HOPPING BROOK - PHOTOVOLTAIC ENERGY SYSTEM

THIS 323.38 KWSTC, ROOF MOUNTED PHOTOVOLTAIC (PV) SYSTEM IS TO BE INSTALLED AT THE OFFICE BUILDING IN HOLLISTON, MASSACHUSETTS. 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 ENERGY STORAGE BATTERIES.

SHEET INDEX

COMPONENTS LIST

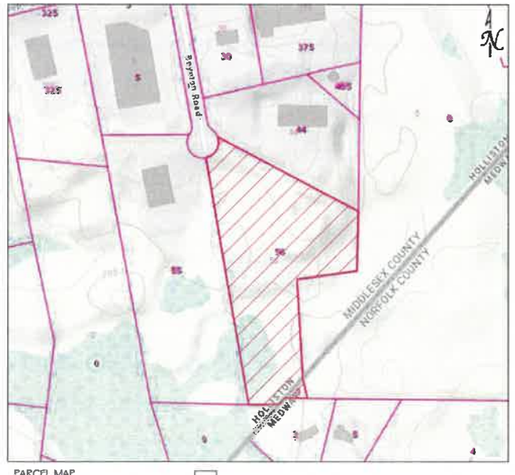
ELECTRICAL			RACKING		
QTY	NAME	DESCRIPTION	QTY	NAME	DESCRIPTION
874	PV MODULE	HELIENE 72M-370 (TOTAL: 18,227 SQ. FT.)	1535	ATTACHMENT	SOLAR CONNECTIONS MINI 155 CLAMPS 48" O.C. MAX.
4	PV INVERTER	SOLECTRIA PVI 60TL 60.0 KW, 480 VAC. 79.4 A	144	END CLAMP	IRONRIDGE END CLAMP
874	RSD	TIGO TS4-A-F (FIRE SAFETY)	1678	MID CLAMP	IRONRIDGE MID CLAMP
1	AC DISCONNECT	240 VAC, 1200 A, NEMA 1	1535	L-FOOT	IRONRIDGE L-FOOT
1	AC DISCONNECT	600 VAC, 400 A, NEMA 3R	5816	FEET OF RACKING RAIL	IRONRIDGE XR-100 RAIL
1	AC COM-BINER PANEL	480 VAC, 400 A, NEMA 3R			
1	PV MONITOR	LOCUS LGATE 360 NEMA 3R			
1	PV METER	480 VAC, 400 A, NEMA 3R			
1	TRANS-FORMER	300 KVA, NEMA 1 PV-SIDE: 277/480 VAC, UTILITY-SIDE: 120/208 VAC			

GOVERNING CODES & STANDARDS

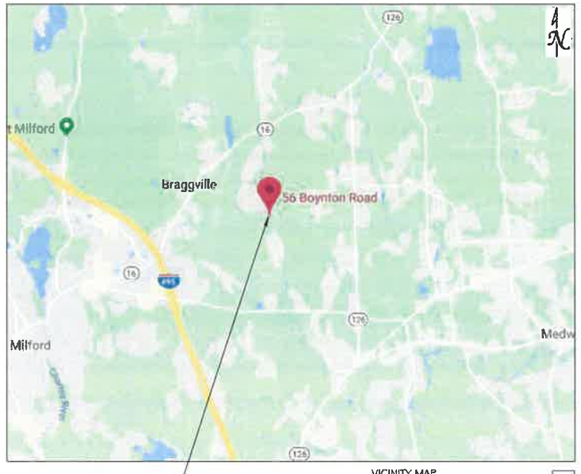
2020 NATIONAL ELECTRICAL CODE
780 CMR, 9TH EDITION
UNDERWRITERS LABORATORIES (UL) STANDARDS
OSHA 29 CFR 1910.269

SITE SPECIFICATIONS

EXPOSURE CATEGORY: B
RISK CATEGORY: II
WIND SPEED (ASCE 7-10): 128 MPH
SNOW LOAD (ASCE 7-10): 40 PSF



PARCEL MAP 1



PROJECT LOCATION

VICINITY MAP 2

Contractor:
earthlight solar & energy solutions
EARTHLIGHT SOLAR & ENERGY SOLUTIONS
92 WEST ROAD
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P: (860) 871-9700
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Project:
HOPPING BROOK
56 BOYNTON RD.
HOLLISTON, MA 01746

Project Details:
323.38 kWstc, 240.00 kW AC
AHJ: HOLLISTON, TOWN OF
APN: 13G001000100560

Engineering Approval:
COMMONWEALTH OF MASSACHUSETTS
RICHARD DOBBINS ELECTRICAL No. 54388
Registered Professional Engineer
SIGNED: 02/25/2020
STAMPED AND SIGNED FOR ELECTRICAL ONLY

REVISIONS

DESCRIPTION	DATE	REV
50% DELIVERABLE	1/6/2020	1
90% DELIVERABLE	1/17/2020	2
PERMIT SET	1/30/2020	A

Sheet Title: COVER

Sheet Number: T1.0

Sheet Size: ARCH D - 36" x 24"

DESIGN & DRAFTING BY:
JUAN CARLOS CHAVEZ

"The best preparation for tomorrow is doing your best today."
- H. Jackson Brown, Jr.

SepiSolar POWER BY DESIGN

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 DISTRIBUITION 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.

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 AND ARTICLE 705.

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.

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 APPROXIMATE LOCATIONS OF ALL JUNCTION BOXES, COMBINER BOXES, CONDUITS, ETC. SHALL BE DETERMINED FROM THE DRAWINGS, AND VERIFIED BY THE CONTRACTOR FOR INSTALLATION.

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.) BREAKERS SHALL BE 80% RATED UNLESS OTHERWISE SPECIFIED.

9.) 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.

10.) THE SHORT-CIRCUIT INTERRUPTING RATING OF ALL NEW EQUIPMENT SHALL BE NO LESS THAN THE INTERRUPTING RATING OF THE EXISTING SERVICE EQUIPMENT, UNLESS A MINIMUM VALUE WAS CALCULATED AND SPECIFIED ON THE PLANS FOR THE NEW EQUIPMENT.

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)

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

ELECTRICAL LEGEND - DC

- [+] = POSITIVE TERMINAL (PHASED RED)
- [-] = NEGATIVE TERMINAL (PHASED BLACK)
- [G] = GROUND TERMINAL (PHASED GREEN)

ELEC. LEGEND - 480 VAC

- [L1] = LINE 1 TERMINAL (PHASED BROWN)
- [L2] = LINE 2 TERMINAL (PHASED ORANGE)
- [L3] = LINE 3 TERMINAL (PHASED YELLOW)
- [N] = NEUTRAL TERMINAL (PHASED WHITE)
- [G] = GROUND TERMINAL (PHASED GREEN)

ELEC. LEGEND - 208 VAC

- [L1] = LINE 1 TERMINAL (PHASED BLACK)
- [L2] = LINE 2 TERMINAL (PHASED RED)
- [L3] = LINE 3 TERMINAL (PHASED BLUE)
- [N] = NEUTRAL TERMINAL (PHASED WHITE)
- [G] = GROUND TERMINAL (PHASED GREEN)

Contractor:
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EARTHLIGHT SOLAR & ENERGY SOLUTIONS
92 WEST ROAD
ELLINGTON, CT 06029
P: (860) 871-9700
E: info@earthlighttech.com

Project:
HOPPING BROOK
56 BOYNTON RD.
HOLLISTON, MA 01746

Project Details:
323.38 kWstc, 240.00 kW AC
AHJ: HOLLISTON, TOWN OF
APN: 13001000010056O

Engineering Approval:
COMMONWEALTH OF MASSACHUSETTS
RICHARD J. DOBBINS
ELECTRICAL
No. 54388
REGISTERED PROFESSIONAL ENGINEER
SIGNED: 02/25/2020
STAMPED AND SIGNED FOR ELECTRICAL ONLY

REVISIONS

DESCRIPTION	DATE	REV
50% DELIVERABLE	1/6/2020	1
90% DELIVERABLE	1/17/2020	2
PERMIT SET	1/30/2020	A

Sheet Title:
PROJECT NOTES

Sheet Number:
T1.1

Sheet Size:
ARCH D - 36" x 24"

