

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	31 x SOLARIA POWERXT 430R-PL
2	INVERTER	31 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	13.33 KW
7	AC SIZE	8.99 KVA



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

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PROJECT INFORMATION

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5	PV5	DETAILED ELECTRICAL WIRING SCHEMATIC
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Customer Information:

Cory Kolek
29 Dekalb Court
Fuquay-Varina NC 27526

Customer Signature:

Sheet Name:

Drawing Index

JOB NUMBER:

23-125-CK

Date:

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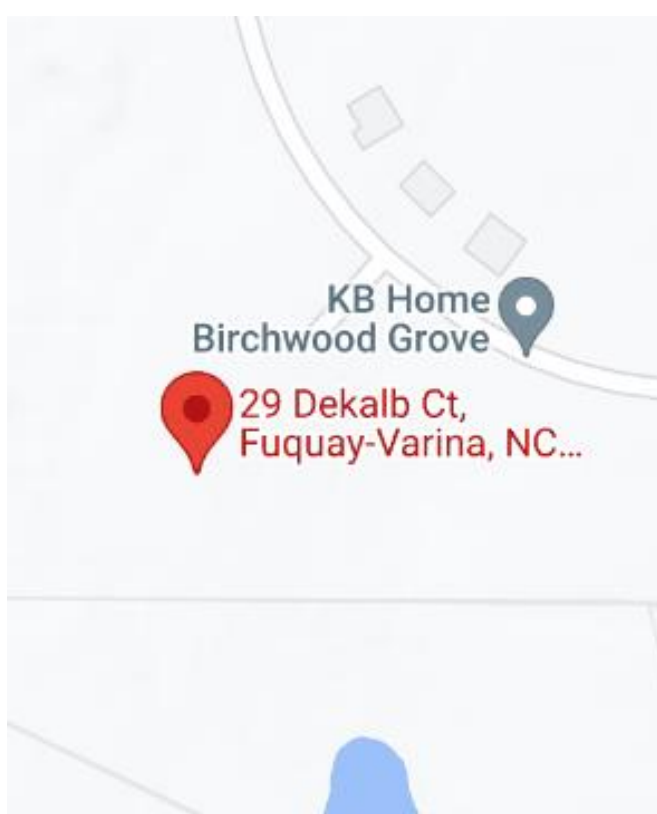
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17" X 22"

Sheet Number:

PV1



DESIGN CRITERIA
WIND SPEED: 135 MPH
GROUND SNOW LOAD: 20 PSF
WIND EXPOSURE FACTOR: B


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

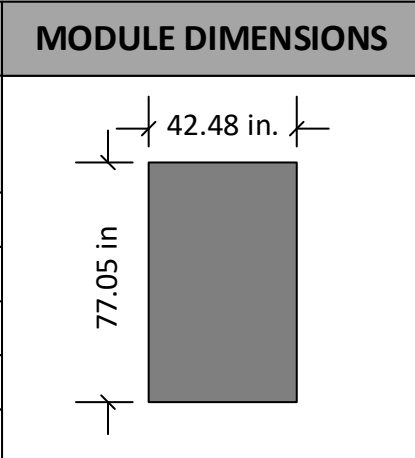
SCOPE OF WORK
INSTALLATION OF UTILITY INTERACTIVE PHOTOVOLTAIC SOLAR SYSTEM.

VICINITY MAP

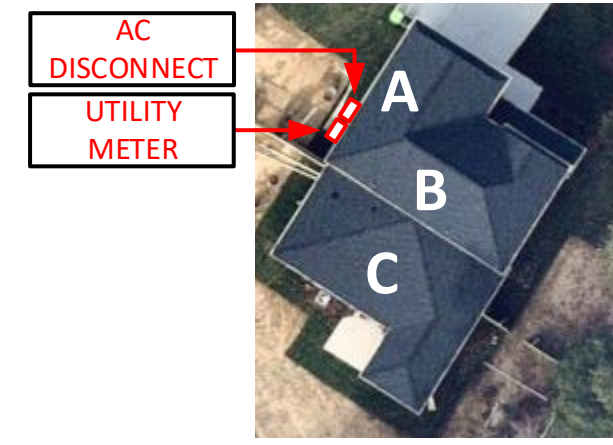
TOP VIEW OF THE BUILDING



ROOF DESCRIPTION			
ROOFS	PITCH	AZIMUTH	NO. OF MODULES
A	34°	302°	08
B	34°	213°	12
C	19°	213°	11
Vent			
		<ul style="list-style-type: none"> Roof C has no vents 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			
ROOFS	A	B	C
DEAD LOAD (PSF)	2.58	2.61	2.49



SYSTEM DETAILS

NUMBER OF PANELS : 31
 PANELS MODEL : SOLARIA POWERXT 430R-PL
 DC SIZE : 13.33 kW
 AC SIZE : 8.99 kVA

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

Customer Information:

Cory Kolek
 29 Dekalb Court
 Fuquay-Varina NC 27526

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Site Layout

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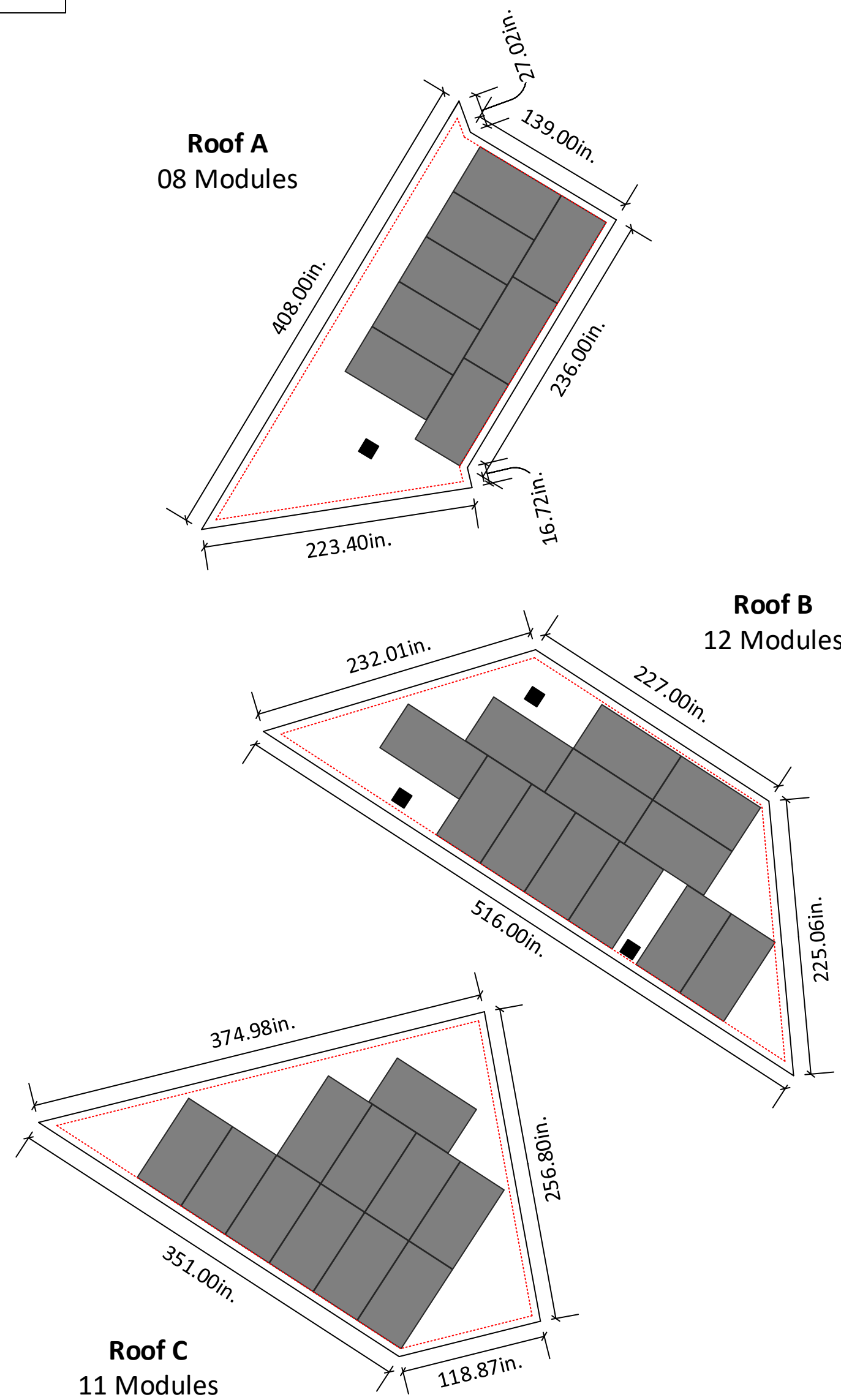
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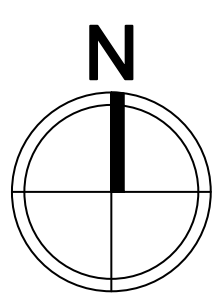
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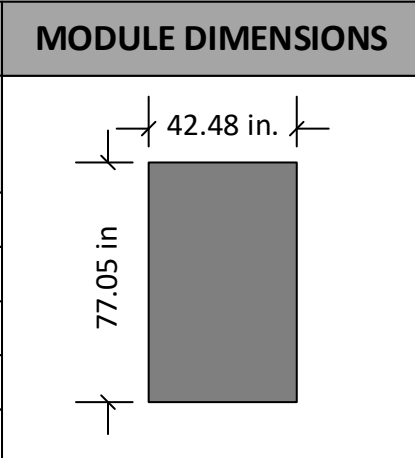


6in setback from sides of the roof

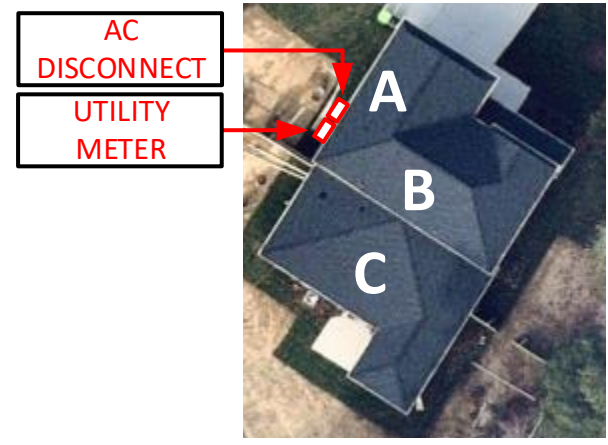
SITE LAYOUT
 SCALE: 1/8" - 1'



ROOF DESCRIPTION			
ROOFS	PITCH	AZIMUTH	NO. OF MODULES
A	34°	302°	08
B	34°	213°	12
C	19°	213°	11



STRING LAYOUT					
ENPHASE IQ COMBINER 4					
Strings #	No. of Modules	Color	Strings #	No. of Modules	Color
String 1	12	Blue			Green
String 2	11	Orange			Purple
String 3	08	Brown			Light Blue

