



---

1011 N Causeway Blvd, Suite 19 ♦ Mandeville, Louisiana 70471 ♦ Phone: 985.624.5001 ♦ Fax: 985.624.5303

---

Tuesday, December 27, 2022

Property Owner: RICHARD BARRETO

Property Address: 89 CALDWELL ST, SPRING LAKE, NC 28390

**RE: Photovoltaic System Roof Installations**

I have reviewed the existing structure referenced above to determine the adequacy of the existing structure support the proposed installation of an array of solar panels on the roof.

Based on my review, the existing structure meets or exceeds applicable codes listed below to support the proposed solar panel installation. This assessment is based on recent on-site inspection by solar inspectors and photographs of the existing structure. The photovoltaic system is designed to withstand uplift and downward forces; our assessment is regarding the structure's support of the array. Stresses induced by the introduction of individual mount loads on the rafters or truss top chord are within acceptable limits as shown on the attached calculations. The structural considerations used in our review and assessment include the following:

**Evaluation Criteria:**

Applied Codes: ASCE 7-10 NCBC 2018 NCRC 2018 NEC 2017

Risk Category: II

Design Wind Speed (3-second gust): 118 mph

Wind Exposure Category: B

Ground Snow Load: 10 PSF

Seismic Design Category: D

**Existing Structure:**

Roof Material: Shingle

Roof Structure: 2x6 Truss Top Chord

Roof Slope: 4/12

PRINCIPAL ENGINEERING, INC.  
1011 N. CAUSEWAY BLVD. STE 19  
MANDEVILLE, LA 70471  
985.624.5001  
INFO@PI-AEC.COM  
NORTH CAROLINA FIRM NO. C4113

**PRINCIPAL Infrastructure®**

Architecture ♦ Engineering ♦ Construction

www.pi-aec.com ♦ info@pi-aec.com

---

This item has been digitally signed and sealed by Henry I. DiFranco, Jr., P.E. on December 27, 2022. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

**Effect of the Solar Array on Structure Loading:**

Gravity Load:

Per IBC Section 1607, the areas of the roof where solar panels are located are considered inaccessible, and therefore not subject to roof live loading. Live load in these areas is replaced by the dead load of the solar array, 3 psf. The total gravity load on the structure is therefore reduced and the structure may remain unaltered. Connections of the mounts to the underlying structure are to be installed in a staggered pattern, except at the array ends, to distribute the loading evenly to the roof structure. The stresses within the rafters or truss top chord due to the introduction of discrete mount loads are within acceptable limits, as shown on the attached calculations.

Wind Load:

The solar panel array will be flush mounted (no more than 6" above the surrounding roof surface, and parallel to the roof surface. Any additional wind loading on the structure due to the presence of the array is negligible. The array structure is designed by the manufacturer to withstand uplift and downward forces resulting from wind and snow loads. The attached calculations verify the capacity of the connection of the solar array to the roof to resist uplift due to wind loads, the governing load case.

Snow Load:

The reduced friction of the glass surface of the solar panels allows for the lower slope factor (Cs) per Section 7.4 of ASCE 7.10 resulting in a reduced design snow load for the structure. This analysis conservatively considered the snow load to be unchanged.

Seismic Load:

Analysis shows that additional seismic loads due to the array installation will be small. Even conservatively neglecting the wall materials, the solar panel installation represents an increase in the total weight of the roof and corresponding seismic load of less than 10%. This magnitude of additional forces meets the requirements of the exception in Section 11B.4 of ASCE 7-10. The existing lateral force resisting system of the structure is therefore allowed to remain unaltered.

PRINCIPAL ENGINEERING, INC.  
1011 N. CAUSEWAY BLVD. STE 19  
MANDEVILLE, LA 70471  
985.624.5001  
INFO@PI-AEC.COM  
NORTH CAROLINA FIRM NO. C4113

<p>This item has been digitally signed and sealed by Henry I. DiFranco, Jr., P.E. on December 27, 2022 Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.</p>
--

Conclusion:

To the best of my professional knowledge and belief, the subject construction and photovoltaic system installation will be in compliance with all state and local building codes and guidelines in effect at the time of our review.

Limitations:

Engineer's assessment of the existing structure is based on recent field reports and current photographs of the elements of the structure that were readily accessible at the time of inspection. The design of the solar panel racking (mounts, rails, connectors, etc.), connections between the racking and panels, and electrical construction related to the installation are the responsibility of others. The photovoltaic system installation must be by competent personnel in accordance with manufacturer recommendations and specifications and should meet or exceed industry standards for quality. The contractor is responsible for ensuring that the solar array is installed according to the approved plans and must notify the engineer of any undocumented damage or deterioration of the structure, or of discrepancies between the conditions depicted in the approved plans and those discovered on site so that the project may be reevaluated and altered as required. Engineer does not assume any responsibility for improper installation of the proposed photovoltaic system.

PRINCIPAL ENGINEERING, INC.  
1011 N. CAUSEWAY BLVD. STE 19  
MANDEVILLE, LA 70471  
985.624.5001  
INFO@PI-AEC.COM  
NORTH CAROLINA FIRM NO. C4113

This item has been digitally signed and sealed by Henry I. DiFranco, Jr., P.E. on December 27, 2022. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

**Uplift and Wind Downforce Calculation Summary (ASCE 7-10)  
Mount, Rack, & Panel Proportioning**

Property Owner:	RICHARD BARRETO	Individual Panel Dimensions		
Project Address:	89 CALDWELL ST	Length (in)	Width (in)	Area (sf)
City, State:	SPRING LAKE, NC 28390	77	39	20.85

Wind Load Calculation Summary (ASCE 7-10 C&C Provisions)				
Building Characteristics, Design Input, and Adjustment Factors				
Roof Dimensions:	Length (b):	55 ft.	Least Dimension:	33 ft.
	Width (w):	33 ft.		
Roof Height (h):		25 ft.	Must be less than 60	✓
Pitch:	4 on 12 =	18.4°	Must be less than 45°	✓
Roof Configuration		Gable		
Roof Structure:		2x6 Truss Top Chord		
Roof material:		Plywood		
Ultimate Wind Speed (mph):		118	From ASCE 7-10, Fig. 26.5	
Exposure Category:		B	Para 26.7.3	
Directionality Factor, K <sub>d</sub>		0.85	Table 26.6-1	
Risk Category:		2	Table 1.5-2	
Exposure Coefficient, K <sub>z</sub>		0.7	Table 30.3-1	
Topographic Adj., K <sub>zt</sub>		1	Fig. 26.8-1	
Effective Wind Area (sf):		21	(Area per individual panel)	
Velocity Pressure (psf), q <sub>h</sub> :		21.21	psf, Eq. 30.3-1	
Internal Pressure Coeff, GC <sub>pi</sub>		0.18	Table 26.11-1	

Roof Zone Strip (a), in ft, Fig. 30.5-1, Note 5	
1 - Least Roof Horizontal Dimension (L or W) x 0.10	3.3
2 - Roof Height x 0.4	10
3 - Least Roof Horizontal Dimension (L or W) x 0.04	1.32
4 - Lesser of (1) and (2)	3.3
5 - Greater of (3) and (4)	3.3
6 - Greater of (5) and 3 feet	<b>a= 3.3 ft.</b>

PRINCIPAL ENGINEERING, INC.  
1011 N. CAUSEWAY BLVD. STE 19  
MANDEVILLE, LA 70471  
985.624.5001  
INFO@PI-AEC.COM  
NORTH CAROLINA FIRM NO. C4113

This item has been digitally signed and sealed by Henry I. DiFranco, Jr., P.E. on December 27, 2022. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.



Net Design Wind Pressures					
(ASCE 7, Eq. 30.4.1; Load Factor for ASD = 0.6, per ASCE 7, 2.4.1)					
	Uplift (-psf)		Down (psf)		Description of Zone
	GC <sub>p</sub>	Pressure	GC <sub>p</sub>	Pressure	
Zone 1	-0.88	<b>16.0</b>	0.40	<b>16.0</b>	Interior Roof Area, >(a) ft from edge
Zone 2	-1.53	<b>-21.7</b>	0.40	<b>16.0</b>	Strip of (a) ft wide at roof edge
Zone 3	-2.40	<b>-32.8</b>	0.39	<b>16.0</b>	Corner intersection of Zone 2 strips

Snow Load		
Ground Snow Load, p <sub>g</sub>	10.0	From ASCE 7 or AHJ
Terrain Category:	B	Para 6.5.6.3
Exposure	Fully	
Exposure Factor C <sub>e</sub>	0.8	Table 7-2
Thermal Factor, C <sub>t</sub>	1.0	Table 7-3
Importance Factor, I <sub>s</sub>	1.0	Table 1.5.2
Roof Configuration	Gable	
Roof Slope	18.4°	
Distance from Eave to Ridge	16.5	
p <sub>m</sub> , Minimum required Snow Load	N/A	Para. 7.3.4
p <sub>f</sub> , Calculated Snow Load	5.60	Eq. 7.3-1
p <sub>f</sub> , Design Snow Load	5.60 psf	

PRINCIPAL ENGINEERING, INC.  
 1011 N. CAUSEWAY BLVD. STE 19  
 MANDEVILLE, LA 70471  
 985.624.5001  
 INFO@PI-AEC.COM  
 NORTH CAROLINA FIRM NO. C4113

This item has been digitally  
 signed and sealed by  
 Henry I. DiFranco, Jr., P.E.  
 on **December 27, 2022**  
 Printed copies of this  
 document are not considered  
 signed and sealed and the  
 signature must be verified  
 on any electronic copies.

Mount Selection and Spacing		
Manufacturer:	Unirac	Perpendicular Panel Orientation
Mount:	Flashloc Comp Kit	Allowable Arrangement by Uplift Pressure
Substrate:	Wood Rafters/Truss Top Chord	< 37 psf : 2 rails, mounts @ 4'-0" o.c.
Connector:	5/16" x 4" Lag Screw	37 to 75 psf : 2 rails, mounts @ 2'-0" o.c.
		75 to 112 psf : 3 rails, mounts @ 2'-0" o.c.
Allowable Uplift:	480 max.	112 to 150 psf : 4 rails, mounts @ 2'-0" o.c.
<b>Required Mount Layout</b>		> 150 psf : Mount capacity exceeded
<b>Zone 1</b>	2 rails, mounts @ 4'-0" o.c.	
<b>Zone 2</b>	2 rails, mounts @ 4'-0" o.c.	
<b>Zone 3</b>	2 rails, mounts @ 4'-0" o.c.	
<i>(Allowable loads are based on individual mount failure before rail failure)</i>		

PRINCIPAL ENGINEERING, INC.  
 1011 N. CAUSEWAY BLVD. STE 19  
 MANDEVILLE, LA 70471  
 985.624.5001  
 INFO@PI-AEC.COM  
 NORTH CAROLINA FIRM NO. C4113

This item has been digitally  
 signed and sealed by  
 Henry I. DiFranco, Jr., P.E.  
 on **December 27, 2022**  
 Printed copies of this  
 document are not considered  
 signed and sealed and the  
 signature must be verified  
 on any electronic copies.

# PHOTOVOLTAIC ROOF MOUNT SYSTEM

18 MODULES-ROOF MOUNTED - 6.570 KW DC STC, 6.089 KW DC PTC, 5.220 KW AC

89 CALDWELL ST, SPRING LAKE, NC 28390



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

## PROJECT DATA

PROJECT ADDRESS: 89 CALDWELL ST, SPRING LAKE, NC 28390

OWNER: RICHARD BARRETO

CONTRACTOR: ADT SOLAR LLC  
PHONE: (985) 238-0864

DESIGNER: ESR

SCOPE: 6.570 KW DC ROOF MOUNT SOLAR PV SYSTEM WITH 18 HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W PV MODULES WITH 18 ENPHASE IQ8PLUS-72-2-US MICROINVERTERS

AUTHORITIES HAVING JURISDICTION:  
BUILDING: HARNETT, COUNTY OF (NC)  
ZONING: HARNETT, COUNTY OF (NC)  
UTILITY: SOUTH RIVER ELEC MEMBER CORP (NC)

## SHEET INDEX

PV-1	COVER SHEET
PV-2	SITE PLAN
PV-3	ROOF PLAN & MODULES
PV-4	ELECTRICAL PLAN
PV-5	STRUCTURAL DETAIL
PV-6	ELECTRICAL LINE DIAGRAM
PV-7	WIRING CALCULATIONS
PV-8	LABELS
PV-9	PLACARD
PV-10	JHA FORM
PV-11	MICRO INVERTER CHART
PV-12+	EQUIPMENT SPECIFICATIONS

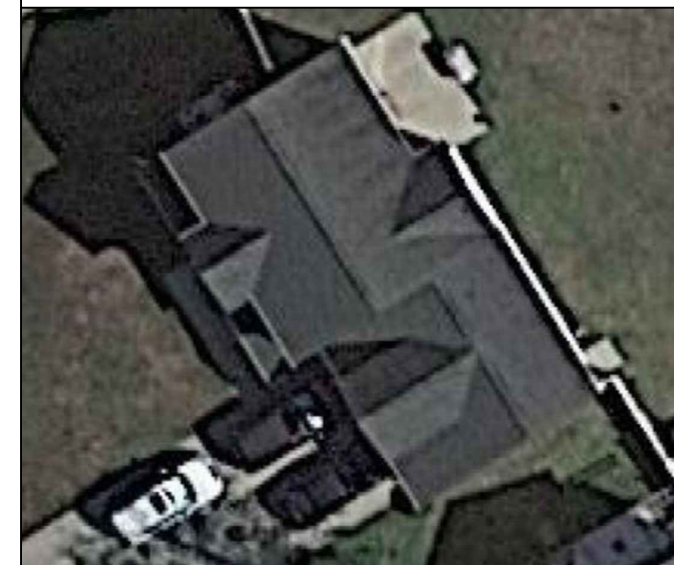
## GENERAL NOTES

- ALL COMPONENTS ARE UL LISTED AND CEC CERTIFIED, WHERE WARRANTED.
- THE SOLAR PV SYSTEM WILL BE INSTALLED IN ACCORDANCE WITH ARTICLE 690 OF THE NEC 2017.
- THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION.
- ALL CONDUCTORS OF A CIRCUIT, INCLUDING THE EGC, MUST BE INSTALLED IN THE SAME RACEWAY, OR CABLE, OR OTHERWISE RUN WITH THE PV ARRAY CIRCUIT CONDUCTORS WHEN THEY LEAVE THE VICINITY OF THE PV ARRAY.
- WHERE METALLIC CONDUIT CONTAINING DC CONDUCTORS IS USED INSIDE THE BUILDING, IT SHALL BE IDENTIFIED AS "CAUTION: SOLAR CIRCUIT" EVERY 10FT.
- HEIGHT OF THE AC DISCONNECT SHALL NOT EXCEED 6'-7" PER NEC CODE 240.24.
- A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH CEC 690.47 AND 250.50 THROUGH 60 AND 250-166 SHALL BE PROVIDED. PER NEC GROUNDING ELECTRODE SYSTEM OF EXISTING BUILDING MAY BE USED AND BONDED TO THE SERVICE ENTRANCE. IF EXISTING SYSTEM IS INACCESSIBLE OR INADEQUATE A SUPPLEMENTAL GROUNDING ELECTRODE WILL BE USED AT THE INVERTER LOCATION CONSISTING OF A UL LISTED 8 FT. GROUND ROD WITH ACORN CLAMP. GROUNDING ELECTRODE CONDUCTORS SHALL BE NO LESS THAN #8 AWG AND NO LARGER THAN #6 AWG COPPER AND BONDED TO THE EXISTING GROUNDING ELECTRODE TO PROVIDE FOR A COMPLETE SYSTEM.
- PHOTOVOLTAIC MODULES ARE TO BE CONSIDERED NON-COMBUSTIBLE.
- PHOTOVOLTAIC INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
- ALL WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNED AND LISTED FOR SUCH USE. WIRING MUST BE PERMANENTLY AND COMPLETELY HELD OFF THE ROOF SURFACE.
- ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH THE LOCAL BUILDING CODE. IF EXPOSED TO SUNLIGHT, IT SHALL BE UV RESISTANT. ALL PLAQUES AND SINAGE WILL BE INSTALLED AS REQUIRED BY THE NEC AND AHJ.
- INVERTER(S) USED IN UNGROUNDED SYSTEM SHALL BE UL 1741 LISTED.
- THE INSTALLATION OF EQUIPMENT AND ALL ASSOCIATED WIRING AND INTERCONNECTION SHALL BE PERFORMED ONLY BY QUALIFIED PERSONS [NEC 690.4(C)]
- ALL OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED (OR BETTER), INCLUDING ALL ROOF MOUNTED TRANSITION BOXES AND SWITCHES.
- ALL EQUIPMENT SHALL BE PROPERLY GROUNDED AND BONDED IN ACCORDANCE WITH NEC ARTICLE 250.
- SYSTEM GROUNDING SHALL BE IN ACCORDANCE WITH NEC 690.41.
- PV SYSTEM CIRCUITS INSTALLED ON OR IN BUILDINGS SHALL INCLUDE A RAPID SHUTDOWN FUNCTION IN ACCORDANCE WITH NEC 690.12
- DISCONNECTING MEANS SHALL BE LOCATED IN A VISIBLE, READILY ACCESSIBLE LOCATION WITHIN THE PV SYSTEM EQUIPMENT OR A MAXIMUM OF 10 FEET AWAY FROM THE SYSTEM [NEC 690.13(A)]
- ALL WIRING METHODS SHALL BE IN ACCORDANCE WITH NEC 690.31
- WORK CLEARANCES AROUND ELECTRICAL EQUIPMENT WILL BE MAINTAINED PER NEC 110.26(A)(1), 110.26(A)(2) AND 110.26(A)(3).
- ROOFTOP MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED & IDENTIFIED IN ACCORDANCE WITH UL1703
- ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER NEC.