DESIGN & DRAFTING BY:
JUAN CARLOS CHAVEZ

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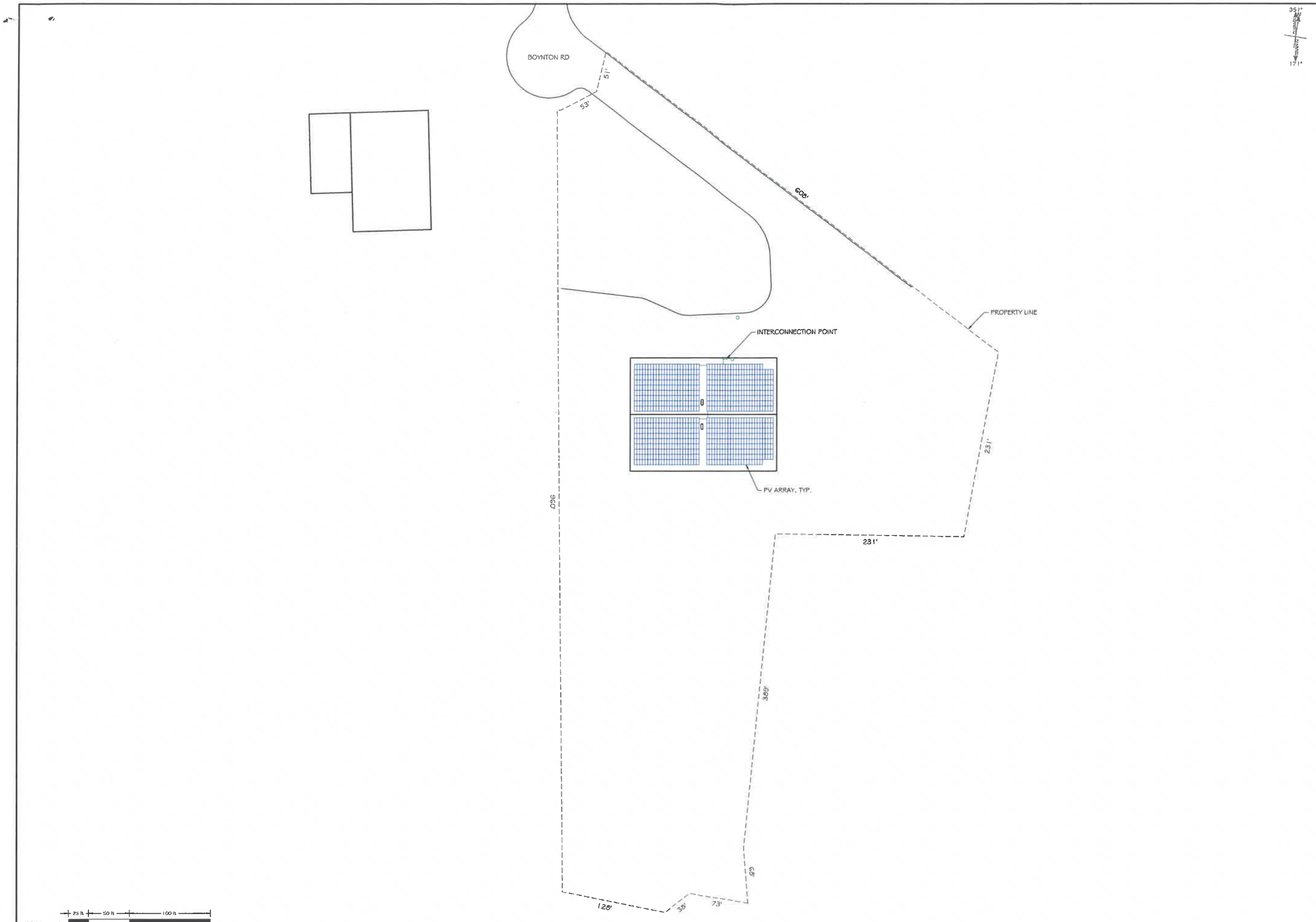
- H. Jackson Brown, Jr.

SepiSolar
POWER BY DESIGN

Reviewed & Approved by:
RD



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Sheet Title:

PLOT PLAN

Sheet Number:

P1.0

Sheet Size:

ARCH D - 36" x 24"

DESIGN & DRAFTING BY:
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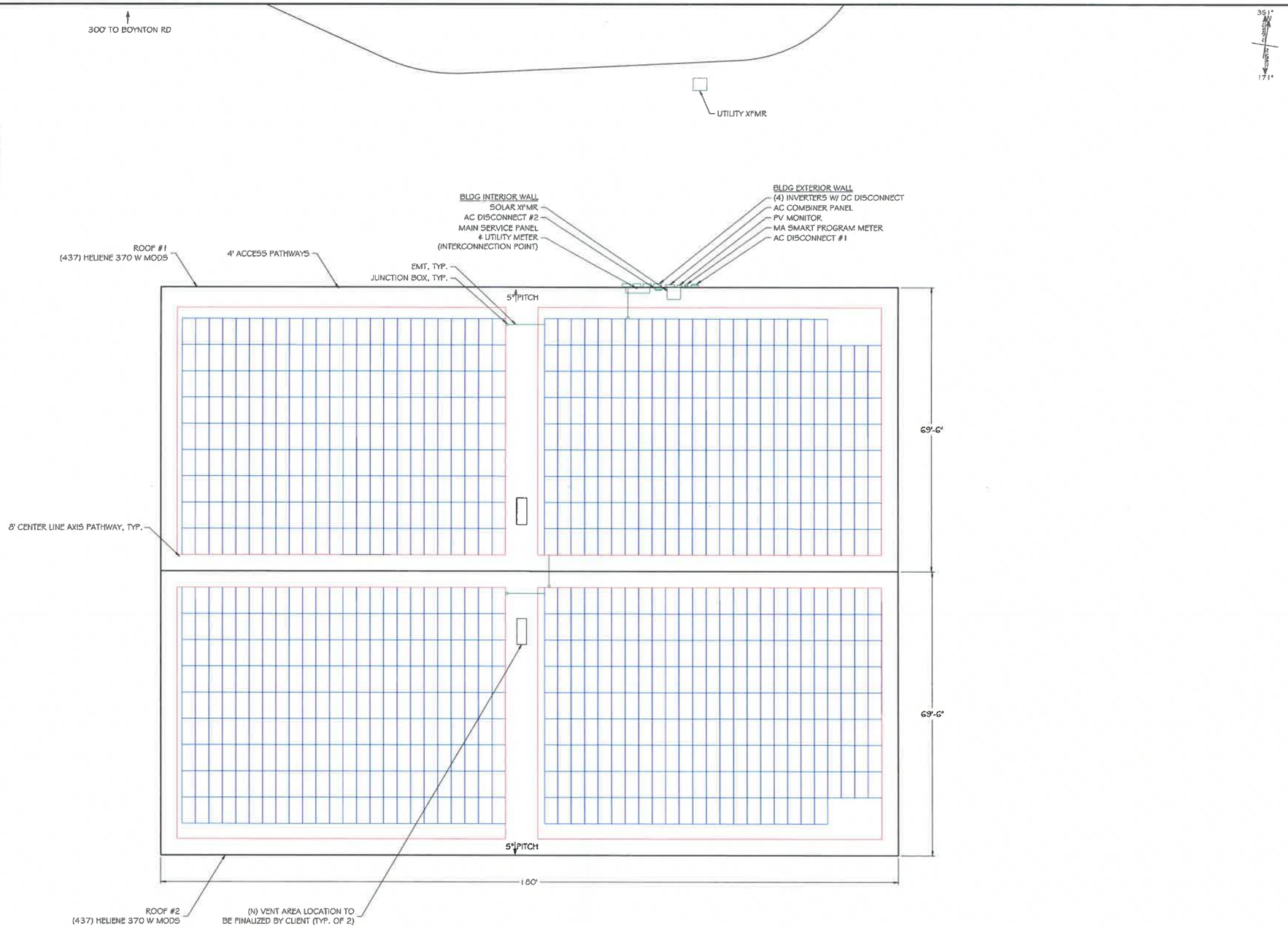
Reviewed & Approved by:

RD

SYMBOL LEGEND		
SYMBOL	NAME	DESCRIPTION
	ROOFTOP PV MOD.	HELIENE 72M-370
	FIRE SETBACK	MA FIRE REQUIRED PATHWAYS

PV SYSTEM SUMMARY TABLE					
Roof ID	Inverter ID	Module Qty.	kW size	Tilt/Pitch	Azimuth
1	Inv 1	216	79.92	5°	351°
	Inv 2	221	81.77	5°	351°
2	Inv 3	216	79.92	5°	171°
	Inv 4	221	81.77	5°	171°



SCALE: 1" = 12'