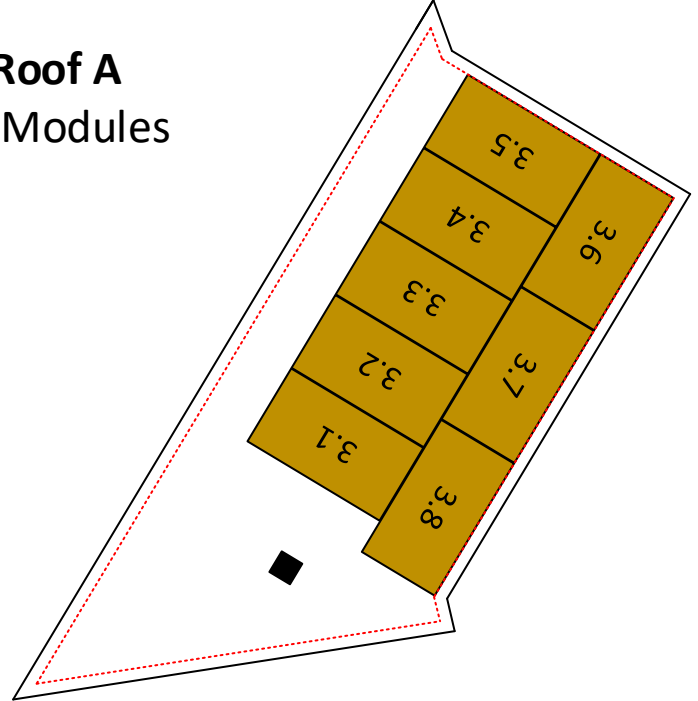


SYSTEM DETAILS

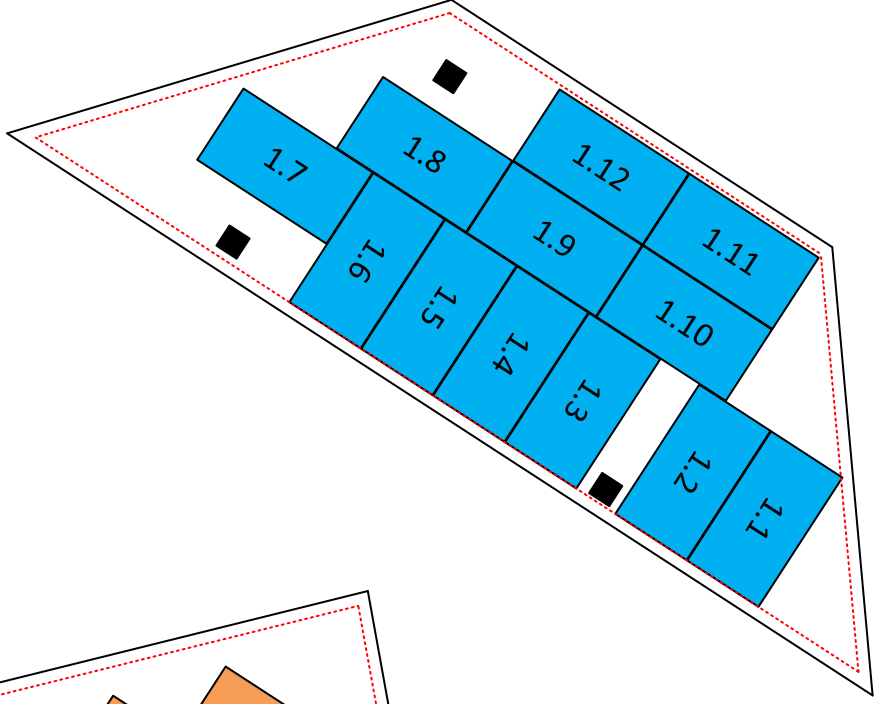
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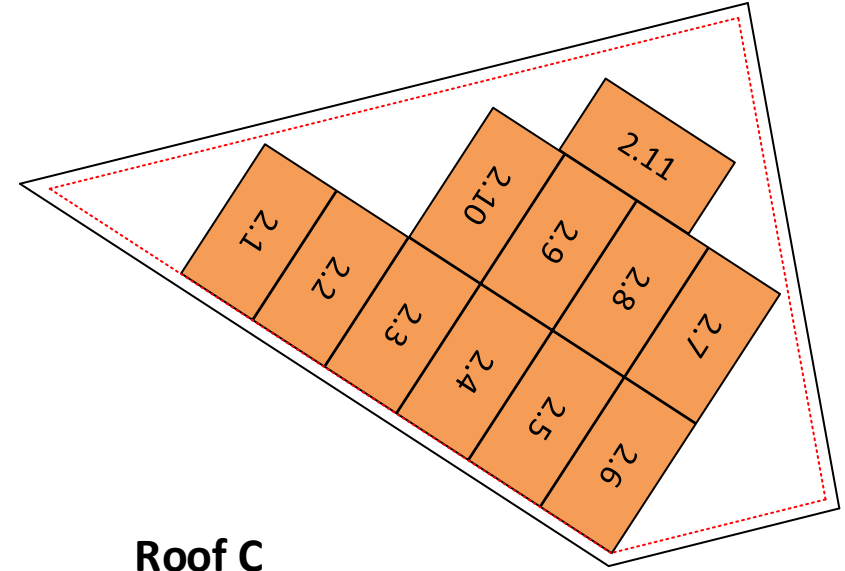
Roof A
08 Modules



Roof B
12 Modules

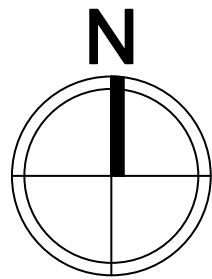


Roof C
11 Modules



6in setback from sides of the roof

STRING MAPPING
SCALE: 1/8" - 1'



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Cory Kolek
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String Mapping

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PV3



STRING CALCULATION

String #	No of Modules	Estimated Power	I _{max}	V _{oc}	V _{mpp}	V _{rise} (<= 2%)
1	12	5,160 W	18.15 AC	<30	240V AC	1.18+0.63 = 1.81
2	11	4,730 W	16.63 AC	<30	240V AC	0.96+0.35 = 1.31
3	08	3,440 W	12.1 AC	<30	240V AC	0.62+0.42 = 1.04

NEC Code and UL Standard References

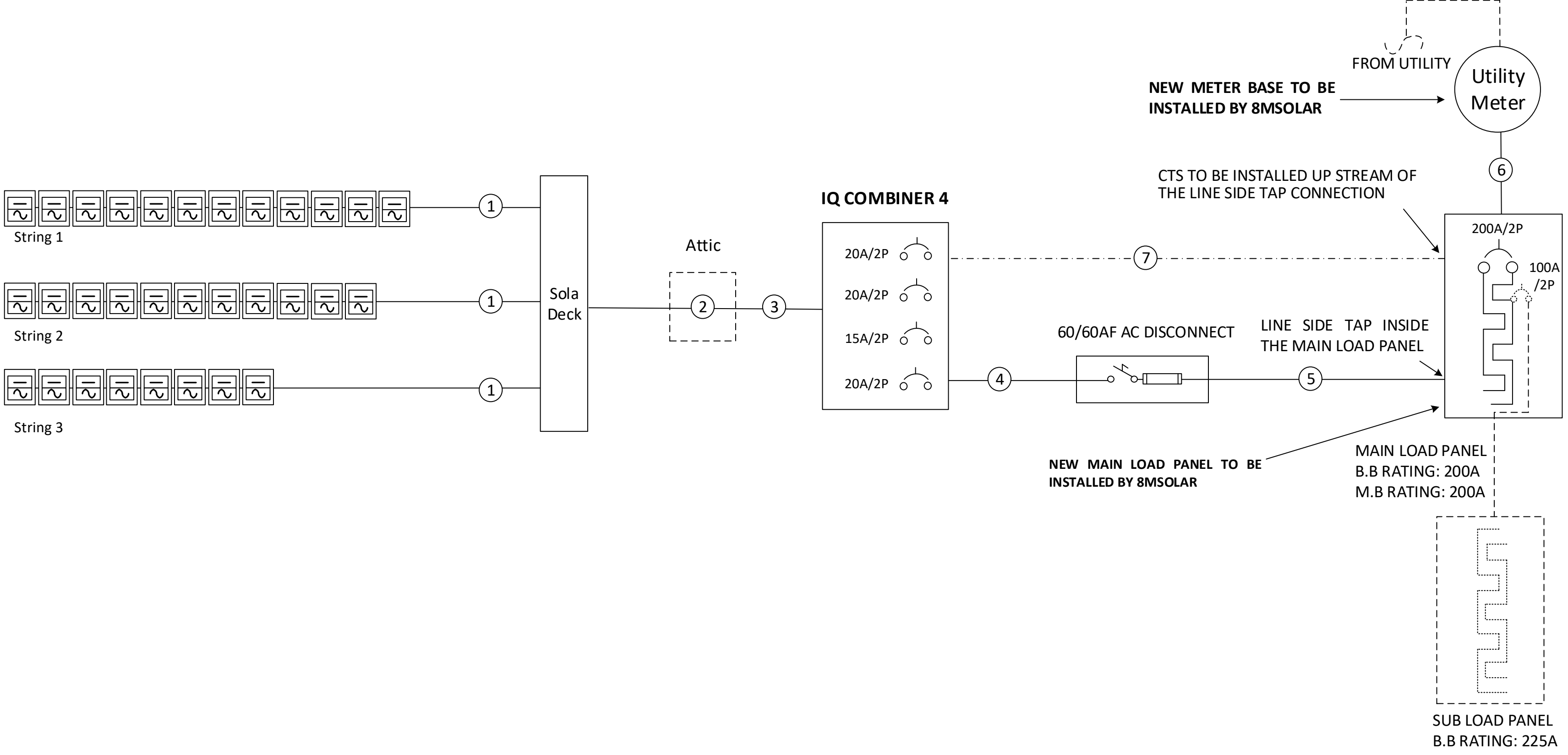
Rapid Shut Down	NEC 690.12 (A-D), UL1741	Grounding	NEC Article 250.30(A)
Disconnecting Means	NEC 690.13	Conduit Fill	NEC Table C.9, 310.15(B)(3)(a)
Feeder Sizing	NEC Table 310, 15(B)(16, 17)	Interconnection	NEC 705.12
Over current Protection	NEC 690.9		



