CURRENT: 39 A
OPERATING VOLTAGE: 840 VDC
MAX SYSTEM VOLTAGE: 980 VDC
SHORT CIRCUIT CURRENT: 45 A

STRING WIRING CONFIGURATION:
STRING 1 - 39 MODULES (20) OPTIMIZERS

WARNING:
ELECTRIC SHOCK HAZARD

4" x 3" PLACARD (QTY. 1)
APPLY TO:
DC DISCONNECT @ INVERTER #1

PHOTOVOLTAIC SYSTEM DC DISCONNECT

OPERATING CURRENT: 26.5 A
OPERATING VOLTAGE: 840 VDC
MAX SYSTEM VOLTAGE: 980 VDC
SHORT CIRCUIT CURRENT: 45 A

STRING WIRING CONFIGURATION:
STRING 1 - 38 MODULES (19) OPTIMIZERS
STRING 2 - 40 MODULES (20) OPTIMIZERS

WARNING:
ELECTRIC SHOCK HAZARD

4" x 3" PLACARD (QTY. 1)
APPLY TO:
DC DISCONNECT @ INVERTER #2

CAUTION:
SOLAR ELECTRIC SYSTEM CONNECTED

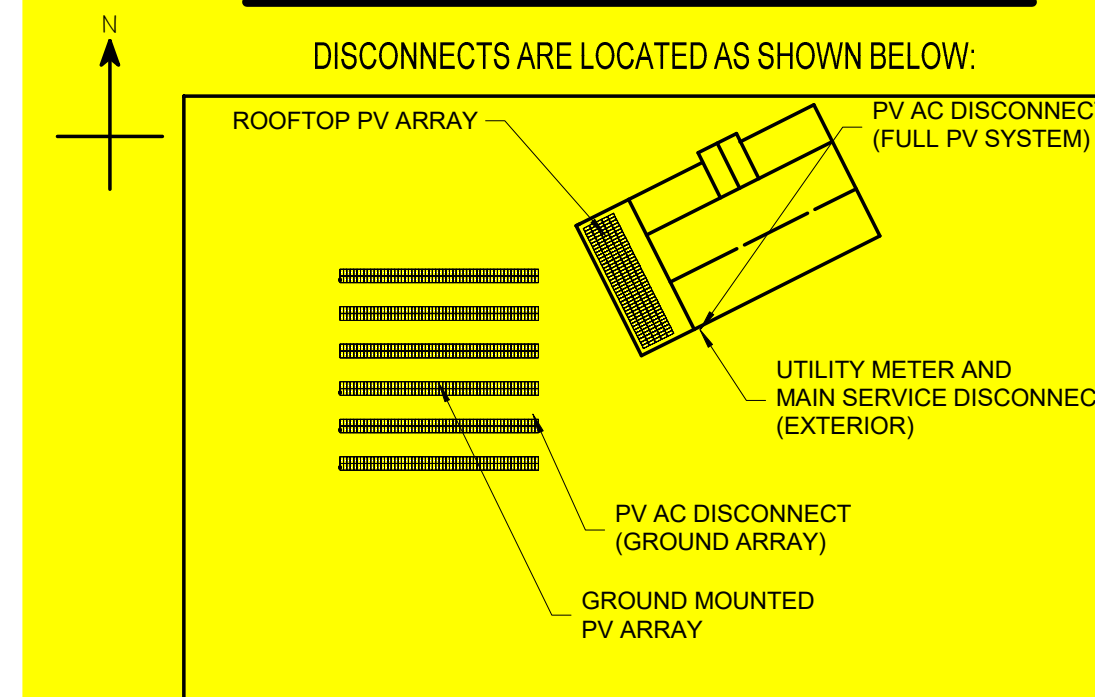
FOR SERVICE OR INFO, CONTACT:
DIRECT ENERGY SOLAR
CUSTOMERCARE@DIRECTENERGYSOLAR.COM
888-603-6085

5" x 3" PLACARD (QTY. 3)
APPLY TO:
MAIN METER CABINET
MAIN DISCONNECT

FAULT CURRENT AT THIS LOCATION: 30,306AIC L-L
8/27/2018

REQ'D BY: NEC 110.24(B)
APPLY TO:
MAIN SERVICE PANEL

POWER TO THIS BUILDING IS ALSO SUPPLIED BY A ROOF MOUNTED AND A GROUND MOUNTED SOLARPHOTOVOLTAIC SYSTEM WITH DISCONNECTS LOCATED AT SERVICE AND AT GROUND ARRAY



REQ'D BY: NEC 690.56
QTY: 2
APPLY TO:
- MAIN SERVICE
- BUILDING ENTRANCE

SIGNAGE REQUIREMENTS
1.) RED BACKGROUND
2.) WHITE LETTERING
3.) MIN. 3/8" LETTER HEIGHT
4.) ALL CAPITAL LETTERS
5.) ARIAL OR SIMILAR FONT
6.) WEATHER RESISTANT MATERIAL, PER UL 969