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Sheet Title:
SITE PLAN

Sheet Number:
A1.0

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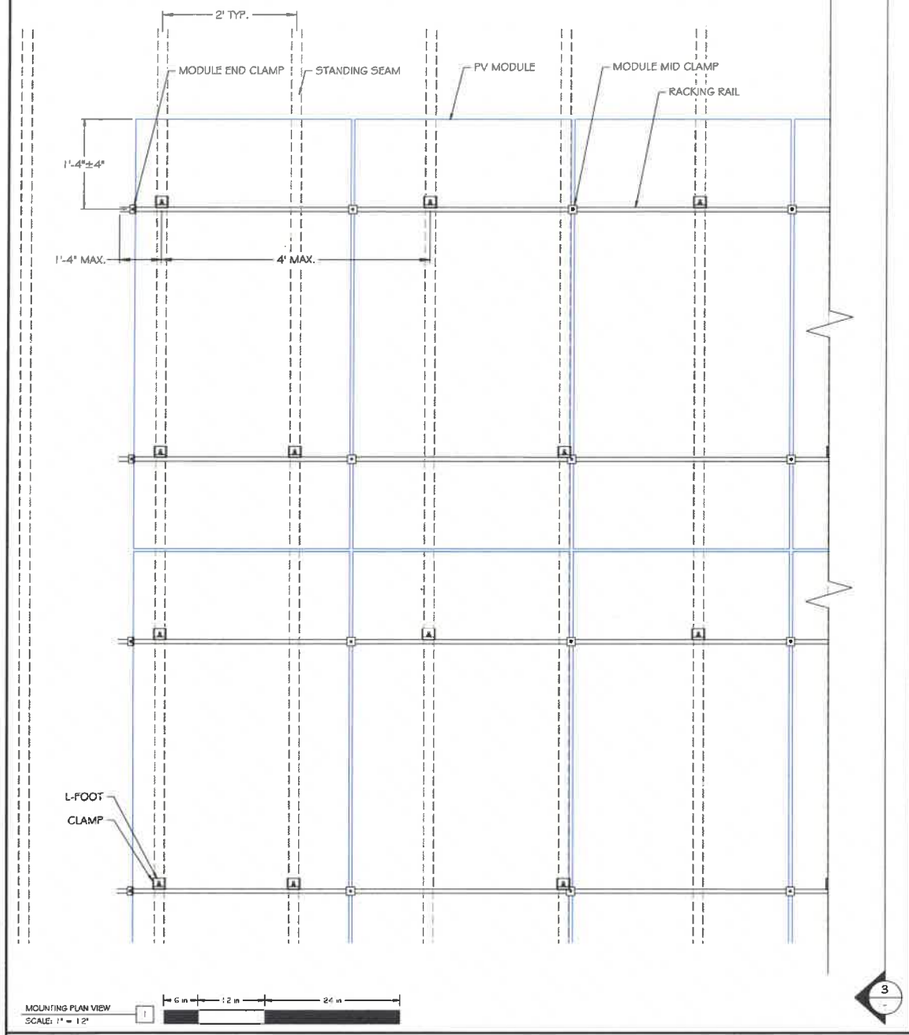
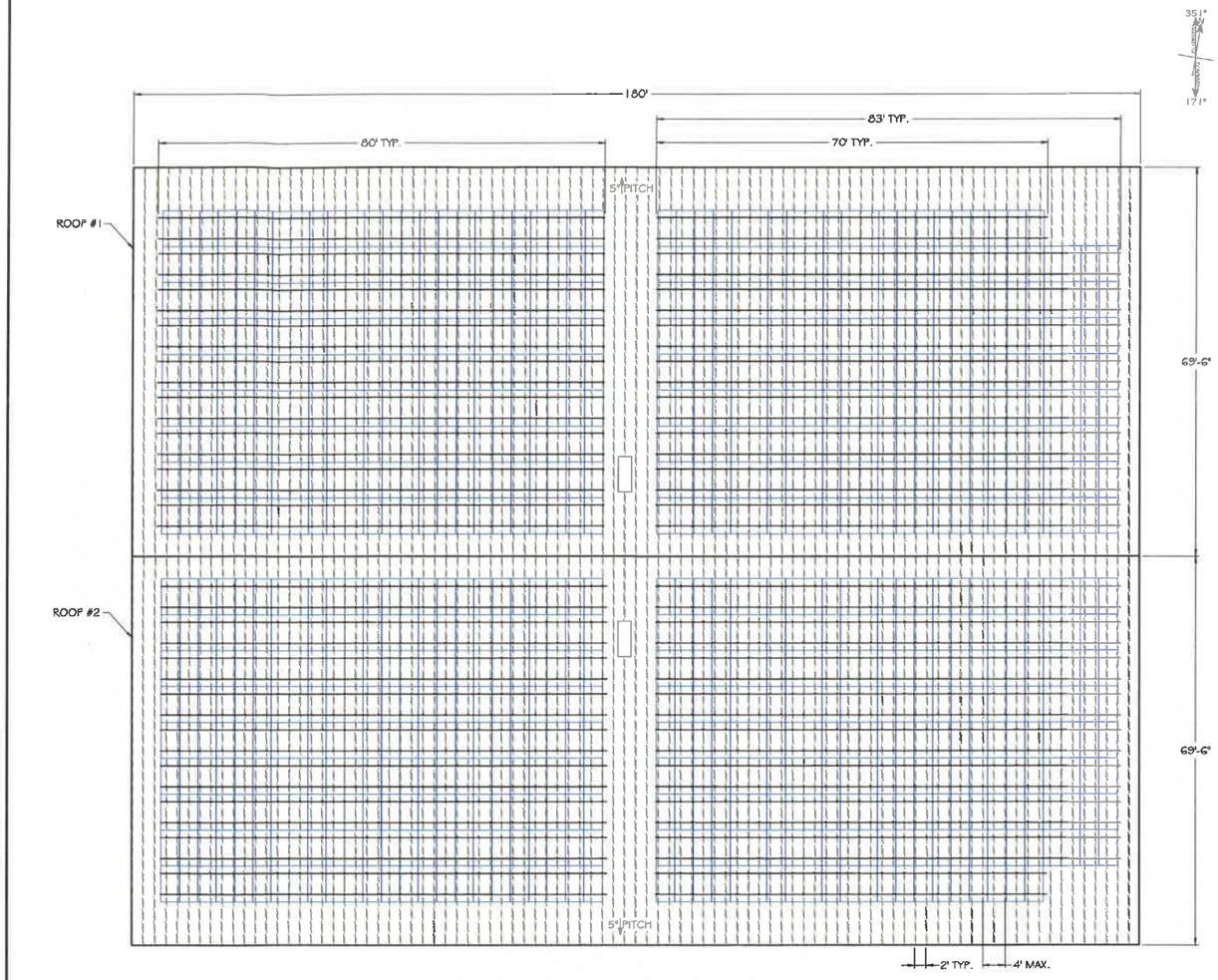
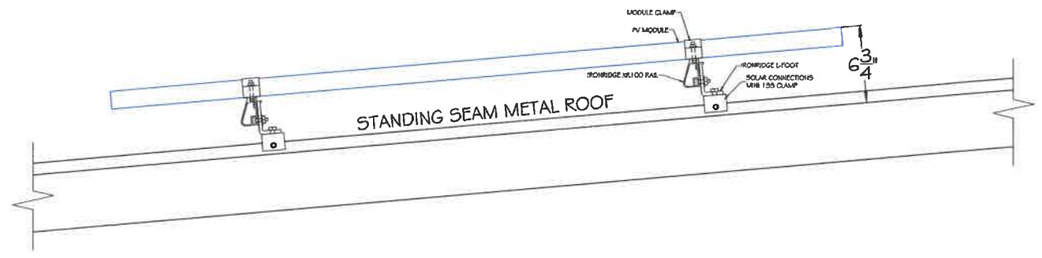


MOUNTING PLAN VIEW
SCALE: 1" = 12"



ROOF PV LAYOUT
SCALE: 1" = 12'



MOUNTING PLAN VIEW
SCALE: 1" = 6"

STRUCTURAL CALCULATIONS			
	QTY	WEIGHT EA.	TOTAL
PV MODULE	874	x 52.4 LBS	= 45798 LBS
RACKING RAIL	5816	x 0.68 LB/FT	= 3955 LBS
ATTACHMENT	1535	x 1.00 LBS	= 1535 LBS
TIGO TS4-A-F	874	x 1.00 LBS	= 874 LBS
TOTAL WEIGHT: 52161 LBS			
ARRAY AREA: 18227 SQ. FT.			
DEAD LOAD: 2.9 PSF			
POINT LOAD: 34.0 LBS			

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Sheet Title:
MOUNTING & RACKING METHOD

Sheet Number:
S1.0

Sheet Size:
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DESIGN & DRAFTING BY:
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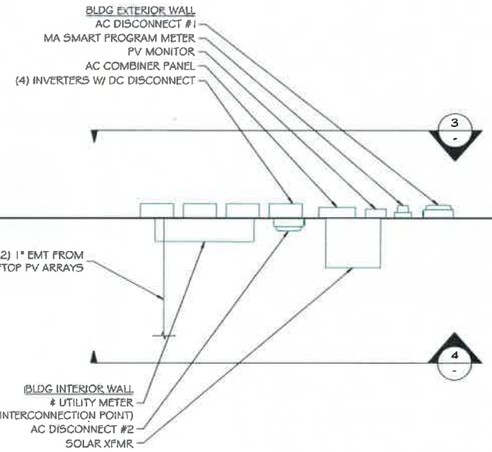
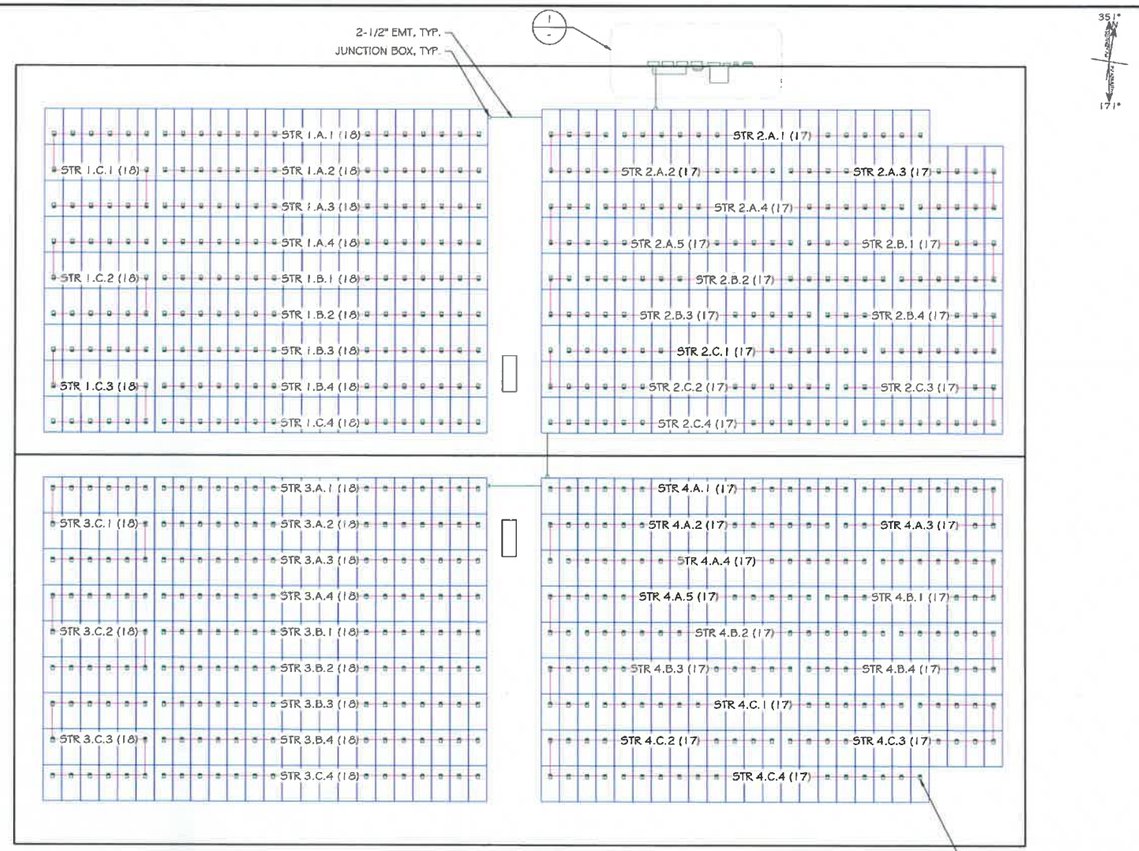


