



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

Tuesday, October 24, 2023

Property Owner: Kiddian Gonzalez

Property Address: 1651 Raynor McLamb Road, Linden, NC 28356

RE: Photovoltaic System Roof Installations

I have reviewed the existing structure referenced above to determine the adequacy of the existing structure to 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. The structural considerations used in our review and assessment include the following:

Evaluation Criteria:

Applied Codes: ASCE 7-10 NCBC 2018 NCRC 2018 NEC 2020

Risk Category: II

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

Wind Exposure Category: C

Ground Snow Load: 10 PSF

Seismic Short Period Acceleration (SDS): 0.208

Existing Structure:

Roof Material: Shingle

Roof Structure: 2x6 Rafters

Roof Slope: 5/12

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MANDEVILLE, LA 70471
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NORTH CAROLINA FIRM NO. C4113

PRINCIPAL Infrastructure®

Architecture ♦ Engineering ♦ Construction

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Effect of the Solar Array on Structure Loading:

Gravity Load:

The existing structure was evaluated using gravity load combinations including dead, snow, and live loads per IRC Section R324.4. 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). The component wind loads were evaluated and did not significantly increase the wind load on the structure. 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:

The solar panel installation represents an increase in the weight of the roof and corresponding lateral seismic loads of less than 10%. By code, therefore, re-analysis of the existing structure is not required.

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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.

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

Property Owner:	Kiddian Gonzalez	Individual Panel Dimensions		
Project Address:	1651 Raynor McLamb Road	Length (in)	Width (in)	Area (sf)
City, State:	Linden, NC 28356	74	41.1	21.12

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:	31 ft.
	Width (w):	31 ft.		
Roof Height (h):		15 ft.	Must be less than 60	✓
Pitch:	5 on 12 =	22.6°	Must be less than 45°	✓
Roof Configuration		Gable		
Roof Structure:		2x6 Rafters		
Roof material:		Plywood		
Ultimate Wind Speed (mph):		118	From ASCE 7-10, Fig. 26.5	
Exposure Category:		C	Para 26.7.3	
Directionality Factor, K_d		0.85	Table 26.6-1	
Risk Category:		2	Table 1.5-2	
Exposure Coefficient, K_z		0.9	Table 30.3-1	
Topographic Adj., K_{zt}		1	Fig. 26.8-1	
Effective Wind Area (sf):		22	(Area per individual panel)	
Velocity Pressure (psf), q_n :		27.27	psf, Eq. 30.3-1	
Internal Pressure Coeff, GC_{pi}		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	3.1
2 - Roof Height x 0.4	6
3 - Least Roof Horizontal Dimension (L or W) x 0.04	1.24
4 - Lesser of (1) and (2)	3.1
5 - Greater of (3) and (4)	3.1
6 - Greater of (5) and 3 feet	a= 3.1 ft.

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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 _p	Pressure	GC _p	Pressure	
Zone 1	-0.88	-17.3	0.39	16.0	Interior Roof Area, >(a) ft from edge
Zone 2	-1.52	-27.8	0.38	16.0	Strip of (a) ft wide at roof edge
Zone 3	-2.39	-42.0	0.35	16.0	Corner intersection of Zone 2 strips

Snow Load		
Ground Snow Load, p _g	10.0	From ASCE 7 or AHJ
Reducible (Y/N)?		
Terrain Category:	C	Para 6.5.6.3
Exposure	Fully	
Exposure Factor C _e	0.9	Table 7-2
Thermal Factor, C _t	1.0	Table 7-3
Importance Factor, I _s	1.0	Table 1.5.2
Roof Configuration	Gable	
Roof Slope	22.6°	
Distance from Eave to Ridge	15.5	
p _m , Minimum required Snow Load	N/A	Para. 7.3.4
p _f , Calculated Snow Load	6.30	Eq. 7.3-1
p _f , Design Snow Load	6.30 psf	

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Mount Selection and Spacing		
Manufacturer:	Unirac	Portrait Panel Orientation
Mount:	Flashkit Pro	Allowable Arrangement by Uplift Pressure
Substrate:	Wood Rafters/Truss Top Chord	≤ 39 psf : 2 rails, mounts @ 4'-0" o.c.
Connector:	3/8" - #16 Lag Bolt/Screws	40 to 78 psf : 2 rails, mounts @ 2'-0" o.c.
Allowable Uplift:	480lb, max.	79 to 117 psf : 3 rails, mounts @ 2'-0" o.c.
Portrait Mount Layout		118 to 156 psf : 4 rails, mounts @ 2'-0" o.c.
Zone 1	2 rails, mounts @ 4'-0" o.c.	≥ 157 psf : Mount capacity exceeded
Zone 2	2 rails, mounts @ 4'-0" o.c.	
Zone 3	2 rails, mounts @ 2'-0" o.c.	
<i>(Allowable loads are based on individual mount failure before rail failure)</i>		

Landscape Mount Layout		Landscape Panel Orientation
Zone 1	2 rails, mounts @ 6'-0" o.c.	Allowable Arrangement by Uplift Pressure
Zone 2	2 rails, mounts @ 6'-0" o.c.	≤ 47 psf : 2 rails, mounts @ 6'-0" o.c.
Zone 3	2 rails, mounts @ 6'-0" o.c.	48 to 70 psf : 3 rails, mounts @ 6'-0" o.c. or 2 rails, mounts @ 4'-0" o.c.
		71 to 105 psf : 3 rails, mounts @ 4'-0" o.c.
		106 to 140 psf : 2 rails, mounts @ 2'-0" o.c.
		141 to 210 psf : 3 rails, mounts @ 2'-0" o.c.
		211 to 280 psf : 4 rails, mounts @ 2'-0" o.c.
		≥ 281 psf : Mount capacity exceeded