Project:
ANDOVER, NJ 07821

Project Details:
307.395 kWstc, 230.00 kW AC
AHJ: GREEN, TOWNSHIP

Engineering Approval:

REVISIONS		
DESCRIPTION	DATE	REV
ORIGINAL	6/15/2018	A
ELECTRICAL	7/17/2018	B
LAYOUT	7/17/2018	C

Sheet Title:
SAFETY PLACARDS

Sheet Number:
E2.2

Sheet Size:
ARCH D - 36" x 24"

DESIGN & DRAFTING BY:
CLARK FLEMING
Do not pray for an easy life, pray for the strength to endure a difficult one.
- Bruce Lee

SepiSolar
POWER BY DESIGN

Reviewed & Approved by:
RD

ARC FLASH HAZARD PPE CATEGORIES		
CATEGORY	REQUIRED PERSONAL PROTECTIVE EQUIPMENT	INCIDENT ENERGY
0	SAFETY GLASSES, LONG-SLEEVE SHIRT AND LONG PANTS MADE OF NON-MELTING, FLAMMABLE MATERIALS (I.E., UNTREATED COTTON, N/A WOOL, RAYON, SILK, OR BLENDS OF THESE MATERIALS)	0-4
1	SAFETY GLASSES, HARD HAT, FR SHIRT AND PANTS (OR FR COVERALLS), LEATHER PROTECTIVE GLOVES, AND LEATHER SHOES	4-8
2	SAFETY GLASSES OR GOGGLES, HEARING PROTECTION, HARD HAT, COTTON UNDERWEAR, FR SHIRT AND PANTS (OR FR COVERALLS), ARC RATED FACE SHIELD (OR ARC FLASH HOOD), LEATHER GLOVES, AND LEATHER SHOES	8-25
3	SAFETY GLASSES OR GOGGLES, HEARING PROTECTION, HARD HAT, COTTON UNDERWEAR, FR SHIRT AND PANTS, FR COVERALLS (IN ADDITION TO FR SHIRT AND PANTS), ARC FLASH HOOD, LEATHER GLOVES, AND LEATHER SHOES	25-40
4	SAFETY GLASSES OR GOGGLES, HEARING PROTECTION, HARD HAT, COTTON UNDERWEAR, FR SHIRT AND PANTS, FR COVERALLS (IN ADDITION TO FR SHIRT AND PANTS), FULL FLASH SUIT WITH HOOD, LEATHER GLOVES, AND LEATHER SHOES	40+

ANY ELECTRICAL EQUIPMENT WITH AN INCIDENT ENERGY OF GREATER THAN 40 CAL/CM² MUST BE DE-ENERGIZED BEFORE MAINTENANCE IS PERFORMED

FOR ADDITIONAL INFORMATION ON ARC FLASH PPE AND RATING REQUIREMENTS, PLEASE REFERENCE THE STANDARD FOR ELECTRICAL SAFETY IN THE WORKPLACE (NFPA 70E)

WARNING

ARC FLASH & SHOCK HAZARD PRESENT
APPROPRIATE PPE REQUIRED

ARC FLASH HAZARD PROTECTION

NOMINAL SYSTEM VOLTAGE: 208
INCIDENT ENERGY: 65.99 CAL/CM²
AT WORKING DISTANCE OF: 18 IN.
ARC FLASH BOUNDARY: 274.1 IN.

208 VDC SHOCK HAZARD WHEN COVER IS REMOVED

SHOCK PROTECTION BOUNDARIES:

LIMITED APPROACH BOUNDARY: 42 IN.
RESTRICTED APPROACH BOUNDARY: N/A

PPE REQUIRED CATEGORY: 4

REQ'D BY: NFPA 70 E

APPLY TO:
MAIN SWITCHGEAR

WARNING

ARC FLASH & SHOCK HAZARD PRESENT
APPROPRIATE PPE REQUIRED

ARC FLASH HAZARD PROTECTION

NOMINAL SYSTEM VOLTAGE: 480
INCIDENT ENERGY: 24.63 CAL/CM²
AT WORKING DISTANCE OF: 18 IN.
ARC FLASH BOUNDARY: 113.8 IN.

480 VDC SHOCK HAZARD WHEN COVER IS REMOVED

SHOCK PROTECTION BOUNDARIES:

LIMITED APPROACH BOUNDARY: 42 IN.
RESTRICTED APPROACH BOUNDARY: 12 IN.

PPE REQUIRED CATEGORY: 2

REQ'D BY: NFPA 70 E

APPLY TO:
AC COMBINER PANEL 'B'

WARNING

ARC FLASH & SHOCK HAZARD PRESENT
APPROPRIATE PPE REQUIRED

ARC FLASH HAZARD PROTECTION

NOMINAL SYSTEM VOLTAGE: 208
INCIDENT ENERGY: 63.22 CAL/CM²
AT WORKING DISTANCE OF: 18 IN.
ARC FLASH BOUNDARY: 202.2 IN.