ELECTRICAL EQUIPMENT LAYOUT
SCALE: 1" = 4'

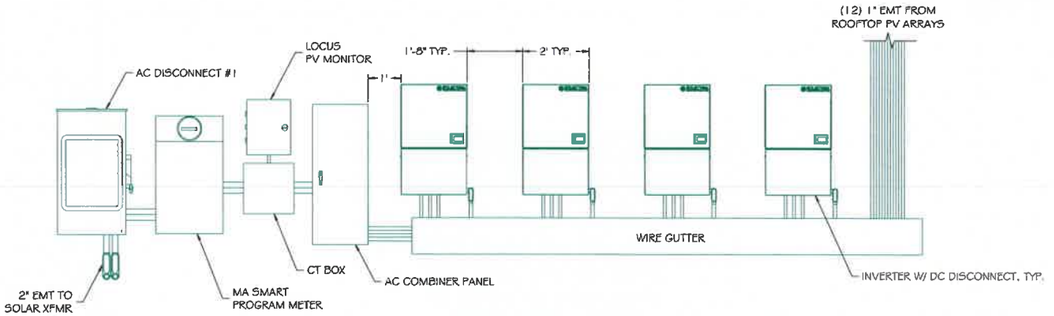
STRING LEGEND:

1.A.2 (18)

- STRING LENGTH
- STRING ID #
- MPPT (A, B, OR C)
- INVERTER ID #

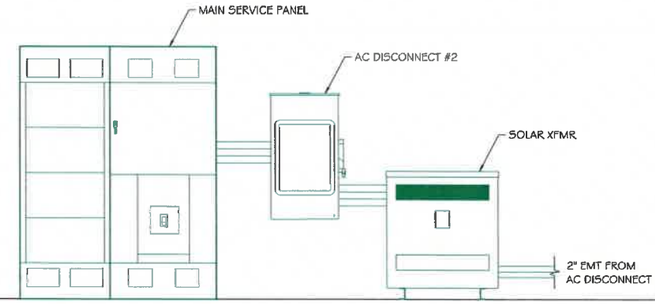


ELECTRICAL ROOM LAYOUT
SCALE: 1" = 12'



FLOOR

BLDG EXTERIOR WALL EQUIP. ELEVATIONS
SCALE: 1" = 2'



FLOOR

BLDG EXTERIOR WALL EQUIP. ELEVATIONS
SCALE: 1" = 2'

Contractor:

earthlight
total & clean solutions

EARTHLIGHT SOLAR & ENERGY SOLUTIONS
92 WEST ROAD
ELLINGTON, CT 06029
P: (860) 871-8700
E: info@earthlighttech.com

Project:
HOPPING BROOK
56 BOYNTON RD.
HOLLISTON, MA 01746

Project Details:
323.36 kWstc, 240.00 kW AC
AHJ: HOLLISTON, TOWN OF
APN: 136001000100560

Engineering Approval:

COMMONWEALTH OF MASSACHUSETTS
RICHARD J. DOBBINS
ELECTRICAL
No. 54368
REGISTERED PROFESSIONAL ENGINEER

SIGNED: 02/25/2020

STAMPED AND SIGNED FOR ELECTRICAL ONLY

REVISIONS

DESCRIPTION	DATE	REV
50% DELIVERABLE	1/6/2020	1
80% DELIVERABLE	1/17/2020	2
PERMIT SET	1/30/2020	A

Sheet Title:
ELECTRICAL LAYOUT

Sheet Number:
E1.0

Sheet Size:
ARCH D - 36" x 24"

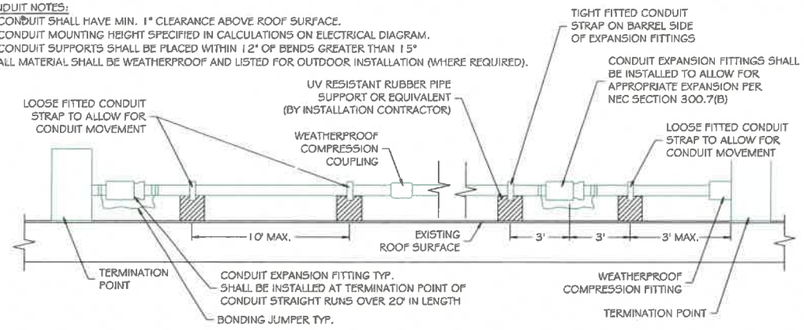
DESIGN & DRAFTING BY:
JUAN CARLOS CHAVEZ

"The best preparation for tomorrow is doing your best today."
- H. Jackson Brown, Jr.

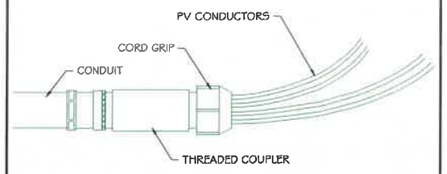
SepiSolar
POWER BY DESIGN

Reviewed & Approved by:
RD

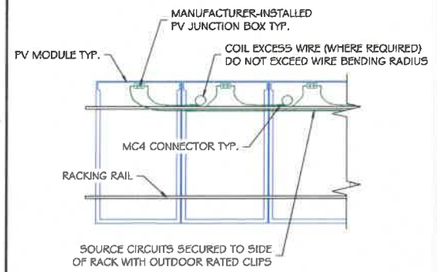
CONDUIT NOTES:
1.) CONDUIT SHALL HAVE MIN. 1" CLEARANCE ABOVE ROOF SURFACE.
2.) CONDUIT MOUNTING HEIGHT SPECIFIED IN CALCULATIONS ON ELECTRICAL DIAGRAM.
3.) CONDUIT SUPPORTS SHALL BE PLACED WITHIN 12" OF BENDS GREATER THAN 15°
4.) ALL MATERIAL SHALL BE WEATHERPROOF AND LISTED FOR OUTDOOR INSTALLATION (WHERE REQUIRED).



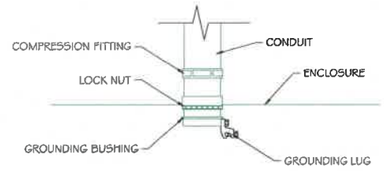
CONDUIT DETAIL
SCALE: NTS — 1



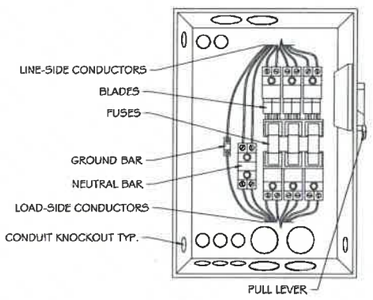
CONDUIT CORD CONNECTOR DETAIL
SCALE: NTS — 2



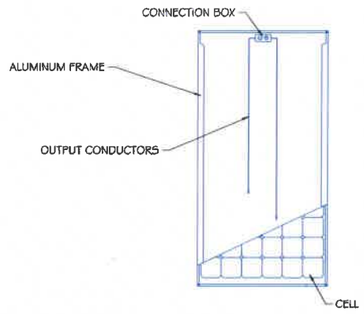
STRINGING DETAIL
SCALE: NTS — 3



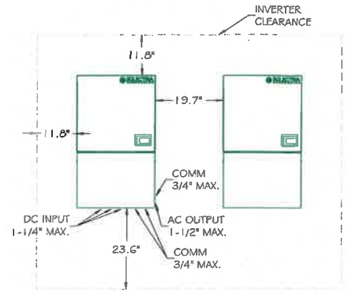
CONDUIT GROUNDING DETAIL
SCALE: NTS — 4



FUSED AC DISCONNECT DETAIL
SCALE: NTS — 5

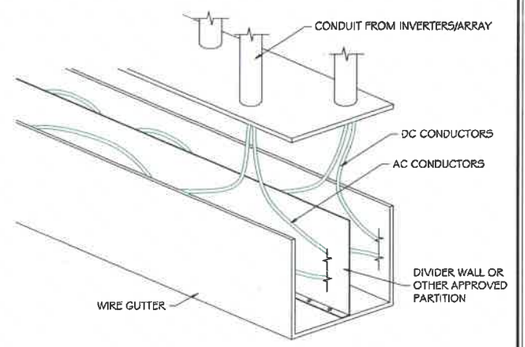


PV MODULE DETAIL
SCALE: NTS — 6



SOLECTRIA PV- GOTL INVERTER CLEARANCE DETAIL
SCALE: NTS — 7

WIRE GUTTER NOTES:
1.) WIRE GUTTERS SHALL BE INSTALLED PER NEC 314.
2.) WIRE GUTTERS SHALL BE SIZED PER TABLE 314.28.
3.) PARTITIONS SHALL BE INSTALLED TO SEPARATE PV DC AND AC CONDUCTORS, PER 690.31(B).
4.) WHERE BARRIERS ARE INSTALLED IN A BOX, EACH SECTION SHALL BE CONSIDERED AS A SEPARATE BOX.
5.) WIRE GUTTERS SHALL BE CONSTRUCTED OF MATERIALS AND IN A MANNER COMPLIANT WITH NEC 314.40.