## VICINITY MAP



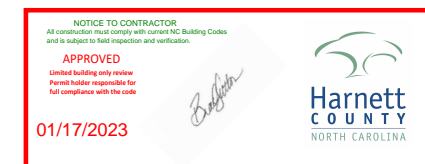
## HOUSE PHOTO



## CODE REFERENCES

PROJECT TO COMPLY WITH THE FOLLOWING:

- 2018 NORTH CAROLINA BUILDING CODE
- 2018 NORTH CAROLINA RESIDENTIAL CODE
- 2018 NORTH CAROLINA FIRE CODE
- 2018 NORTH CAROLINA ENERGY CONSERVATION CODE
- 2017 NATIONAL ELECTRICAL CODE



REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

This item has been digitally signed and sealed by Henry I. DiFranco, Jr., P.E. on December 27, 2022. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

PRINCIPAL ENGINEERING, INC.  
1011 N. CAUSEWAY BLVD. STE 19  
MANDEVILLE, LA 70471  
985.624.5001  
INFO@PI-AEC.COM  
NORTH CAROLINA FIRM NO. C4113

## PROJECT NAME & ADDRESS

RICHARD BARRETO  
RESIDENCE  
89 CALDWELL ST,  
SPRING LAKE, NC 28390

SHEET NAME  
COVER SHEET

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-1

# PROJECT DESCRIPTION:

18 X HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W PV MODULES  
 ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES  
 DC SYSTEM SIZE: 18 x 365 = 6.570KW DC  
 AC SYSTEM SIZE: 18 x 290 = 5.220KW AC

## EQUIPMENT SUMMARY

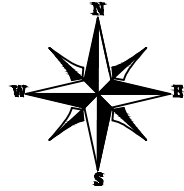
18 HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES  
 18 ENPHASE IQ8PLUS-72-2-US MICROINVERTERS

ROOF ARRAY AREA #1:- 115.74 SQ FT.

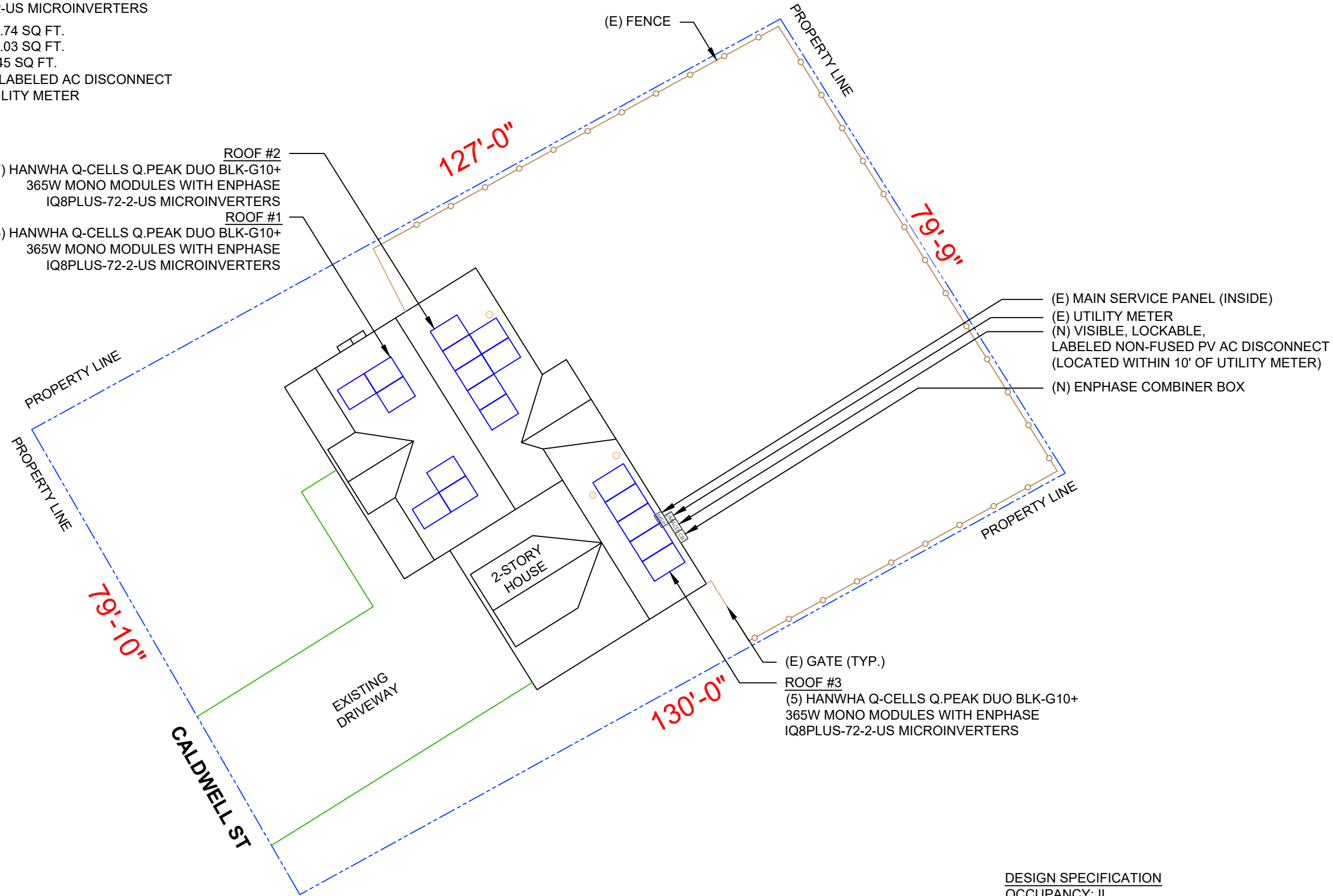
ROOF ARRAY AREA #2:- 135.03 SQ FT.

ROOF ARRAY AREA #3:- 96.45 SQ FT.

NOTE: VISIBLE, LOCKABLE, LABELED AC DISCONNECT  
 LOCATED WITHIN 10' OF UTILITY METER



ROOF #2  
 (7) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+  
 365W MONO MODULES WITH ENPHASE  
 IQ8PLUS-72-2-US MICROINVERTERS  
 ROOF #1  
 (6) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+  
 365W MONO MODULES WITH ENPHASE  
 IQ8PLUS-72-2-US MICROINVERTERS



ROOF #3  
 (5) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+  
 365W MONO MODULES WITH ENPHASE  
 IQ8PLUS-72-2-US MICROINVERTERS

(E) MAIN SERVICE PANEL (INSIDE)  
 (E) UTILITY METER  
 (N) VISIBLE, LOCKABLE,  
 LABELED NON-FUSED PV AC DISCONNECT  
 (LOCATED WITHIN 10' OF UTILITY METER)  
 (N) ENPHASE COMBINER BOX



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

This item has been digitally signed and sealed by Henry I. DiFranco, Jr., P.E. on December 27, 2022. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

PRINCIPAL ENGINEERING, INC.  
 1011 N. CAUSEWAY BLVD. STE 19  
 MANDEVILLE, LA 70471  
 985.624.5001  
 INFO@PI-AEC.COM  
 NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS  
**RICHARD BARRETO  
 RESIDENCE**  
 89 CALDWELL ST,  
 SPRING LAKE, NC 28390

SHEET NAME  
**SITE PLAN**

SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-2**

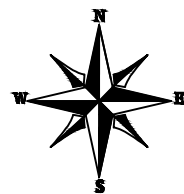
**1** | **SITE PLAN**  
 PV-2 | SCALE: 1/16" = 1'-0"

DESIGN SPECIFICATION  
 OCCUPANCY: II  
 CONSTRUCTION: SINGLE-FAMILY  
 ZONING: RESIDENTIAL  
 GROUND SNOW LOAD: REFER STRUCTURAL LETTER  
 WIND EXPOSURE: REFER STRUCTURAL LETTER  
 WIND SPEED: REFER STRUCTURAL LETTER



# MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 18 MODULES  
 MODULE TYPE = HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES  
 MODULE WEIGHT = 43.8 LBS / 19.9 KG.  
 MODULE DIMENSIONS = 67.6" x 41.1" = 19.29 SF.



ROOF #1  
 (6) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES WITH ENPHASE IQ8PLUS-72-2-US MICROINVERTERS

ROOF #2  
 PITCH - 34°  
 AZIM. - 58°

ROOF #2  
 (7) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES WITH ENPHASE IQ8PLUS-72-2-US MICROINVERTERS

(46) UNIRAC FLASHLOC ATTACHMENTS  
 (N) UNIRAC SOLARMOUNT RAIL

(E) MAIN SERVICE PANEL (INSIDE)

ROOF #3  
 (5) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES WITH ENPHASE IQ8PLUS-72-2-US MICROINVERTERS

HANWHA Q-CELLS  
 Q.PEAK DUO BLK-G10+  
 365W MODULES

ROOF DESCRIPTION				
ROOF TYPE			ASPHALT SHINGLE	
ROOF	ROOF PITCH	AZIMUTH	TRUSS SIZE	TRUSS SPACING
#1	34°	238°	2X6	24"
#2	34°	58°	2X6	24"
#3	18°	58°	2X6	24"

ARRAY AREA & ROOF AREA CALC'S			
TOTAL # OF MODULES	TOTAL ARRAY AREA (Sq. Ft.)	TOTAL ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
18	347.22	1915.04	18



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

This item has been digitally signed and sealed by Henry I. DiFranco, Jr., P.E. on December 27, 2022. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

PRINCIPAL ENGINEERING, INC.  
 1011 N. CAUSEWAY BLVD. STE 19  
 MANDEVILLE, LA 70471  
 985.624.5001  
 INFO@PI-AEC.COM  
 NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS  
**RICHARD BARRETO RESIDENCE**  
 89 CALDWELL ST,  
 SPRING LAKE, NC 28390

SHEET NAME  
**ROOF PLAN & MODULES**

SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-3**

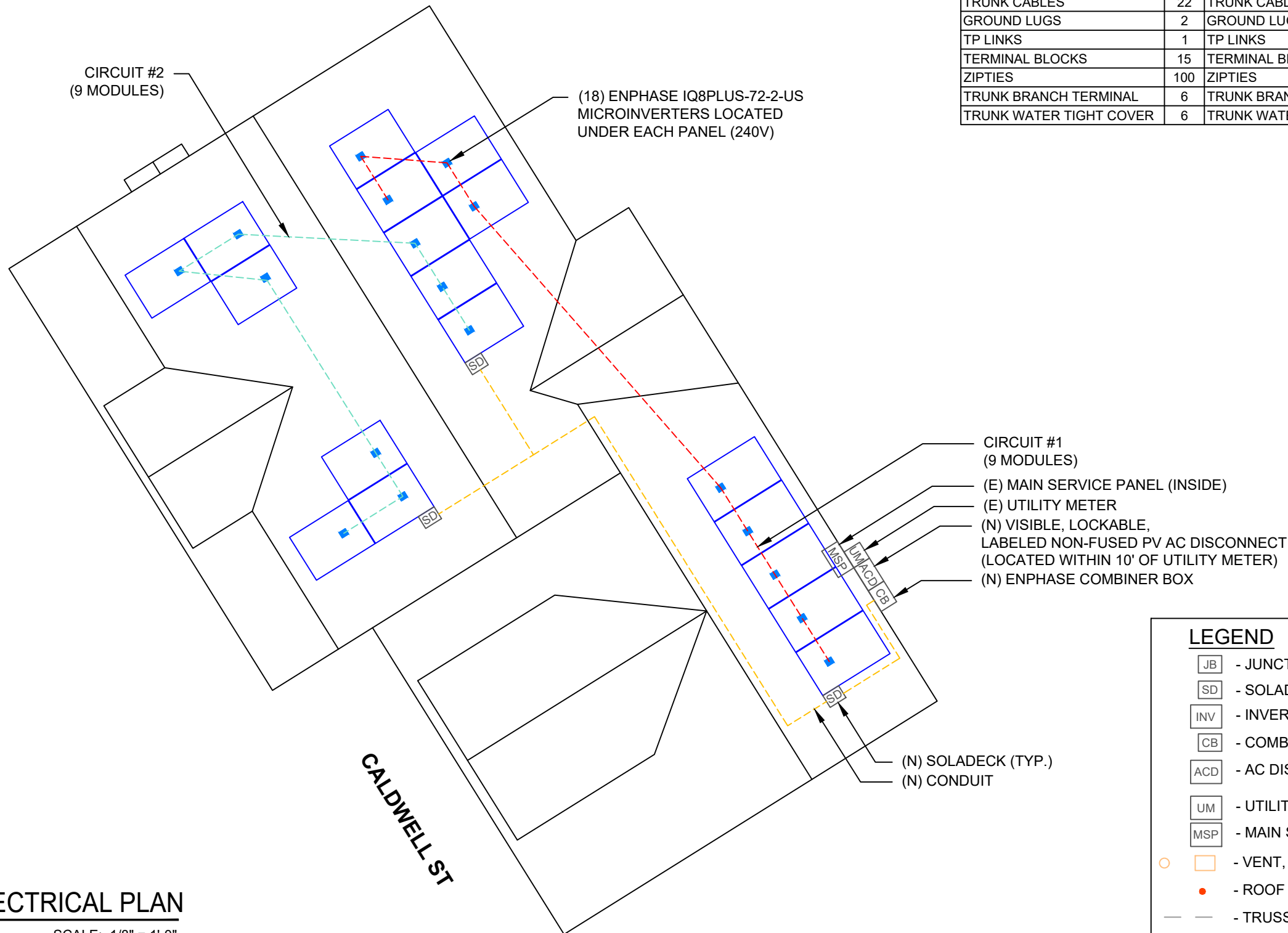
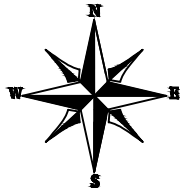
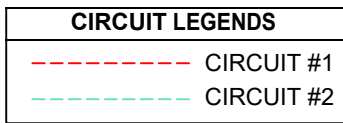
LEGEND	
[JB]	- JUNCTION BOX
[SD]	- SOLADECK
[INV]	- INVERTER
[CB]	- COMBINER BOX
[ACD]	- AC DISCONNECT
[UM]	- UTILITY METER
[MSP]	- MAIN SERVICE PANEL
○	- VENT, ATTIC FAN (ROOF OBSTRUCTION)
●	- ROOF ATTACHMENT
---	- TRUSS
---	- CONDUIT

# 1 ROOF PLAN & MODULES

PV-3

SCALE: 1/8" = 1'-0"

DC SYSTEM SIZE: 18 x 365 = 6.570KW DC  
 AC SYSTEM SIZE: 18 x 290 = 5.220KW AC  
 (18) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES  
 WITH (18) ENPHASE IQ8PLUS-72-2-US MICROINVERTERS  
 LOCATED UNDER EACH PANEL (240V)



BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULES	18	HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MODULES
MICRO INVERTERS	18	ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
SOLADECKS	3	SOLADECKS
RAIL	9	UNIRAC SM STANDARD RAIL, 168" SILVER
SPLICE	4	SPLICE KIT
MID MODULE CLAMPS	22	MID MODULE CLAMPS
END CLAMPS	28	END CLAMPS / STOPPER SLEEVE
ATTACHMENTS	46	UNIRAC FLASHLOC ATTACHMENT
INVERTER MOUNT CLIP	18	INVERTER MOUNT CLIP
INVERTER T-BOLTS	18	INVERTER T-BOLTS
TRUNK CABLES	22	TRUNK CABLES
GROUND LUGS	2	GROUND LUGS
TP LINKS	1	TP LINKS
TERMINAL BLOCKS	15	TERMINAL BLOCKS
ZIPTIES	100	ZIPTIES
TRUNK BRANCH TERMINAL	6	TRUNK BRANCH TERMINAL
TRUNK WATER TIGHT COVER	6	TRUNK WATER TIGHT COVER



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

This item has been digitally signed and sealed by Nestor J. Houghton, P.E. on December 27, 2022. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

PRINCIPAL ENGINEERING, INC.  
 1011 N. CAUSEWAY BLVD. STE 19  
 MANDEVILLE, LA 70471  
 985.624.5001  
 INFO@PI-AEC.COM  
 NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS  
**RICHARD BARRETO RESIDENCE**  
 89 CALDWELL ST,  
 SPRING LAKE, NC 28390