208 VDC SHOCK HAZARD WHEN COVER IS REMOVED

SHOCK PROTECTION BOUNDARIES:

LIMITED APPROACH BOUNDARY: 42 IN.
RESTRICTED APPROACH BOUNDARY: N/A

PPE REQUIRED CATEGORY: 4

REQ'D BY: NFPA 70 E

APPLY TO:
AC DISCONNECT 'B'

WARNING

ARC FLASH & SHOCK HAZARD PRESENT
APPROPRIATE PPE REQUIRED

ARC FLASH HAZARD PROTECTION

NOMINAL SYSTEM VOLTAGE: 480
INCIDENT ENERGY: 13.41 CAL/CM²
AT WORKING DISTANCE OF: 18 IN.
ARC FLASH BOUNDARY: 78.6 IN.

480 VDC SHOCK HAZARD WHEN COVER IS REMOVED

SHOCK PROTECTION BOUNDARIES:

LIMITED APPROACH BOUNDARY: 42 IN.
RESTRICTED APPROACH BOUNDARY: 12 IN.

PPE REQUIRED CATEGORY: 2

REQ'D BY: NFPA 70 E

APPLY TO:
AC DISCONNECT 'A'

WARNING

ARC FLASH & SHOCK HAZARD PRESENT
APPROPRIATE PPE REQUIRED

ARC FLASH HAZARD PROTECTION

NOMINAL SYSTEM VOLTAGE: 480
INCIDENT ENERGY: 55.35 CAL/CM²
AT WORKING DISTANCE OF: 18 IN.
ARC FLASH BOUNDARY: 186.4 IN.

480 VDC SHOCK HAZARD WHEN COVER IS REMOVED

SHOCK PROTECTION BOUNDARIES:

LIMITED APPROACH BOUNDARY: 42 IN.
RESTRICTED APPROACH BOUNDARY: 12 IN.

PPE REQUIRED CATEGORY: 4

REQ'D BY: NFPA 70 E

APPLY TO:
TRANSFORMER

WARNING

ARC FLASH & SHOCK HAZARD PRESENT
APPROPRIATE PPE REQUIRED

ARC FLASH HAZARD PROTECTION

NOMINAL SYSTEM VOLTAGE: 480
INCIDENT ENERGY: 13.04 CAL/CM²
AT WORKING DISTANCE OF: 18 IN.
ARC FLASH BOUNDARY: 77.2 IN.

480 VDC SHOCK HAZARD WHEN COVER IS REMOVED

SHOCK PROTECTION BOUNDARIES:

LIMITED APPROACH BOUNDARY: 42 IN.
RESTRICTED APPROACH BOUNDARY: 12 IN.

PPE REQUIRED CATEGORY: 2

REQ'D BY: NFPA 70 E

APPLY TO:
AC COMBINER PANEL 'A'

Available Fault Current Calculation

Utility Symmetrical Fault Current = 40,000 amperes kVA = 300
 E = 208
 trans. FLA = 833

$I = \frac{kVA \times 1000}{E \times 1.732} = \text{trans. FLA}$

$I_{sca} = \frac{\text{trans. FLA} \times 100 \times PF}{\text{transformer Z}}$ PF = 100%
 Z = 1.50%
 I_{sca} = 55,516 amperes

Point to Point Method Three Phase 208/120
 Length (distance) (FEET) L = 70
 Copper in Nonmetallic Raceway

'f' factor = $1.732 \times L \times I$ (ASC) I_{sca} = 40,000
 $N \times C \times E \times L - N$ # conductors per phase N = 3
 Phase conductor constant C = 24,297 Phase Conductor 400 kcmil
 Volt Line to Line E L - L = 208 Volt
 f = 0.320
 Neutral conductor constant C = 24,297 Neutral Conductor 400 kcmil
 Volt Line to Neutral E L - N = 120 Volt
 f = 0.554

Multiplier
 $M = \frac{1}{1 + f}$ Line to Line M = 0.758
 Line to Neutral M = 0.643

Fault Current at Service Equipment
 I_{sca} x M = fault current at terminals of main disconnect L-L = 30,306 amperes
 I_{sca} x M = fault current at terminals of main disconnect L-N = 25,733 amperes

Fault Current from Main Switchgear to AC Disconnect 'B' Copper in Metal Raceway

Three Phase Feeder Length (distance) L = 15
 (ASC) I_{sca} = 30,306 Phase 25,733 Neutral
 # conductors per phase N = 3
 Phase conductor constant C = 18,177 Phase Conductor 300 kcmil
 Volt Line to Line E L - L = 208 Volt
 f = 0.069
 Neutral conductor constant C = 18,177 Neutral Conductor 300 kcmil
 Volt Line to Neutral E L - N = 120 Volt
 f = 0.102

Multiplier
 $M = \frac{1}{1 + f}$ Line to Line M = 0.935
 Line to Neutral M = 0.907

I_{sca} x M = fault current at terminal of the panel L-L = 28,339 amperes
 I_{sca} x M = fault current at terminal of the panel L-N = 23,347 amperes

Fault Current from AC Disconnect 'B' to Transformer Copper in Nonmetallic Raceway