WIRE GUTTER PARTITION DETAIL
SCALE: NTS — 8

EQUIPMENT GROUNDING DETAIL
SCALE: NTS — 9

SOLAR AC DISCONNECT
REQD BY: NEC 690.13(B) — 1
APPLY TO: AC DISCONNECT SWITCHES

SOLAR DC DISCONNECT
REQD BY: NEC 690.13(B) — 2
APPLY TO: DC DISCONNECT SWITCHES

⚠ WARNING
ELECTRIC SHOCK HAZARD
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION
REQD BY: NEC 690.13(B) — 3
APPLY TO: DISCONNECTS, FUSES, CIRCUIT BREAKERS

WARNING: PHOTOVOLTAIC POWER SOURCE
REQD BY: NEC 690.31(D)(2) — 4
APPLY TO: JUNCTION BOXES, RACEWAYS, CABLE TRAYS, CONDUIT BODIES WITH AVAILABLE OPENINGS, EVERY 10', WITHIN 1' OF TURNS/PENETRATIONS

⚠ WARNING
DUAL POWER SUPPLY
SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM
REQD BY: NEC 705.12(B)(3) — 5
APPLY TO: ANY/ALL ELECTRICAL PANELS CONNECTED TO MULTIPLE POWER SOURCES

⚠ WARNING
THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE, SHALL NOT EXCEED AMPACITY OF BUSBAR.
REQD BY: NEC 705.12(B)(2)(3)(c) — 6
APPLY TO: AC COMBINER PANEL

⚠ CAUTION ⚠
DO NOT INSTALL ADDITIONAL LOADS IN THIS PANEL
REQD BY: NEC 705.12(B)(2)(3)(c) — 7
APPLY TO: AC COMBINER PANEL

⚠ WARNING
ARC FLASH HAZARD
APPROPRIATE PPE REQUIRED. FAILURE TO COMPLY CAN RESULT IN INJURY OR DEATH. REFER TO NFPA 70E.
REQD BY: NEC 110.16, NFPA 70E — 8
APPLY TO: AC COMBINER PANEL

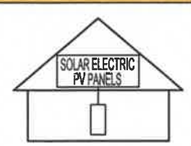
PHOTOVOLTAIC SYSTEM DISCONNECT
AC CURRENT: 916 A
VOLTAGE: 208 VAC
REQD BY: NEC 690.54 — 9
APPLY TO: POINT OF INTERCONNECTION

GRID TIED PHOTOVOLTAIC POWER SOURCE
OPERATING CURRENT: 111.3 A
OPERATING VOLTAGE: 707 V
MAX SYSTEM VOLTAGE: 995 V
MAX SYSTEM CURRENT: 145.7 A
MAX INVERTER OUTPUT: 80 kW, 79.4 A, 480 VAC
REQD BY: NEC 690.53 — 10
APPLY TO: INVERTER #1, #3

GRID TIED PHOTOVOLTAIC POWER SOURCE
OPERATING CURRENT: 120.6 A
OPERATING VOLTAGE: 668 V
MAX SYSTEM VOLTAGE: 940 V
MAX SYSTEM CURRENT: 158.9 A
MAX INVERTER OUTPUT: 80 kW, 79.4 A, 480 VAC
REQD BY: NEC 690.53 — 11
APPLY TO: INVERTER #2, #4

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

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

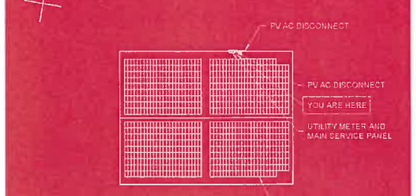


TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY

REQD BY: NEC 690.12 & 690.56(C) — 12
APPLY TO: RAPID SHUTDOWN INITIATION SWITCH

REQD BY: NEC 690.54 — 13
APPLY TO: UTILITY METER

CAUTION
POWER FROM THIS BUILDING IS ALSO SUPPLIED FROM THE FOLLOWING POWER SOURCES WITH DISCONNECTS LOCATED AS SHOWN



SERVICE BY QUALIFIED PERSONNEL ONLY

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P: (860) 871-9700
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Project:
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56 BOYNTON RD.
HOLLISTON, MA 01746

Project Details:
323.38 kWstc, 240.00 kW AC
AHJ: HOLLISTON, TOWN OF
APN: 136001000010056O

Engineering Approval:
COMMONWEALTH OF MASSACHUSETTS — RICHARD DOBBINS — ELECTRICAL — No. 54388 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 02/25/2020
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REVISIONS

DESCRIPTION	DATE	REV
50% DELIVERABLE	1/6/2020	1
90% DELIVERABLE	1/17/2020	2
PERMIT SET	1/30/2020	A

Sheet Title:
CONSTRUCTION DETAILS & SAFETY PLACARDS

Sheet Number:
E1.1

Sheet Size:
ARCH D - 36" x 24"

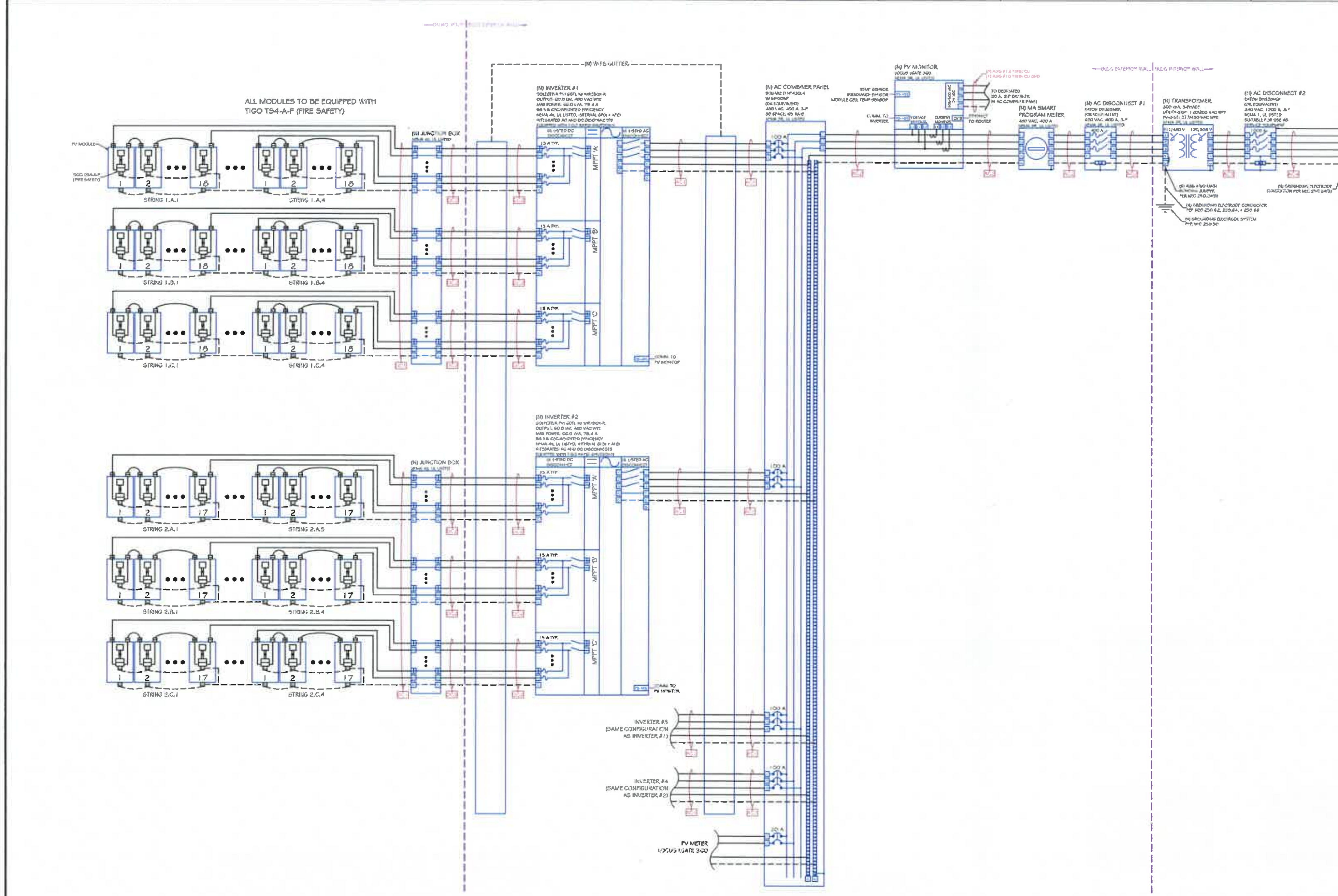
DESIGN & DRAFTING BY:
JUAN CARLOS CHAVEZ

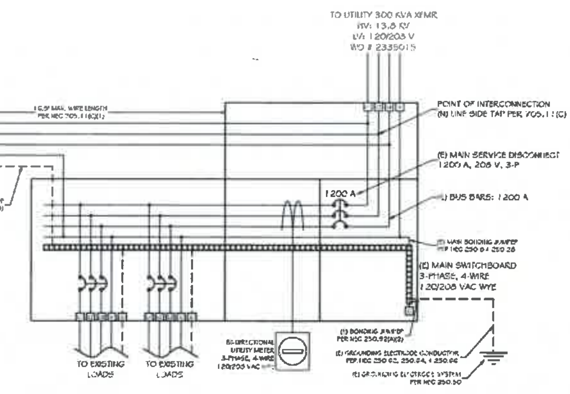
"The best preparation for tomorrow is doing your best today."
- H. Jackson Brown, Jr.