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E: info@8msolar.com

31 X SOLARIA POWERXT 430R-PL
430W
ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
290VA
RAPID SHUTDOWN EQUIPPED

Note: Power Drop Required: Service Side Work



Customer Information:

Cory Kolek
29 Dekalb Court
Fuquay-Varina NC 27526

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Electrical One Line Diagram

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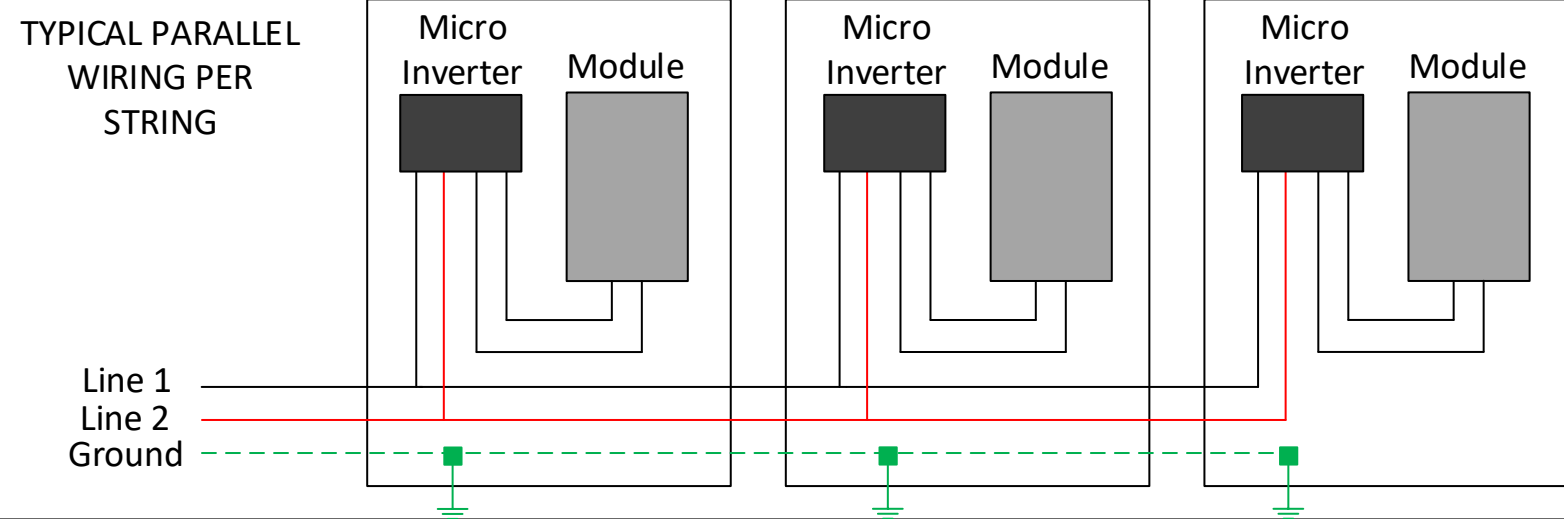
PV4

- System Size: 13,330W DC
- (31) SOLARIA POWERXT 430R-PL
- (31) ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
- Inverter Output: 1.21A max @ 240 VAC (each microinverter)
- 290 VA AC output max (each micro inverter)
- 8.99 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	6 x #10 THHN Cu	3/4" LFMC	#10 Green	20
3	6 x #10 THHN Cu	3/4" EMT	#10 Green	20
4	3 x #6 THHN Cu	3/4" LFNC	#8 Green	60
5	3 x #6 THHN Cu	3/4" EMT		60
6	3 x #3/0 THHN Cu	2" PVC		200
7	Lead Wire 18AWG, PVC Extruded	3/4" EMT		