Three Phase Feeder Length (distance) L = 35
 (ASC) I_{sca} = 28,339 Phase 23,347 Neutral
 # conductors per phase N = 3
 Phase conductor constant C = 20,868 Phase Conductor 300 kcmil
 Volt Line to Line E L - L = 208 Volt
 f = 0.132
 Neutral conductor constant C = 20,868 Neutral Conductor 300 kcmil
 Volt Line to Neutral E L - N = 120 Volt
 f = 0.188

Multiplier
 $M = \frac{1}{1 + f}$ Line to Line M = 0.883
 Line to Neutral M = 0.841

I_{sca} x M = fault current at terminal of the panel L-L = 25,036 amperes
 I_{sca} x M = fault current at terminal of the panel L-N = 19,646 amperes

Fault Current from Transformer to AC Combiner 'B' Copper in Nonmetallic Raceway

Three Phase Feeder Length (distance) L = 20
 (ASC) I_{sca} = 12,955 Phase 9,028 Neutral
 # conductors per phase N = 2
 Phase conductor constant C = 11,424 Phase Conductor 2/0
 Volt Line to Line E L - L = 480 Volt
 f = 0.094
 Neutral conductor constant C = 11,424 Neutral Conductor 2/0
 Volt Line to Neutral E L - N = 120 Volt
 f = 0.114

Multiplier
 $M = \frac{1}{1 + f}$ Line to Line M = 0.914
 Line to Neutral M = 0.898

I_{sca} x M = fault current at terminal of the panel L-L = 11,837 amperes
 I_{sca} x M = fault current at terminal of the panel L-N = 8,103 amperes

Fault Current from AC Combiner Panel 'B' to AC Disconnect 'A' Copper in Nonmetallic Raceway

Three Phase Feeder Length (distance) L = 175
 (ASC) I_{sca} = 11,837 Phase 8,103 Neutral
 # conductors per phase N = 2
 Phase conductor constant C = 11,424 Phase Conductor 2/0
 Volt Line to Line E L - L = 480 Volt
 f = 0.755
 Neutral conductor constant C = 11,424 Neutral Conductor 2/0
 Volt Line to Neutral E L - N = 120 Volt
 f = 0.896

Multiplier
 $M = \frac{1}{1 + f}$ Line to Line M = 0.570
 Line to Neutral M = 0.527

I_{sca} x M = fault current at terminal of the panel L-L = 6,745 amperes
 I_{sca} x M = fault current at terminal of the panel L-N = 4,274 amperes

Fault Current from AC Disconnect 'A' to AC Combiner Panel 'A' Copper in Metal Raceway

Three Phase Feeder Length (distance) L = 10
 (ASC) I_{sca} = 6,745 Phase 4,274 Neutral
 # conductors per phase N = 2
 Phase conductor constant C = 10,755 Phase Conductor 2/0
 Volt Line to Line E L - L = 480 Volt
 f = 0.026
 Neutral conductor constant C = 10,755 Neutral Conductor 2/0
 Volt Line to Neutral E L - N = 120 Volt
 f = 0.029

Multiplier
 $M = \frac{1}{1 + f}$ Line to Line M = 0.975
 Line to Neutral M = 0.972

I_{sca} x M = fault current at terminal of the panel L-L = 6,573 amperes
 I_{sca} x M = fault current at terminal of the panel L-N = 4,155 amperes

Incident Energy at Main Switchgear

Available fault current I = 30,306 kAIC
 Conductor gap G = 32 mm
 K₁ Factor K₁ = 0.555
 K₂ Factor K₂ = -0.113

$E_{in} = 10^{(K_1 + K_2 + 1.081 \log(I) + 0.0011G)}$

Normalized incident energy E_{in} = 119.876 J/cm² = 28.770 cal/cm²

Working distance D = 18 in = 457.2 mm
 Exposure time T_{exp} = 0.2 sec
 X Factor X = 1.473

$E_i = 1.5(E_{in})(T_{exp}/0.2)(610/D)^X$

Adjusted incident energy E_i = 274.965 J/cm² = 65.992 cal/cm²

Incident Energy if disconnect switch is closed = 65.992 cal/cm²

Required minimum PPE rating = Category 4

Incident Energy at AC Disconnect 'B'

Available fault current I = 28,339 kAIC
 Conductor gap G = 25 mm
 K₁ Factor K₁ = 0.555
 K₂ Factor K₂ = -0.113

$E_{in} = 10^{(K_1 + K_2 + 1.081 \log(I) + 0.0011G)}$

Normalized incident energy E_{in} = 109.529 J/cm² = 26.287 cal/cm²

Working distance D = 18 in = 457.2 mm
 Exposure time T_{exp} = 0.2 sec
 X Factor X = 1.641

$E_i = 1.5(E_{in})(T_{exp}/0.2)(610/D)^X$

Adjusted incident energy E_i = 263.700 J/cm² = 63.288 cal/cm²

Incident Energy if disconnect switch is closed = 63.288 cal/cm²

Required minimum PPE rating = Category 4

Incident Energy at Transformer

Available fault current I = 25,036 kAIC
 Conductor gap G = 25 mm
 K₁ Factor K₁ = 0.555
 K₂ Factor K₂ = -0.113