SepiSolar POWER BY DESIGN

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)
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)





PV Module Specifications			
Model Number:	HELIENE 72M-370		
Weight (lbs):	52.4		
Dimensions (in):	77 x 39 x 1.6		
Power @ STC (W):	370		
Voc (VDC):	48.7		
Vmp (VDC):	40.2	Voc Temp Coeff (%/°C):	-0.31
Isc (A):	9.77	Max Voltage (VDC):	1,000
Imp (A):	9.28	Module Quantity:	874

Inverter #1 - #4 Specifications			
Model Number:	SOLECTRIA PVI 60TL		
Nominal Power (kW AC):	60.00	Max App. Pwr (kW AC):	66.00
Nominal AC Voltage (V):	480	(3/N/PE)	
Max Output Current (A):	79.4		
CEC Weighted Efficiency:	98.5%		
Maximum DC Voltage (V):	1000	Max Current MPPT A:	38.0
DC Start Voltage (V):	330	Max Current MPPT B:	38.0
Max. MPPT Voltage (V):	850	Max Current MPPT C:	38.0
Min. MPPT Voltage (V):	540		
MPPT Quantity:	3		
Inverter Quantity:	4		

Transformer Calculations					
PV Voltage:	480	VAC	Util. Voltage:	208	VAC
PV Current:	317.6	Amps	Util. Current:	732.9	Amps
Minimum Transformer kVA Rating:				300.0	kVA

Array Configuration					
System: 323.38 kWstc, 240 kW AC					
Total PV Module Qty: 874					
	Inverter I.D. #	Inv #1	Inv #2	Inv #3	Inv #4
	Inverter AC Power (kW):	60.00	60.00	60.00	60.00
	PV Power (kWstc):	79.92	81.77	79.92	81.77
	Inverter DC AC Ratio:	1.33	1.36	1.33	1.36
	Module Total Qty:	216	221	216	221
MPPT "A"	String Qty:	4	5	4	5
	String Length:	18	17	18	17
	Max Open Circuit Voltage:	995	940	995	940
	Operating Voltage:	707	668	707	668
	Max Short Circuit Current:	48.9	61.1	48.9	61.1
	Operating Current:	37.1	46.4	37.1	46.4
MPPT "B"	String Qty:	4	4	4	4
	String Length:	18	17	18	17
	Max Open Circuit Voltage:	995	940	995	940
	Operating Voltage:	707	668	707	668
	Max Short Circuit Current:	48.9	48.9	48.9	48.9
	Operating Current:	37.1	37.1	37.1	37.1
MPPT "C"	String Qty:	4	4	4	4
	String Length:	18	17	18	17
	Max Open Circuit Voltage:	995	940	995	940
	Operating Voltage:	707	668	707	668
	Max Short Circuit Current:	48.9	48.9	48.9	48.9
	Operating Current:	37.1	37.1	37.1	37.1

PV System Maximum Voltage Calculation per NEC 690.7(A)

Local Record Low Temp: -19 °C — Data Source: SOUTH WEYMOUTH NAS

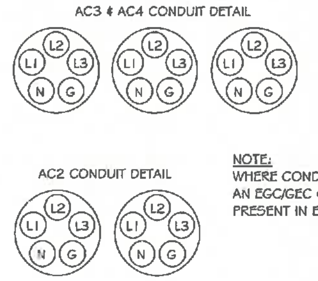
Voc Temp Coefficient	x	25°C - Record Low Temp.	+ 1 =	Voc Correction Factor	Voc Correction Factor	x	Voc	x	Max # of Modules in Series	=	Temperature Corrected Open Circuit Voltage
0.31%/°C	x	44°C	+ 1 =	1.136	1.136	x	48.7	x	18	=	995.4 Volts DC

Utility-side AC System Summary	
NOMINAL SYSTEM VOLTAGE:	208 Volts AC
MAX CURRENT PER 690.8(A):	733 Amps
MAX CURRENT PER 690.8(B):	916 Amps

PV-side AC System Summary	
NOMINAL SYSTEM VOLTAGE:	480 Volts AC
MAX CURRENT PER 690.8(A):	318 Amps
MAX CURRENT PER 690.8(B):	397 Amps

AC3 & AC4 CONDUIT DETAIL

AC2 CONDUIT DETAIL



NOTE:
WHERE CONDUCTORS ARE INSTALLED IN PARALLEL, AN EGC/GEC GROUND CONDUCTOR MUST BE PRESENT IN EACH CONDUIT PER NEC 250.122(F).

WIRE AND CONDUIT SCHEDULE

TAG	# OF PARALLEL CONDUITS	CONDUIT SIZE	CONDUIT TYPE	PHASE CONDUCTOR QTY, SIZE AND TYPE PER CONDUIT			NEUTRAL CONDUCTOR QTY, SIZE AND TYPE PER CONDUIT			GROUND CONDUCTOR QTY, SIZE AND TYPE PER CONDUIT			EST. DIST.	VOLTAGE DROP
DC1	(1)	N/A	N/A	2/STRING	AWG #10	PV-WIRE	N/A	N/A	N/A	1	AWG #6	BARE CU	120	0.54%
DC2	(1)	1"	EMT	10	AWG #10	XHHW-2	N/A	N/A	N/A	1	AWG #10	XHHW-2	130	0.56%
AC1	(1)	1-1/4"	EMT	3	AWG #3	THWN-2	1	AWG #8	THWN-2	1	AWG #8	THWN-2	10	0.16%
AC2	(2)	2"	EMT	3	AWG #3/0	THWN-2	1	AWG #3	THWN-2	1	AWG #3	THWN-2	10	0.10%
AC3	(3)	2-1/2"	EMT	3	400 kcmil	THWN-2	1	AWG #2/0	THWN-2	1	AWG #2/0	THWN-2	10	0.07%
AC4	(3)	2-1/2"	EMT	3	400 kcmil	THWN-2	1	AWG #3/0	THWN-2	1	AWG #3/0	THWN-2	10	0.07%

CONDUIT FILL CALCULATIONS

TAG	CONDUCTOR AREA (SQ IN)	x	CONDUCTOR QTY	=	CONDUCTOR FILL (SQ IN)	NEUTRAL AREA (SQ IN)	x	NEUTRAL QTY	=	NEUTRAL FILL (SQ IN)	GROUND AREA (SQ IN)	x	GROUND QTY	=	GROUND FILL (SQ IN)	TOTAL WIRE FILL	CONDUIT TYPE	CONDUIT SIZE	CONDUIT AREA (SQ IN)	x 40% =	MAX CONDUIT FILL	CONDUIT FILL PERCENT
DC1	0.0531	x	N/A	=		N/A	x	0	=	0.0000	0.0206	x	1	=	0.0206	N/A	N/A	N/A		x .4 =		
DC2	0.0243	x	10	=	0.2430	N/A	x	0	=	0.0000	0.0243	x	1	=	0.0243	0.2673	EMT	1"	0.864	x .4 =	0.3456	30.9%
AC1	0.0973	x	3	=	0.2919	0.0366	x	1	=	0.0366	0.0366	x	1	=	0.0366	0.3651	EMT	1-1/4"	1.496	x .4 =	0.5984	24.4%
AC2	0.2679	x	3	=	0.8037	0.0973	x	1	=	0.0973	0.0973	x	1	=	0.0973	0.9983	EMT	2"	3.356	x .4 =	1.3424	29.7%
AC3	0.5863	x	3	=	1.7589	0.2223	x	1	=	0.2223	0.2223	x	1	=	0.2223	2.2035	EMT	2-1/2"	5.858	x .4 =	2.3432	37.6%
AC4	0.5863	x	3	=	1.7589	0.2679	x	1	=	0.2679	0.2679	x	1	=	0.2679	2.2947	EMT	2-1/2"	5.858	x .4 =	2.3432	39.2%

TAG	CIRCUIT ORIGIN	CIRCUIT DESTINATION	CONDUCTOR SPECIFICATIONS: MATERIAL	CONN. TEMP. RATING	TRADE SIZE	AMPACITY PER 310.16 & 310.17	REQUIRED CONDUCTOR AMPACITY: MAX CURRENT 690.8(A)(1)	x Isc (Amps)	x # OF COMBINED STRINGS	= MAX CURRENT PER 690.8(A)(1)	x CONT. OPERATION 690.8(B)(1)	= MAX CURRENT PER 690.8(B)(1)	AMPACITY CHECK #1: MAX CURRENT PER 690.8(B)(1) < CONDUCTOR AMPACITY
DC1	PV STRING	JUNCTION BOX	COPPER	90°C	AWG #10	55 Amps	1.25	x 9.77	x 1	= 12.2 Amps	x 1.25	= 15.3 Amps	15.3 Amps < 55.0 Amps
DC2	JUNCTION BOX	INVERTER	COPPER	75°C	AWG #10	35 Amps	1.25	x 9.77	x 1	= 12.2 Amps	x 1.25	= 15.3 Amps	15.3 Amps < 35.0 Amps

TAG	CONDUCTOR TEMPERATURE DERATING: CIRCUIT ENVIRONMENT	LOCAL 2% AVG. HIGH TEMP (°C)	HEIGHT ABOVE ROOF (in)	TEMP. ADDER PER 310.15(B)(3)(c)	EXPECTED OPERATING TEMP (°C)	AMPACITY CORRECTION 310.15(B)(1)	CONDUIT FILL DERATING: # OF UNGROUNDED CONDUCTORS	AMPACITY CORRECTION 310.15(C)(1)	CORRECTED AMPACITY CALCULATION: 90°C CONDUCTOR AMPACITY	x TEMP DERATE	x CONDUIT FILL DERATE	= DERATED CONDUCTOR AMPACITY	AMPACITY CHECK #2: MAX CURRENT PER 690.8(B)(2) < DERATED CORRECTED AMPACITY	VOLTAGE DROP: EST. ONE-WAY DISTANCE	VOLTAGE DROP
DC1	ROOFTOP, FREE AIR	32	-	N/A	32	0.96	N/A	1.00	55	x 0.96	x 1.00	= 52.8 Amps	12.2 Amps < 52.8 Amps	120 ft	0.54%
DC2	ROOFTOP, IN CONDUIT	32	1	0	32	0.96	10	0.50	40	x 0.96	x 0.50	= 19.2 Amps	12.2 Amps < 19.2 Amps	130 ft	0.56%