SHEET NAME  
**ELECTRICAL PLAN**

SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-4**

**LEGEND**

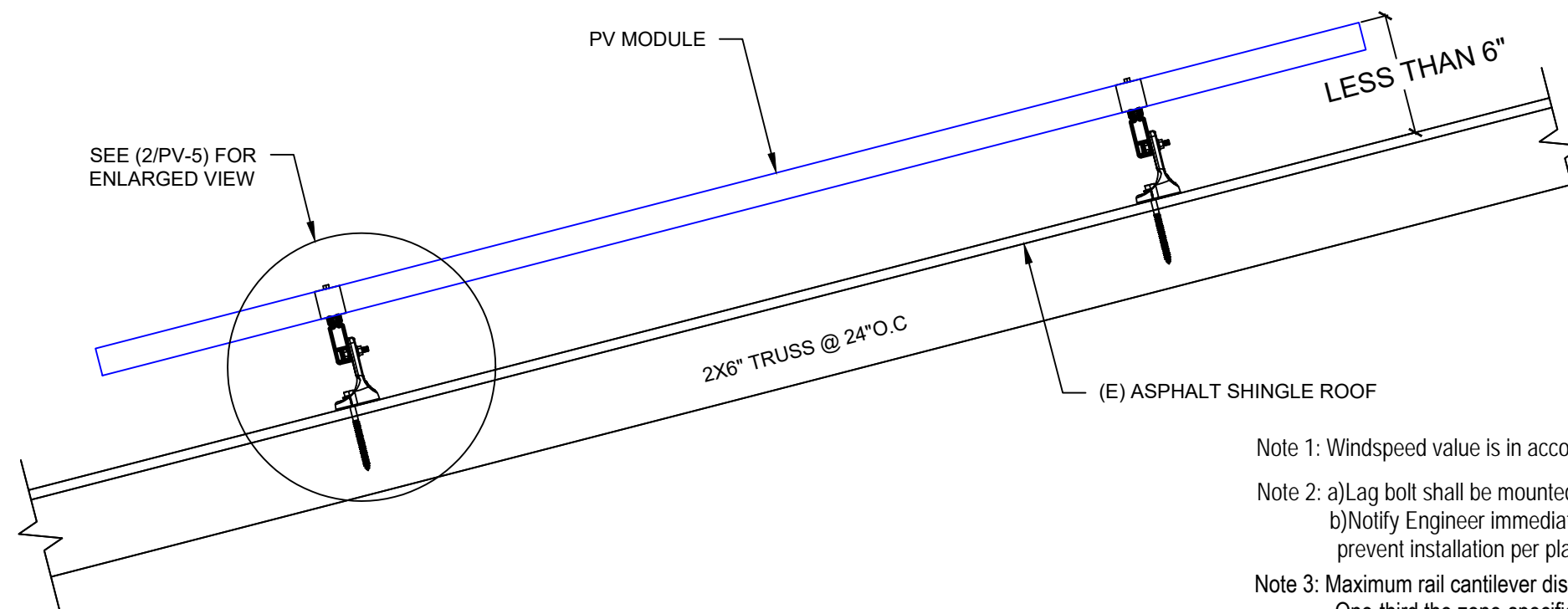
- [JB] - JUNCTION BOX
- [SD] - SOLADECK
- [INV] - INVERTER
- [CB] - COMBINER BOX
- [ACD] - AC DISCONNECT
- [UM] - UTILITY METER
- [MSP] - MAIN SERVICE PANEL
- - VENT, ATTIC FAN (ROOF OBSTRUCTION)
- - ROOF ATTACHMENT
- - TRUSS
- - CONDUIT



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	



Note 1: Windspeed value is in accordance with ASCE 7-10, Risk Cat II

Note 2: a) Lag bolt shall be mounted into rafters  
 b) Notify Engineer immediately if conditions differ or prevent installation per plan.

Note 3: Maximum rail cantilever distance beyond outermost mount is One-third the zone-specific mount spacing.

Note 4: Installer shall adjust mount spacing by zone to match prescribed values on engineer's calculation letter

**1** ATTACHMENT DETAIL

PV-5

SCALE: N.T.S.

This item has been digitally signed and sealed by Henry I. DiFranco, Jr., P.E. on December 27, 2022. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

PRINCIPAL ENGINEERING, INC.  
 1011 N. CAUSEWAY BLVD. STE 19  
 MANDEVILLE, LA 70471  
 985.624.5001  
 INFO@PI-AEC.COM  
 NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS

**RICHARD BARRETO  
 RESIDENCE**  
 89 CALDWELL ST,  
 SPRING LAKE, NC 28390

SHEET NAME

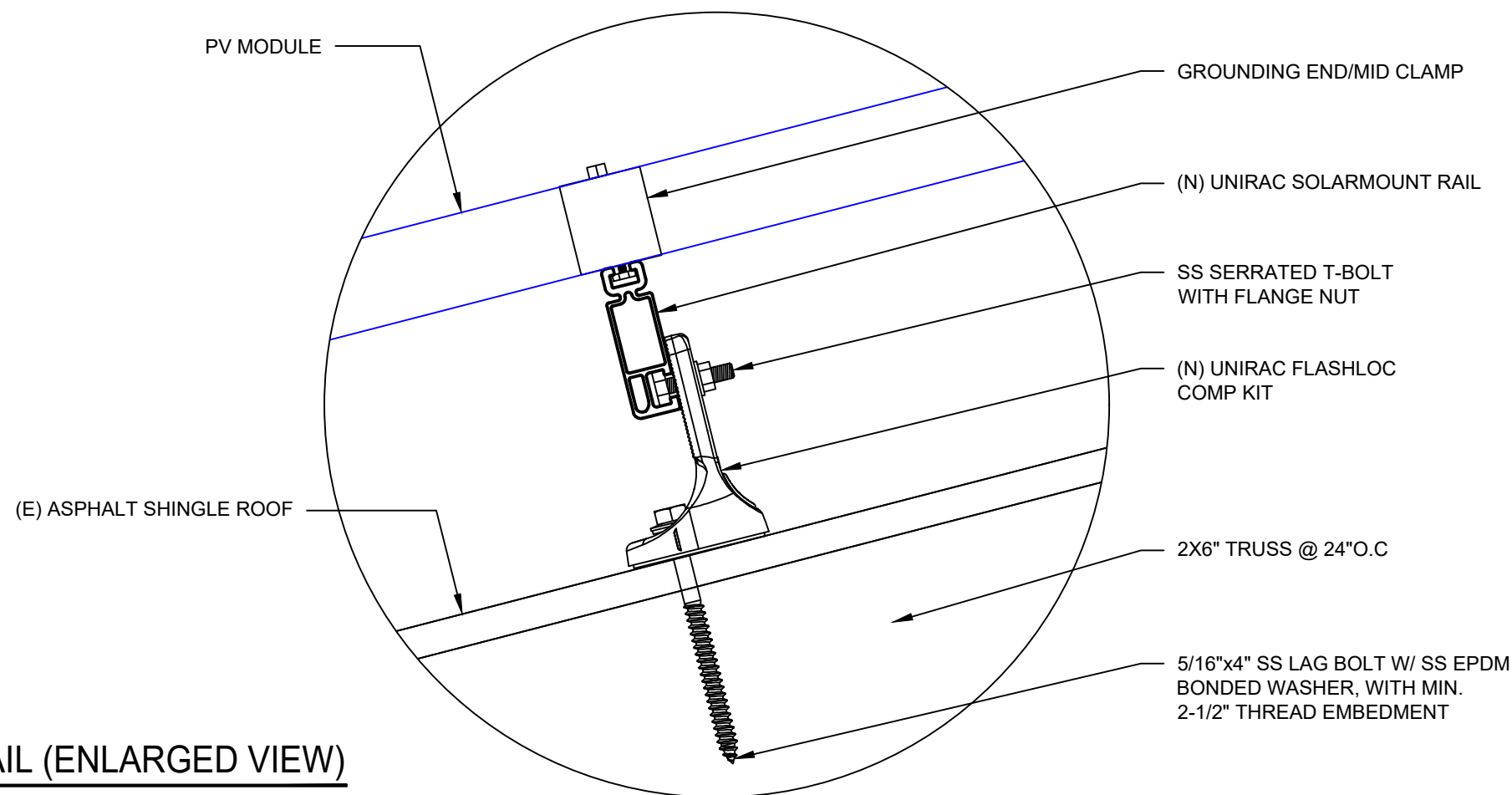
STRUCTURAL DETAIL

SHEET SIZE

ANSI B  
 11" X 17"

SHEET NUMBER

PV-5



**2** ATTACHMENT DETAIL (ENLARGED VIEW)

PV-5

SCALE: N.T.S.

DC SYSTEM SIZE: 18 x 365 = 6.570KW DC  
 AC SYSTEM SIZE: 18 x 290 = 5.220KW AC

(18) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES  
 WITH (18) ENPHASE IQ8PLUS-72-2-US MICROINVERTERS  
 LOCATED UNDER EACH PANEL (240V)  
 (2) BRANCH CIRCUITS OF 09 MODULES CONNECTED IN PARALLEL

**BACKFEED BREAKER CALCULATION (120% RULE):**

(MAIN BUSS X 1.2 - MAIN BREAKER) >= (INVERTER CURRENT\*1.25)  
 (200A X 1.2 - 200A) >= (27.225A)  
 (40A) >= (27.225A) HENCE OK

**OCPD CALCULATIONS:**

NEC 690.9(B)  
 (18 IQ8 PLUS) \* 1.21A \* 1.25  
 =27.225A

**INTERCONNECTION NOTES:**

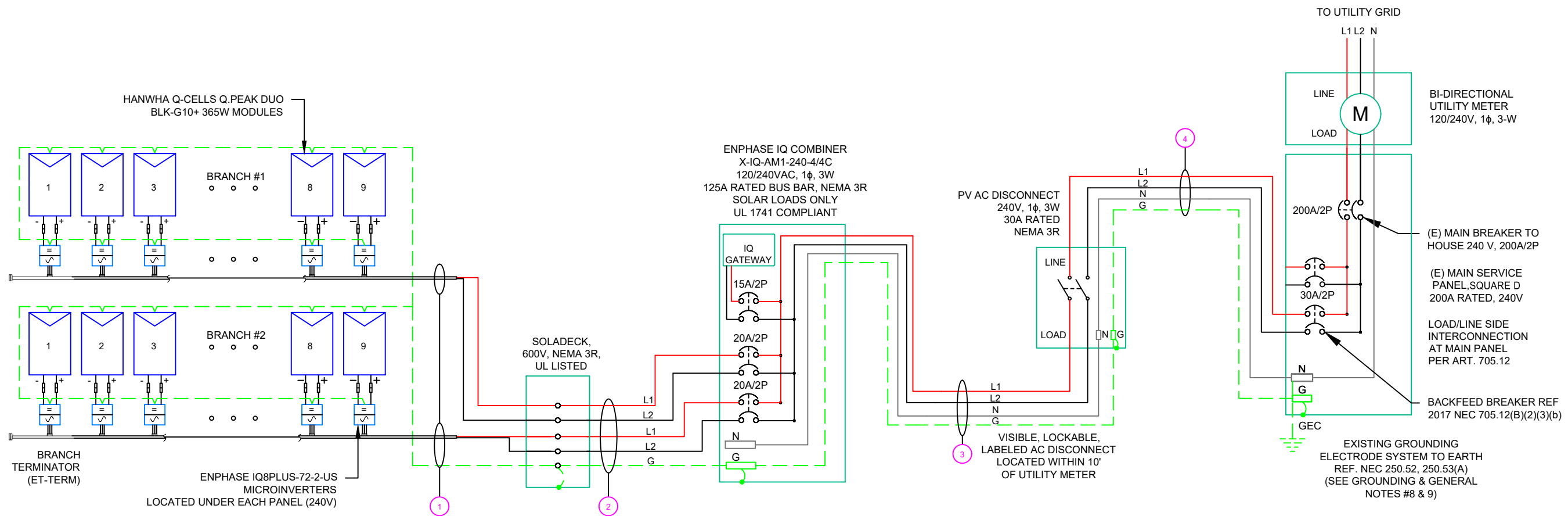
1. INTERCONNECTION SIZING, LIMITATIONS AND COMPLIANCE DETERMINED IN ACCORDANCE WITH [NEC 705.12], AND [NEC 690.59].
2. GROUND FAULT PROTECTION IN ACCORDANCE WITH [NEC 215.9], [NEC 230.95].
3. ALL EQUIPMENT TO BE RATED FOR BACKFEEDING.
4. PV BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUSBAR RELATIVE TO THE MAIN BREAKER.

**DISCONNECT NOTES:**

1. DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING LIVE ARE CONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS)
2. AC DISCONNECT MUST BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH
3. DISCONNECT MEANS AND THEIR LOCATION SHALL BE IN ACCORDANCE WITH [NEC 225.31] AND [NEC 225.32].

**GROUNDING & GENERAL NOTES:**

1. PV GROUNDING ELECTRODE SYSTEM NEEDS TO BE INSTALLED IN ACCORDANCE WITH [NEC 690.43]
2. PV INVERTER IS UNGROUNDED, TRANSFORMER-LESS TYPE.
3. DC GEC AND AC EGC TO REMAIN UNSPLICED, OR SPLICED TO EXISTING ELECTRODE
4. ANY EXISTING WIRING INVOLVED WITH PV SYSTEM CONNECTION THAT IS FOUND TO BE INADEQUATE PER CODE SHALL BE CORRECTED PRIOR TO FINAL INSPECTION.
5. SOLADECK QUANTITIES, AND PLACEMENT SUBJECT TO CHANGE IN THE FIELD - SOLADECKS DEPICTED ON ELECTRICAL DIAGRAM REPRESENT WIRE TYPE TRANSITIONS.
6. AC DISCONNECT NOTED IN EQUIPMENT SCHEDULE OPTIONAL IF OTHER AC DISCONNECTING MEANS IS LOCATED WITHIN 10' OF SERVICE DISCONNECT.
7. RACEWAYS AND CABLES EXPOSED TO SUNLIGHT ON ROOFTOPS SHOULD BE INSTALLED MORE THAN 7/8" ABOVE THE ROOF USING CONDUIT SUPPORTS.
8. VERIFY UFER/EXISTING ROD OR ADD TWO GROUNDING RODS(5/8" X 8' EMBEDMENT) SPACED 6 FEET MINIMUM APART.(RECOMMENDED MINIMUM SPACING SHALL BE THE LENGTH OF THE GROUND ROD USED.)
9. BOND COLD WATER AND GAS LINES(IF PRESENT) TO GROUNDING ELECTRODE CONDUCTOR



**(GN) GENERAL NOTES :**

1. CONDUIT TO BE UL LISTED FOR WET LOCATION AND UV PROTECTED (EX. -EMT, SCH 80 PVC OR RMC).
2. FMC MAYBE USED IN INDOOR APPLICATIONS WHERE PERMITTED BY NEC ART. 348

QTY	CONDUCTOR INFORMATION	CONDUIT TYPE	CONDUIT SIZE
① (4)	#12AWG - Q CABLE (L1 & L2 NO NEUTRAL)	N/A	N/A
(1)	#6AWG - BARE COPPER IN FREE AIR		
② (4)	#12AWG - THWN-2 (L1,L2) (EXTERIOR) / #12/2 ROMEX IN ATTIC	EMT, LFMC OR PVC	1"
(1)	#12AWG - THWN-2 GND		
③ (2)	#10AWG - THWN-2 (L1,L2)		
(1)	#10AWG - THWN-2 N	EMT, LFMC OR PVC	1"
(1)	#10AWG - THWN-2 GND		
④ (2)	#10AWG - THWN-2 (L1,L2)		
(1)	#10AWG - THWN-2 N	EMT, LFMC OR PVC	1"
(1)	#10AWG - THWN-2 GND		



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

This item has been digitally signed and sealed by Nestor J. Houghton, P.E. on December 27, 2022. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

PRINCIPAL ENGINEERING, INC.  
 1011 N. CAUSEWAY BLVD. STE 19  
 MANDEVILLE, LA 70471  
 985.624.5001  
 INFO@PI-AEC.COM  
 NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS  
**RICHARD BARRETO RESIDENCE**  
 89 CALDWELL ST,  
 SPRING LAKE, NC 28390

SHEET NAME  
**ELECTRICAL LINE DIAGRAM**

SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-6**

**1 ELECTRICAL LINE DIAGRAM**

PV-6

SCALE: N.T.S.



INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
MIN/MAX DC VOLT RATING	30V MIN/ 58V MAX
MAX INPUT POWER	235W-440W
NOMINAL AC VOLTAGE RATING	240V/ 211-264V
MAX AC CURRENT	1.21A
MAX MODULES PER CIRCUIT	13 (SINGLE PHASE)
MAX OUTPUT POWER	290 VA

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MODULE
VMP	34.58V
IMP	10.56A
VOC	41.21V
ISC	11.07A
TEMP. COEFF. VOC	-0.27%/°C
MODULE DIMENSION	67.6"L x 41.1"W x 1.26"D (In Inch)

AMBIENT TEMPERATURE SPECS	
RECORD LOW TEMP	-10°C
AMBIENT TEMP (HIGH TEMP 2%)	35°C
MODULE TEMPERATURE COEFFICIENT OF Voc	-0.27%/°C

PERCENT OF VALUES	NUMBER OF CURRENT CARRYING CONDUCTORS IN EMT
.80	4-6
.70	7-9
.50	10-20

AC CALCULATIONS																						
CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FULL LOAD AMPS "FLA" (A)	FLA*1.25 (A)	OC PD SIZE (A)	NEUTRAL SIZE	GROUND SIZE	CONDUCTOR SIZE	75°C AMPACITY (A)	AMPACITY CHECK #1	AMBIENT TEMP. (°C)	TOTAL CC CONDUCTORS IN RACEWAY	90°C AMPACITY (A)	DERATION FACTOR FOR AMBIENT TEMPERATURE NEC 310.15(B)(2)(a)	DERATION FACTOR FOR CONDUCTORS PER RACEWAY NEC 310.15(B)(3)(a)	90°C AMPACITY DERATED (A)	AMPACITY CHECK #2	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/KFT)	VOLTAGE DROP AT FLA (%)	CONDUIT SIZE	CONDUIT FILL (%)
CIRCUIT 1	SOLADECK	240	10.89	13.6125	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	35	2	30	0.96	1	28.8	PASS			0.38	N/A	#N/A
CIRCUIT 2	SOLADECK	240	10.89	13.6125	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	35	2	30	0.96	1	28.8	PASS			0.38	N/A	#N/A
	SOLADECK	240	10.89	13.6125	20	N/A	CU #12 AWG	CU #12 AWG	25	PASS	35	4	30	0.96	0.8	23.04	PASS	30	1.98	0.539	1" PVC	7.992788
	COMBINER PANEL	240	21.78	27.225	30	CU #10 AWG	CU #10 AWG	CU #10 AWG	35	PASS	35	2	40	0.96	1	38.4	PASS	5	1.24	0.113	1" PVC	10.14423
	PV AC DISCONNECT	240	21.78	27.225	30	CU #10 AWG	CU #10 AWG	CU #10 AWG	35	PASS	35	2	40	0.96	1	38.4	PASS	5	1.24	0.113	1" PVC	10.14423

Circuit 1 Voltage Drop	1.144
Circuit 2 Voltage Drop	1.144



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

This item has been digitally signed and sealed by Nestor J. Houghton, P.E. on December 27, 2022. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

PRINCIPAL ENGINEERING, INC.  
1011 N. CAUSEWAY BLVD. STE 19  
MANDEVILLE, LA 70471  
985.624.5001  
INFO@PI-AEC.COM  
NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS  
**RICHARD BARRETO  
RESIDENCE**  
89 CALDWELL ST,  
SPRING LAKE, NC 28390

SHEET NAME  
**WIRING CALCULATIONS**

SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-7**

**ELECTRICAL NOTES**

- ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
- WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
- WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- WHERE SIZES OF SOLADECKS, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
- MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
- TEMPERATURE RATINGS OF ALL CONDUCTORS, TERMINATIONS, BREAKERS, OR OTHER DEVICES ASSOCIATED WITH THE SOLAR PV SYSTEM SHALL BE RATED FOR AT LEAST 75 DEGREE C.