$E_{in} = 10^{(K_1 + K_2 + 1.081 \log(I) + 0.0011G)}$

Normalized incident energy E_{in} = 95.796 J/cm² = 22.991 cal/cm²

Working distance D = 18 in = 457.2 mm
 Exposure time T_{exp} = 0.2 sec
 X Factor X = 1.641

$E_i = 1.5(E_{in})(T_{exp}/0.2)(610/D)^X$

Adjusted incident energy E_i = 230.639 J/cm² = 55.353 cal/cm²

Incident Energy if disconnect switch is closed = 55.353 cal/cm²

Required minimum PPE rating = Category 4

Incident Energy at AC Combiner Panel 'B'

Available fault current I = 11,837 kAIC
 Conductor gap G = 25 mm
 K₁ Factor K₁ = 0.555
 K₂ Factor K₂ = -0.113

$E_{in} = 10^{(K_1 + K_2 + 1.081 \log(I) + 0.0011G)}$

Normalized incident energy E_{in} = 42.626 J/cm² = 10.230 cal/cm²

Working distance D = 18 in = 457.2 mm
 Exposure time T_{exp} = 0.2 sec
 X Factor X = 1.641

$E_i = 1.5(E_{in})(T_{exp}/0.2)(610/D)^X$

Adjusted incident energy E_i = 102.626 J/cm² = 24.630 cal/cm²

Incident Energy if disconnect switch is closed = 24.630 cal/cm²

Required minimum PPE rating = Category 2

Incident Energy at AC Disconnect 'A'

Available fault current I = 6,745 kAIC
 Conductor gap G = 25 mm
 K₁ Factor K₁ = 0.555
 K₂ Factor K₂ = -0.113

$E_{in} = 10^{(K_1 + K_2 + 1.081 \log(I) + 0.0011G)}$

Normalized incident energy E_{in} = 23.208 J/cm² = 5.570 cal/cm²

Working distance D = 18 in = 457.2 mm
 Exposure time T_{exp} = 0.2 sec
 X Factor X = 1.641

$E_i = 1.5(E_{in})(T_{exp}/0.2)(610/D)^X$

Adjusted incident energy E_i = 55.874 J/cm² = 13.410 cal/cm²

Incident Energy if disconnect switch is closed = 13.410 cal/cm²

Required minimum PPE rating = Category 2

Incident Energy at AC Combiner Panel 'A'

Available fault current I = 6,573 kAIC
 Conductor gap G = 25 mm
 K₁ Factor K₁ = 0.555
 K₂ Factor K₂ = -0.113

$E_{in} = 10^{(K_1 + K_2 + 1.081 \log(I) + 0.0011G)}$

Normalized incident energy E_{in} = 22.568 J/cm² = 5.416 cal/cm²

Working distance D = 18 in = 457.2 mm
 Exposure time T_{exp} = 0.2 sec
 X Factor X = 1.641

$E_i = 1.5(E_{in})(T_{exp}/0.2)(610/D)^X$

Adjusted incident energy E_i = 54.336 J/cm² = 13.041 cal/cm²

Incident Energy if disconnect switch is closed = 13.041 cal/cm²

Required minimum PPE rating = Category 2

Project: ANDOVER, NJ 07821
 Project Details: 307.395 kWsec, 230.00 kW AC
 AHJ: GREEN, TOWNSHIP

Engineering Approval:

REVISIONS		
DESCRIPTION	DATE	REV
ORIGINAL	6/15/2018	A
ELECTRICAL	7/17/2018	B
LAYOUT	7/17/2018	C

FAULT CURRENT CALCULATIONS

Sheet Title: **E2.3**

Sheet Size: **ARCH D - 36" x 24"**

DESIGN & DRAFTING BY:
 CLARK FLEMING
"Do not pray for an easy life, pray for the strength to endure a difficult one."
 - Bruce Lee

SOLARMOUNT Technical Datasheets

SOLARMOUNT Beams
Part No. 310132C, 310132C-B, 310168C, 310168C-B, 310240D, 310240D-B, 310240C, 310240C-B, 310240E, 310240E-B, 410240M, 410240M-B

Properties	Units	SOLARMOUNT	SOLARMOUNT HD
Beam Height	in	2.5	3.0
Approximate Weight (per linear ft)	pcf	0.811	1.271
Total Cross Sectional Area	in ²	0.876	1.059
Section Modulus (X-Axis)	in ³	0.353	0.896
Section Modulus (Y-Axis)	in ³	0.113	0.221
Moment of Inertia (X-Axis)	in ⁴	0.464	1.450
Moment of Inertia (Y-Axis)	in ⁴	0.044	0.267
Radius of Gyration (X-Axis)	in	0.289	1.170
Radius of Gyration (Y-Axis)	in	0.254	0.502

*Axis are measured using these aluminum alloys: 6063-T5, 6061-T3, 6062-T6

OPTIMIZED COMPONENTS

INTEGRATED BONDING & PRE-ASSEMBLED PARTS
Components are pre-assembled and optimized to reduce installation steps and save labor time. Our new pre-wiring & bonding process eliminates tape and wire protruding from or protruding through to reduce theft. Unlike the conventional method with a wire management clip for an easier installation.