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PHOTOVOLTAIC ROOF MOUNT SYSTEM

21 MODULES-ROOF MOUNTED - 8.400 kWDC, 5.040 kWAC

1651 RAYNOR MCLAMB RD, LINDEN, NC 28356 USA



SYSTEM SUMMARY:

- (N) 21 - Q.CELL Q.PEAK DUO BLK ML-G10+ (400W) MODULES
- (N) 21 - ENPHASE ENERGY IQ8-60-2-US [240V] MICRO-INVERTERS
- (N) JUNCTION BOX
- (E) 200A MAIN SERVICE PANEL WITH (E) 200A MAIN BREAKER
- (N) 30A NON-FUSED AC DISCONNECT
- (N) ENPHASE IQ COMBINER 4
- X2-IQ-AM1-240-4 (IEEE 1547:2018)

INTERCONNECTION METHOD : BACKFEED BREAKER

DESIGN CRITERIA:

- ROOF TYPE: - COMP SINGLE
- NUMBER OF LAYERS: - 02
- ROOF FRAME: - 2"X6" RAFTERS @24" O.C.
- STORY: - ONE STORY
- SNOW LOAD :- 10 PSF
- WIND SPEED :- 118 MPH
- WIND EXPOSURE:- C
- RISK CATEGORY:- II
- COORDINATE:- 35.285098, -78.840995

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NOTE: INSTALLER TO DETERMINE OPTIMAL CONDUIT RUN ON SITE. ATTIC RUN IS OPTIONAL UNLESS REQUIRED BELOW.
ATTIC RUN: REQUIRED

GOVERNING CODES:

- 2018 NORTH CAROLINA BUILDING CODE (NCBC)
- 2018 NORTH CAROLINA RESIDENTIAL CODE (NCRC)
- 2018 NORTH CAROLINA FIRE CODE (NCFC)
- 2018 NORTH CAROLINA PLUMBING CODE (NCPC)
- 2018 NORTH CAROLINA MECHANICAL CODE (NMC)
- 2018 NORTH CAROLINA FUEL GAS CODE (NCFGC)
- 2018 NORTH CAROLINA ENERGY CONSERVATION CODE (NCECC)
- 2020 NORTH CAROLINA ELECTRICAL CODE (NCEC)

SHEET INDEX

- | | |
|-------|--|
| PV-0 | COVER SHEET |
| PV-1 | SITE PLAN WITH ROOF PLAN |
| PV-2 | ROOF PLAN WITH MODULES |
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| PV-4 | ELECTRICAL LINE DIAGRAM WITH CALCULATION |
| PV-5 | WARNING LABELS & PLACARD |
| PV-6+ | EQUIPMENT SPEC SHEETS |

CONSTRUCTION NOTE:

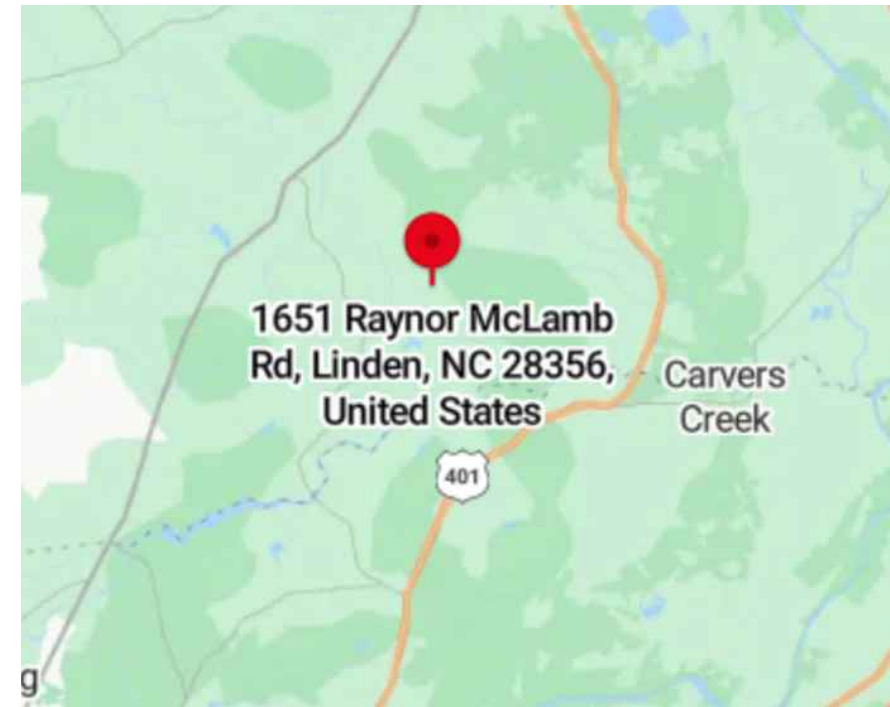
A LADDER SHALL BE IN PLACE FOR INSPECTION
THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE AND THIS SYSTEM IS A UTILITY GRID INTERACTIVE SYSTEM
A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH NEC 690-47 AND 250-50 THROUGH 60 250-166 SHALL BE PROVIDED PER NEC, GROUNDING ELECTRODE SYSTEM OF EXISTING BUILDING MAY BE USED AND BONDED TO AT THE SERVICE ENTRANCE. IF EXISTING SYSTEM IS INACCESSIBLE, OR INADEQUATE, OR IS ONLY METALLIC WATER PIPING, 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 GREATER THAN #8 AWG COPPER AND BONDED TO THE EXISTING GROUNDING ELECTRODE TO PROVIDE OR A COMPLETE GROUND. EACH MODULE WILL BE GROUNDED USING THE SUPPLIED GROUNDING POINTS IDENTIFIED BY THE MANUFACTURER.
EXPOSED NON-CURRENT CARRYING METAL PARTS OF MODULE FRAMES, EQUIPMENT, AND CONDUCTOR ENCLOSURES SHALL BE GROUNDED IN ACCORDANCE WITH 250.134 OR 250.136(A) REGARDLESS OF VOLTAGE. PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED
ALL SIGNAGE WILL BE INSTALLED AS REQUIRED BY AND 2017 NEC.
HEIGHT OF INTEGRATED AC/DC DISCONNECT SHALL NOT EXCEED 6' 7" PER NEC 240.24
THE GROUNDING ELECTRODE CONDUCTOR SHALL BE PROTECTED FROM PHYSICAL DAMAGE BETWEEN THE GROUNDING ELECTRODE AND THE PANEL (OR INVERTER) IF SMALLER THAN #6 AWG COPPER WIRE PER NEC 250-64B. THE GROUNDING ELECTRODE CONDUCTOR WILL BE CONTINUOUS, EXCEPT FOR SPLICES OR JOINTS AT BUSBARS WITHIN LISTED EQUIPMENT PER NEC 250.64C. ALL EXTERIOR CONDUIT SHALL BE PAINTED TO MATCH ADJACENT SURFACES. THE PV CONNECTION IN THE PANEL BOARD SHALL BE POSITIONED AT THE OPPOSITE (LOAD) END FROM THE INPUT FEEDER LOCATION OR MAIN CIRCUIT LOCATION. NEC 690.64(B)(7)
SITE CONDITIONS SHALL PREVAIL IF NO SCALE IS GIVEN. DRAWINGS ARE NOT NECESSARILY TO SCALE. ALL DIMENSIONS SHALL BE VERIFIED BY SUBCONTRACTOR UPON COMMENCEMENT OF CONSTRUCTION.