**CAUTION:  
AUTHORIZED SOLAR  
PERSONNEL ONLY!**

LABEL-1:  
LABEL LOCATION:  
AC DISCONNECT

**⚠ WARNING**  
**ELECTRICAL SHOCK HAZARD**  
TERMINALS ON THE LINE AND LOAD SIDES MAY  
BE ENERGIZED IN THE OPEN POSITION

LABEL- 2:  
LABEL LOCATION:  
AC DISCONNECT  
COMBINER  
MAIN SERVICE PANEL  
SUBPANEL  
MAIN SERVICE DISCONNECT  
CODE REF: NEC 690.13(B)

**⚠ WARNING DUAL POWER SOURCE  
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM**

LABEL- 3:  
LABEL LOCATION:  
PRODUCTION METER  
UTILITY METER  
MAIN SERVICE PANEL  
SUBPANEL  
CODE REF: NEC 705.12(C) & NEC 690.59

**⚠ WARNING**  
**TURN OFF PHOTOVOLTAIC AC  
DISCONNECT PRIOR TO  
WORKING INSIDE PANEL**

LABEL- 4:  
LABEL LOCATION:  
MAIN SERVICE PANEL  
SUBPANEL  
MAIN SERVICE DISCONNECT  
COMBINER  
CODE REF: NEC 110.27(C) & OSHA 1910.145 (f) (7)

**⚠ CAUTION**  
**PHOTOVOLTAIC SYSTEM CIRCUIT IS  
BACKFEED**

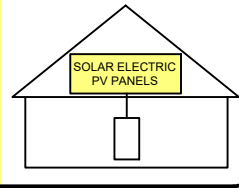
LABEL- 5:  
LABEL LOCATION:  
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)  
SUBPANEL (ONLY IF SOLAR IS BACK-FED)  
CODE REF: NEC 705.12(D) & NEC 690.59

**⚠ WARNING**  
**POWER SOURCE OUTPUT  
CONNECTION. DO NOT  
RELOCATE THIS  
OVERCURRENT DEVICE**

LABEL- 6:  
LABEL LOCATION:  
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)  
SUBPANEL (ONLY IF SOLAR IS BACK-FED)  
CODE REF: NEC 705.12(B)(3)(2)

**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



LABEL- 7:  
LABEL LOCATION:  
AC DISCONNECT  
CODE REF: IFC 605.11.3.1(1) & NEC 690.56(C)

**RAPID SHUTDOWN SWITCH  
FOR SOLAR PV SYSTEM**

LABEL- 8:  
LABEL LOCATION:  
AC DISCONNECT  
CODE REF: NEC 690.56(C)(2)

**PHOTOVOLTAIC**  
**AC DISCONNECT**

LABEL- 9:  
LABEL LOCATION:  
AC DISCONNECT  
CODE REF: NEC 690.13(B)

**PHOTOVOLTAIC  
AC DISCONNECT**  
NOMINAL OPERATING AC VOLATGE **240 V**  
RATED AC OUTPUT CURRENT **21.78 A**

LABEL- 10:  
LABEL LOCATION:  
MAIN SERVICE PANEL  
SUBPANEL  
AC DISCONNECT  
CODE REF: NEC 690.54

**MAIN PHOTOVOLTAIC  
SYSTEM DISCONNECT**

LABEL- 11:  
LABEL LOCATION:  
MAIN SERVICE DISCONNECT (ONLY IF MAIN SERVICE DISCONNECT IS PRESENT)  
CODE REF: NEC 690.13(B)



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

This item has been digitally signed and sealed by Nestor J. Houghton, P.E. on December 27, 2022. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

PRINCIPAL ENGINEERING, INC.  
1011 N. CAUSEWAY BLVD. STE 19  
MANDEVILLE, LA 70471  
985.624.5001  
INFO@PI-AEC.COM  
NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS  
**RICHARD BARRETO  
RESIDENCE**  
89 CALDWELL ST,  
SPRING LAKE, NC 28390

SHEET NAME  
**LABELS**

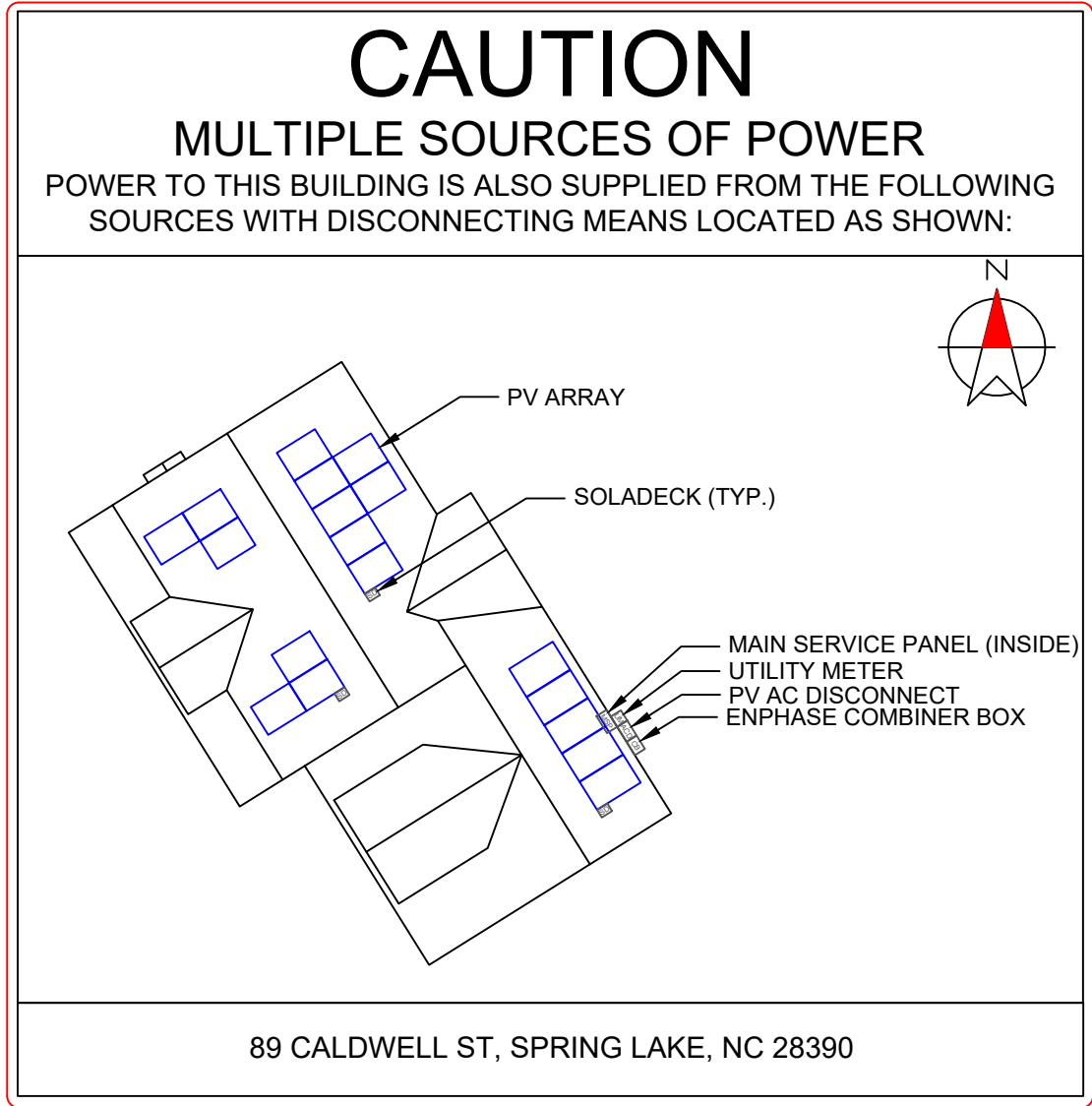
SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-8**



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	



This item has been digitally signed and sealed by Nestor J. Houghton, P.E. on December 27, 2022. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

PRINCIPAL ENGINEERING, INC.  
 1011 N. CAUSEWAY BLVD. STE 19  
 MANDEVILLE, LA 70471  
 985.624.5001  
 INFO@PI-AEC.COM  
 NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS

**RICHARD BARRETO  
 RESIDENCE**

89 CALDWELL ST,  
 SPRING LAKE, NC 28390

SHEET NAME  
**PLACARD**

SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-9**

**DIRECTORY**  
 PERMANENT PLAQUE OR DIRECTORY PROVIDING THE LOCATION OF THE SERVICE DISCONNECTING MEANS AND THE PHOTOVOLTAIC SYSTEM.

(ALL PLAQUES AND SIGNAGE WILL BE INSTALLED AS OUTLINED WITHIN: NEC 690.56(B)&(C), [NEC 705.10])

LABELING NOTES:

1. LABELS CALLED OUT ACCORDING TO ALL COMMON CONFIGURATIONS. ELECTRICIAN TO DETERMINE EXACT REQUIREMENTS IN THE FIELD PER CURRENT NEC AND LOCAL CODES AND MAKE APPROPRIATE ADJUSTMENTS.
2. LABELING REQUIREMENTS BASED ON THE 2017 NATIONAL ELECTRIC CODE, OSHA STANDARD 19010.145, ANSI Z535.
3. MATERIAL BASED ON THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
4. LABELS TO BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED [NEC 110.21]
5. LABELS TO BE A MINIMUM LETTER HEIGHT OF 3/8", WHITE ON RED BACKGROUND; REFLECTIVE, AND PERMANENTLY AFFIXED [IFC 605.11.1.1]



**(H)** - INSPECT ENTIRE JOBSITE FOR HAZARDS

**(SV)** - DRAW SUNPRO VEHICLE LOCATION ON PLANS

**(HHZ)** - DRAW HARD HAT ZONE AROUND HOUSE

**(X)** - DRAW FALL PROTECTION ANCHOR LOCATIONS

**(L)** - DRAW LADDER & ROOF ACCESS POINTS

**(EH)** - DRAW ELECTRICAL HAZARD AREAS

**(W/TH)** - DRAW WATER & TRIP HAZARD LOCATIONS

**SKY LIGHT:** YES | NO IF SO, HOW MANY: \_\_\_\_\_

**SERVICE LINE ENTRANCE:** OVERHEAD | UNDERGROUND  
 \*IF OVERHEAD, DRAW POWERLINE ON PLAN SET AND PROVIDE APPROPRIATE WORK BOUNDARY

**ROOF SURFACE:** SHINGLE | METAL | TILE | TPO

**CIRCLE WEATHER CONDITIONS:**

SUNNY OVERCAST LIGHT RAIN

HEAVY RAIN FOGGY WINDY

TEMPERATURE: \_\_\_\_\_ IF WINDY, STATE WIND SPEED: \_\_\_\_\_

CHECK IF THE FOLLOWING EQUIPMENT IS READILY AVAILABLE ON ALL SUNPRO SOLAR INSTALLATION VEHICLES ON EACH JOB SITE:

- \_\_\_ EYE WASH BOTTLE/SOLUTION
- \_\_\_ DRINKING WATER
- \_\_\_ FIRE EXTINGUISHER
- \_\_\_ FIRST AID KIT
- \_\_\_ NECESSARY JOB SPECIFICS

**ADDRESS OF NEAREST MEDICAL CARE FACILITY:**

LEAD INSTALLER IS TO CONDUCT A DAILY SAFETY BRIEFING AND THE INCLUDED CHECKLIST MUST BE COMPLETED WITH ALL NECESSARY LABELS PRIOR TO BEGINNING ANY ONSITE WORK.

\_\_\_\_\_  
 LEAD INSTALLER SIGNATURE      DATE

**CREW SIGNATURES:**

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**PROJECT ADDRESS:**



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

Blank area for notes or additional information.