VERSATILITY

ONE PRODUCT - MANY APPLICATIONS
Quickly set modules flush to the roof or at a desired tilt angle. Change module orientation to parallel or perpendicular while retaining a large variety of forced modules on the structure or equipment racks. Available round, clear and black anodized finishes to supplement your project's financial and aesthetic objectives.

AVAILABILITY

NATIONWIDE NETWORK
Unirac maintains the largest network of stocking distributors for our roofing solutions. Our partners have demonstrated their level of customer support, availability, and product value, thereby providing the highest level of service to users of these products. Contact your distributor for full and complete delivery to meet your project objectives. Visit www.unirac.com for a list of distributors.

AUTOMATED DESIGN TOOL

DESIGN PLATFORM AT YOUR SERVICE
Creating a bill of materials is a time-consuming task with 10 variables, a powerful online tool that streamlines the process of designing a code compliant solar mounting system. Save time by creating a user profile and reuse components and projects automatically when you log in. We will enjoy the ability to share projects with customers, they need to print reports and send to a distributor, just click and done.

SolarEdge Three Phase Inverters for the 277/480V Grid for North America

SE10KUS / SE20KUS / SE30KUS / SE33.3KUS

INVERTERS

The best choice for SolarEdge enabled systems

- Specifically designed to work with power optimizers
- Superior efficiency (98.5%)
- Integrated arc fault protection and rapid shutdown for NEC 2014 and 2017, per article 690.11 and 690.12
- UL1743 SA certified, for CPC1 Rule 71 grid compliance
- Built-in module-level monitoring
- Internet connection through Ethernet or Wireless
- Small, lightweight, and easy to install outdoors or indoors on provided bracket
- Fixed voltage inverter for larger stringing
- Integrated Safety Switch
- Supplied with RS485 Surge Protection Device, to better withstand lightning events

SolarEdge Three Phase Inverters for the 277/480V Grid for North America

SE10KUS / SE20KUS / SE30KUS / SE33.3KUS

SE10KUS	SE20KUS	SE30KUS	SE33.3KUS		
Rated AC Power Output	10000	20000	30000	33000	VA
Maximum AC Power Output	20000	20000	20000	21000	VA
AC Output Line Connections	4 wires WYE (L1-L2-L3-N) plus PE				
AC Output Voltage (Minimum-Normal-Maximum) (L-N)	220-277-330				
AC Output Voltage (Minimum-Normal-Maximum) (L-L)	422-480-528				
AC Frequency (50/60/60Hz)	50/60				
Max. Continuous Output Current (per Phase)	10	20	30	33	A
GND Threshold	1	1	1	1	A
Utility Monitoring & Islanding Protection	Yes				
Country Configurable Set Points	Yes				

INPUT

Maximum DC Power (Module 370)	13500	27000	40500	45000	W
Transformer-Not ULFIR-Required	Yes				
Maximum Input Voltage (DC to Grid)	600				VDC
Maximum Input Voltage (DC to DC)	900				VDC
Normal Input Voltage (DC to Grid)	420				VDC
Normal Input Voltage (DC to DC)	600				VDC
Maximum Input Current	13.5	26.5	33	40	A
Maximum Input Short-Circuit Current	40				A
Reverse-Polarity Protection	Yes				
Ground Fault Leakage Protection	Yes				
DC Isolated Efficiency	98	98.5	98.5	98.5	%
AC Isolated Efficiency	< 9				
Light Loss Power Consumption	< 4				W

ADDITIONAL FEATURES

- Supports Communication Interfaces: RS485, Ethernet, ZigBee (optional)
- Automatic Rapid Shutdown: See Grid Disconnect*
- RS485 Surge Protection: Supplied with the Inverter

STANDARD COMPLIANCE

- UL1743, UL1743 SA, UL1818, CSA C22.2, Canadian-APU according to T-1, N-107
- IEEE 1547, IEEE 1547.2, IEEE 1547.4 (FIH)
- IEC 62109, IEC 62109-2, IEC 62109-3

INSTALLATION SPECIFICATIONS

- AC Input conductor size / AWG range: 3/4" minimum / 12-6 AWG / 3/4" minimum / 8-6 AWG
- DC Input conductor size / AWG range: 3 pairs / 3/4" minimum / 12-6 AWG
- Number of AC Strands: 3 pairs / 3/4" minimum / 12-6 AWG
- Dimensions (W x H x D): 21 x 12.5 x 10.5 / 340 x 315 x 260
- Dimensions with Safety Switch (W x H x D): 260 x 315 x 265 / 1778 x 315 x 1050
- Weight: 79.7 / 83.2 / 91.0 / 99.5
- Weight with Safety Switch: 79.7 / 86.2 / 93.0 / 100.8
- Casting: Epoxy (not applicable)
- Note: 40 to 140 / 40 to 140 / 40 to 140 / 40 to 140
- Operating Temperature Range: -40 to +60 / -40 to +60 / -40 to +60 / -40 to +60
- Protection Rating: NEMA 3R