ELECTRICAL NOTES

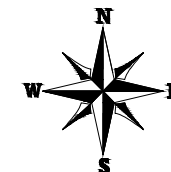
- ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 & 75 DEGREE C WET ENVIRONMENT.
- WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, 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 JUNCTION BOXES, 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 E.G.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
- THE POLARITY OF THE GROUNDED CONDUCTORS IS NEGATIVE



1 AERIAL PHOTO
PV-0 SCALE: NTS



2 VICINITY MAP
PV-0 SCALE: NTS



LIGHTING ELECTRIC

230 Blacksnake Rd,
Stanley, NC 28164-1622
LICENSE : NC-29517

VERSION

DESCRIPTION	DATE	REV
INITIAL RELEASE	10/19/2023	UR

PROJECT NAME

KIDDIAN GONZALEZ
1651 RAYNOR MCLAMB RD,
LINDEN, NC 28356 USA
APN# 0545-78-5655.000
UTILITY: N/A
AHJ: HARNETT COUNTY

SHEET NAME

COVER SHEET

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

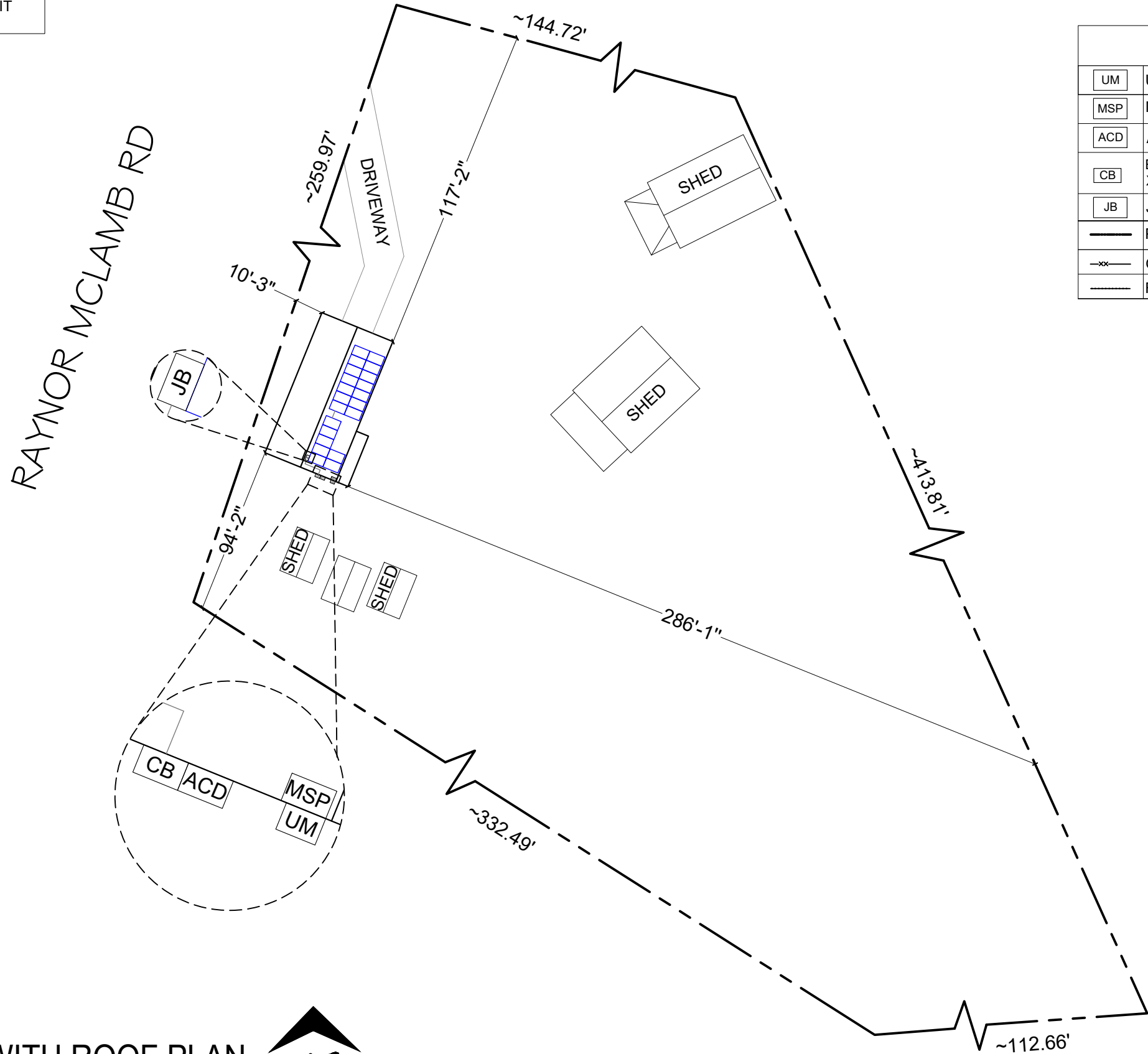
PV-0

● **ROOF ACCESS POINT** SHALL BE LOCATED IN AREAS THAT DO NOT REQUIRE THE PLACEMENT OF GROUND LADDERS OVER OPENINGS SUCH AS WINDOWS OR DOORS, AND LOCATED AT STRONG POINTS OF BUILDING CONSTRUCTION IN LOCATIONS WHERE THE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS TREE LIMBS, WIRES OR SIGNS.

NOTE:
3/4" OR GREATER EMT CONDUIT
RUN (7/8" ABOVE ROOF)

NOTE:
A. ALL ELECTRICAL EQUIPMENT, INVERTERS/COMBINER, DISCONNECTS, MAIN SERVICE PANELS, ETC. SHALL NOT BE INSTALLED WITHIN 3' OF THE GAS METERS' SUPPLY OR DEMAND PIPING.

LEGEND	
UM	UTILITY METER
MSP	MAIN SERVICE PANEL
ACD	AC DISCONNECT
CB	ENPHASE IQ COMBINER 4 X2-IQ-AM1-240-4 (IEEE 1547:2018)
JB	JUNCTION BOX
—	PROPERTY LINE
—x—	GATE
----	FENCE



LIGHTING ELECTRIC

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SHEET NAME

SITE PLAN WITH
ROOF PLAN

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-1

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1 SITE PLAN WITH ROOF PLAN

SCALE: 3/128" = 1'-0"



MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 21 MODULES
 MODULE TYPE = Q.CELL Q.PEAK DUO BLK ML-G10+ (400W) MODULES
 MODULE WEIGHT = 48.5 LBS / 22.0 KG.
 MODULE DIMENSIONS = 74.0X 41.1 = 21.12 SF
 UNIT WEIGHT OF ARRAY = 2.30 PSF

- PLUMBING VENTS, SKYLIGHTS AND MECHANICAL VENTS SHALL NOT BE COVERED, MOVED, RE-ROUTED OR RE-LOCATED.

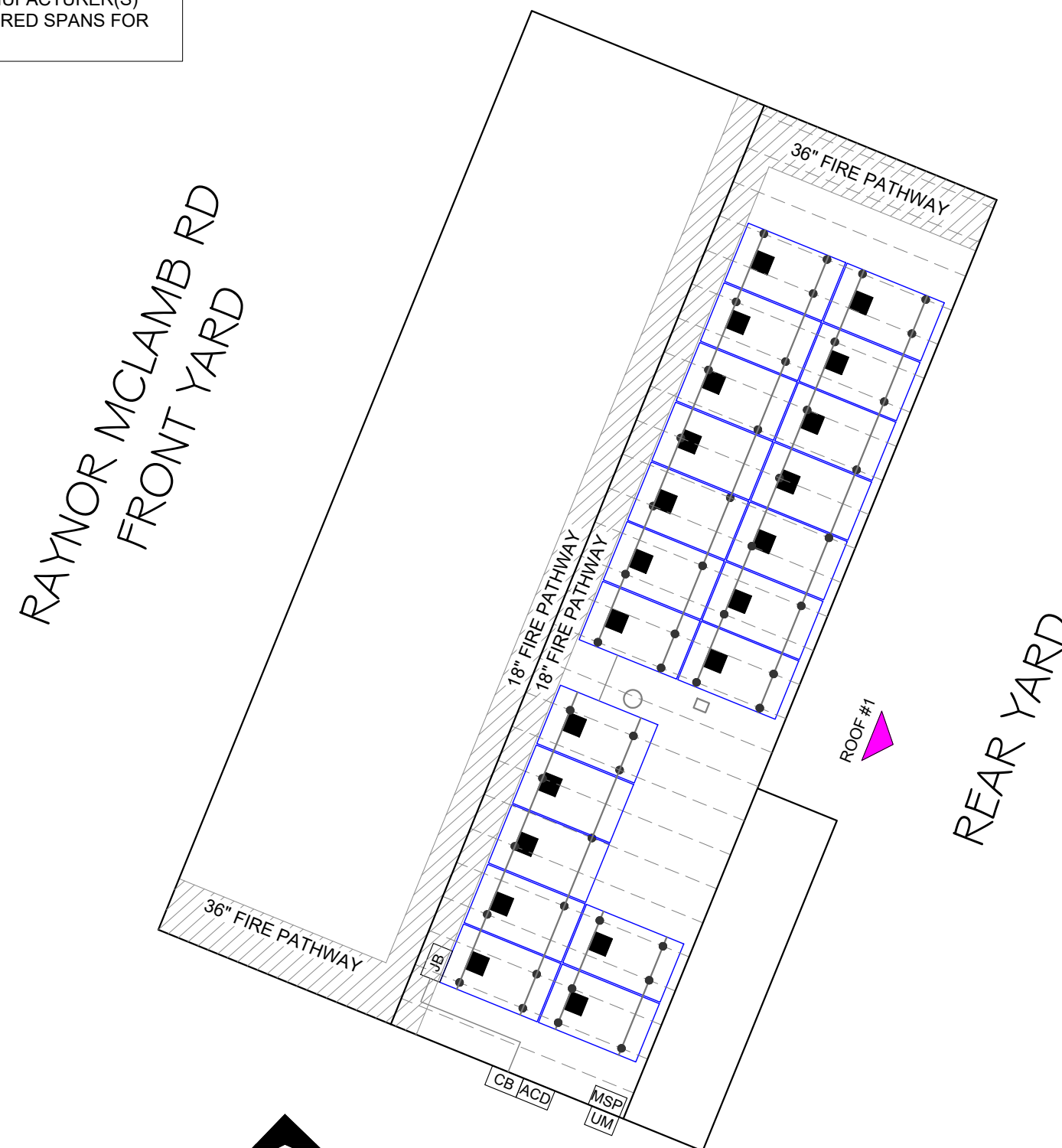
NOTE: ACTUAL ROOF CONDITIONS AND RAFTERS (OR SEAM) LOCATIONS MAY VARY. INSTALL PER MANUFACTURER(S) INSTALLATION GUIDELINES AND ENGINEERED SPANS FOR ATTACHMENTS