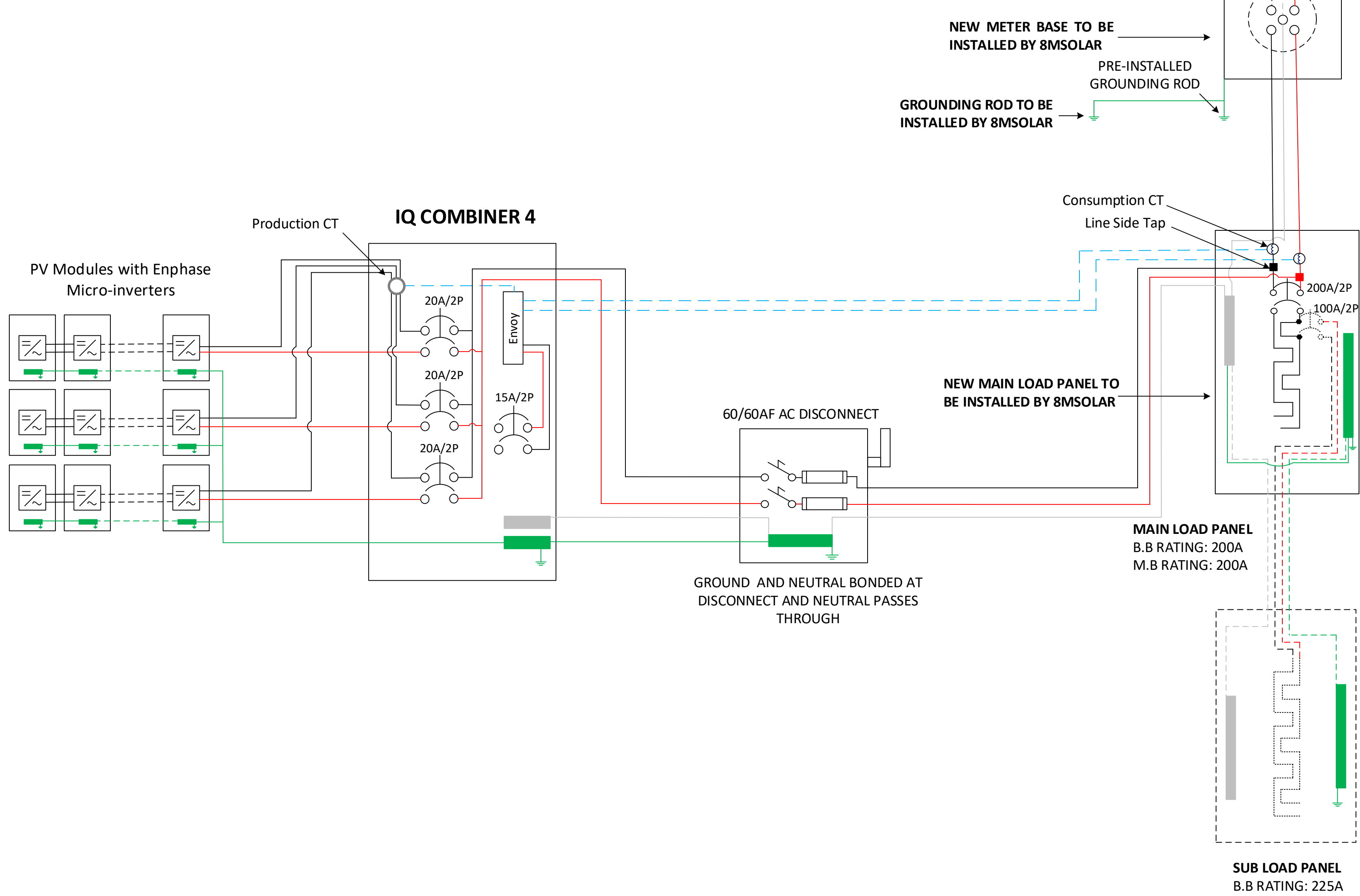


Line 1	—
Line 2	—
Neutral	—
Ground	—

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

Note: Neutral and Ground bar should be bonded in main load panel

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.



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

Customer Information:

Cory Kolek
29 Dekalb Court
Fuquay-Varina NC 27526

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Detailed Electrical Diagram

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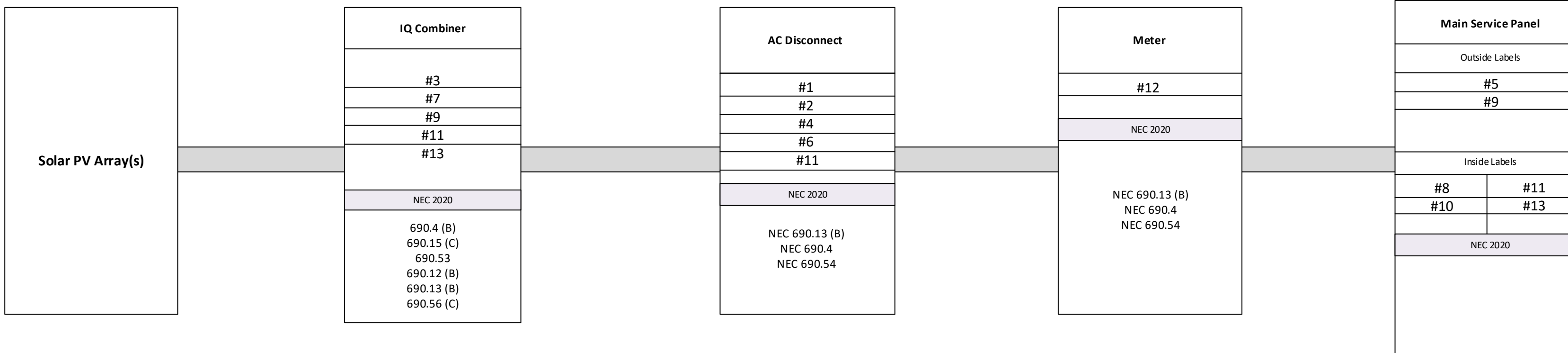
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PV5





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:

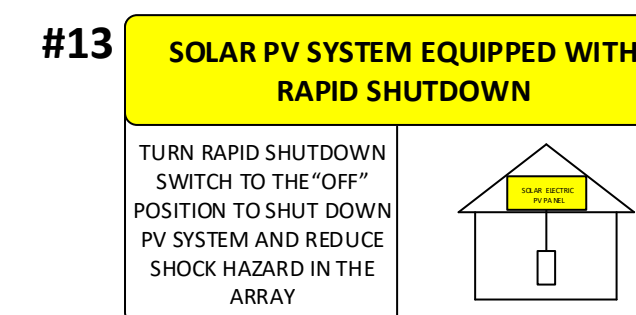
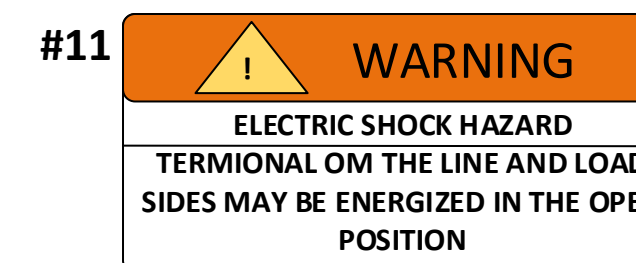
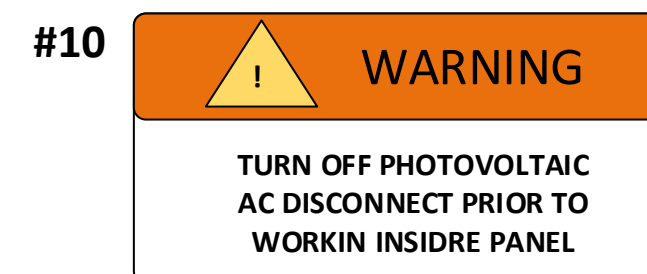
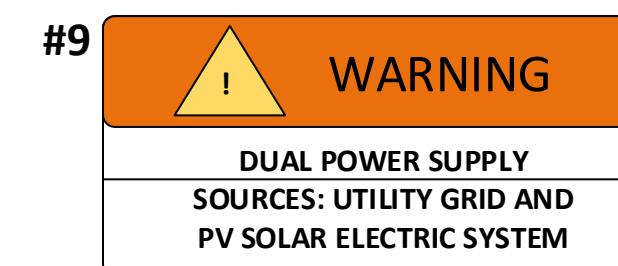
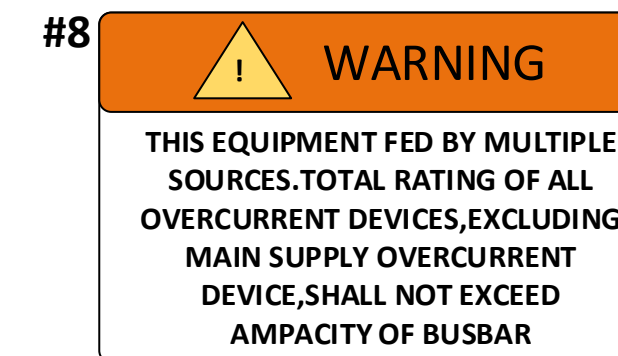
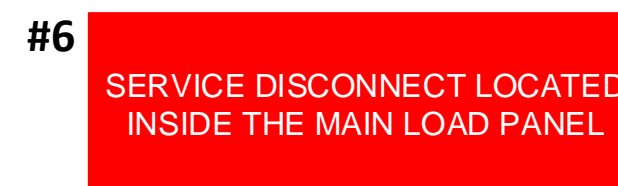
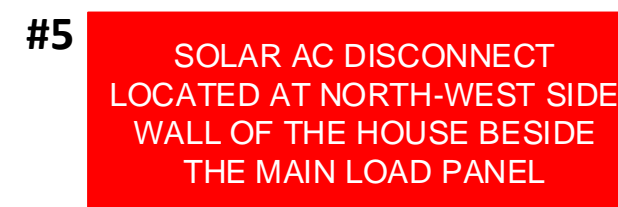
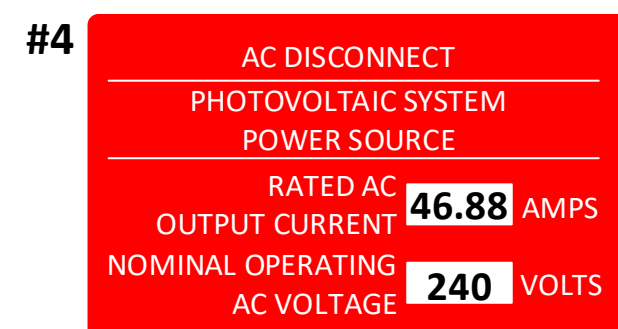
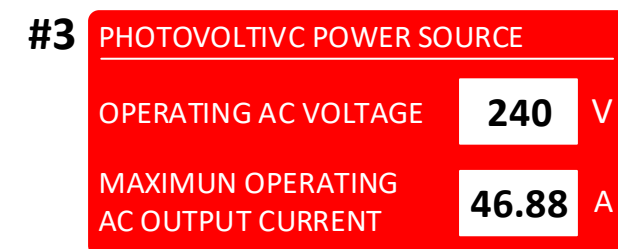
- (1) REFLECTIVE, WEATHER RESISTANT MATERIAL SUITABLE FOR THE ENVIRONMENT (USE UL-969) AS STANDARD FOR WEATHER RATING); DURABLE ADHESIVE MATERIALS MEET THIS REQUIREMENT.