**PROJECT NAME & ADDRESS**

**RICHARD BARRETO  
 RESIDENCE**  
 89 CALDWELL ST,  
 SPRING LAKE, NC 28390

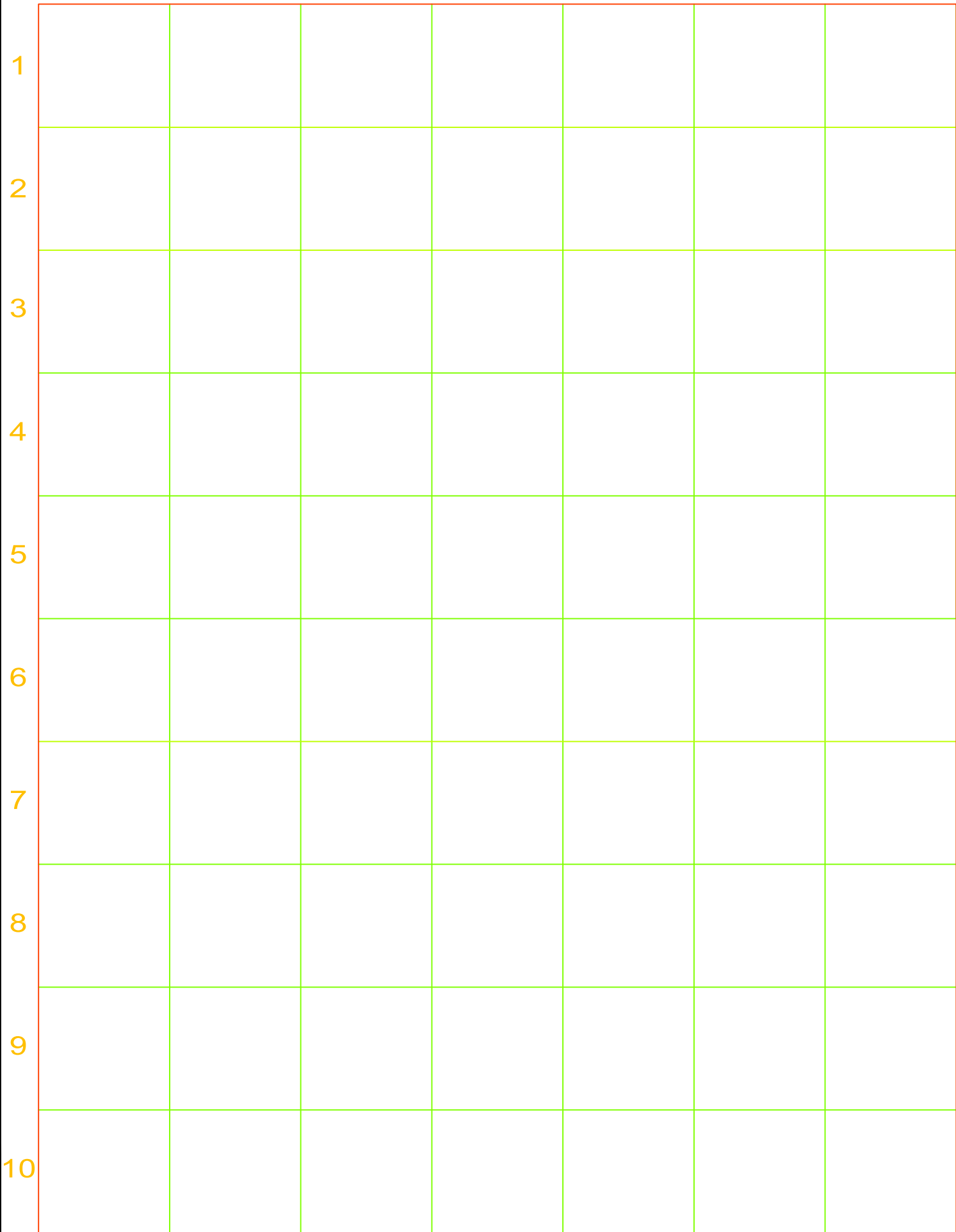
SHEET NAME  
**JHA FORM**

SHEET SIZE  
**ANSI B  
 11" X 17"**

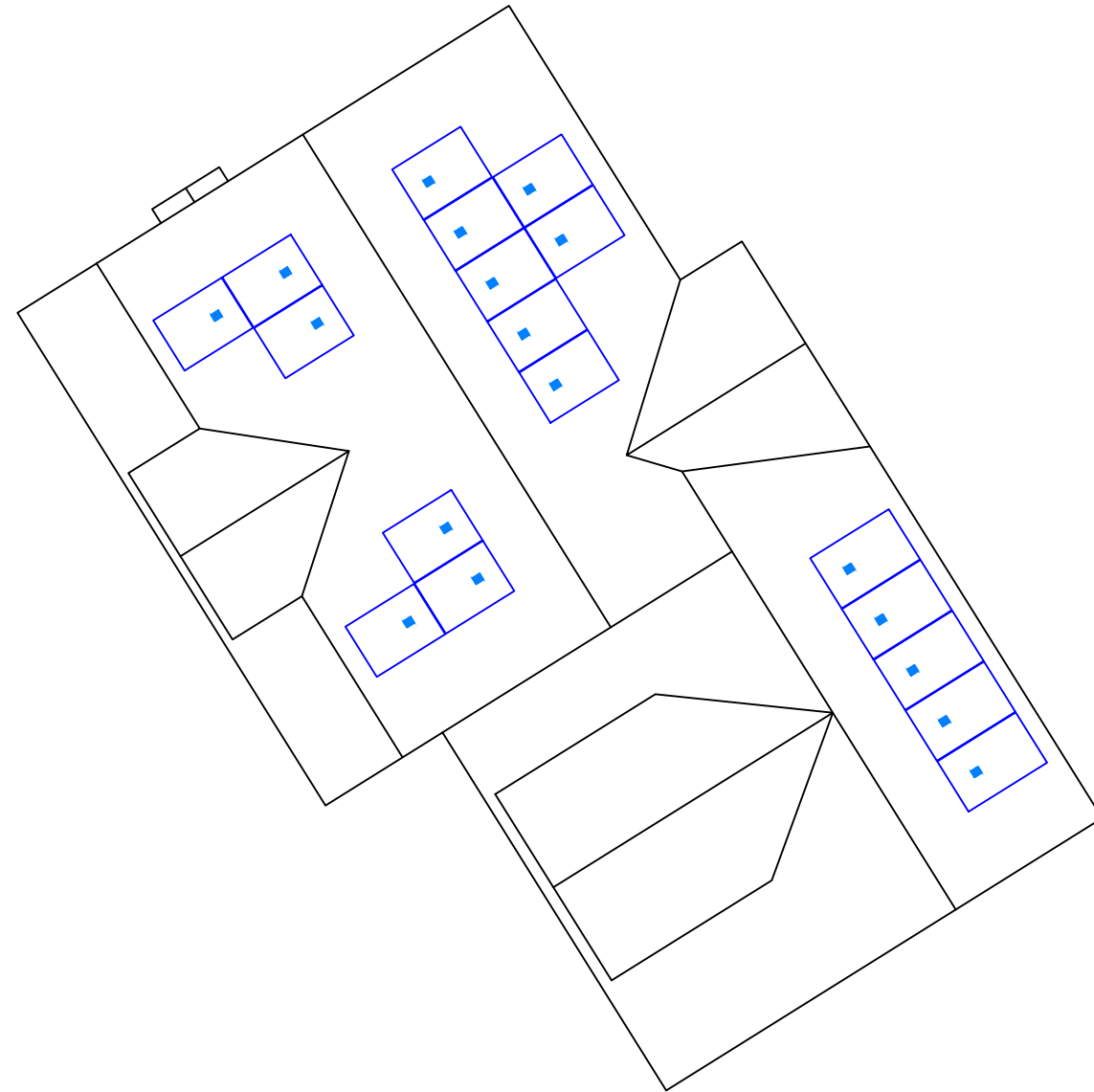
SHEET NUMBER  
**PV-10**



1-10    11-20    21-30    31-40    41-50    51-60    61-70



# MICRO INVERTER CHART



22171 MCH RD  
 MANDEVILLE, LA 70471  
 PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

PROJECT NAME & ADDRESS  
**RICHARD BARRETO  
 RESIDENCE**  
 89 CALDWELL ST,  
 SPRING LAKE, NC 28390

SHEET NAME  
**MICRO INVERTER CHART**

SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-11**



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

PROJECT NAME & ADDRESS

RICHARD BARRETO  
RESIDENCE  
89 CALDWELL ST,  
SPRING LAKE, NC 28390

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-12

Specifications subject to technical changes © Q CELLS Q.PEAK DUO-G10+-360-380-DA\_2022-02\_Rev01\_NA



powered by  
**Q.ANTUM DUO Z**  
**Q.PEAK DUO BLK-G10+**  
**360-380**

ENDURING HIGH PERFORMANCE



**BREAKING THE 21% EFFICIENCY BARRIER**

Q.ANTUM DUO Z Technology with zero gap cell layout boosts module efficiency up to 20.9%.



**THE MOST THOROUGH TESTING PROGRAMME IN THE INDUSTRY**

Q CELLS is the first solar module manufacturer to pass the most comprehensive quality programme in the industry: The new "Quality Controlled PV" of the independent certification institute TÜV Rheinland.



**INNOVATIVE ALL-WEATHER TECHNOLOGY**

Optimal yields, whatever the weather with excellent low-light and temperature behaviour.



**ENDURING HIGH PERFORMANCE**

Long-term yield security with Anti LID Technology, Anti PID Technology<sup>1</sup>, Hot-Spot Protect and Traceable Quality Tra.Q™.



**EXTREME WEATHER RATING**

High-tech aluminium alloy frame, certified for high snow (5400 Pa) and wind loads (4000 Pa).

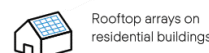


**A RELIABLE INVESTMENT**

Inclusive 25-year product warranty and 25-year linear performance warranty<sup>2</sup>.

<sup>1</sup> APT test conditions according to IEC/TS 62804-1:2015, method A (-1500V, 96h)  
<sup>2</sup> See data sheet on rear for further information.

THE IDEAL SOLUTION FOR:

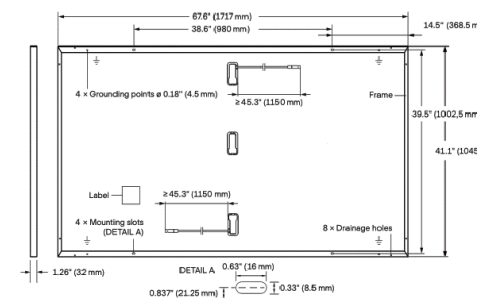


Engineered in Germany



MECHANICAL SPECIFICATIONS

Format	67.6in × 41.1in × 1.26in (including frame) (1717mm × 1045mm × 32mm)
Weight	43.8lbs (19.9kg)
Front Cover	0.13in (3.2mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 20 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09-3.98 × 1.26-2.36 × 0.59-0.71in (53-101 × 32-60 × 15-18mm), Protection class IP67, with bypass diodes
Cable	4mm <sup>2</sup> Solar cable; (+) ≥45.3in (1150mm), (-) ≥45.3in (1150mm)
Connector	Stäubli MC4; IP68

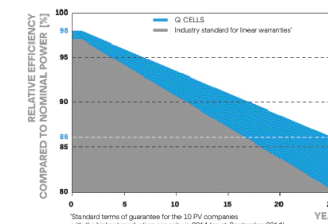


ELECTRICAL CHARACTERISTICS

POWER CLASS		350	355	360	365	370
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC <sup>1</sup> (POWER TOLERANCE +5W / -0W)						
Power at MPP <sup>1</sup>	P <sub>MPP</sub> [W]	350	355	360	365	370
Short Circuit Current <sup>1</sup>	I <sub>SC</sub> [A]	10.97	11.00	11.04	11.07	11.10
Open Circuit Voltage <sup>1</sup>	V <sub>OC</sub> [V]	41.11	41.14	41.18	41.21	41.24
Current at MPP	I <sub>MPP</sub> [A]	10.37	10.43	10.49	10.56	10.62
Voltage at MPP	V <sub>MPP</sub> [V]	33.76	34.03	34.31	34.58	34.84
Efficiency <sup>1</sup>	η [%]	≥19.5	≥19.8	≥20.1	≥20.3	≥20.6
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT <sup>2</sup>						
Power at MPP	P <sub>MPP</sub> [W]	262.6	266.3	270.1	273.8	277.6
Short Circuit Current	I <sub>SC</sub> [A]	8.84	8.87	8.89	8.92	8.95
Open Circuit Voltage	V <sub>OC</sub> [V]	38.77	38.80	38.83	38.86	38.90
Current at MPP	I <sub>MPP</sub> [A]	8.14	8.20	8.26	8.31	8.37
Voltage at MPP	V <sub>MPP</sub> [V]	32.24	32.48	32.71	32.94	33.17

<sup>1</sup>Measurement tolerances P<sub>MPP</sub> ±3%; I<sub>SC</sub>; V<sub>OC</sub> ±5% at STC: 1000W/m<sup>2</sup>, 25±2°C, AM 1.5 according to IEC 60904-3 • <sup>2</sup>800W/m<sup>2</sup>, NMOT, spectrum AM 1.5

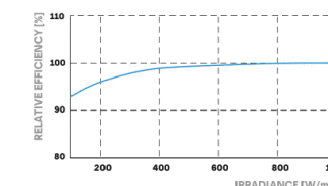
Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 93.5% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organisation of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25°C, 1000W/m<sup>2</sup>).

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I <sub>SC</sub>	α [%/K]	+0.04	Temperature Coefficient of V <sub>OC</sub>	β [%/K]	-0.27
Temperature Coefficient of P <sub>MPP</sub>	γ [%/K]	-0.35	Nominal Module Operating Temperature	NMOT [°F]	109±5.4 (43±3°C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V <sub>sys</sub> [V]	1000 (IEC)/1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating [A DC]	20	Fire Rating based on ANSI / UL 61730	TYPE 2
Max. Design Load, Push / Pull <sup>3</sup> [lbs / ft <sup>2</sup> ]	75 (3600 Pa) / 55 (2660 Pa)	Permitted Module Temperature on Continuous Duty	-40°F up to +185°F (-40°C up to +85°C)
Max. Test Load, Push / Pull <sup>3</sup> [lbs / ft <sup>2</sup> ]	113 (5400 Pa) / 84 (4000 Pa)		

<sup>3</sup> See Installation Manual

QUALIFICATIONS AND CERTIFICATES

Quality Controlled PV - TÜV Rheinland; IEC 61215:2016; IEC 61730:2016. This data sheet complies with DIN EN 50380.



Hanwha Q CELLS America Inc.

400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | TEL +1 949 748 59 96 | EMAIL inquiry@us.q-cells.com | WEB www.q-cells.us





## IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.



IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.



IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

### Easy to install

- Lightweight and compact with plug-n-play connectors
- Power Line Communication (PLC) between components
- Faster installation with simple two-wire cabling

### High productivity and reliability

- Produce power even when the grid is down\*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

### Microgrid-forming

- Complies with the latest advanced grid support\*\*
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) requirements

\* Only when installed with IQ System Controller 2, meets UL 1741.

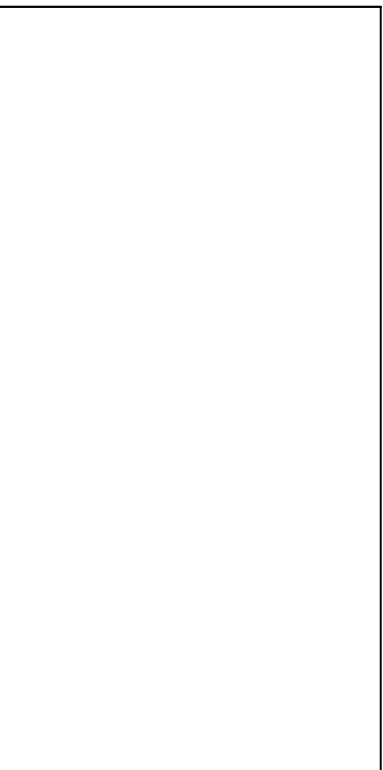
\*\* IQ8 and IQ8Plus supports split phase, 240V installations only.

## IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings <sup>1</sup>	W	235 – 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 – 37	29 – 45
Operating range	V	25 – 48	25 – 58
Min/max start voltage	V	30 / 48	30 / 58
Max input DC voltage	V	50	60
Max DC current <sup>2</sup> [module I <sub>sc</sub> ]	A		15
Overtoltage class DC port			II
DC port backfeed current	mA		0
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range <sup>3</sup>	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
AC short circuit fault current over 3 cycles	Arms	2	
Max units per 20 A (L-L) branch circuit <sup>4</sup>		16	13
Total harmonic distortion		<5%	
Overtoltage class AC port		III	
AC port backfeed current	mA	30	
Power factor setting		1.0	
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging	
Peak efficiency	%	97.5	97.6
CEC weighted efficiency	%	97	97
Night-time power consumption	mW	60	
MECHANICAL DATA			
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)	
Relative humidity range		4% to 100% (condensing)	
DC Connector type		MC4	
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01	
		This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	

(1) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility>  
 (2) Maximum continuous input DC current is 10.6A (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	



PROJECT NAME & ADDRESS  
**RICHARD BARRETO  
 RESIDENCE**  
 89 CALDWELL ST,  
 SPRING LAKE, NC 28390

SHEET NAME  
**EQUIPMENT  
 SPECIFICATION**

SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-13**



# Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4  
X-IQ-AM1-240-4C



X-IQ-AM1-240-4C

X-IQ-AM1-240-4

The **Enphase IQ Combiner 4/4C** with Enphase IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

### Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

### Simple

- Centered mounting brackets support single stud mounting
- Supports bottom, back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

### Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed

## Enphase IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C (X-IQ-AM1-240-4C)	IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.
ACCESSORIES AND REPLACEMENT PARTS (not included, order separately)	
Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Envoy breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit [enphase.com](http://enphase.com)

© 2022 Enphase Energy. All rights reserved. Enphase, the Enphase logo, IQ Combiner 4/4C, and other names are trademarks of Enphase Energy, Inc. Data subject to change. 02-14-2022



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

### REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

### PROJECT NAME & ADDRESS

RICHARD BARRETO  
RESIDENCE  
89 CALDWELL ST,  
SPRING LAKE, NC 28390

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-14

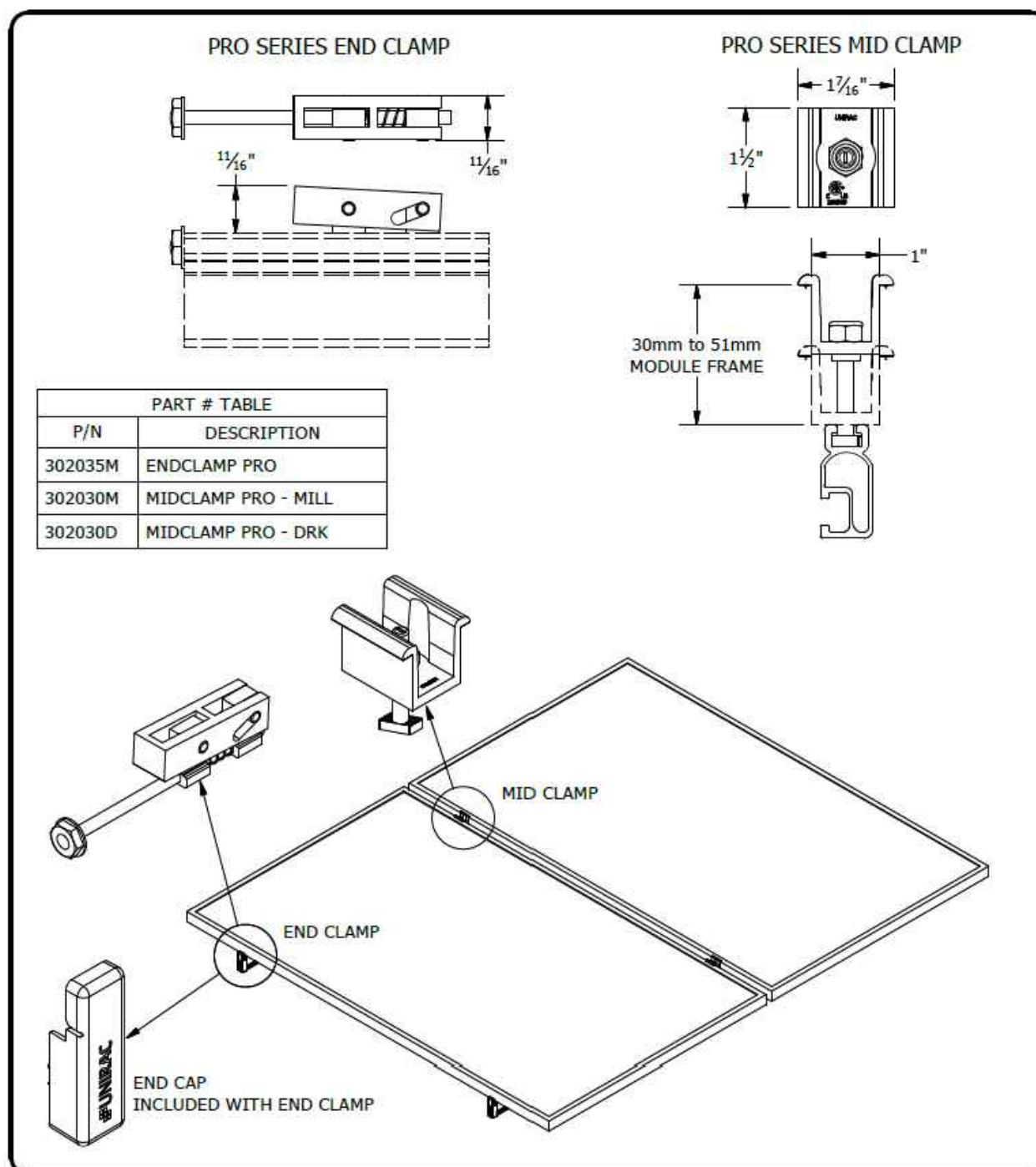


To learn more about Enphase offerings, visit [enphase.com](http://enphase.com)