ARRAY AREA & ROOF AREA CALC'S		
AREA OF NEW ARRAY (Sq. Ft.)	AREA OF ROOF(PLAN VIEW) (Sq. Ft.)	TOTAL ROOF AREA COVERED BY ARRAY %
443.54	1567	28.30%

ARRAY AREA & ROOF AREA CALC'S				
ROOF	# OF MODULES	ARRAY AREA (Sq. Ft.)	ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
#1	21	443.54	829	53.50

ROOF DESCRIPTION				
ROOF TYPE			COMP SINGLE ROOF	
ROOF	ROOF TILT	AZIMUTH	RAFTERS SIZE	RAFTERS SPACING
#1	22°	112°	2"X6"	24" O.C.

NOTE:
 3/4" OR GREATER EMT CONDUIT RUN (7/8" ABOVE ROOF)



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BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
RAIL	11	UNIRAC SM RAIL RAIL 168" MILL
SPLICE	06	BND SPLICE BAR PRO SERIES MILL
MID CLAMP	34	UNIVERSAL AF SERIES MID CLAMP
END CLAMP	16	UNIVERSAL AF SERIES END CLAMP
ATTACHMENT	47	UNIRAC FLASH KIT PRO
GROUNDING LUG	04	GROUND LUG

LEGEND	
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MSP	MAIN SERVICE PANEL
ACD	AC DISCONNECT
CB	ENPHASE IQ COMBINER 4 X2-IQ-AM1-240-4 (IEEE 1547:2018)
JB	JUNCTION BOX
■	ENPHASE ENERGY IQ8-60-2-US [240V] MICRO-INVERTER
—	UNIRAC SM RAIL RAIL
●	ROOF ATTACHMENT UNIRAC FLASH KIT PRO @ 48" O.C.
○ □	VENT, ATTIC FAN (ROOF OBSTRUCTION)
⊞	CHIMNEY
----	RAFTERS
▨	FIRE SETBACK

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1 ROOF PLAN WITH MODULES
 SCALE: 1/8" = 1'-0"

