

PHOTOVOLTAIC ROOF MOUNT SYSTEM

SR.# PROJECT INFORMATION

CODE AND STANDARDS

THE INSTALLATION OF SOLAR ARRAYS AND PHOTOVOLTAIC POWER SYSTEMS SHALL COMPLY WITH THE FOLLOWING CODES:

- 2020 NATIONAL ELECTRICAL CODE
- 2018 NORTH CAROLINA RESIDENTIAL CODE
- 2018 NORTH CAROLINA BUILDING CODE
- ALL OTHER ORDINANCE ADOPTED BY THE LOCAL GOVERNING AGENCIES

SITE NOTES / OSHA REGULATION

1. A LADDER SHALL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.
2. THE SOLAR PV INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
3. ROOFTOP MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED AND IDENTIFIED BY RECOGNIZED ELECTRICAL TESTING LABORATORY.
4. MODULES AND SUPPORT STRUCTURES SHALL BE GROUNDED
5. SOLAR INVERTER SHALL BE LISTED TO UL1741
6. ALL CONDUCTORS SHALL BE COPPER AND SHOULD BE 75 AND 90 DEG RATED
7. REMOVAL OF AN INTERACTIVE INVERTER OR OTHER EQUIPMENT SHALL NOT DISCONNECT THE BONDING CONNECTION BETWEEN THE GROUNDING ELECTRODE CONDUCTOR, THE PHOTOVOLTAIC SOURCE AND OUTPUT CIRCUIT GROUNDED CONDUCTORS.
8. LIVE PARTS OF PV SOURCE CIRCUITS AND PV OUTPUT CIRCUITS OVER 150V TO GROUND SHALL NOT BE ACCESSIBLE TO OTHER THAN QUALIFIED PERSONS WHILE ENERGIZED.
9. ALL PV MODULES AND ASSOCIATED EQUIPMENT AND WIRING SHALL BE PROTECTED FROM PHYSICAL DAMAGE.

SOLAR CONTRACTOR

1. MODULE CERTIFICATIONS INCLUDE UL1703, IEC61646, IEC61370.
2. IF APPLICABLE, MODULE GROUNDING LUGS MUST BE INSTALLED AT THE MARKED GROUNDING LUG HOLES PER THE MANUFACTURERS INSTALLATION REQUIREMENTS.
3. AS INDICATED BY DESIGN, OTHER NRTL LISTED MODULE GROUNDING DEVICES MAY BE USED IN PLACE OF STANDARD GROUNDING LUGS AS SHOWN IN MANUFACTURER DOCUMENTATION AND APPROVED BY THE AHJ.
4. ALL MICROINVERTERS, PHOTOVOLTAIC MODULES, AC COMBINERS, DC-AC CONVERTERS AND SOURCE CIRCUIT COMBINERS INTENDED FOR USE IN A PHOTOVOLTAIC POWER SYSTEM WILL BE IDENTIFIED AND LISTED FOR THE APPLICATION PER NEC690.4(B).
5. ALL SIGNAGE TO BE INSTALLED IN ACCORDANCE WITH LOCAL BUILDING CODE.
6. TERMINALS AND LUGS WILL BE TIGHTENED TO MANUFACTURER TORQUE SPECIFICATIONS (WHEN PROVIDED) IN ACCORDANCE WITH NEC CODE 110.14(D) ON ALL ELECTRICAL CONNECTIONS.
7. MAX DC VOLTAGE CALCULATED USING MANUFACTURER PROVIDED TEMP COEFFICIENT FOR VOC UNLESS NOT AVAILABLE.

1	PV MODULES	61 x REC 405AA PURE
2	INVERTER	61 x IQ8PLUS-72-2-US
3	ROOF TYPE	ASPHALT SHINGLES
4	RACKING	PSR-B84 RAILS (BLACK)
5	MOUNTING TYPE	COMP MOUNT FLASHING (BLACK)
6	DC SIZE	24.705 KW
7	AC SIZE	17.69 KVA



5112 Departure Drive,
Raleigh NC 27616
O: 919.948.6474
E: info@8msolar.com

SR.# PROJECT INFORMATION

1	PV1	DRAWING INDEX
2	PV2	SITE LAYOUT
3	PV3	STRING MAPPING
4	PV4	ELECTRICAL ONE LINE DIAGRAM
5	PV5	DETAILED ELECTRICAL WIRING SCHEMATIC
6	PV6	PV LABELS
7	PV7	BILL OF MATERIALS
8	PV8	ATTACHMENT DETAILS

Customer Information:

Bonita K Richie

1446 Neighbors Rd
Dunn NC 28334

Customer Signature:

Sheet Name:

Drawing Index

JOB NUMBER:

23-572-GR

Date:

11/15/2023

Revision:

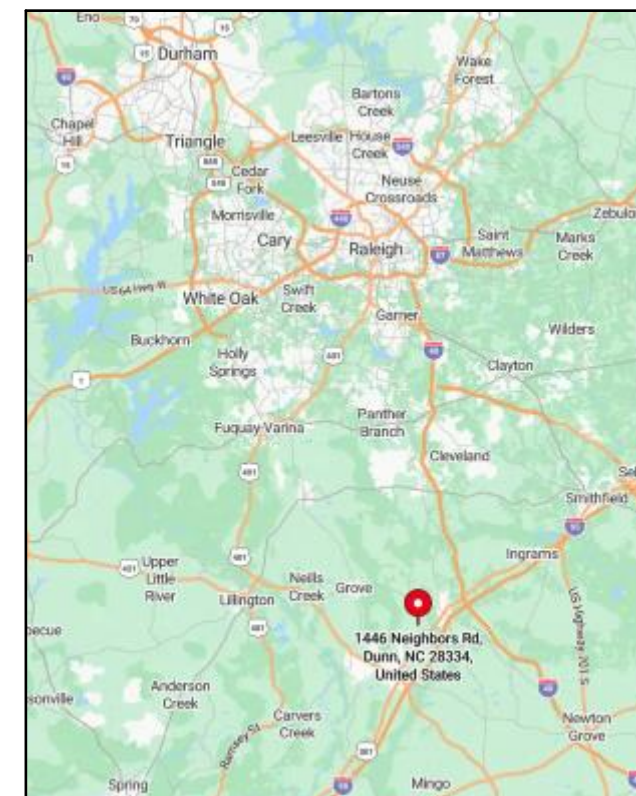
A

Sheet Size:

ANSI C
17" X 22"

Sheet Number:

PV1



VICINITY MAP




TOP VIEW OF THE BUILDING

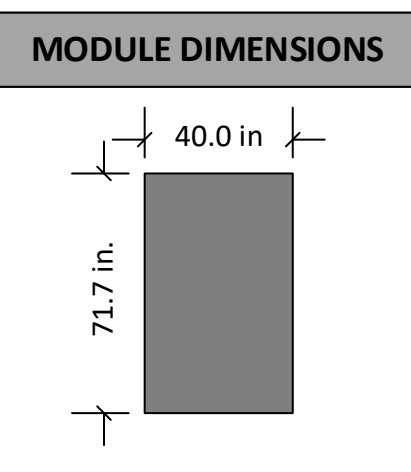


DESIGN CRITERIA
WIND SPEED: 130 MPH
GROUND SNOW LOAD: 10 PSF
WIND EXPOSURE FACTOR: B

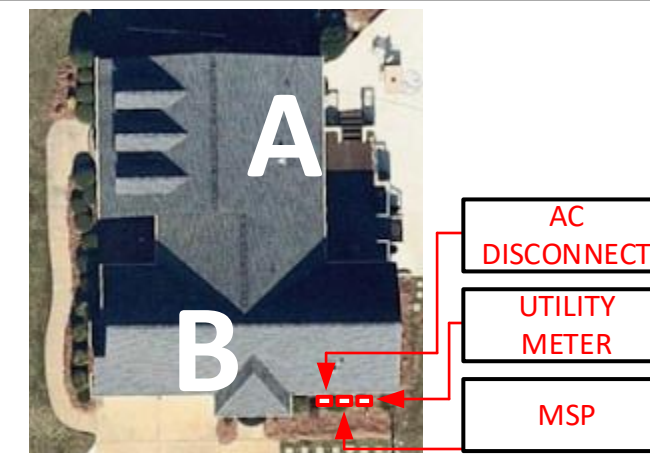
UTILITY COMPANY:
DUKE ENERGY
PERMIT ISSUER (AHJ):
HARNETT COUNTY

SCOPE OF WORK
INSTALLATION OF UTILITY
INTERACTIVE PHOTOVOLTAIC
SOLAR SYSTEM.

ROOF DESCRIPTION			
ROOF	PITCH	AZIMUTH	NO. OF MODULES
A	33°	89°	30
B	45°	179°	31
Vent		<ul style="list-style-type: none"> No vents will be covered by PV modules during the installation 	



PV System Dead Load (Panel + Racking weight) / PV System Area (No. of panels x Weight of panel (lbs.) + Length of racking (ft.) x 1.15 lb.ft.) / (No. of panels x Height x Width) = Total psf			
ROOF	A	B	
DEAD LOAD (PSF)	2.66	2.71	



SYSTEM DETAILS

NUMBER OF PANELS : 61
 PANELS MODEL : REC 405AA PURE
 DC SIZE : 24.705 kW
 AC SIZE : 17.69 kVA



5112 Departure Drive,
 Raleigh NC 27616
 O: 919.948.6474
 E: info@8msolar.com

Customer Information:

Bonita K Richie

1446 Neighbors Rd
 Dunn NC 28334

Customer Signature:

Sheet Name:

Site Layout

JOB NUMBER:

23-572-GR

Date:

11/15/2023

Revision:

A

Sheet Size:

ANSI C
 17" X 22"

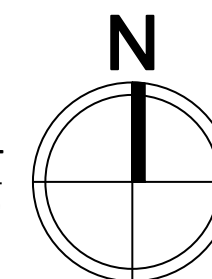
Sheet Number:

PV2

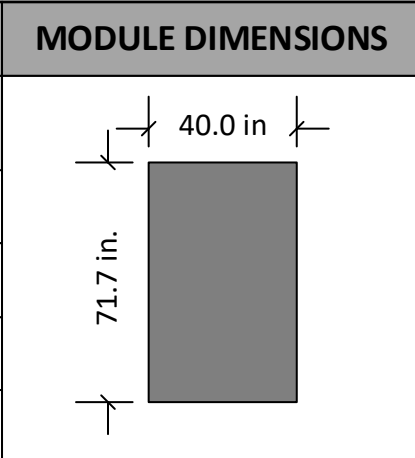


6in setback from sides of the roof

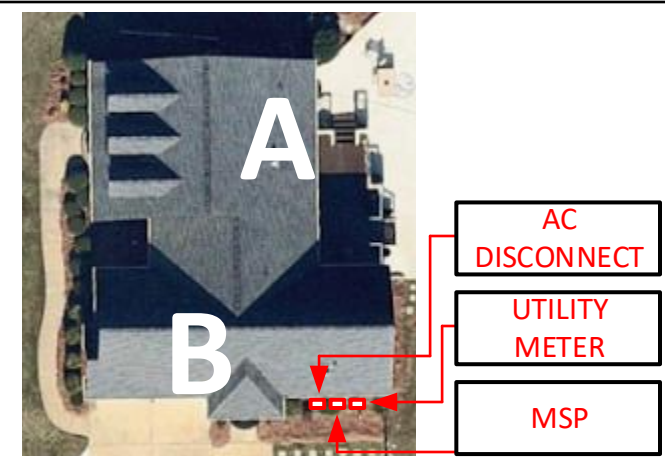
SITE LAYOUT
 SCALE: 1/8" - 1'



ROOF DESCRIPTION			
ROOF	PITCH	AZIMUTH	NO. OF MODULES
A	33°	89°	30
B	45°	179°	31



STRING LAYOUT					
LOAD CENTER 125A					
Strings #	No. of Modules	Color	Strings #	No. of Modules	Color
String 1	11	Blue	String 4	10	Green
String 2	10	Orange	String 5	10	Purple
String 3	10	Yellow	String 6	10	Light Blue



5112 Departure Drive,
Raleigh NC 27616
O: 919.948.6474
E: info@8msolar.com

SYSTEM DETAILS

NUMBER OF PANELS : 61
PANELS MODEL : REC 405AA PURE
DC SIZE : 24.705 kW
AC SIZE : 17.69 kVA

Customer Information:

Bonita K Richie

1446 Neighbors Rd
Dunn NC 28334

Customer Signature:

Sheet Name:

String Mapping

JOB NUMBER:

23-572-GR

Date:

11/15/2023

Revision:

A

Sheet Size:

ANSI C
17" X 22"

Sheet Number:

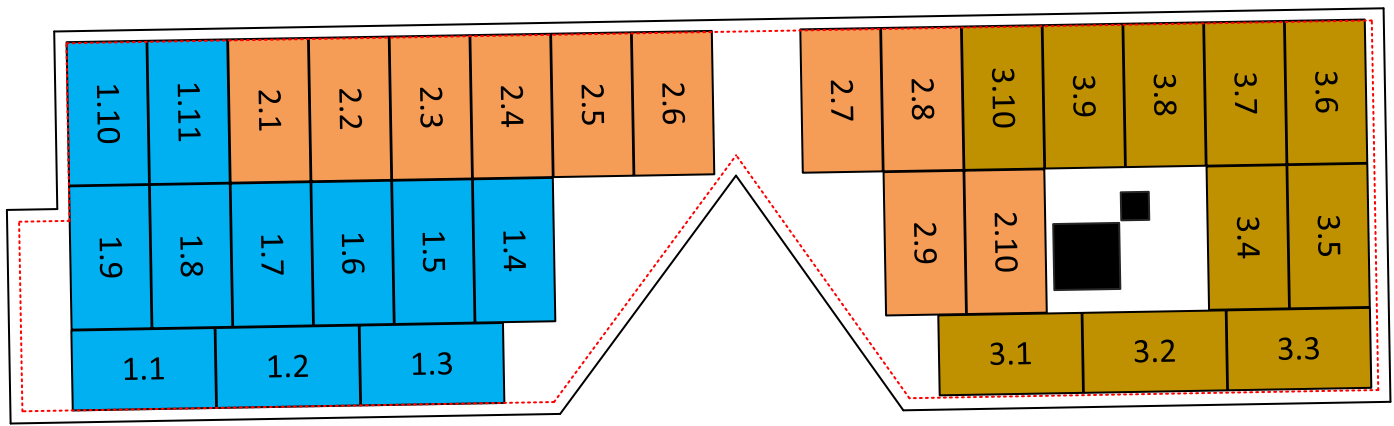
PV3



Roof A
30 Modules

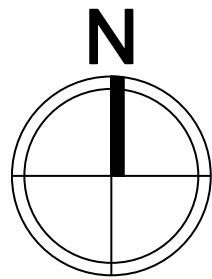


Roof B
31 Modules



6in setback from
sides of the roof

STRING MAPPING
SCALE: 1/8" - 1'