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



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Cory Kolek

29 Dekalb Court
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PV Labels

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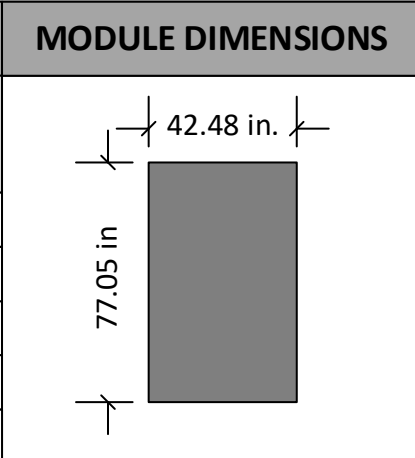
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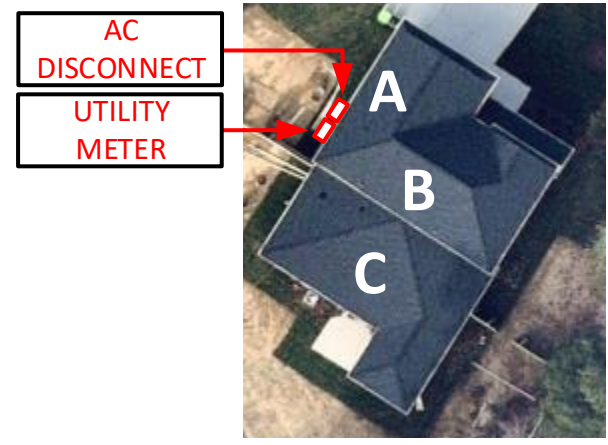
PV6



ROOF DESCRIPTION			
ROOFS	PITCH	AZIMUTH	NO. OF MODULES
A	34°	302°	08
B	34°	213°	12
C	19°	213°	11



Rails and Splices : PSR-B84 (BLACK)	Roof Attachment : Pegasus Comp Mount
Rafter Spacing : 24 in	There is one layer of shingles Roofing material is asphalt shingles
Attachment Span: 4ft	The roof is located in 135mph wind zone



5112 Departure Drive,
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Customer Information:

Cory Kolek
29 Dekalb Court
Fuquay-Varina NC 27526

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Bill of Material

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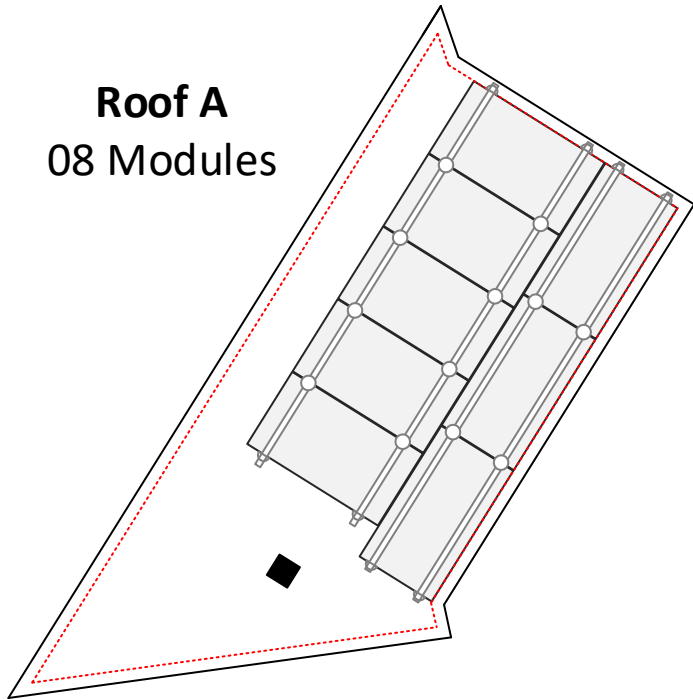
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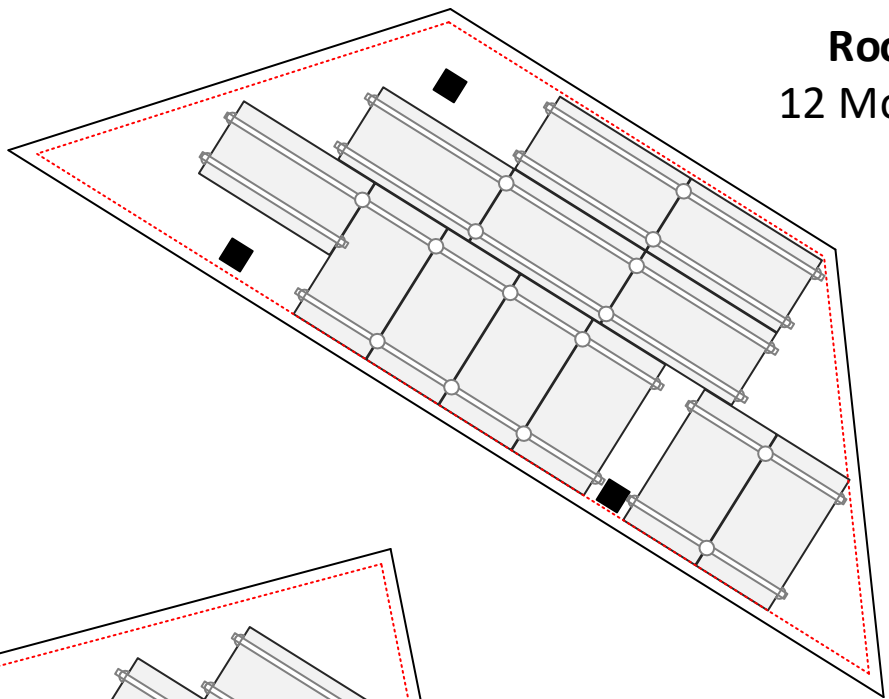
PV7