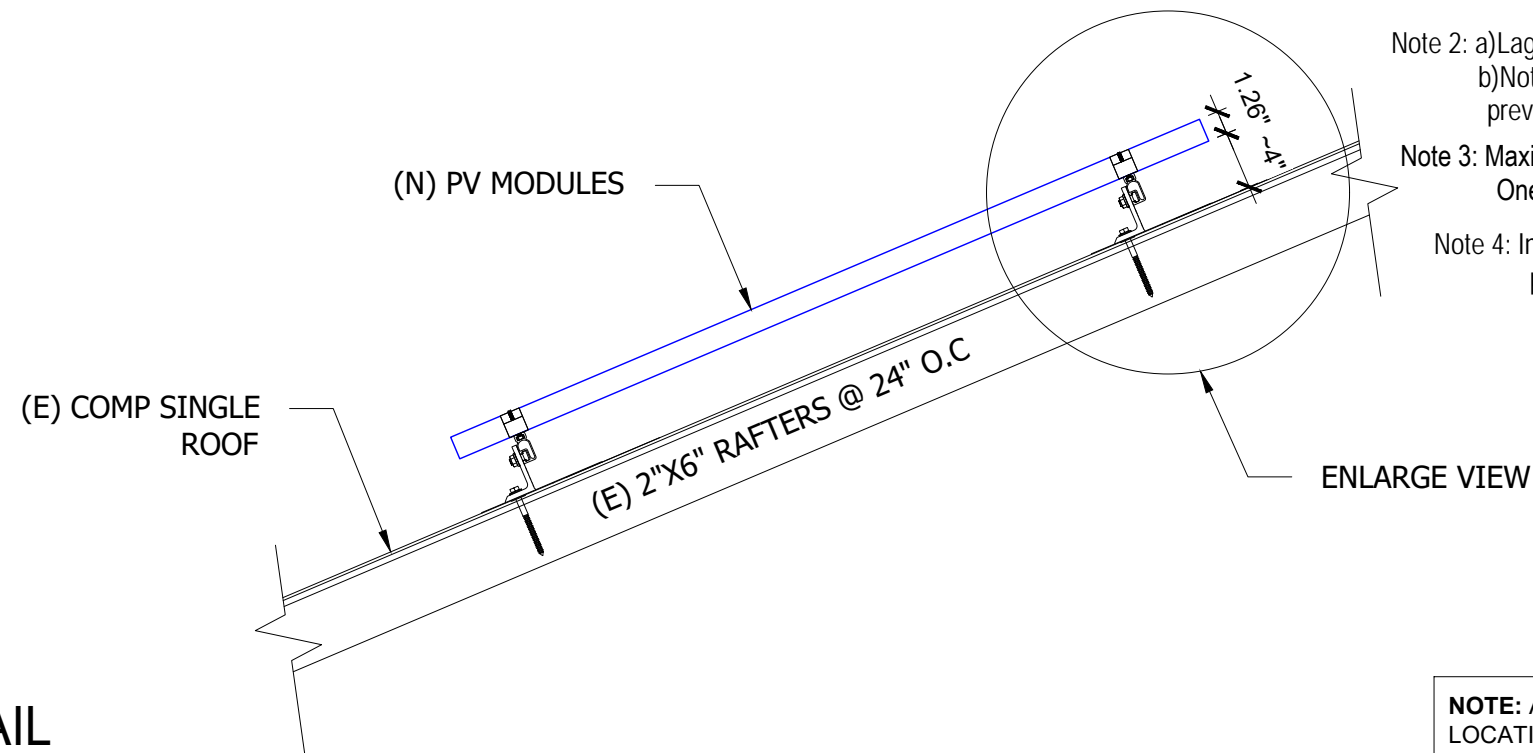


SHEET NAME
 ROOF PLAN WITH MODULES

SHEET SIZE
 ANSI B
 11" X 17"

SHEET NUMBER
 PV-2

1 ATTACHMENT DETAIL
SCALE: NTS



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

NOTE: ACTUAL ROOF CONDITIONS AND RAFTERS (OR SEAM) LOCATIONS MAY VARY. INSTALL PER MANUFACTURER(S) INSTALLATION GUIDELINES AND ENGINEERED SPANS FOR ATTACHMENTS

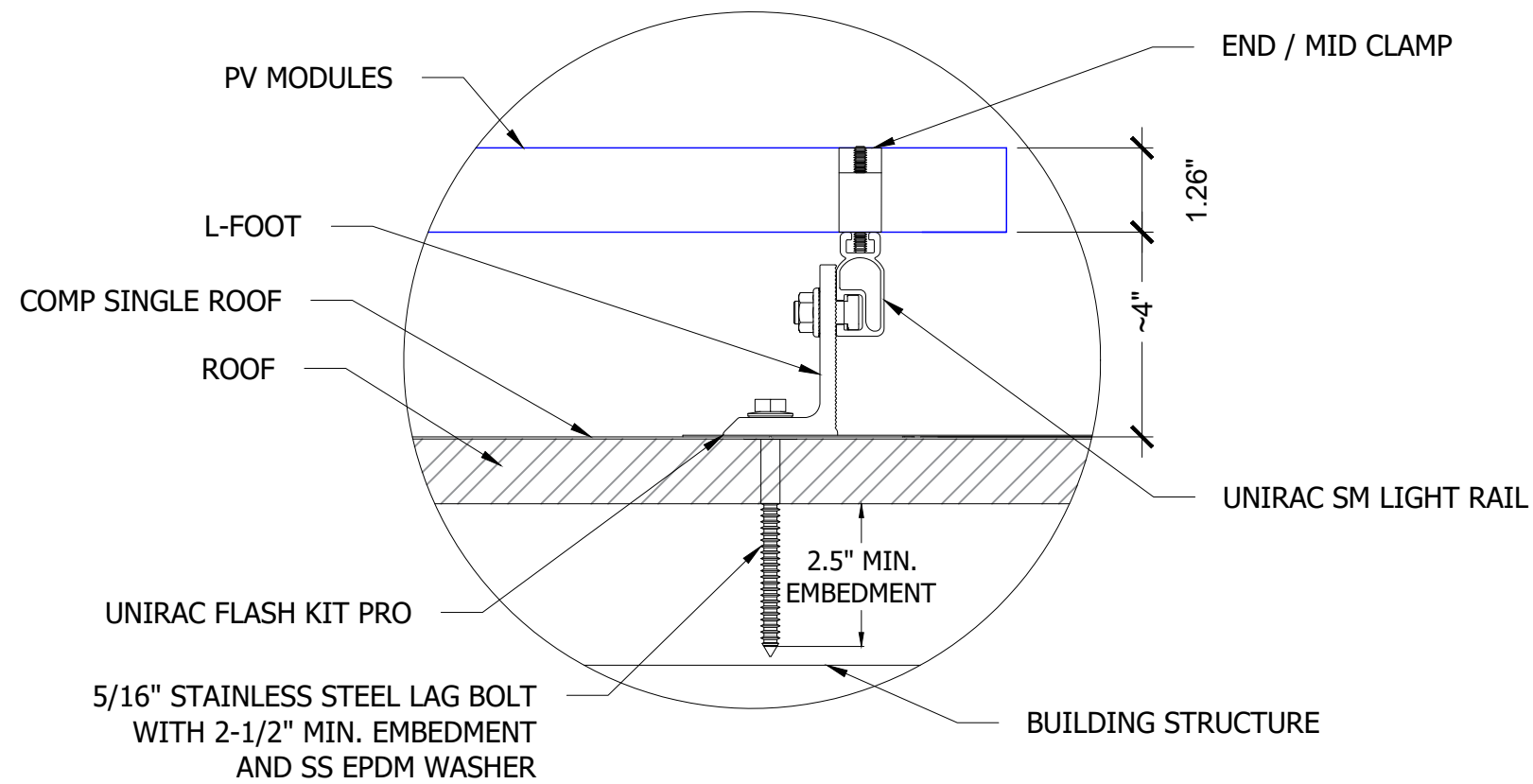
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2 ATTACHMENT DETAIL (ENLARGED VIEW)
SCALE: NTS