STRING CALCULATION

String #	No of Modules	Estimated Power	I _{max}	V _{oc}	V _{mpp}	V _{rise} (<= 2%)
1	11	4,455 W	16.63 AC	<30	240V AC	1.06+0.42 = 1.48
2	10	4,050 W	15.12 AC	<30	240V AC	1.10+0.42 = 1.52
3	10	4,050 W	15.12 AC	<30	240V AC	1.10+0.42 = 1.52
4	10	4,050 W	15.12 AC	<30	240V AC	1.06+0.42 = 1.48
5	10	4,050 W	15.12 AC	<30	240V AC	1.20+0.40 = 1.60
6	10	4,050 W	15.12 AC	<30	240V AC	1.15+0.55 = 1.70

NEC Code (2020) and UL Standard References

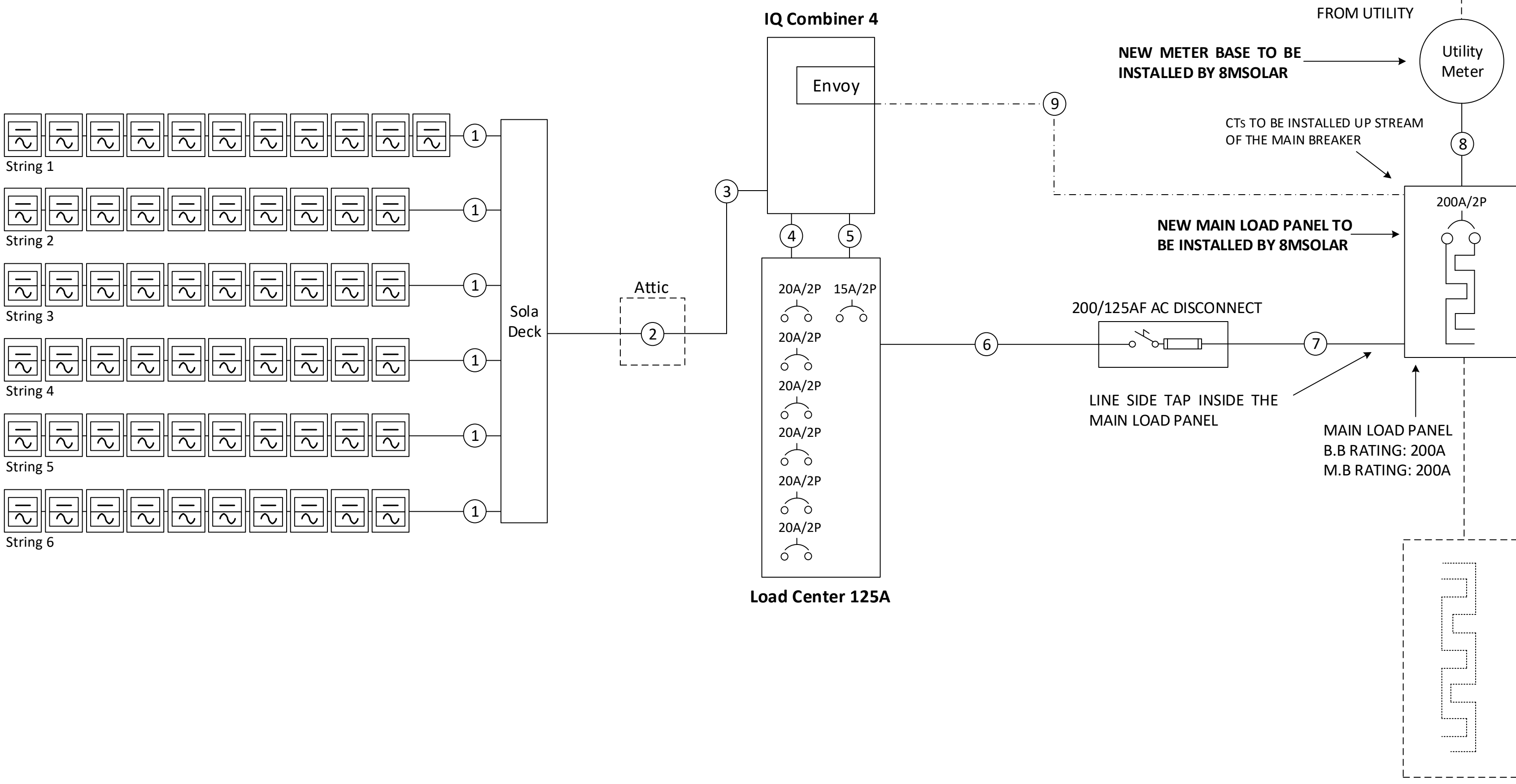
Rapid Shut Down	NEC 690.12 (A-D), UL1741	Grounding	NEC Article 250.30(A)
Disconnecting Means	NEC 690.13	Conduit Fill	NEC Table C.9, 310.15(B)(3)(a)
Feeder Sizing	NEC Table 310, 15(B)(16, 17)	Interconnection	NEC 705.12
Over current Protection	NEC 690.9		



5112 Departure Drive,
Raleigh NC 27616
O: 919.948.6474
E: info@8msolar.com

61 X REC 405AA PURE
405W
ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
290VA
RAPID SHUTDOWN EQUIPPED

Note: Service Side Work: Power Drop Required



Customer Information:

Bonita K Richie

1446 Neighbors Rd
Dunn NC 28334

Customer Signature:

Sheet Name:

Electrical One Line Diagram

JOB NUMBER:

23-572-GR

Date:

11/15/2023

Revision:

A

Sheet Size:

ANSI C
17" X 22"

Sheet Number:

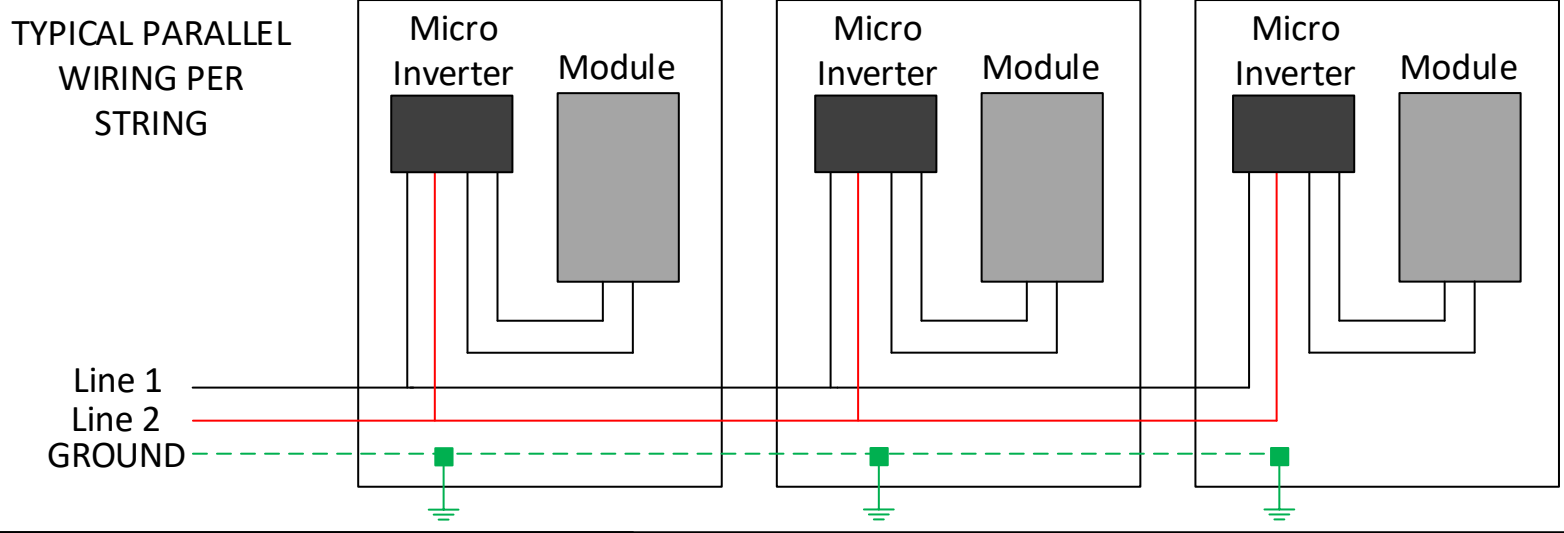
PV4

- System Size: 24,705W DC
- (61) REC 405AA PURE
- (61) ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
- Inverter Output: 1.21A max @ 240 VAC (each microinverter)
- 290 VA AC output max (each micro inverter)
- 17.69 kVA AC output max

- Grounding will be done via Pegasus grounding lugs and mid-clamps to ensure the rail and panels are continuously grounded.
- Rapid Shutdown is included in the Micro Inverters, refer to Micro Inverter attached datasheets.
- The load center / disconnect will be visible, lockable accessible to utility linesmen and will be properly labelled as per NEC requirements. It will be located on the exterior wall of the building, next to the utility meter.

Sr.No	#Wire	Conduit Size	Ground Wire	Amperage
1	1 x #12 Q Cable		#10 Bare Cu	20
2	12 x #10 THHN Cu	1" LFMC	#10 Green Cu	20
3	12 x #10 THHN Cu	1" EMT	#10 Green Cu	20
4	12 x #10 THHN Cu	1" LFNC	#10 Green Cu	20
5	3 x #10 THHN Cu	3/4" LFNC	#10 Green Cu	15
6	3 x #1 THHN Cu	2" PVC	#6 Green Cu	120
7	3 x #1 THHN Cu	2" PVC		120
8	3 x #3/0 THHN Cu	2" PVC		200
9	Lead Wire 18AWG, PVC Extruded	3/4" EMT		





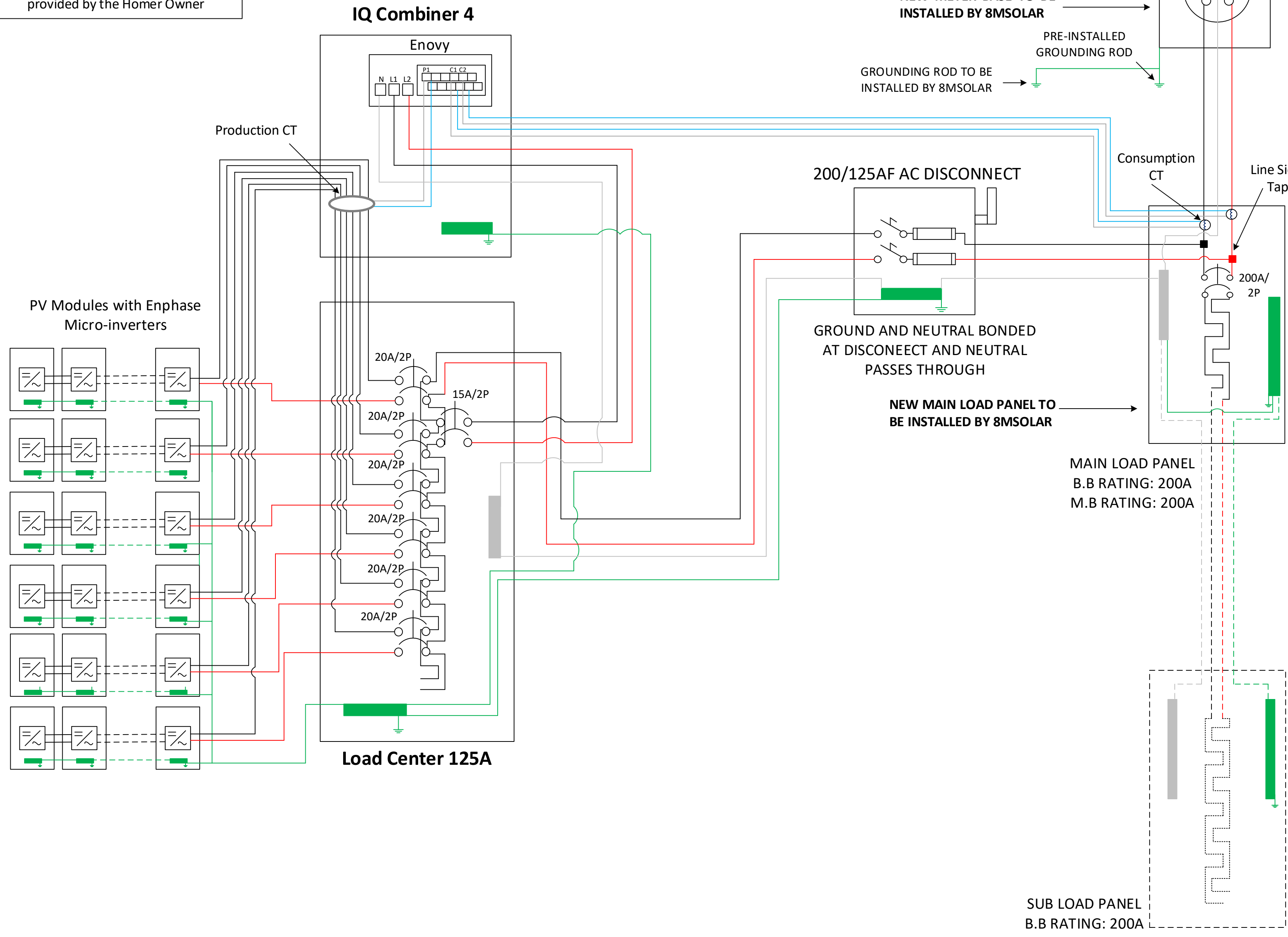
Line 1	
Line 2	
Neutral	
Ground	
CT Wire	

Note: Line 1 from all strings will be passed from the Production CT.

Note: The arrow on Production and Consumption CTs must point towards the loads and away from the source.

Note: Connect both grounding rods in a series connections with a bare copper keeping the minimum distance of 6ft between them.