SolarEdge Power Optimizer

Module Add-On for Commercial Installations for North America P600 / P700 / P730 / P800p / P800s

POWER OPTIMIZER

PV power optimization at the module-level
The most cost effective solution for commercial and large field installations

- Specifically designed to work with SolarEdge inverters
- Up to 25% more energy
- Superior efficiency (99.5%)
- Balance of System cost reduction: 50% less cables, fuses and combiner boxes, over 2x longer string lengths possible
- Fast installation with a single bolt
- Advanced maintenance with module-level monitoring
- Module level voltage shutdown for installer and firefighter safety
- Compliant with arc fault protection and rapid shutdown NEC requirements (when installed as part of the SolarEdge system)
- Use with two PV modules connected in series or in parallel

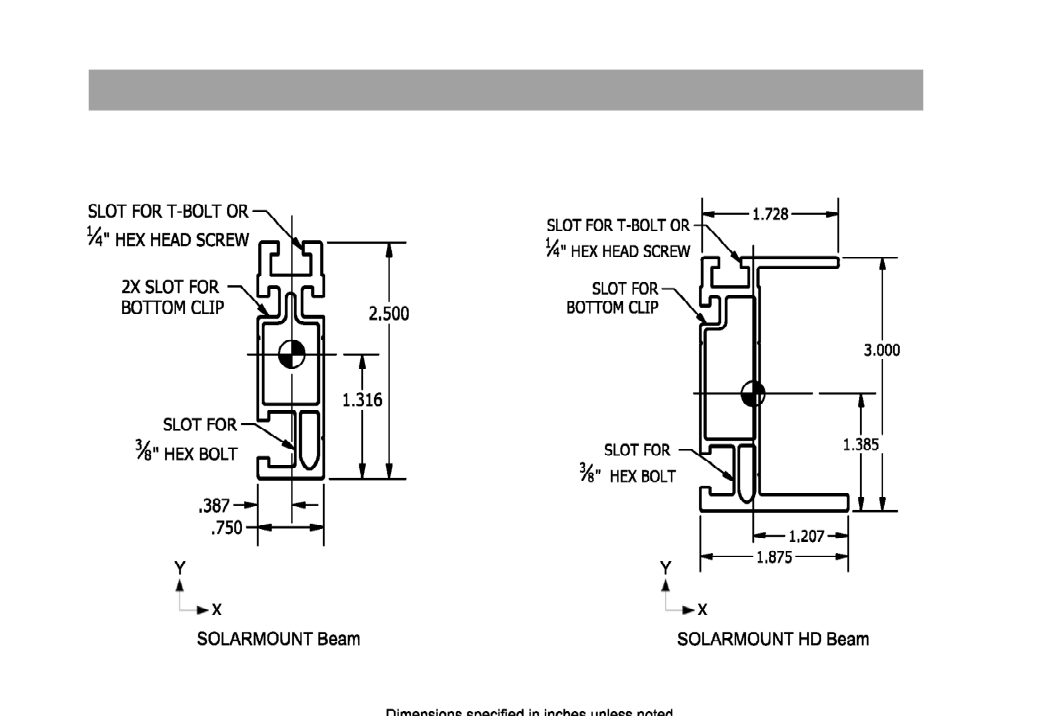
SolarEdge Power Optimizer Module Add-On For Commercial Installations for North America P600 / P700 / P730 / P800p / P800s

Optimizer model (Input module compatibility)	P600	P700	P730	P800p	P800s
Power (P _{max}) (W)	600	700	730	800	800
Module Maximum Power Voltage (V _{mp}) (V)	56	55	55	55	55
Module Maximum Power Current (I _{mp}) (A)	10.7	12.7	13.1	14.5	14.5
Module Maximum Current (I _{sc}) (A)	12.0	14.1	14.5	16.3	16.3
Module Maximum Current (I _{sc}) (A)	12.0	14.1	14.5	16.3	16.3
Module Maximum Current (I _{sc}) (A)	12.0	14.1	14.5	16.3	16.3
Module Maximum Current (I _{sc}) (A)	12.0	14.1	14.5	16.3	16.3

INSTALLATION SPECIFICATIONS

Three phase inverters

Combiner box voltage (V)	120-152.4 V	300	300	300	300
Dimensions (W x H x D) (mm)	63.5 x 152.4 x 101.6	128 x 152.4 x 152.4 x 152.4	128 x 152.4 x 152.4 x 152.4	128 x 152.4 x 152.4 x 152.4	128 x 152.4 x 152.4 x 152.4
Weight (kg)	0.941 / 2.07	3.881 / 8.55	3.881 / 8.55	3.881 / 8.55	3.881 / 8.55



UNIRAC CUSTOMER SERVICE MEANS THE HIGHEST LEVEL OF PRODUCT SUPPORT

- UNIVERSITY TRAINING
- DESIGN SUPPORT
- INTEGRATED BONDING
- VERSATILITY
- AVAILABILITY
- AUTOMATED DESIGN TOOL

TECHNICAL SUPPORT

UNIRAC technical support team is dedicated to assisting customers in addressing issues in real time. An online library of documents including engineering reports, sample orders and technical data sheets, manuals, project permitting and project planning projects, and commitment to free class business practices, and commitment to free class business practices.