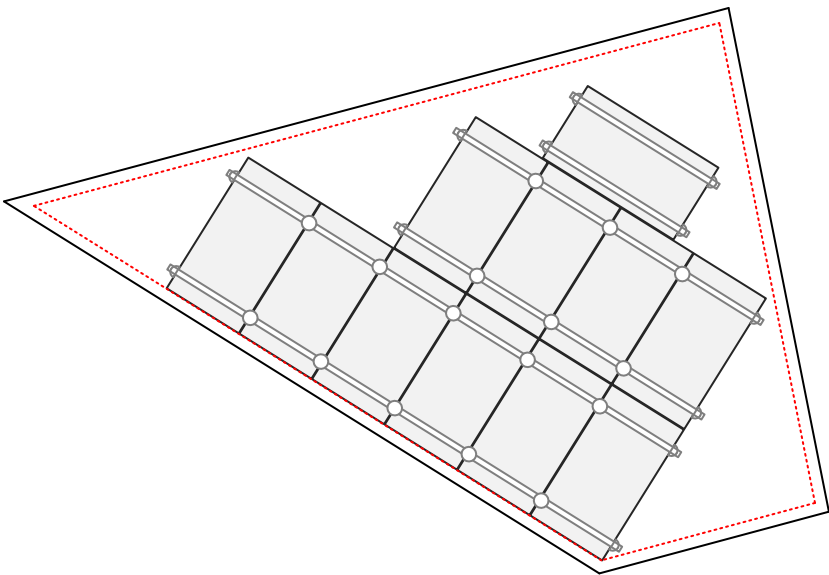
Roof A
08 Modules



Roof B
12 Modules



Roof C
11 Modules



6in setback from
sides of the roof

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	02
10	05-372	01
11	05-215	03
12	07-359	01
13	07-111	02

RAILS AND MOUNTING SYSTEM

- 50 x PSR-B84: Pegasus Rail, Black, 84" (7 Feet)
- 30 x PSR-SPL: Pegasus - Bonded, Structural Splice
- 42 x PSR-MCB: Pegasus - Multiclamp, Mid/End, 30 to 40 mm, Black
- 40 x PSR-HEC: Pegasus - Hidden End Clamp
- 31 x PSR-MLP: Pegasus - MLPE Mount
- 14 x PSR-LUG: Pegasus - Grounding Lug
- 47 x PSR-WMC: Pegasus - Wire Management Clip
- 06 x PSR-CBG: Pegasus - Cable Grip
- 40 x PSR-CAP: Pegasus - End Cap
- 78 x PSCR-UBBDT: Pegasus Comp Mount - Open Slot, Black L Foot, Black Flashing, Dovetail 3/8" T-Bolt
- 62 x Heyco Wire Clips

SOLAR MODULES

- 31 x SOLARIA POWERXT 430R-PL

INVERTER & SUPPORTING ITEMS

- 31 x Enphase IQ8PLUS-72-2-US micro inverter
- 01 x X-IQ-AM1-240-4 IQ Combiner 4