Note: Autel Home EV Charger Will be provided by the Homer Owner



5112 Departure Drive,
Raleigh NC 27616
O: 919.948.6474
E: info@8msolar.com

Customer Information:

Bonita K Richie
1446 Neighbors Rd
Dunn NC 28334

Customer Signature:

Sheet Name:

Detailed Electrical Diagram

JOB NUMBER:

23-572-GR

Date:

11/15/2023

Revision:

A

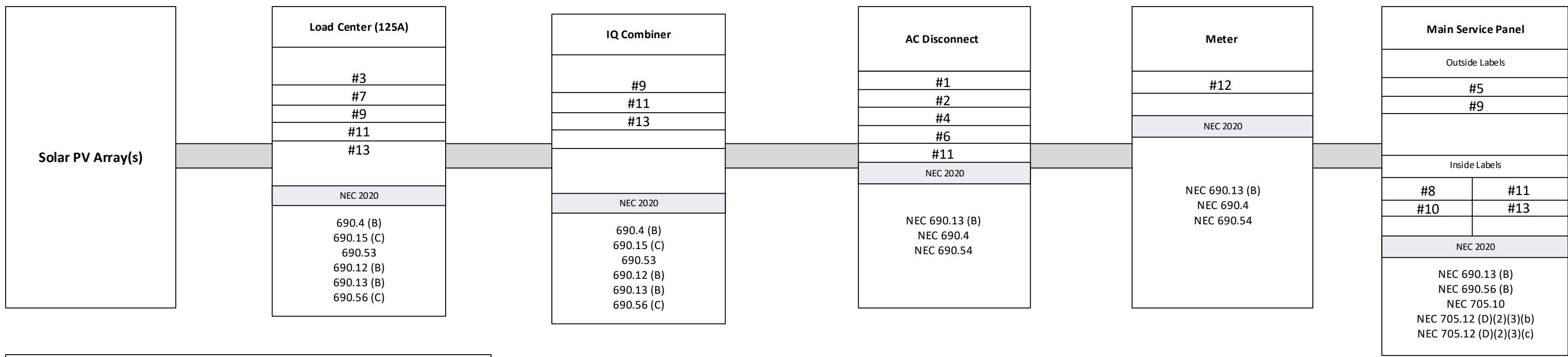
Sheet Size:

ANSI C
17" X 22"

Sheet Number:

PV5





5112 Departure Drive,
Raleigh NC 27616
O: 919.948.6474
E: info@8msolar.com

LABELING AND WARNING SIGNS: NEC 2020

A. PURPOSE
PROVIDE EMERGENCY RESPONDERS WITH APPROPRIATE WARNING AND GUIDANCE WITH RESPECT TO ISOLATING THE SOLAR ELECTRIC SYSTEM. THIS CAN FACILITATE IDENTIFYING ENERGIZED ELECTRICAL LINES THAT CONNECT THE SOLAR PANELS TO THE INVERTER, AS SHOULD NOT BE CUT WHEN VENTING FOR SMOKE REMOVAL.

B. MAIN SERVICE DISCONNECT:

1. RESIDENTIAL BUILDINGS- THE MARKING MAY BE PLACED WITHIN THE MAIN SERVICE DISCONNECT. THE MARKING SHALL BE PLACED ON THE OUTSIDE COVER IF THE MAIN SERVICE DISCONNECT IS OPERABLE WITH THE SERVICE PANEL CLOSED.
2. COMMERCIAL BUILDINGS- THE MARKINGS SHALL BE PLACED ADJACENT TO THE MAIN SERVICE DISCONNECT CLEARLY VISIBLE FROM THE LOCATION WHERE THE LEVER IS OPERATED

3. MARKINGS, VERBIAGE, FORMAT AND TYPE OF MATERIAL

- a. VERBIAGE: CAUTION; SOLAR ELECTRIC SYSTEM CONNECTED
- b. FORMAT:
 - (1) WHITE LETTERING ON A RED BACKGROUND
 - (2) MINIMUM 3/8 INCH LETTER HEIGHT
 - (3) ALL LETTERS SHALL BE CAPITALIZED
 - (4) ARIAL OR SIMILAR FONT, NON-BOLD

c. MATERIAL:

- (1) REFLECTIVE, WEATHER RESISTANT MATERIAL SUITABLE FOR THE ENVIRONMENT (USE UL-969) AS STANDARD FOR WEATHER RATING); DURABLE ADHESIVE MATERIALS MEET THIS REQUIREMENT.

C. MARKING REQUIREMENTS ON CONDUIT, RACEWAYS, ENCLOSURES, CABLE ASSEMBLIES, COMBINERS AND JUNCTION BOXES;

1. MARKING: PLACEMENT, VERBIAGE, FORMAT AND TYPE OF MATERIAL.

- a. PLACEMENT: MARKINGS SHALL BE PLACED EVERY 10 (TEN) FEET ON ALL INTERIOR AND EXTERIOR DC CONDUITS, RACEWAYS, ENCLOSURES AND CABLE ASSEMBLIES, AT TURNS ABOVE AND/OR BELOW PENETRATIONS, ALL COMBINERS AND JUNCTION BOXES.
- b. VERBIAGE: CAUTION SOLAR CIRCUIT
- c. THE FORMAT AND TYPE OF MATERIAL SHALL ADHERE TO SECTION B-3.B & C ABOVE

D. INVERTERS ARE NOT REQUIRED TO HAVE CAUTION MARKINGS

#1 PHOTOVOLTAIC
AC DISCONNECT

#2 RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

#3 PHOTOVOLTAIC POWER SOURCE

OPERATING AC VOLTAGE	240 V
MAXIMUM OPERATING AC OUTPUT CURRENT	92.26 A

#4 AC DISCONNECT PHOTOVOLTAIC SYSTEM POWER SOURCE

RATED AC OUTPUT CURRENT	92.26 AMPS
NOMINAL OPERATING AC VOLTAGE	240 VOLTS

#5 SOLAR AC DISCONNECT LOCATED AT SOUTH SIDE WALL OF THE HOUSE BESIDE THE UTILITY METER

#6 SERVICE DISCONNECT LOCATED INSIDE THE MAIN LOAD PANEL

#7 PHOTOVOLTAIC SYSTEM COMBINER PANEL DO NOT ADD LOADS

#8 WARNING

THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE, SHALL NOT EXCEED AMPACITY OF BUSBAR

#9 WARNING

DUAL POWER SUPPLY SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM

#10 WARNING

TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

#11 WARNING

ELECTRIC SHOCK HAZARD TERMINAL ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

#12 WARNING

THIS SERVICE METER IS ALSO SERVED BY A PHOTOVOLTAIC SYSTEM

#13 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

Customer Information:

Bonita K Richie
1446 Neighbors Rd
Dunn NC 28334

Customer Signature:

Sheet Name:

PV Labels

JOB NUMBER:

23-572-GR

Date:

11/15/2023

Revision:

A

Sheet Size:

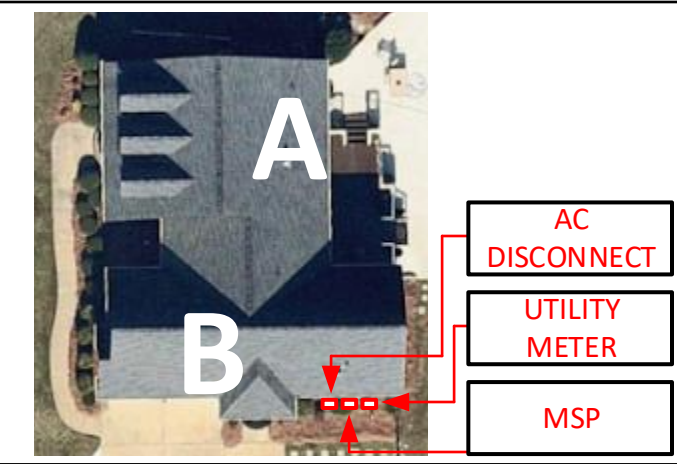
ANSI C
17" X 22"