CERTIFIED-QUALITY PROVIDER

UNIRAC is the only PV mounting vendor with ISO certifications: ISO 9001, ISO 14001 and ISO 45001:2018 which means we deliver the highest standards for fit, form, and function. Our products and services are supported by a 5-year limited product warranty and a 5-year limited finish warranty.

BANKABLE WARRANTY

As a UNIRAC Group Company, UNIRAC has the financial strength to back our products and services. This has resulted in our products being included in the highest standards for fit, form, and function. Our products and services are supported by a 5-year limited product warranty and a 5-year limited finish warranty.

S-5! The Right Way!

S-5-H90 Clamp

The S-5-H90 is a one-piece clamp that was developed to accurately and cost-effectively accommodate metal roof panels with a horizontal seam greater than 655".

S-5-H90 Mini Clamp

The S-5-H90 Mini is a bit shorter than the S-5-H90 and has one set screw and one threaded bolt hole rather than two. The mini is the choice for attaching all kinds of rooftop accessories: signs, walkways, satellite dishes, antennas, rooftop lighting, lightning protection systems, solar straps, wet/dry stack bracing, conduit, condensate lines, mechanical equipment—just about anything!

888-825-3432 | www.S-5.com

S-5! The Right Way!

S-5-H90

S-5-H90 Mini

5" Warranted Finish on this product (optional)
Additional details are provided on the website at www.S-5.com. Copyright © 2018 S-5. All rights reserved. S-5 is a registered trademark of S-5. All other trademarks are the property of their respective owners.

Q PLUS L-G4.2 320-345

Q. ANTUM SOLAR MODULE

The Q. ANTUM solar module Q.PLUS L-G4.2 with power classes up to 345 Wp is the strongest module of its type on the market globally. Powered by Q CELLS solar cells Q.PLUS L-G4.2 was specially designed for large solar power plants to reduce BOS costs. But there is even more to our polycrystalline modules. Only Q CELLS offers German engineering quality with our unique triple field Security.

LOW ELECTRICITY GENERATION COSTS

Higher yield per surface area and lower BOS costs thanks to higher power classes and an efficiency rate of up to 17.7%.

INNOVATIVE ALL WEATHER TECHNOLOGY

Optimal cells, robust frame with excellent low light and temperature behavior.

ENHANCING HIGH PERFORMANCE

Long-term yield security by Anti-PID Technology[®], Non-Spik-Protect and transferable Quality 30/20[™].

LIGHT WEIGHT QUALITY FRAME

High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (2400 Pa).

RELIABLE INVESTMENT

Increase 12-year product warranty and 25-year linear performance guarantee!

Engineered in Germany

MECHANICAL SPECIFICATION

Power: 320-345 Wp, Max. including Nameplate
Weight: 12.0 kg ± 0.05 kg
Max. Length: 2000 mm ± 10 mm
Max. Width: 1000 mm ± 10 mm
Max. Depth: 45 mm ± 1 mm
Max. Hole Spacing: 100 mm ± 1 mm
Max. Hole Diameter: 6 mm ± 0.1 mm
Max. Hole Position: 100 mm ± 1 mm

ELECTRICAL CHARACTERISTICS

Parameter	320	330	340	345
Power (P _{max})	320	330	340	345
Max. Power Voltage (V _{mp})	56	55	55	55
Max. Power Current (I _{mp})	10.7	12.7	13.1	14.5
Max. Current (I _{sc})	12.0	14.1	14.5	16.3
Max. Voltage (V _{oc})	70	69	69	69
Max. Short-Circuit Current (I _{sc})	12.0	14.1	14.5	16.3

PACKAGING INFORMATION

Number of Modules per Tray: 24
Number of Trays per Pallet: 20
Pallet Dimensions (L x W x H): 2100 x 1300 x 1300 mm
Gross Weight per Pallet: 2880 kg
Net Weight per Pallet: 2160 kg

Engineered in Germany

REVISIONS

DESCRIPTION	DATE	REV
ORIGINAL	6/15/2018	A
ELECTRICAL	7/17/2018	B
LAYOUT	7/17/2018	C

Equipment Data Sheet

EQUIPMENT DATA SHEETS

Sheet Number: **D.I.O.**

Sheet Size: **ARCH D - 36" x 24"**

DESIGN & DRAFTING BY: **CLARK FLEMING**

"Do not pray for an easy life, pray for the strength to endure a difficult one." - Bruce Lee

Reviewed & Approved by: **RD**

SepiSolar
POWER BY DESIGN