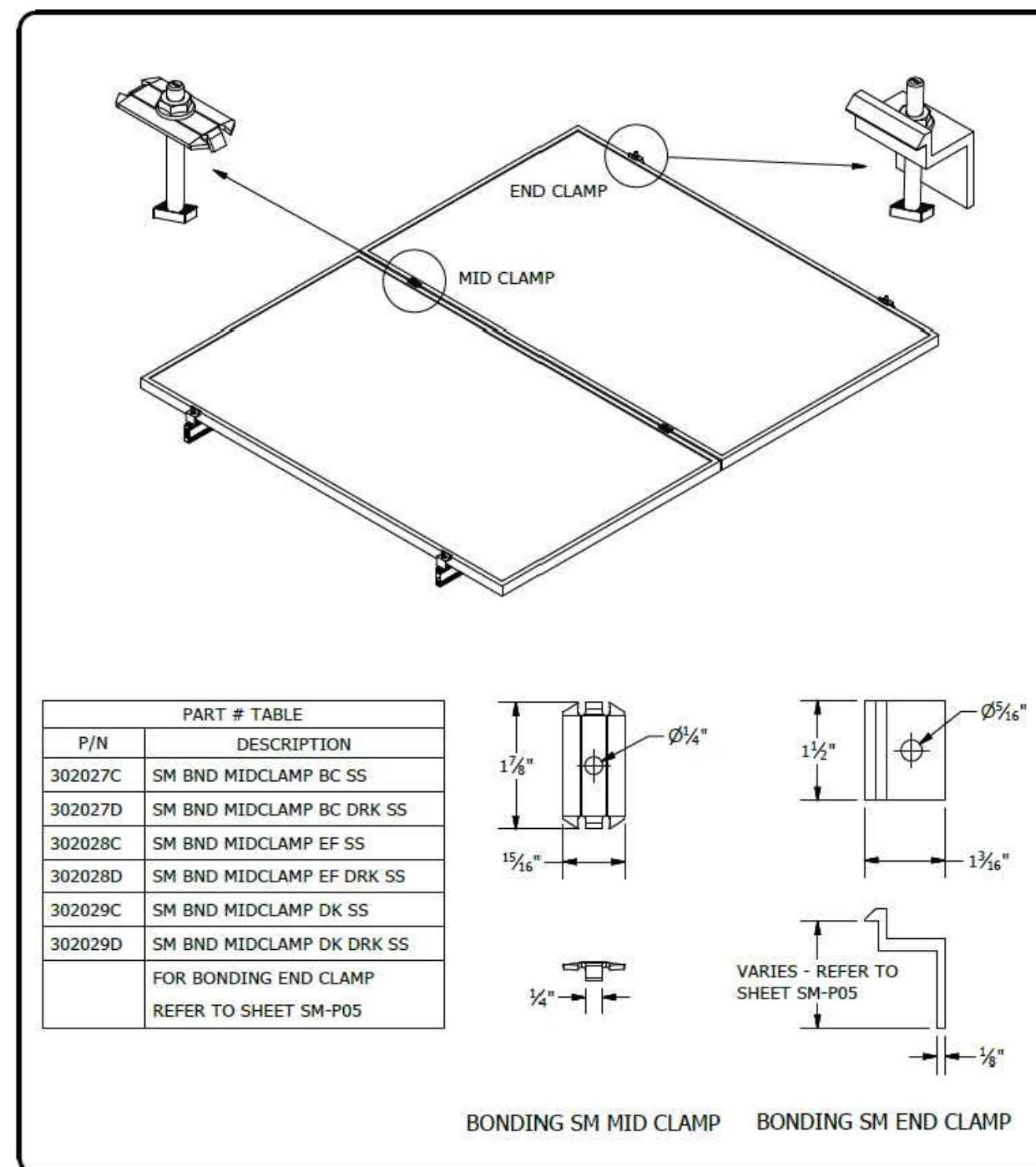




REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	



PART # TABLE	
P/N	DESCRIPTION
302035M	ENDCLAMP PRO
302030M	MIDCLAMP PRO - MILL
302030D	MIDCLAMP PRO - DRK



PART # TABLE	
P/N	DESCRIPTION
302027C	SM BND MIDCLAMP BC SS
302027D	SM BND MIDCLAMP BC DRK SS
302028C	SM BND MIDCLAMP EF SS
302028D	SM BND MIDCLAMP EF DRK SS
302029C	SM BND MIDCLAMP DK SS
302029D	SM BND MIDCLAMP DK DRK SS
FOR BONDING END CLAMP REFER TO SHEET SM-P05	

1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	BONDING TOP CLAMPS
REVISION DATE:	10/26/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

SM-A01A  
SHEET

1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	PRO SERIES BONDING CLAMPS
REVISION DATE:	10/26/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

SM-A01  
SHEET

PROJECT NAME & ADDRESS

RICHARD BARRETO  
RESIDENCE

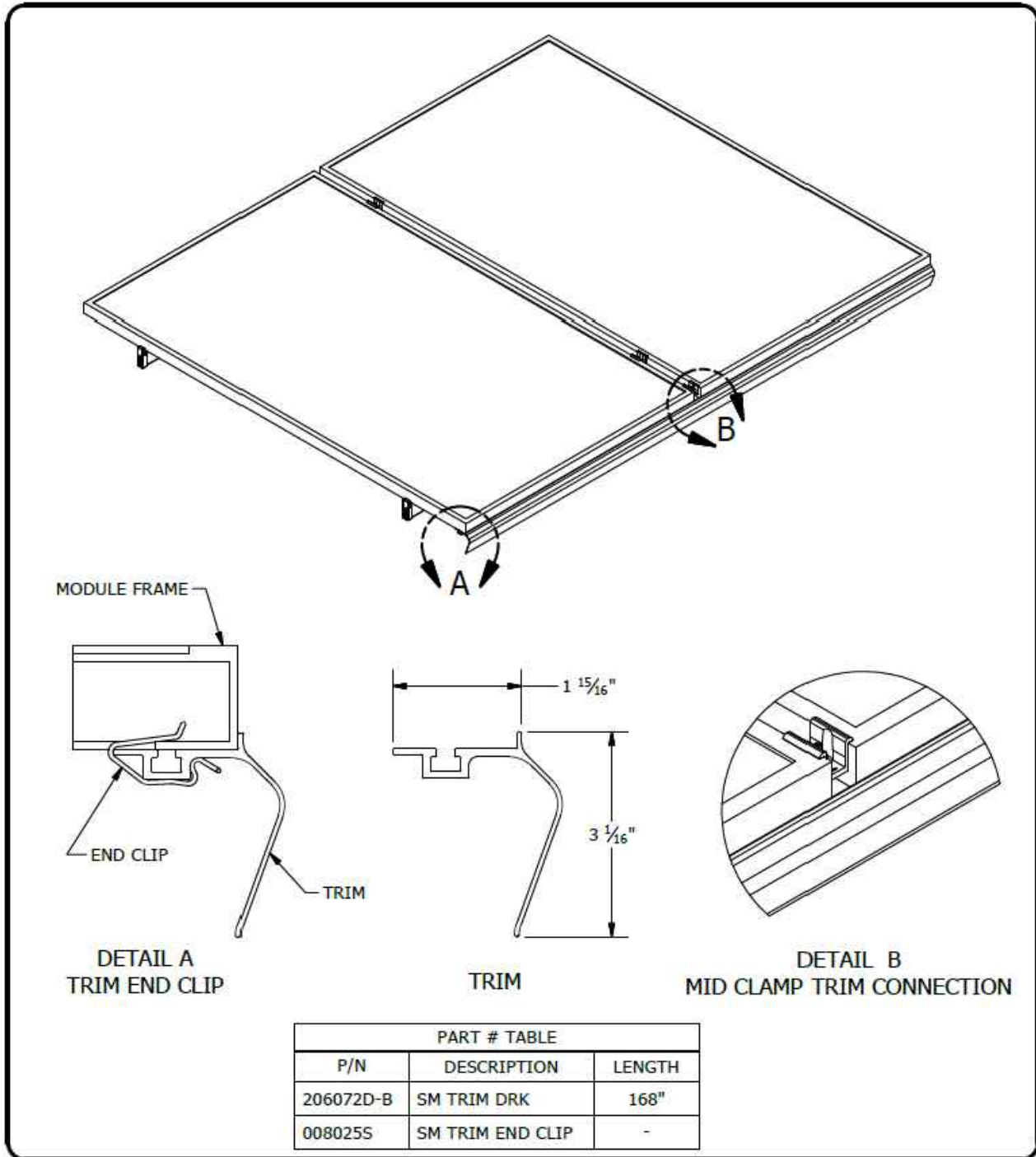
89 CALDWELL ST,  
SPRING LAKE, NC 28390

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-15

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	



1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

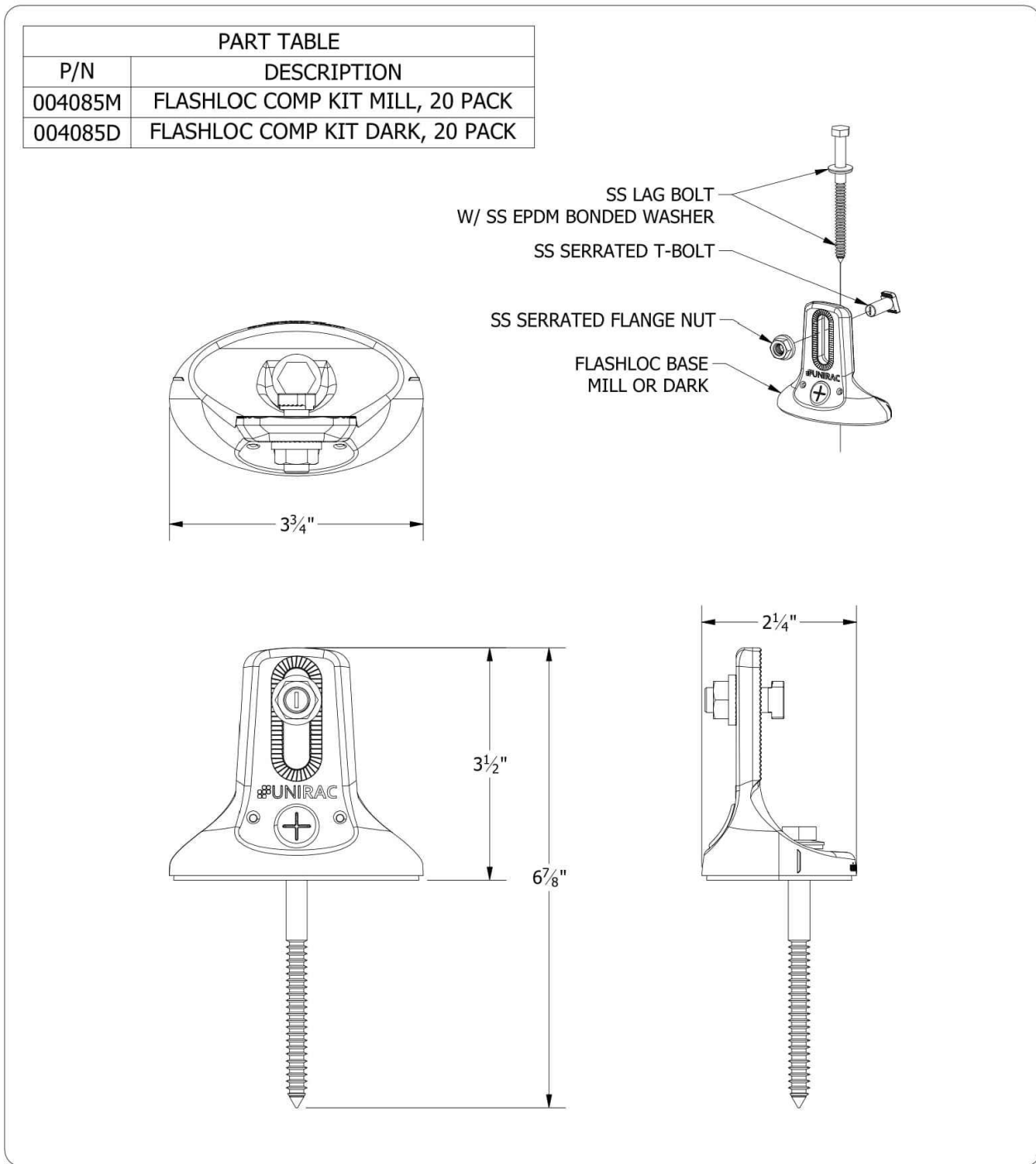
PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	SM TRIM END CLIP
REVISION DATE:	9/27/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

**SM-A02**  
SHEET



1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DRAWING
DESCRIPTION:	FLASHLOC COMP KIT
REVISION DATE:	10/3/2019

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

**FL-A01**  
SHEET

PROJECT NAME & ADDRESS

**RICHARD BARRETO  
RESIDENCE**

89 CALDWELL ST,  
SPRING LAKE, NC 28390

SHEET NAME  
**EQUIPMENT  
SPECIFICATION**

SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-16**



# FLASH LOC

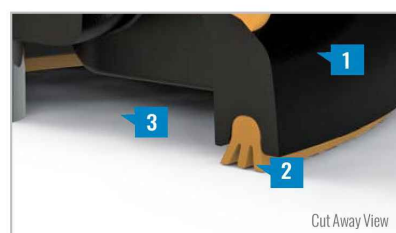


**FLASHLOC** is the ultimate attachment for composition shingle and rolled comp roofs. The all-in-one mount installs fast — no kneeling on hot roofs to install flashing, no prying or cutting shingles, no pulling nails. Simply drive the lag bolt and inject sealant into the base. **FLASHLOC's** patented TRIPLE SEAL technology preserves the roof and protects the penetration with a permanent pressure seal. Kitted with lag bolts, sealant, and hardware for maximum convenience. Don't just divert water, **LOC it out!**



### PROTECT THE ROOF

Install a high-strength waterproof attachment without lifting, prying or damaging shingles.



### LOC OUT WATER

With an outer shield **1** contour-conforming gasket **2** and pressurized sealant chamber **3** the Triple-Loc Seal delivers a 100% waterproof connection.



### HIGH-SPEED INSTALL

Simply drive lag bolt and inject sealant into the port **4** to create a permanent pressure seal.

# FLASH LOC

## INSTALLATION GUIDE



### PRE-INSTALL

Snap chalk lines for attachment rows. On shingle roofs, snap lines 1-3/4" below upslope edge of shingle course. Locate rafters and mark attachment locations.

At each location, drill a 7/32" pilot hole. Clean roof surface of dirt, debris, snow, and ice, then fill pilot hole with sealant.

**NOTE:** Space mounts per racking system install specifications. When down pressure is  $\geq 34$  psf, span may not exceed 2 ft.



### STEP 1: SECURE

Place **FLASHLOC** over pilot hole with lag on down-slope side. Align indicator marks on sides of mount with chalk line. Pass included lag bolt and sealing washer through **FLASHLOC** into pilot hole. Drive lag bolt until mount is held firmly in place.

**NOTE:** The EPDM in the sealing washer will expand beyond the edge of the metal washer when proper torque is applied.



### STEP 2: SEAL

Insert tip of UNIRAC provided sealant into port. Inject until sealant exits both vents.

Continue array installation, attaching rails to mounts with provided T-bolts.

**NOTE:** When **FLASHLOC** is installed over gap between shingle or tabs or vertical joints, fill gap/joint with sealant between mount and upslope edge of shingle course.

Use only provided sealant.