Sheet Number:

PV6



ROOF DESCRIPTION				MODULE DIMENSIONS	Rails and Splices : PSR-B84 (BLACK)	Roof Attachment : Pegasus Comp Mount
ROOF	PITCH	AZIMUTH	NO. OF MODULES		Rafter Spacing : 24 in	There is one layer of shingles Roofing material is asphalt shingles
A	33°	89°	30		Attachment Span: 4ft	The roof is located in 130mph wind zone
B	45°	179°	31			



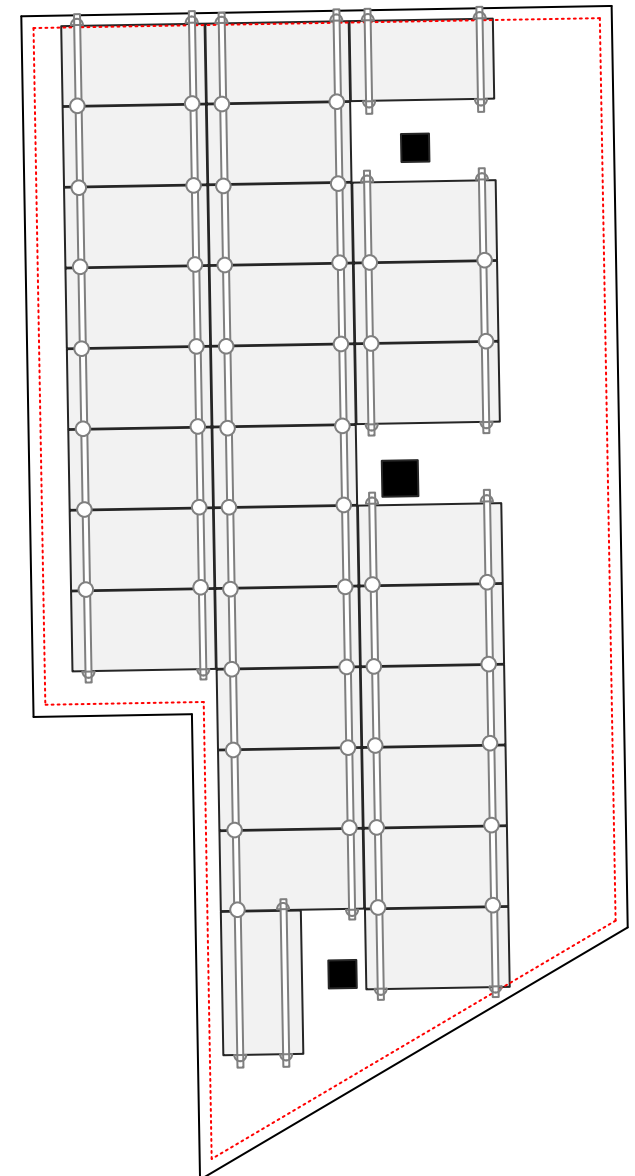
5112 Departure Drive,
Raleigh NC 27616
O: 919.948.6474
E: info@8msolar.com

PV LABELS		
Sr No	Code	Qty
01	03-302	01
02	02-316	01
03	03-390	01
04	03-306	01
05	8M-001	01
06	8M-002	01
07	03-355	01
08	05-108	01
09	05-211	03
10	05-372	01
11	05-215	04
12	07-359	01
13	07-111	03

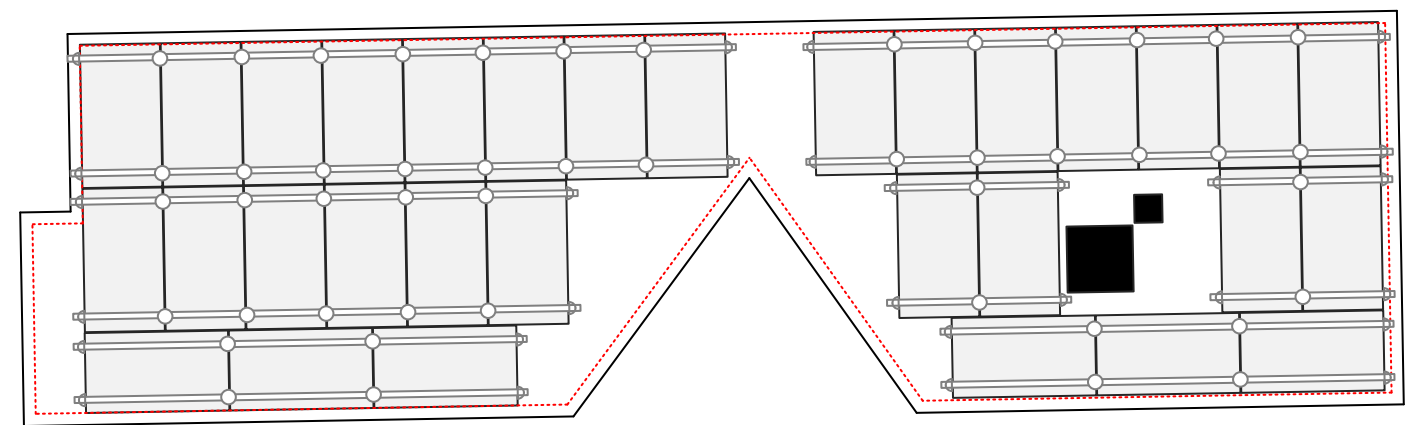
- RAILS AND MOUNTING SYSTEM**
- 72 x PSR-B84: Pegasus Rail, Black, 84" (7 Feet)
 - 47 x PSR-SPL: Pegasus - Bonded, Structural Splice
 - 97 x PSR-MCB: Pegasus - Multiclamp, Mid/End, 30 to 40 mm, Black
 - 52 x PSR-HEC: Pegasus - Hidden End Clamp
 - 61 x PSR-MLP: Pegasus - MLPE Mount
 - 15 x PSR-LUG: Pegasus - Grounding Lug
 - 95 x PSR-WMC: Pegasus - Wire Management Clip
 - 11 x PSR-CBG: Pegasus - Cable Grip
 - 52 x PSR-CAP: Pegasus - End Cap
 - 130 x PSCR-UBBDT: Pegasus Comp Mount - Open Slot, Black L Foot, Black Flashing, Dovetail 3/8" T-Bolt
 - 122 x Heyco Wire Clips
 - 04 x RT Mini II Mounts
 - 16 x Screw 5.0 x 60
 - 04 x RT2-04-FBN25SL 5/16"
 - 04 x LFT-03-M1: Slotted L-Foot Mill