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AHJ: HARNETT COUNTY

SHEET NAME

ATTACHMENT
DETAIL

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-3

SOLAR MODULE SPECIFICATIONS						
MANUFACTURER / MODEL #	VMP	IMP	VOC	ISC	TEMPERATURE COEFFICIENT OF Voc	# OF MODULES
Q.CELL Q.PEAK DUO BLK ML-G10+ (400W), 0.4 kVA	37.13	10.77	45.30	11.14	-0.27%/°C	21
MODULE DIMENSION	74.0" L x 41.1" W x 1.26"D					

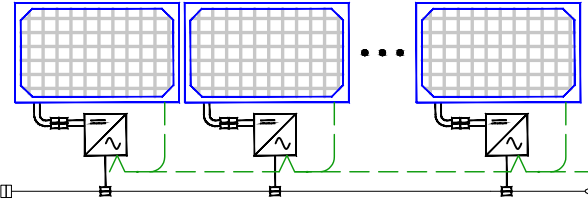
SYSTEM SIZE:- 21 x 400W = 8.400 kWDC
21 x 240W = 5.040 kWAC

NOTE:
3/4" OR GREATER EMT CONDUIT RUN (7/8" ABOVE ROOF)

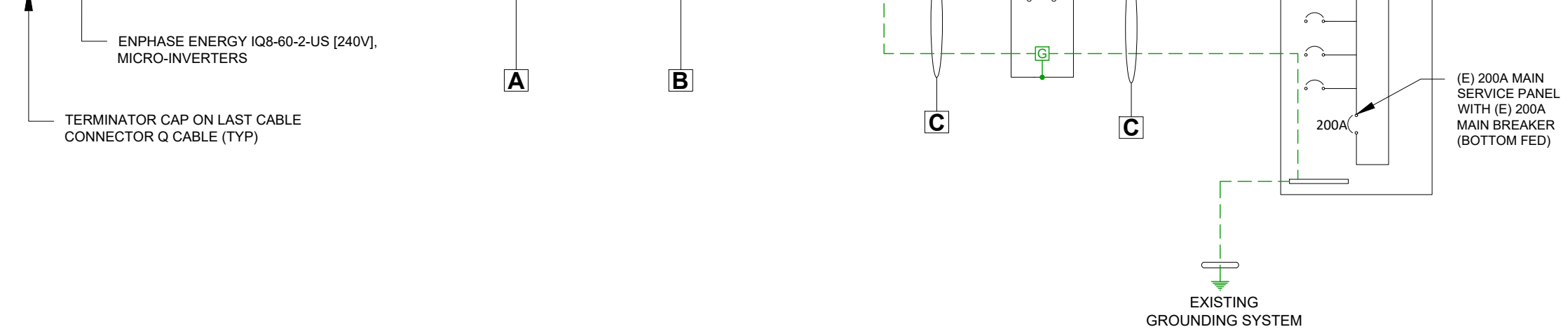
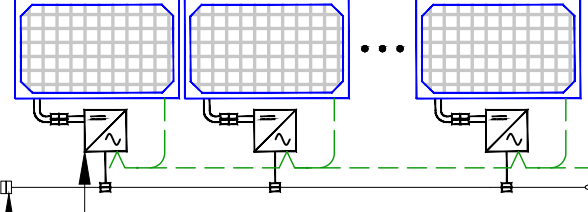
AMBIENT TEMPERATURE SPECIFICATIONS			
RECORD LOW TEMP	AMBIENT TEMP (HIGH TEMP 2%)	CONDUCTOR TEMPERATURE RATE (ON ROOF)	CONDUCTOR TEMPERATURE RATE (OFF ROOF)
-10°	36°	90°	75°

INVERTER SPECIFICATIONS			
MANUFACTURER / MODEL #	QUANTITY	NOMINAL OUTPUT VOLTAGE	NOMINAL OUTPUT CURRENT
ENPHASE ENERGY IQ8-60-2-US [240V], 0.3 kVA	21	240 VAC	1.00A

11 MICRO-INVERTERS IN BRANCH CIRCUIT #1



10 MICRO-INVERTERS IN BRANCH CIRCUIT #2



WIRE TAG	CONDUIT	WIRE QTY	WIRE GAUGE	WIRE TYPE	TEMP. RATING	WIRE AMPACITY (A)	TEMP. DERATE	CONDUIT FILL DERATE	DERATED AMPACITY (A)	INVERTER QTY.	DESIGN CURRENT (A)	GROUND SIZE	GROUND WIRE TYPE				
A	OPEN AIR	2	12 AWG	Q-CABLES	90°C	30	0.91	N/A	27.30	11	13.75	06 AWG	BARE CU GND				
B	3/4" EMT	4	10 AWG	12 AWG	THWN-2	NM-B CABLES WHERE RUN INDOORS	90°C	40	30	0.91	0.8	29.12	21.84	11	13.75	10 AWG	THWN-2
C	3/4" EMT	3	10 AWG	THWN	75°C	35	0.88	1.0	30.80	21	26.25	10 AWG	THWN				