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	



PROJECT NAME & ADDRESS  
**RICHARD BARRETO  
RESIDENCE**  
89 CALDWELL ST,  
SPRING LAKE, NC 28390

SHEET NAME  
**EQUIPMENT  
SPECIFICATION**

SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-17**

**FASTER INSTALLATION. 25-YEAR WARRANTY.**

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

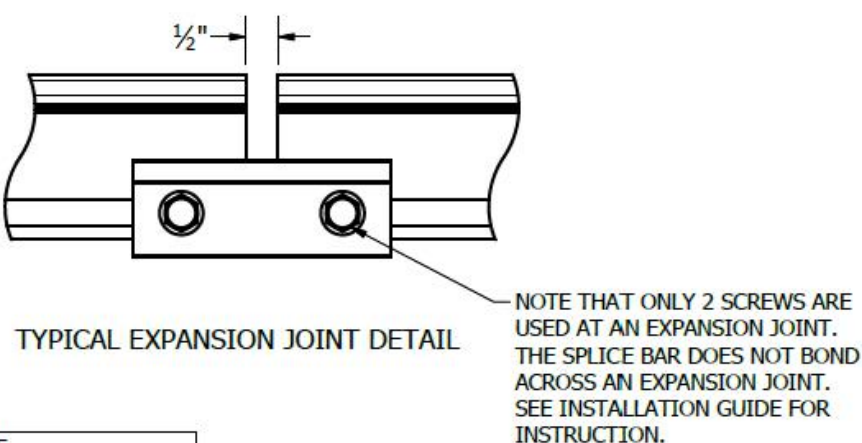
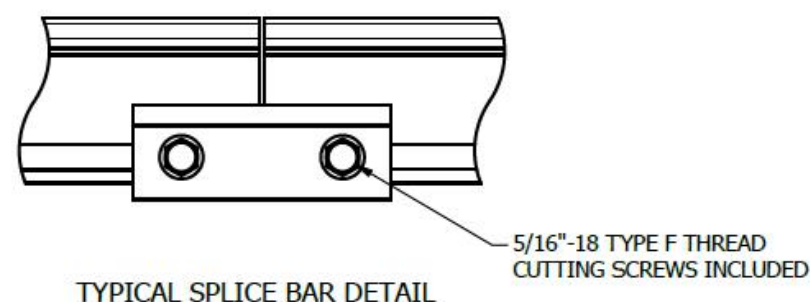
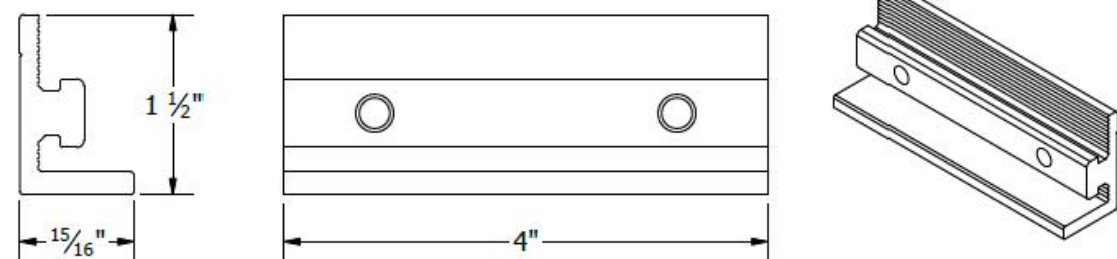
**FASTER INSTALLATION. 25-YEAR WARRANTY.**

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702



REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

BONDING SPLICE BAR



PART # TABLE	
P/N	DESCRIPTION
303019M	BND SPLICE BAR PRO SERIES MILL
303019D	BND SPLICE BAR PRO SERIES DRK

1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	BONDING SPLICE BAR PRO SERIES
REVISION DATE:	8/23/2018

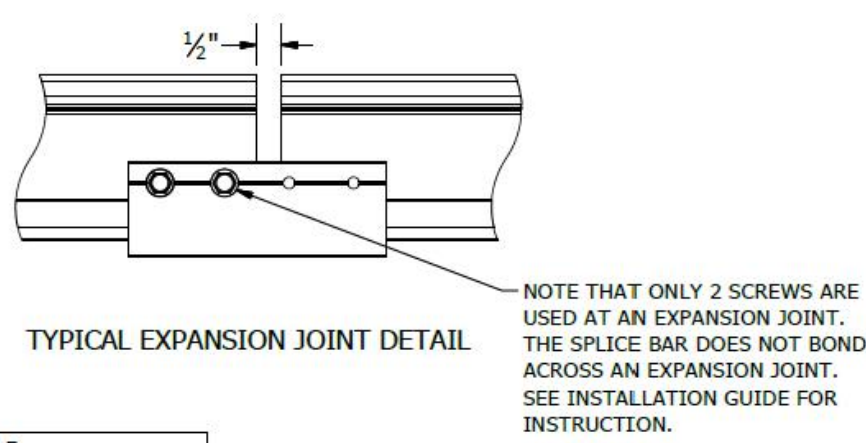
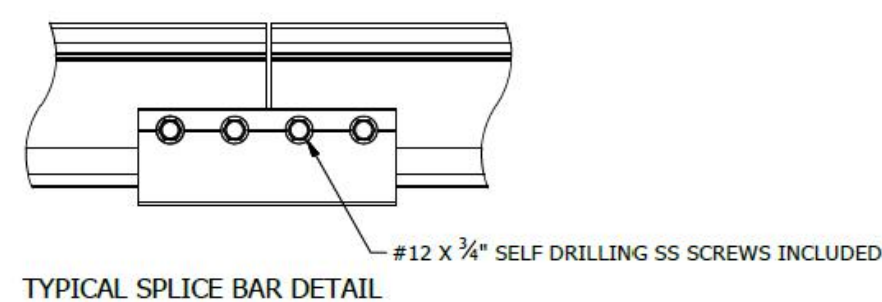
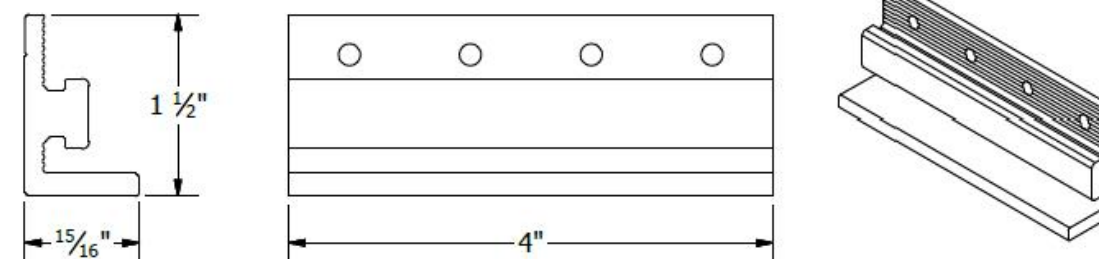
DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

**SM-A05**  
SHEET

BONDING SPLICE BAR



PART # TABLE	
P/N	DESCRIPTION
303018C	BND SPLICE BAR SERRATED CLR
303018D	BND SPLICE BAR SERRATED DRK

1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	BONDING SPLICE BAR
REVISION DATE:	9/27/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

**SM-A05**  
SHEET

PROJECT NAME & ADDRESS

**RICHARD BARRETO  
RESIDENCE**

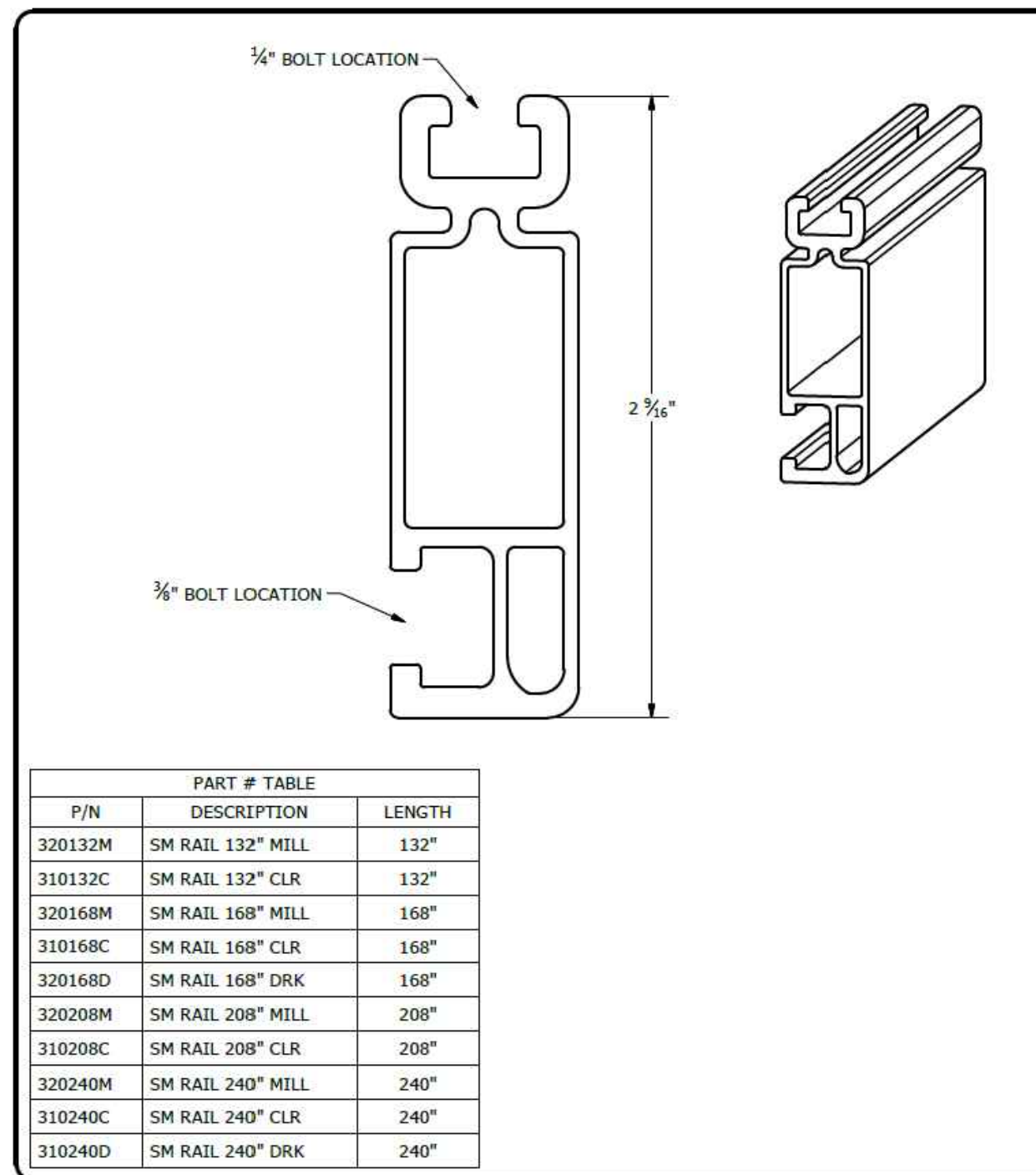
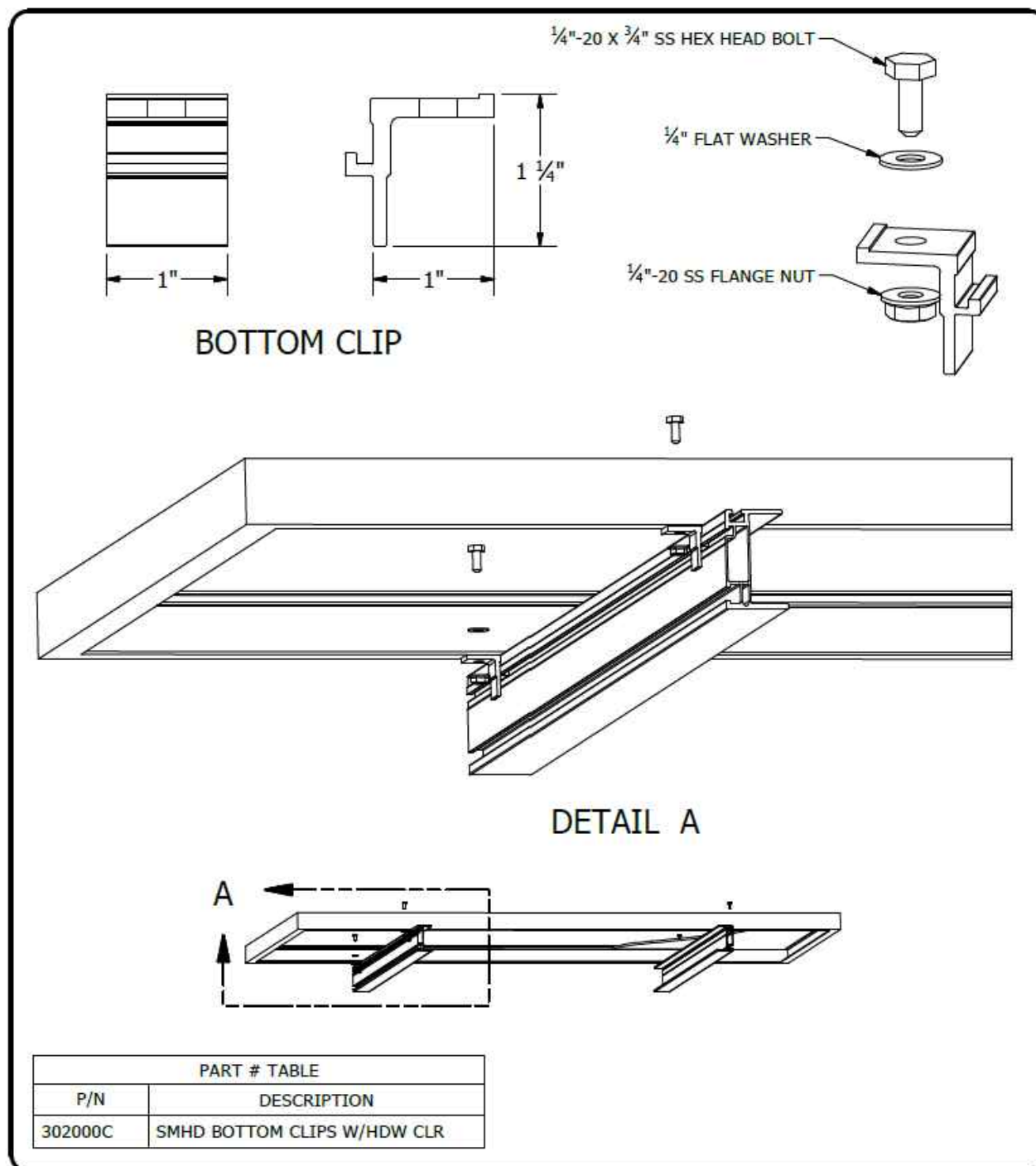
89 CALDWELL ST,  
SPRING LAKE, NC 28390

SHEET NAME  
**EQUIPMENT  
SPECIFICATION**

SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-18**

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	



PART # TABLE		
P/N	DESCRIPTION	LENGTH
320132M	SM RAIL 132" MILL	132"
310132C	SM RAIL 132" CLR	132"
320168M	SM RAIL 168" MILL	168"
310168C	SM RAIL 168" CLR	168"
320168D	SM RAIL 168" DRK	168"
320208M	SM RAIL 208" MILL	208"
310208C	SM RAIL 208" CLR	208"
320240M	SM RAIL 240" MILL	240"
310240C	SM RAIL 240" CLR	240"
310240D	SM RAIL 240" DRK	240"

1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT HD
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	BOTTOM CLIP
REVISION DATE:	9/27/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

**SM-A10**  
SHEET

1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DETAIL
DESCRIPTION:	STANDARD RAIL
REVISION DATE:	9/11/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

**SM-P01**  
SHEET

PROJECT NAME & ADDRESS

**RICHARD BARRETO  
RESIDENCE**

89 CALDWELL ST,  
SPRING LAKE, NC 28390

SHEET NAME  
**EQUIPMENT  
SPECIFICATION**

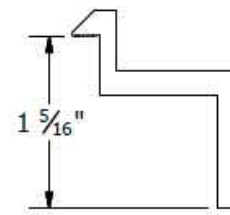
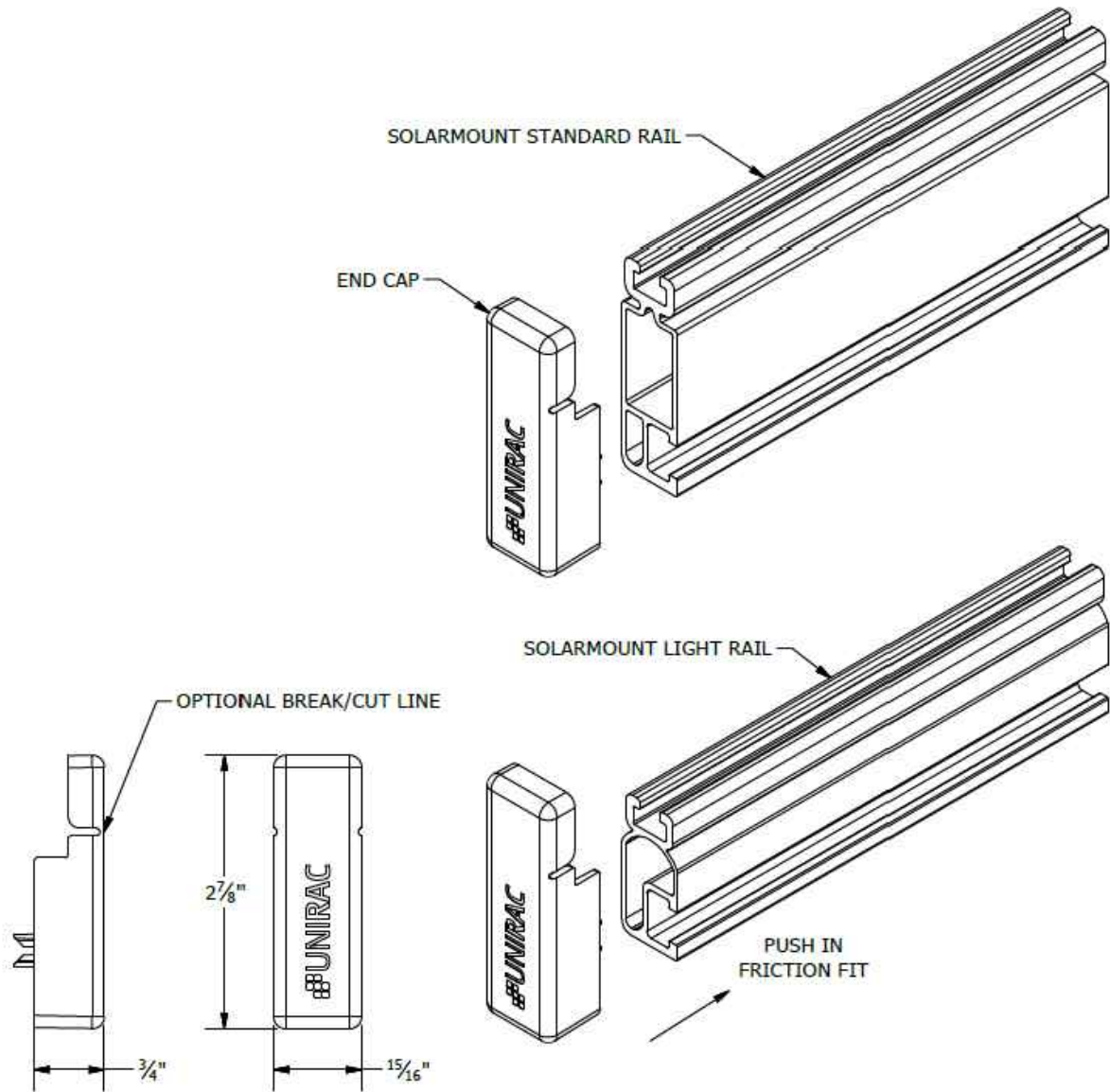
SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-19**

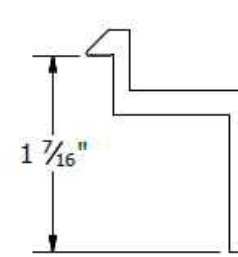


**NOTES:**

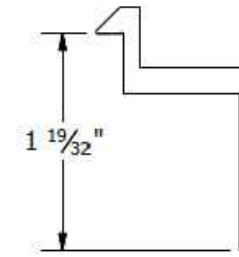
1. END CAP INCLUDED WITH EVERY END CLAMP.
2. END CAP FITS SOLARMOUNT LIGHT AND STANDARD RAIL PROFILES.