TAG	CIRCUIT ORIGIN	CIRCUIT DESTINATION	CONDUCTOR SPECIFICATIONS: MATERIAL	TERMINAL TEMP. RATING	TRADE SIZE	NUMBER OF PARALLEL CONDUCTORS	AMPACITY PER 310.16 & 310.17	REQUIRED CONDUCTOR AMPACITY: INVERTER OUTPUT CURRENT	x # OF INVERTERS	= MAX CURRENT PER 690.8(A)(3)	x CONT. OPERATION 690.8(B)(1)	= MAX CURRENT PER 690.8(B)(1)	AMPACITY CHECK #1: MAX CURRENT PER 690.8(B)(1) < CONDUCTOR AMPACITY
AC1	INVERTER	AC COMBINER PANEL	COPPER	75°C	AWG #3	1	100 Amps	79.4	x 1	= 79.4 Amps	x 1.25	= 99.3 Amps	99.3 Amps < 100 Amps
AC2	AC COMBINER PANEL	TRANSFORMER	COPPER	75°C	AWG #3/0	2	400 Amps	79.4	x 4	= 317.6 Amps	x 1.25	= 397.0 Amps	397.0 Amps < 400 Amps
AC3	TRANSFORMER	FUSED AC DISCONNECT	COPPER	75°C	400 kcmil	3	1005 Amps	SEE XFMR CALCS		= 732.9 Amps	x 1.25	= 916.2 Amps	916.2 Amps < 1005 Amps
AC4	FUSED AC DISCONNECT	LINE SIDE CONN.	COPPER	75°C	400 kcmil	3	1005 Amps	SEE XFMR CALCS		= 732.9 Amps	x 1.25	= 916.2 Amps	916.2 Amps < 1005 Amps

TAG	CONDUCTOR TEMPERATURE DERATING: CIRCUIT ENVIRONMENT	LOCAL 2% AVG. HIGH TEMP (°C)	EXPECTED OPERATING TEMP (°C)	AMPACITY CORRECTION 310.15(B)(1)	CONDUIT FILL DERATING: # OF UNGROUNDED CONDUCTORS	AMPACITY CORRECTION 310.15(C)(1)	CORRECTED AMPACITY CALCULATION: 90°C CONDUCTOR AMPACITY	x TEMP DERATE	x CONDUIT FILL DERATE	= DERATED CORRECTED AMPACITY	AMPACITY CHECK #2: MAX CURRENT PER 690.8(B)(2) < DERATED CONDUCTOR AMPACITY	VOLTAGE DROP: EST. ONE-WAY DISTANCE	VOLTAGE DROP
AC1	EXT. BLDG. WALL (+15°C)	32	47	0.82	3	1.00	115	x 0.82	x 1.00	= 94.3 Amps	79.4 Amps < 94.3 Amps	10 ft	0.16%
AC2	EXT. BLDG. WALL (+15°C)	32	47	0.82	3	1.00	450	x 0.82	x 1.00	= 369 Amps	317.6 Amps < 369.0 Amps	10 ft	0.10%
AC3	INDOORS (+0°C)	32	32	0.96	3	1.00	1140	x 0.96	x 1.00	= 1094 Amps	732.9 Amps < 1094.4 Amps	10 ft	0.07%
AC4	INDOORS (+0°C)	32	32	0.96	3	1.00	1140	x 0.96	x 1.00	= 1094 Amps	732.9 Amps < 1094.4 Amps	10 ft	0.07%

Contractor:
earthlight solar & energy solutions
EARTHLIGHT SOLAR & ENERGY SOLUTIONS
92 WEST ROAD
ELLINGTON, CT 06029
P: (860) 871-9700
E: info@earthlighttech.com

Project:
HOPPING BROOK
56 BOYNTON RD.
HOLLISTON, MA 01746

Project Details:
323.38 kWstc, 240.00 kW AC
AHJ: HOLLISTON, TOWN OF
APN: 13600100000100560

Engineering Approval:
COMMONWEALTH OF MASSACHUSETTS — RICHARD J. DOBBINS — ELECTRICAL — No. 54386 — REGISTERED PROFESSIONAL ENGINEER
SIGNED: 02/25/2020

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90% DELIVERABLE	1/17/2020	2
PERMIT SET	1/30/2020	A

Sheet Title:
ELECTRICAL DIAGRAM

Sheet Number:
E2.0

Sheet Size:
ARCH D - 36" x 24"

DESIGN & DRAFTING BY:
JUAN CARLOS CHAVEZ

"The best preparation for tomorrow is doing your best today."
- H. Jackson Brown, Jr.

SepiSolar POWER BY DESIGN

Reviewed & Approved by:
RD

HELIENE 72M

72 CELL MONOCRYSTALLINE MODULE

370 Wp — MAX POWER OUTPUT

19.1% — MAX EFFICIENCY

10 YEAR — PRODUCT WARRANTY

25 YEAR — LINEAR PERFORMANCE GUARANTEE

- GUARANTEED POSITIVE POWER SORTING: [-0 : +4.99 WP]
- AVAILABLE IN 1000V OR 1500V SYSTEM VOLTAGE RATING
- MANUFACTURED ACCORDING TO INTERNATIONAL QUALITY SYSTEM STANDARDS: ISO9001
- H-BLACK INTEGRATION AVAILABLE (ALL-BLACK MODULE)

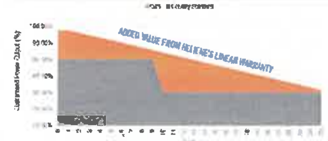
HELIENE INC. IS A PREMIER SOLAR MODULE MANUFACTURER, SERVICING THE GROWING SOLAR ENERGY MARKETS OF NORTH AMERICA.

COMBINING PROVEN EUROPEAN TECHNOLOGY WITH NORTH AMERICAN INGENUITY ALLOWS HELIENE TO MAKE A REAL COMMITMENT IN PROVIDING SMARTER ENERGY CHOICES FOR THE FUTURE.

www.heliene.com

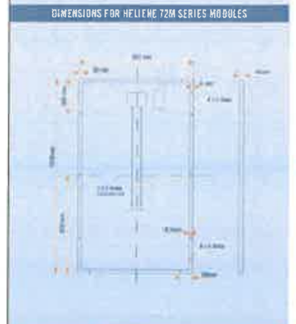
LINEAR PERFORMANCE GUARANTEE

10 YEAR WORKMANSHIP WARRANTY • 25 YEAR LINEAR PERFORMANCE GUARANTEE

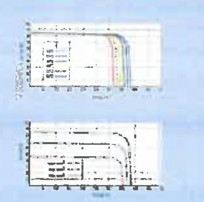


72M

DIMENSIONS FOR HELIENE 72M SERIES MODULES



I-V CURVE FOR HELIENE 72M SERIES



CERTIFICATIONS

ELECTRICAL DATA (STC)

MECHANICAL DATA

CERTIFICATIONS

TEMPERATURE RATINGS

PACKAGING CONFIGURATION

MAXIMUM RATINGS

WARRANTY

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

HELIENE

Module Level Rapid Shutdown

Made Easy by Yaskawa Solectria Solar & Tigo

YASKAWA

Yaskawa Solectria Solar provides the simplest, most economical and robust solution for NEC 2017 Module-Level Rapid Shutdown compliance through our partnership with Tigo Energy. Our PV Rapid Shutdown System combines the state-of-the-art Solectria PVI 25/50/60TL inverters with Tigo's TS4 Fire Safety shutdown modules and is fully UL1741 certified.

System Concept

How the System Works
- Upon loss of AC voltage, the inverter stops sending the PLC signal
- PV modules go into safe shutdown

Solectria "Shutdown Ready" Inverter
- PVI 25TL-480
- PVI 50TL-480 and PVI-60TL-480 with PVI-50-60TL-WIREBOX-R

Wire PV Array in the Normal Manner
- Connect PV modules in series to form PV source circuits
- Wire the PV source circuits into the Inverter Wiring Box: no extra steps

ROBUST AND FLEXIBLE SOLUTIONS
- Choose either the TS4-F or TS4-A-F, one per PV module, or the new TS4-A-2F that accepts input from two PV modules
- SunSpec specification compliant signaling, using proven powerline communications
- Solectria PVI 25TL, PVI 50TL and PVI 60TL inverters with factory-integrated powerline transmitter inside wiring box, ready for the Tigo TS4-F, TS4-A-F and TS4-A-2F
- Nothing to add in the field

SAFETY CERTIFIED
- UL1741 certified PV Rapid Shutdown System (PVRSS)

Easiest Installation
- Smart PV modules with factory-integrated Tigo TS4-F junction box are available from numerous PV module manufacturers.
- For the complete list of Smart PV Modules visit: www.tigoenergy.com/where-to-buy.

Easy Installation
- Quickly and easily retrofit other PV modules with a Tigo TS4-A-F in the field.
- Secure the TS4-A-F to the PV module frame using integrated clips, no fasteners required.

Most Economical
- Solectria PVI 25TL, PVI 50TL/60TL inverter combined with Tigo TS4-A-2F provides the most economical solution meeting the NEC 2017 requirements for module-level rapid shutdown.
- Two PV modules connect to each TS4-A-2F resulting in the two PV modules connected in series during normal operation.
- In safe shutdown mode, the voltage of all PV array wiring drops below the NEC 2017 limits.