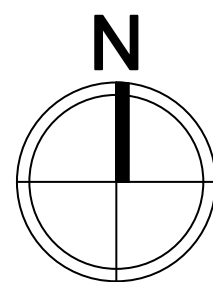
ENPHASE CABLES AND ACCESSORIES

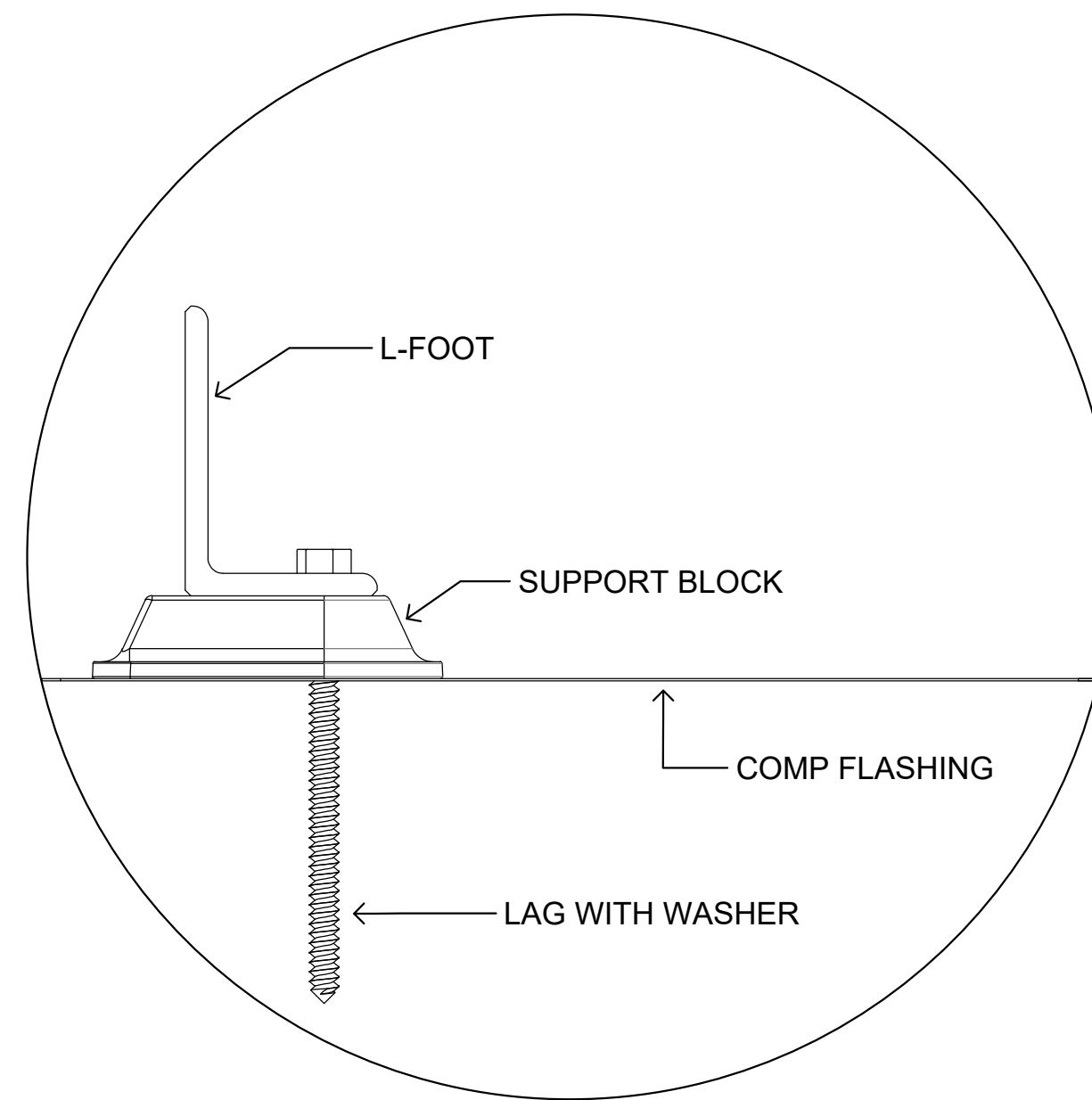
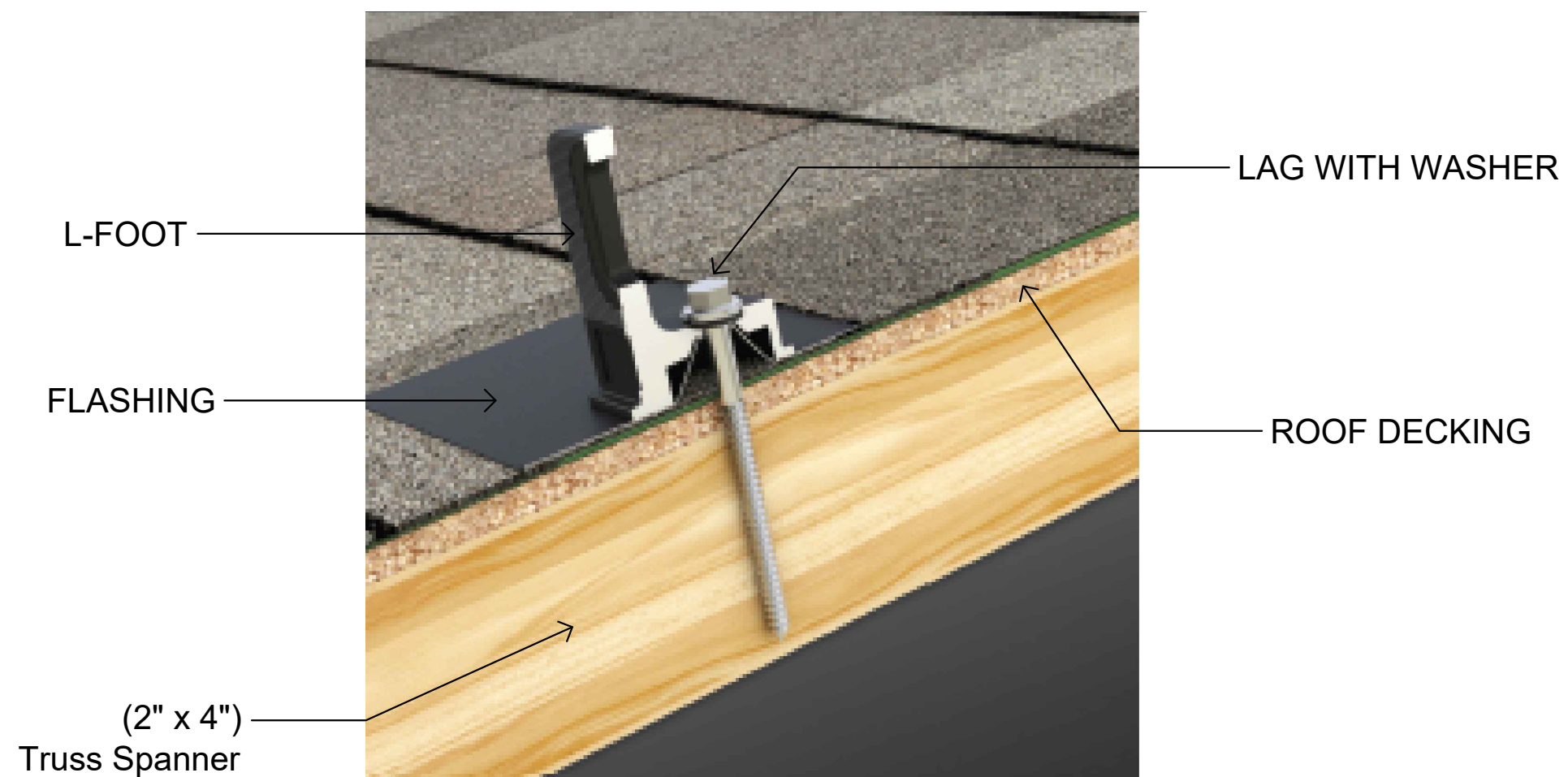
- 25 x Q-12-10-240: Q Cable
- 12 x Q-12-20-200: Q Cable
- 01 x Q-12-RAW-300:Q Cable, 12 AWG (40ft)
- 09 x Q-CONN-10M Male Field-wireable connector
- 09 x Q-CONN-10F Female Field-wireable connector
- 03 x Q-TERM-10: Terminator Cap
- 04 x Q-SEAL-10: Female Sealing Cap
- 01 x Q-CLIP-100: Q Cable rail mount cable management clip (Pack of 100)
- 01 x Q-DISC-10: Disconnect tool

ELECTRICAL ITEMS

- 03 x Eaton BR220B with hold down kit support (Circuit breaker, 2 pole, 20A)
- 01 x UAT417-XGF: 200A Meter Base
- 01 x QOM2200VH: 200A Main breaker, 2 pole
- 01 x QO112L200GRB: Square D 'QO' 200 Amp 12-Space 12-Circuit Outdoor Main Lug Load Center with Ground Bar
- 02 x IPCS 4002: Line/Load Side Hot Taps (#4/0 main - #2-10 tap) Medium types
- 01 x D222NRB: 250volt/60amp/2pole fusible disconnect (NEMA 3R)
- 02 x SQUARE D FRNR60: 250volt/60amp fuses
- 01 x EZSLR JB-1.2: SolaDeck Box
- 05 x FM-CM-001-B: Roof Flashing Conduit Supports

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





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

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Cory Kolek
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Revision:

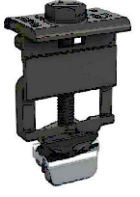



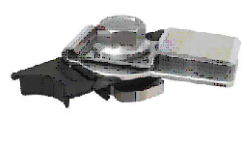
A

Sheet Size:

ANSI C
17" X 22"

Sheet Number:

PV8

					
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.