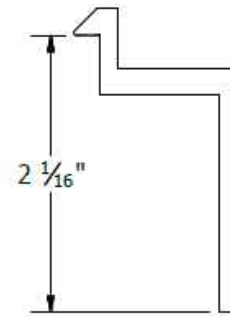
**B CLAMP**  
30mm to 32mm Module Thickness  
(1.18" to 1.26")



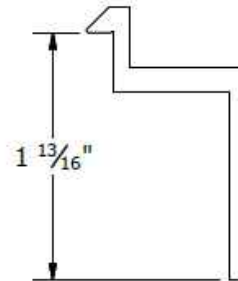
**C CLAMP**  
33mm to 36mm Module Thickness  
(1.30" to 1.42")



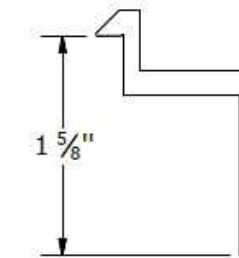
**D CLAMP**  
38mm to 40mm Module Thickness  
(1.50" to 1.57")



**E CLAMP**  
50mm to 51mm Module Thickness  
(1.97" to 2.00")

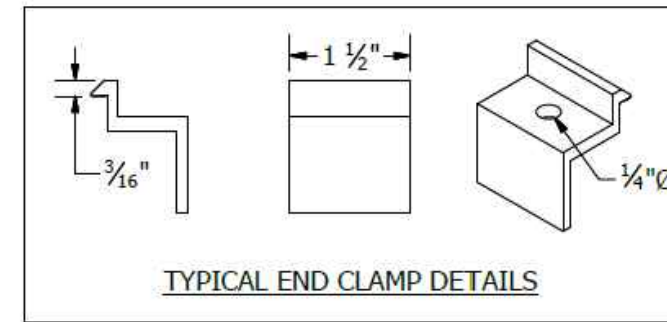


**F CLAMP**  
45mm to 47mm Module Thickness  
(1.77" to 1.85")



**K CLAMP**  
39mm to 41mm Module Thickness  
(1.54" to 1.61")

PART # TABLE	
P/N	DESCRIPTION
302021C	SM ENDCLAMP B CLR AL
302021D	SM ENDCLAMP B DRK AL
302022C	SM ENDCLAMP C CLR AL
302022D	SM ENDCLAMP C DRK AL
302023C	SM ENDCLAMP D CLR AL
302023D	SM ENDCLAMP D DRK AL
303024C	SM ENDCLAMP E CLR AL
302024D	SM ENDCLAMP E DRK AL
302025C	SM ENDCLAMP F CLR AL
302025D	SM ENDCLAMP F DRK AL
302026C	SM ENDCLAMP K CLR AL
302026D	SM ENDCLAMP K DRK AL



TYPICAL END CLAMP DETAILS



1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DETAIL
DESCRIPTION:	END CAPS
REVISION DATE:	9/27/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

**SM-P04**  
SHEET



1411 BROADWAY BLVD. NE  
ALBUQUERQUE, NM 87102 USA  
PHONE: 505.242.6411  
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DETAIL
DESCRIPTION:	END CLAMPS - TOP MOUNTING
REVISION DATE:	9/27/2017

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE  
NOMINAL

PRODUCT PROTECTED BY  
ONE OR MORE US PATENTS

LEGAL NOTICE

**SM-P05**  
SHEET



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

PROJECT NAME & ADDRESS

RICHARD BARRETO  
RESIDENCE

89 CALDWELL ST,  
SPRING LAKE, NC 28390

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-20

# SolaDeck

FLASHED PV ROOF-MOUNT COMBINER/ENCLOSURE

## Basic Features

- Stamped Seamless Construction
- 18 Gauge Galvanized Steel
- Powder Coated Surfaces
- Flashes into the roof deck
- 3 Roof deck knockouts .5", .75", 1"
- 5 Centering dimples for entry/exit fittings or conduit
- 2 Position Ground lug installed
- Mounting Hardware Included



SolaDeck Model SD 0783



## SolaDeck UL50 Type 3R Enclosures

Available Models:

- Model SD 0783 - (3" fixed Din Rail)
- Model SD 0786 - (6" slotted Din Rail)



## SolaDeck UL 1741 Combiner/Enclosures

Models SD 0783-41 and SD 0786-41 are labeled and ETL listed UL STD 1741 according to the UL STD 1741 for photovoltaic combiner enclosures.

Max Rated - 600VDC, 120AMPS

**Model SD 0783-41** 3" Fixed Din Rail fastened using Norlock System

### \*\*Typical System Configuration

- 4- Din Rail Mounted Fuse Holders 600VDC 30 AMP
- 1- Power Distribution Block 600VDC 175AMP
- 1- Bus Bar with UL lug

**Model SD 0786-41** 6" Slotted Din Rail fastened using steel studs

### \*\*Typical System Configuration

- 4- Din Rail Mounted Fuse Holders 600VDC 30 AMP
- 4- Din Rail Mounted Terminal Blocks
- Bus Bars with UL lug

\*\*Fuse holders and terminal blocks added in the field must be UL listed or recognized and meet 600 VDC 30 AMP 110C for fuse holders, 600V 50 AMP 90C for rail mounted terminal blocks and 600 V 175 AMP 90C for Power Distribution Blocks. Use Copper Wire Conductors.



Cover is trimmed to allow conduit or fittings. base is center dimpled for fitting locations.



Model SD 0783-41, wired with Din Rail mounted fuse holders, bus bar and power distribution block.



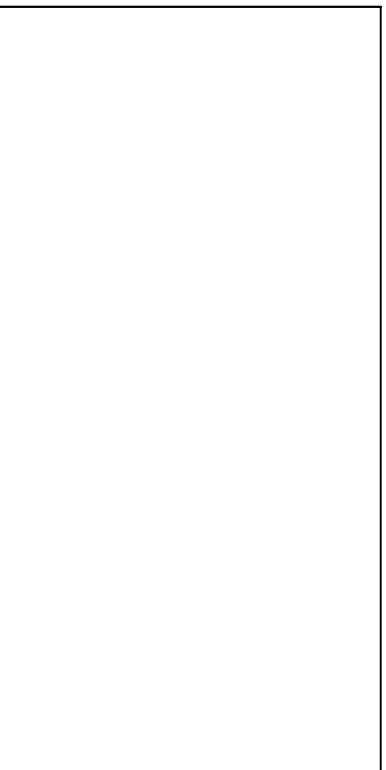
Model SD 0786-41, wired with Din Rail mounted fuse holders, terminal blocks and bus bars.

RSTC Enterprises, Inc • 2219 Heimstead Road • Eau Claire, WI 54703  
For product information call 1(866) 367-7782



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	



PROJECT NAME & ADDRESS  
**RICHARD BARRETO  
RESIDENCE**  
89 CALDWELL ST,  
SPRING LAKE, NC 28390

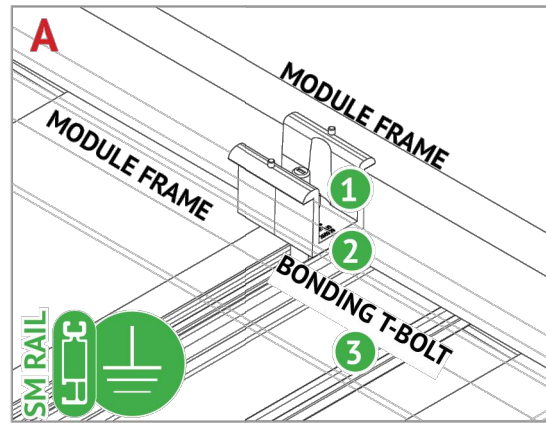
SHEET NAME  
**EQUIPMENT  
SPECIFICATION**

SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-21**

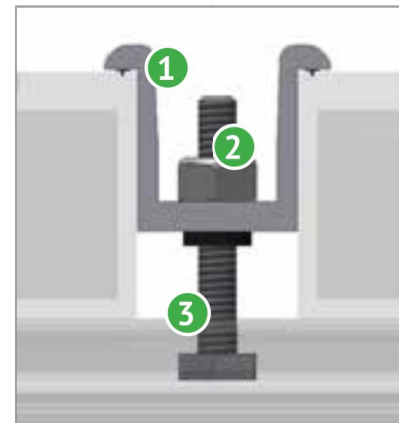


REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	12/26/2022	

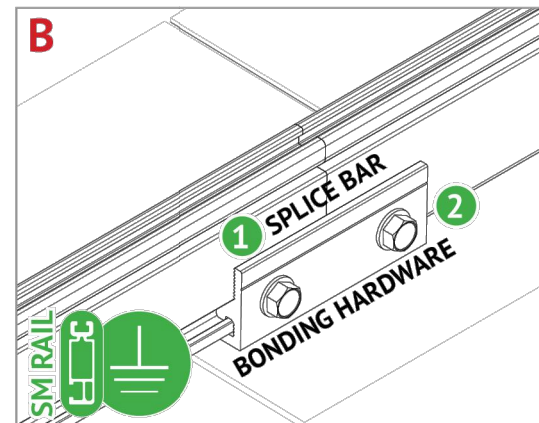


### BONDING MIDCLAMP ASSEMBLY

- 1 Aluminum mid clamp with stainless steel bonding pins that pierce module frame anodization to bond module to module through clamp
- 2 Stainless steel nut bonds aluminum clamp to stainless steel T-bolt
- 3 Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, clamp, and modules to SM rail



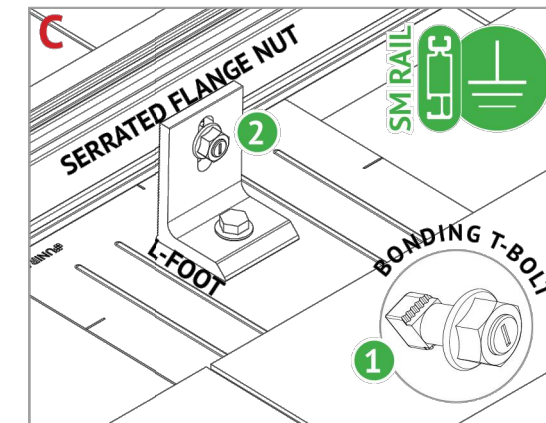
### BONDING MIDCLAMP ASSEMBLY



### BONDING RAIL SPLICE BAR

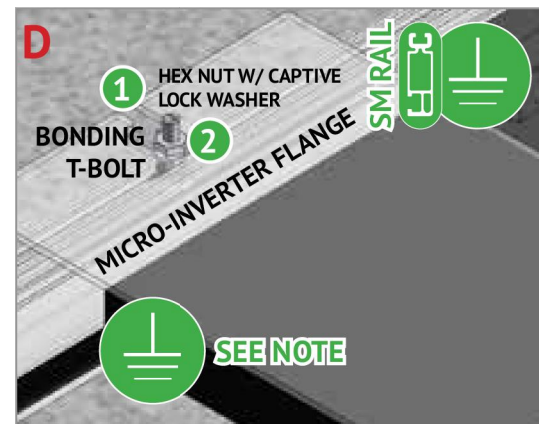
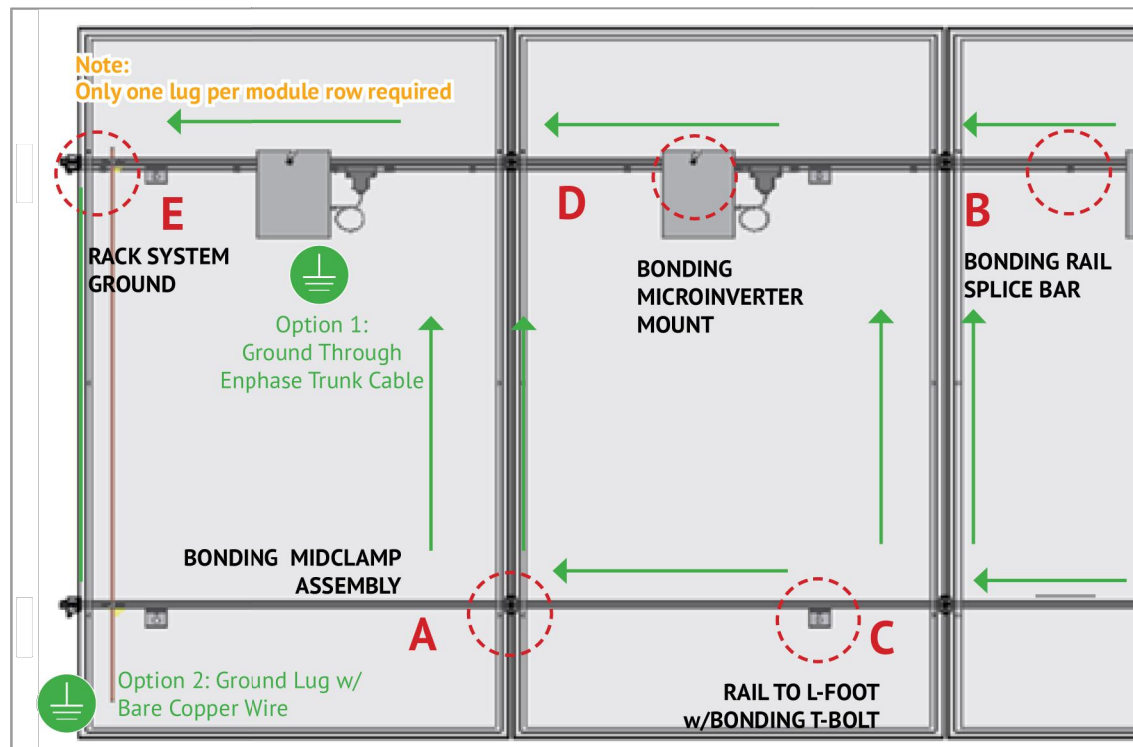
- 1 Bonding Hardware creates bond between splice bar and each rail section
- 2 Aluminum splice bar spans across rail gap to create rail to rail bond. Rail on at least one side of splice will be grounded.

**Note:** Splice bar and bolted connection are non-structural. The splice bar function is rail alignment and bonding.



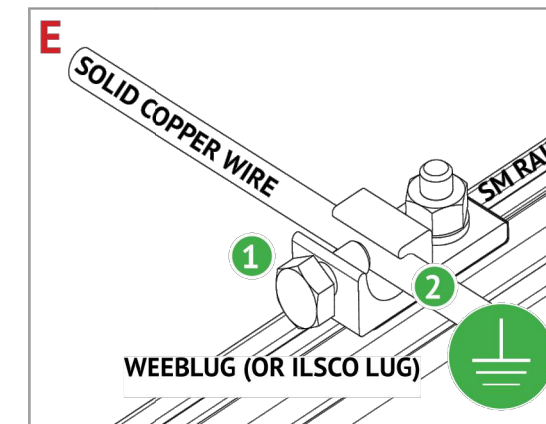
### RAIL TO L-FOOT w/BONDING T-BOLT

- 1 Serrated flange nut removes L-foot anodization to bond L-Foot to stainless steel T-bolt
- 2 Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail



### BONDING MICROINVERTER MOUNT

- 1 Hex nut with captive lock washer bonds metal microinverter flange to stainless steel T-bolt
- 2 Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail **System ground including racking and modules may be achieved through the trunk cable of approved microinverter systems. See page J for details**



### RACK SYSTEM GROUND

- 1 WEEB washer dimples pierce anodized rail to create bond between rail and lug
- 2 Solid copper wire connected to lug is routed to provide final system ground connection. **NOTE: IlSCO lug can also be used when secured to the side of the rail. See page K for details**

PROJECT NAME & ADDRESS  
**RICHARD BARRETO RESIDENCE**  
89 CALDWELL ST,  
SPRING LAKE, NC 28390

SHEET NAME  
**GROUNDING DETAIL**

SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-22**