SOLECTRIA SOLAR

Rapid Shutdown-Ready Solectria Inverters

Specifications

Solectria Inverter Specifications	PVI 25TL	PVI 50TL	PVI 60TL
Model (Module-Level Rapid Shutdown Ready)	PVI-25TL-480	PVI-50TL and PVI-50-60TL-WIREBOX-R	PVI-60TL and PVI-50-60TL-WIREBOX-R
Absolute Maximum Input Voltage	1000 V	1000 V	1000 V
Maximum Power Voltage Range (MPPT)	560 - 850 V	480 - 850 V	540 - 850 V
Operating Voltage Range	200 - 950 V	200 - 950 V	200 - 950 V
Number of MPP Trackers	2	3	3
Fused Inputs	6 (3 / MPPT)	15 (5 / MPPT)	15 (5 / MPPT)
Maximum Rated PV Current (I_{sc} x 1.25)	90 A (45 A / MPPT)	204 A (68 A / MPPT)	204 A (68 A / MPPT)
Maximum Rated PV Power	39 kW (19.5 kW / MPPT)	75 kW (30 kW / MPPT)	90 kW (33 kW / MPPT)
Nominal Output Voltage	480 VAC, 3-Phase/PE/N	480 VAC, 3-Phase/PE/N	480 VAC, 3-Phase/PE/N
Real/Apparent Power/Output Current	25 kW / 25kVA / 30.5 A	50 kW / 50 kVA / 60.2 A*	60 kW / 60 kVA / 72.3 A*
Certifications	Rule 21, UL1741SA	Rule 21, UL1741SA	Rule 21, UL1741SA
Warranty	10 Years	10 Years	10 Years
Where to Buy: For complete inverter specifications and information on where to buy, please visit www.solectria.com			

* Standard selectable option for kVA overhead available. See PVI 50TL and PVI 60TL data sheets for more information

Tigo

Tigo Specifications	TS4-A-F	TS4-A-2F
ENVIRONMENTAL		
Operating Temperature Range	-40°C to +85°C	-40°C to +70°C
Outdoor Rating	IP68, NEMA 3R	IP68, NEMA 3R
MECHANICAL		
Dimensions	138.4 mm x 139.7 mm x 22.9 mm	138.4 mm x 139.7 mm x 22.9 mm
Output Voltage Range	490 g	580 g
ELECTRICAL		
Voltage Range	16 - 90 V	16 - 90 V
Maximum Current	15 A	15 A
Maximum Power	500 W	1,000 W
Communications Type	PLC	PLC
Where to Buy: For complete Tigo TS4-A-F and TS4-A-2F specifications and where to buy, please visit www.tigoenergy.com		

SOLECTRIA SOLAR

YASKAWA

Locus ENERGY

LGate 360

COMMERCIAL SOLAR MONITORING SOLUTION

The LGate 360 can be configured to monitor nearly any type of PV system. The standard configuration consists of an industrial grade datalogger and revenue-grade energy meter mounted inside a weatherized enclosure. All LGates are shipped with integrated disconnect breakers making field installation much simpler. In addition, each unit can be configured to aggregate data from a large variety of peripheral devices such as inverters, string/sub-array combiner boxes and weather stations.

DATA COLLECTION

The LGate uses the RS-485 Modbus protocol to communicate with downstream devices. Any device that supports Modbus can be connected and monitored by the LGate. Up to 32 devices can be connected through the Modbus loop. All data is collected, timestamped and then stored in non-volatile memory. This interval data is stored locally until the next scheduled upload.

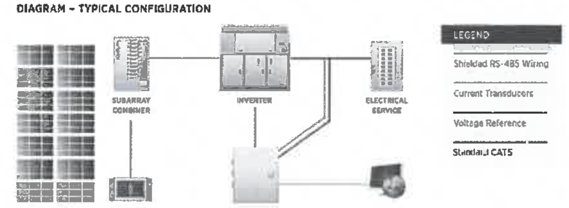
CONNECTIVITY

Once the LGate collects and stores performance data from connected devices, it will upload batches of data at regular intervals to Locus Energy's Solar-OS™ web application. The LGate can transmit data over Ethernet or cellular networks. The integrated datalogger can be set to communicate through almost any type of local area network.

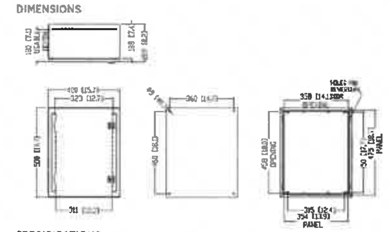
ABOUT LOCUS ENERGY:

LGATE 360 | LOCUS ENERGY

DIAGRAM – TYPICAL CONFIGURATION



DIMENSIONS



SPECIFICATIONS

COMPONENTS		COMPLIANCE
Datalogger	AcquiSuite EMB A8810	ANSI C12.20 Class 0.5 (Power Meter)
Meter	Veris Industries E50 Series Meter	CAN/CSA-C22.2 No. 14 Listed Industrial Control Panel
DC Power	Schneider Electric ABL8RP	UL Listed 508A listed Industrial Control Panel
Cell Modem	MultiTech Systems MultiModem rCell	

COMMUNICATION		PHYSICAL	
LAN	RJ45 10/100 Ethernet, full half duplex, auto polarity	Enclosure	NEMA 4
		Weight	30 lbs
Cellular (optional)	GSM/CDMA	Dimensions	20" L x 16" W x 8" H
Networking	DHCP or Static IP	Environment	-30 to 70C, 95% RH, non-condensing

POWER METER	
Voltage Inputs	277/480V, 120/208V
Phases	Single phase, Split phase, Three phase at 50 or 60 Hz
Current Inputs	mV full scale output CTs

LGATE 360 | LOCUS ENERGY

Contractor:

earthlight solar & energy solutions

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92 WEST ROAD
ELLINGTON, CT 06029
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E: info@earthlighttech.com

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HOLLISTON, MA 01746

Project Details:
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APN: 13600100000100560

Engineering Approval:

COMMONWEALTH OF MASSACHUSETTS — RICHARD J DOBBINS — ELECTRICAL — No. 54388 — REGISTERED PROFESSIONAL ENGINEER

SIGNED: 02/25/2020

STAMPED AND SIGNED FOR ELECTRICAL ONLY

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ARCH D - 36" x 24"

DESIGN & DRAFTING BY:
JUAN CARLOS CHAVEZ

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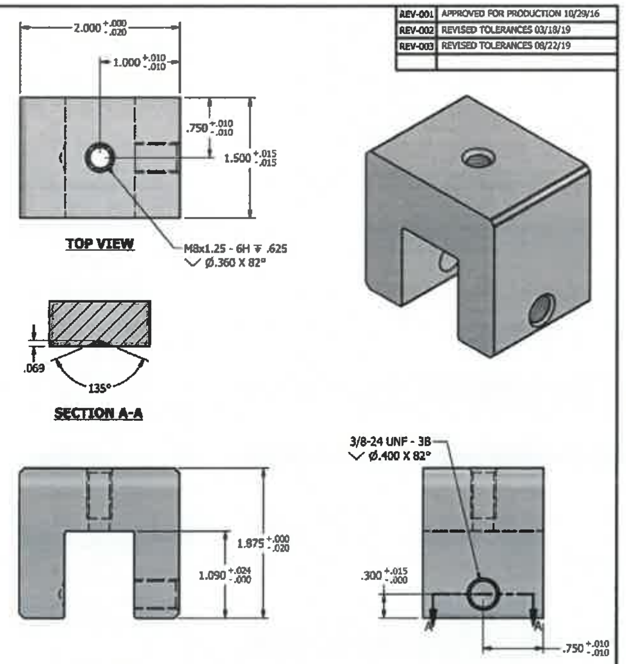
SepiSolar

Reviewed & Approved by:
RD

*** SCI PRODUCT CUT SHEET ***

REV-001	APPROVED FOR PRODUCTION 10/29/16
REV-002	REVISED TOLERANCES 03/18/19
REV-003	REVISED TOLERANCES 08/22/19



NOTES:

1. FOR CLARITY THIS DRAWING IS NOT TO SCALE.
2. CONTACT THE MANUFACTURER FOR RECOMMENDED LAYOUTS, SPACING AND ADDITIONAL DETAILS.
3. INSTALLATION MUST BE COMPLETED WITH THE MANUFACTURERS WRITTEN SPECIFICATIONS AND INSTALLATION INSTRUCTIONS.
4. THESE DRAWINGS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

SOLAR CONNECTIONS INTERNATIONAL
THE FUTURE OF SOLAR ATTACHMENTS
4800 METALMASTER WAY - McHENRY, IL 60050

8800-601 - POWER CLAMP MINI - 1SS | DIE: 8800

DRAWN BY:	[illegible]
DATE:	11/27/2019
SCALE:	N.T.S.
MATERIAL:	Aluminum 6061

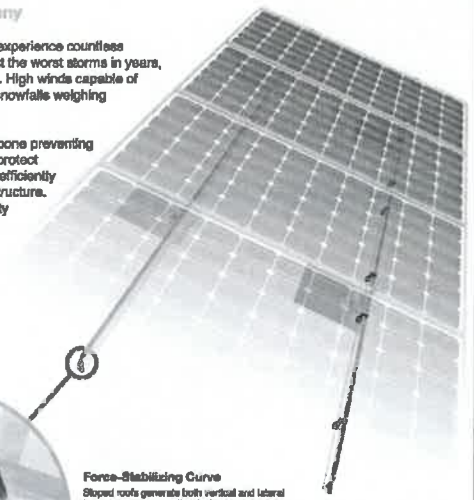
IRONRIDGE

XR Rail Family

Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.



Force-Stabilizing Curve

Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs

XR Rails are compatible with FlashFoot and other pitched roof attachments.

IronRidge offers a range of tilt leg options for flat roof mounting applications.

Corrosion-Resistant Materials

All XR Rails are made of marine-grade aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.

XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.

XR10

XR10 is a sleek, low-profile mounting rail, perfectly matched to regions without snow. It achieves 6 foot spans, while also staying light and economical.

- 6' spanning capability
- Moderate load capability
- Clear anodized finish
- Internal splices available

XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans.

- 8' spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available

XR1000

XR1000 is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans 12 feet or more for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone 1, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed span tables and certifications.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	100						
	120						
	140	XR10		XR100		XR1000	
	160						
10-20	100						
	120						
	140						
	160						
30	100						
	160						
40	100						
	160						
50-70	160						
80-90	160						

Contractor:

earthlight solar & energy solutions

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