- SOLAR MODULES**
- 61 x REC 405AA PURE
- INVERTER & SUPPORTING ITEMS**
- 61 x Enphase IQ8PLUS-72-2-US micro inverter
 - 01 x X-IQ-AM1-240-4: IQ Combiner 4
- ENPHASE CABLES AND ACCESSORIES**
- 64 x Q-12-10-240: Q Cable
 - 07 x Q-12-20-200: Q Cable
 - 01 x Q-12-RAW-300:Q Cable, 12 AWG (120ft)
 - 18 x Q-CONN-10M Male Field-wireable connector
 - 18 x Q-CONN-10F Female Field-wireable connector
 - 06 x Q-TERM-10: Terminator Cap
 - 09 x Q-SEAL-10: Female Sealing Cap
 - 01 x Q-CLIP-100: Q Cable rail mount cable management clip (Pack of 100)
 - 01 x Q-DISC-10: Disconnect tool
- ELECTRICAL ITEMS**
- 01 x UAT417-XGF: 200A Meter Base
 - 01 x BR816B200RF: Outdoor Sub Panel (Eaton) 200A MCB/8 space min (NEMA 3R), Feed through lugs
 - 01 x BR230: Eaton BR 30/2
 - 01 x BR260: Eaton BR 60/2
 - 01 x BR290: Eaton BR 90/2
 - 01 x HOM2040L125PRB: Load center, Homeline, 1 phase, 20 spaces, 40 circuits, 125A convertible main lugs, NEMA 3R
 - 06 x HOM220: SQ D HOM 20/2
 - 01 x HOM215: SQ D HOM 15/2
 - 01 x QO1515: SQ D QO 15A tandem breaker
 - 01 x QO260: SQ D QO 60/2
 - 02 x IPCS 2540: Line/Load Side Hot Taps (#250 main - #4/0-6 tap) Large types
 - 01 x D224NRB: 250volt/200amp/2pole fusible disconnect (NEMA 3R)
 - 02 x SQUARE D FRNR125: 250volt/125amp fuses
 - 03 x EZSLR JB-1.2: SolaDeck

Roof A
30 Modules

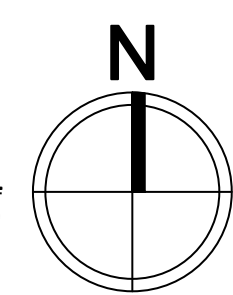


Roof B
31 Modules



6in setback from sides of the roof

BILL OF MATERIAL
SCALE: 1/8" - 1'



Customer Information:

Bonita K Richie

1446 Neighbors Rd
Dunn NC 28334

Customer Signature:

Sheet Name:

Bill of Material

JOB NUMBER:

23-572-GR

Date:

11/15/2023

Revision:

A

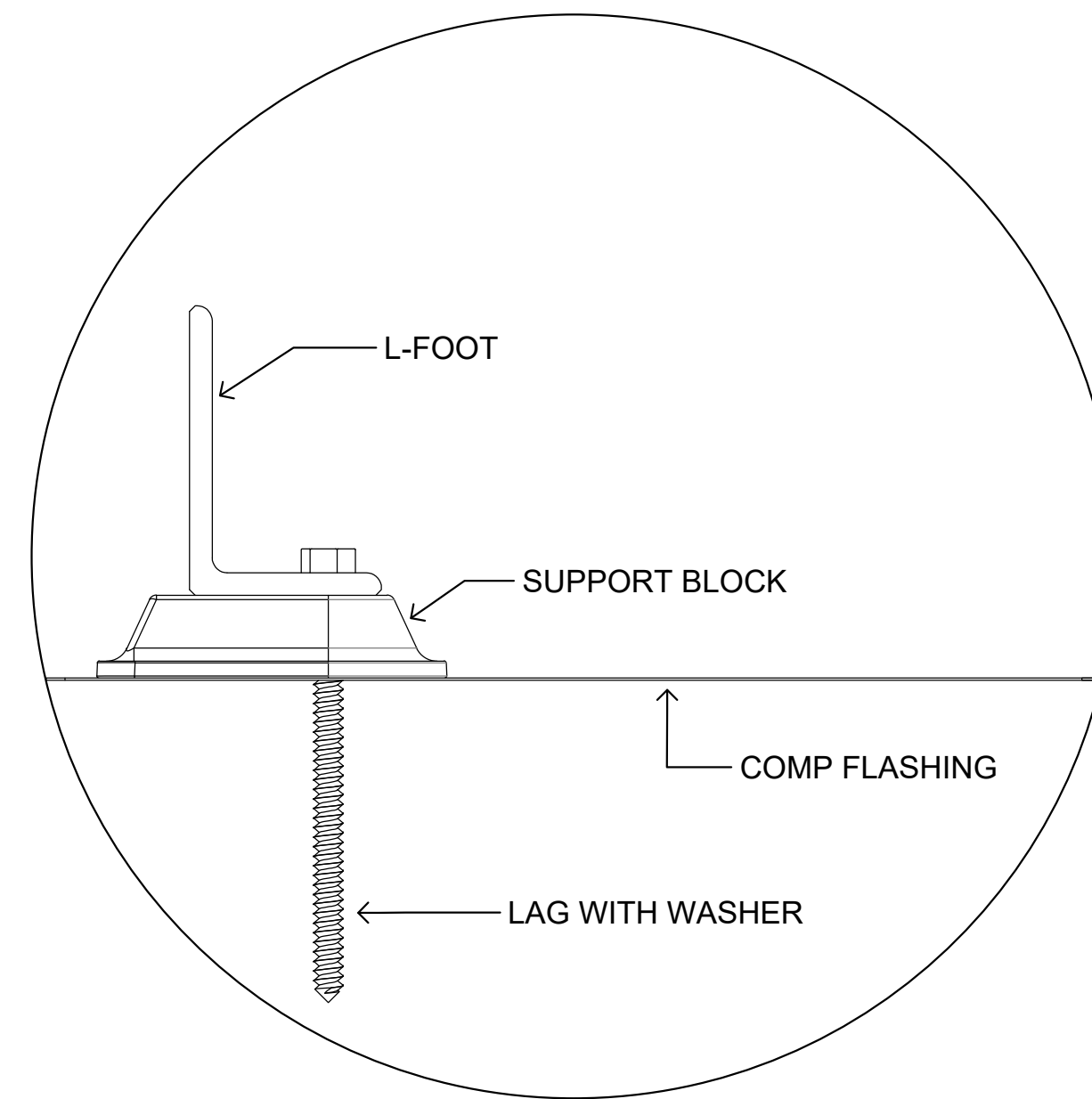
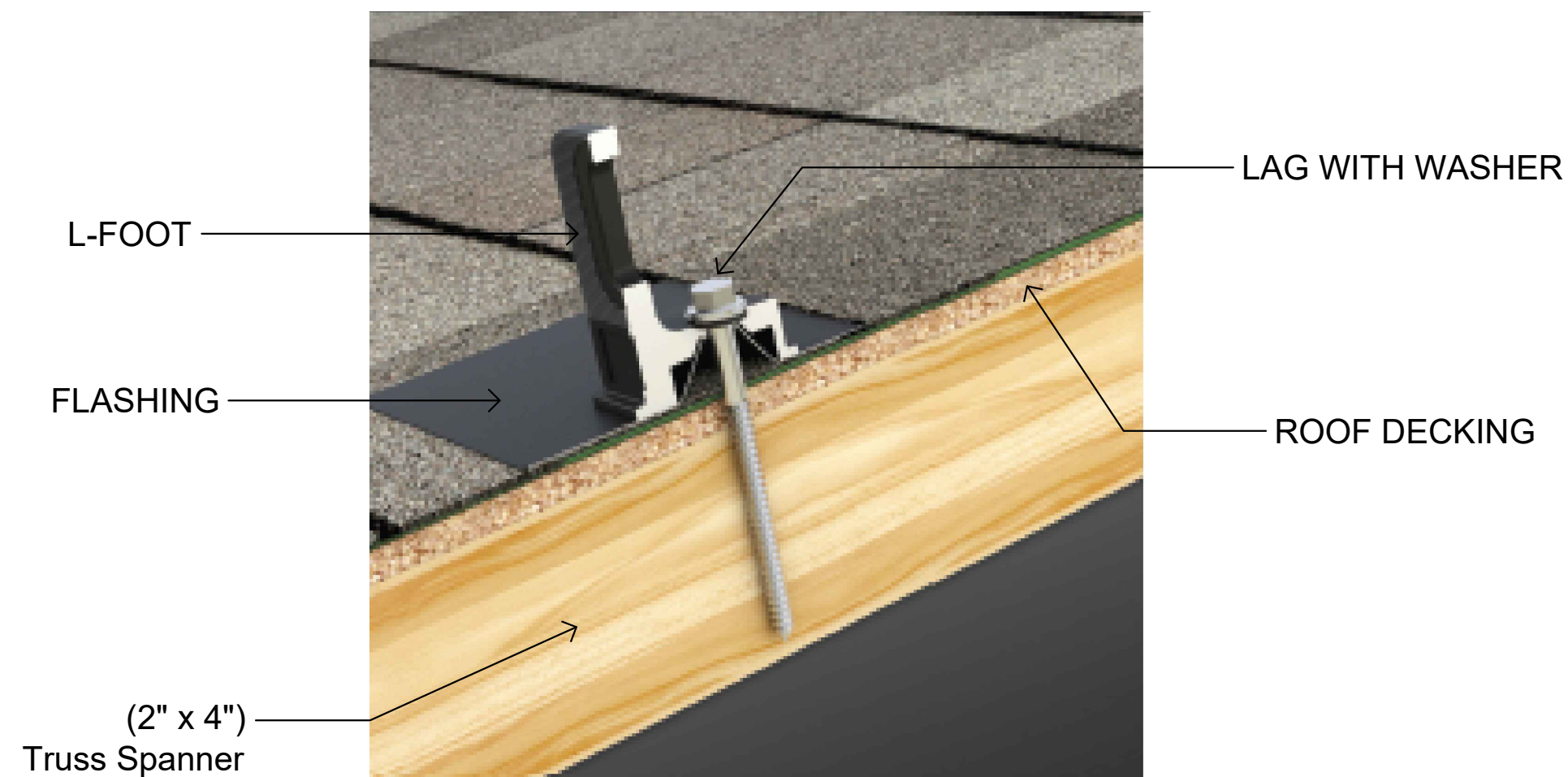
Sheet Size:

ANSI C
17" X 22"

Sheet Number:

PV7





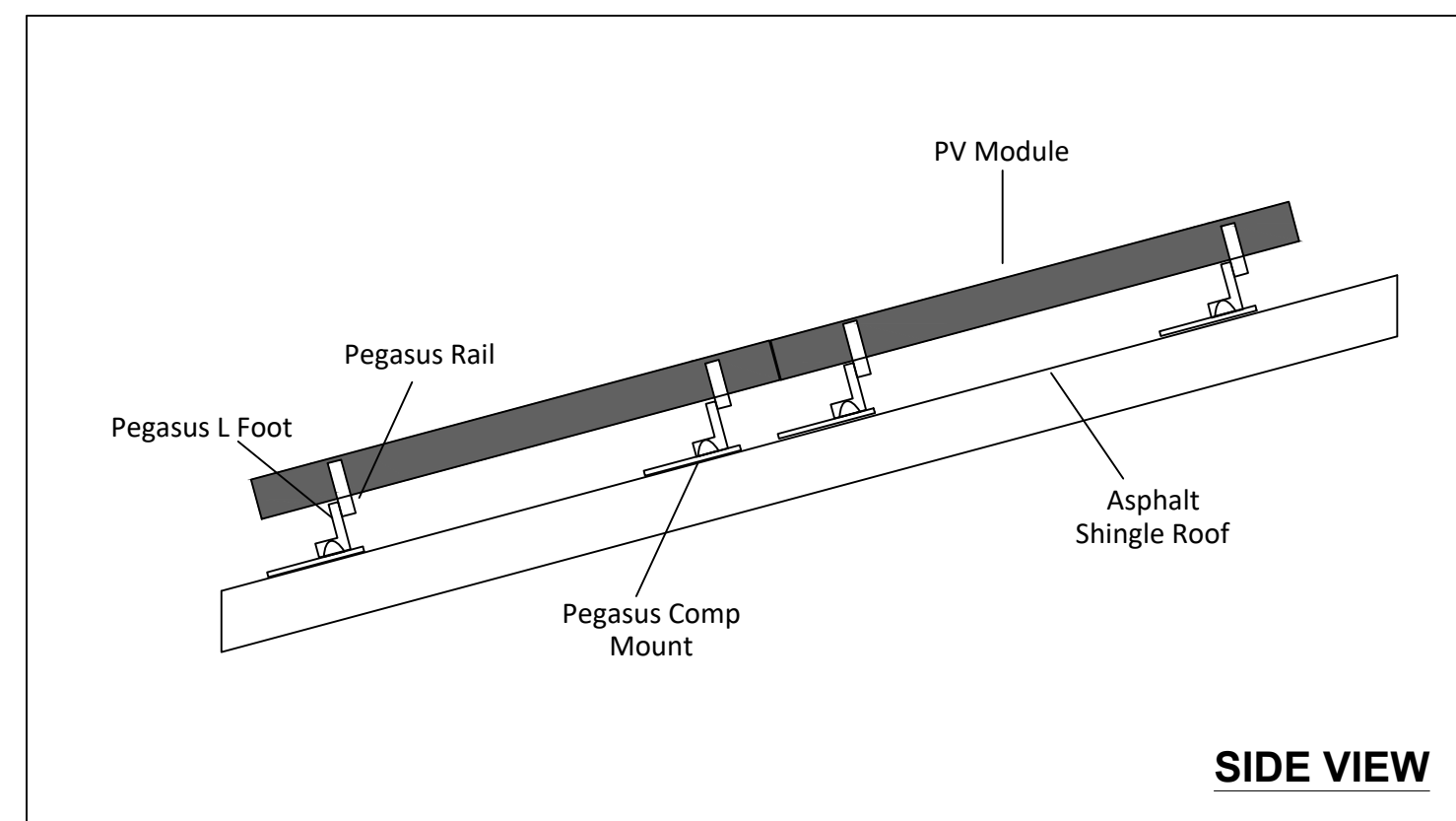
Customer Information:

Bonita K Richie

1446 Neighbors Rd
Dunn NC 28334

Customer Signature:

					
Multi-Clamp	Hidden End Clamp	MLPE Mount	Dovetail T-Bolt	Ground Lug	Cable Grip
Torque Value 100 in-lbs.	Torque Value 135 in-lbs.	Torque Value 135 in-lbs.	Torque Value 300 in-lbs.	Torque Value 135 in-lbs.	Torque Value 135 in-lbs.



Sheet Name:

Attachment Details

JOB NUMBER:

23-572-GR

Date:

11/15/2023

Revision:

A

Sheet Size:

ANSI C
17" X 22"

Sheet Number:

PV8

PV Dead Load	
Roof A	<p>PV System Dead Load (Panel + Racking weight) / PV System Area (30 panels x 45 lbs./panel + 207 ft. of racking x 1.17 lb.ft) / (30 panels x 5.975' x 3.33') = 2.66 psf</p>
Roof B	<p>PV System Dead Load (Panel + Racking weight) / PV System Area (31 panels x 45 lbs./panel + 241 ft. of racking x 1.17 lb.ft) / (31 panels x 5.975' x 3.33') = 2.71 psf</p>