LIGHTING ELECTRIC

230 Blacksnake Rd,
Stanley, NC 28164-1622
LICENSE : NC-29517

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	10/19/2023	UR

PROJECT NAME
KIDDIAN GONZALEZ
1651 RAYNOR MCLAMB RD,
LINDEN, NC 28356 USA
APN# 0545-78-5655.000
UTILITY: N/A
AHJ: HARNETT COUNTY

SHEET NAME
ELECTRICAL LINE DIAGRAM WITH CALCULATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-4

1 ELECTRICAL LINE DIAGRAM WITH CALCULATION
SCALE: NTS

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

LABEL LOCATION:
INVERTER(S), AC DISCONNECT(S), AC COMBINER PANEL (IF APPLICABLE).
PER CODE(S): NEC 2020: NEC 706.15 (C)(4) & NEC 690.13(B)

PHOTOVOLTAIC
AC DISCONNECT

LABEL LOCATION:
AC DISCONNECT
NEC 690.13(B)

⚠ WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION:
POINT OF INTERCONNECTION
PRODUCTION METER
NEC 705.12(B)(3)(3) & NEC 690.59

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

LABEL LOCATION:
SERVICE PANEL IF SUM OF BREAKERS EXCEEDS PANEL RATING
NEC 705.12 (B)(3)(2)

NOTES AND SPECIFICATIONS:

- SIGNS AND LABELS SHALL MEET THE REQUIREMENTS OF THE 2020 ARTICLE 110.21(B), UNLESS SPECIFIC INSTRUCTIONS ARE REQUIRED BY SECTION 690, OR IF REQUESTED BY THE LOCAL AHJ.
- SIGNS AND LABELS SHALL ADEQUATELY WARN OF HAZARDS USING EFFECTIVE WORDS, COLORS AND SYMBOLS.
- LABELS SHALL BE PERMANENTLY AFFIXED TO THE EQUIPMENT OR WIRING METHOD AND SHALL NOT BE HAND WRITTEN.
- LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED.
- SIGNS AND LABELS SHALL COMPLY WITH ANSI Z535.4-2011, PRODUCT SAFETY SIGNS AND LABELS, UNLESS OTHERWISE SPECIFIED.
- DO NOT COVER EXISTING MANUFACTURER LABELS.

PHOTOVOLTAIC AC DISCONNECT
MAXIMUM AC OPERATING CURRENT: 21.00 AMPS
NOMINAL OPERATING AC VOLTAGE: 240 VAC

LABEL LOCATION:
AC DISCONNECT(S), PHOTOVOLTAIC SYSTEM POINT OF INTERCONNECTION.
PER CODE(S): NEC 2020: 690.54

PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION:
EMT/CONDUIT RACEWAYS
(PER CODE: NEC690.31(D)(2))

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT

LABEL LOCATION:
MAIN SERVICE DISCONNECT / UTILITY METER
(PER CODE: NEC 690.13(B))

⚠ WARNING
THIS EQUIPMENT FED BY MULTIPLE SOURCES TOTAL RATING OF ALL OVERCURRENT DEVICES EXCLUDING MAIN POWER SUPPLY SHALL NOT EXCEED AMPACITY OF BUSBAR

LABEL LOCATION:
POINTS OF CONNECTION/BREAKER
CODE: NEC 705.12(B)(3)(3)

RAPID SHUTDOWN FOR SOLAR PV SYSTEM

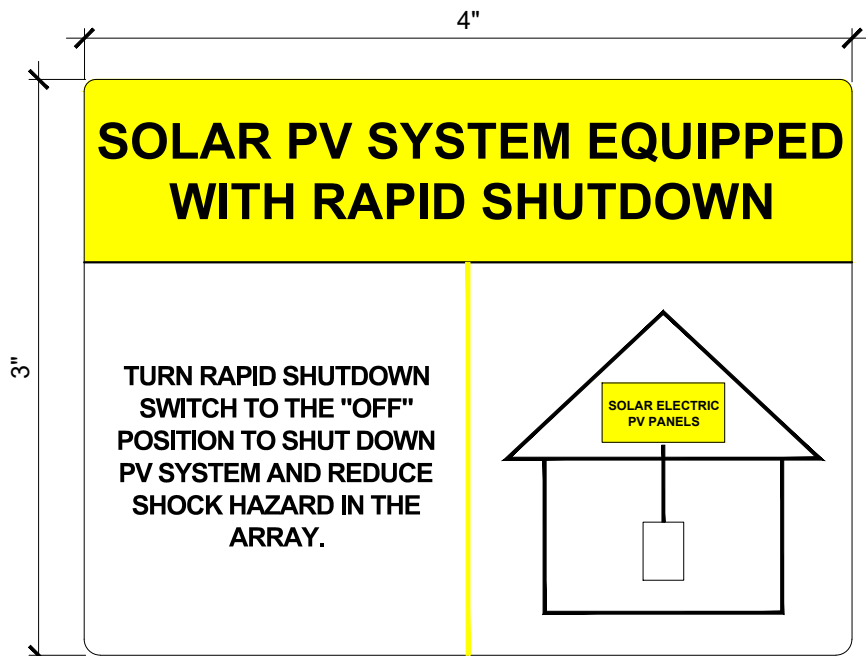
LABEL LOCATION:
UTILITY SERVICE ENTRANCE/METER, INVERTER/DC DISCONNECT IF REQUIRED BY LOCAL AHJ, OR OTHER LOCATIONS AS REQUIRED BY LOCAL AHJ.
PER CODE(S): NEC 2020: 690.56(C)(2)

⚠ CAUTION
PHOTOVOLTAIC SYSTEM CIRCUIT IS BACKFED

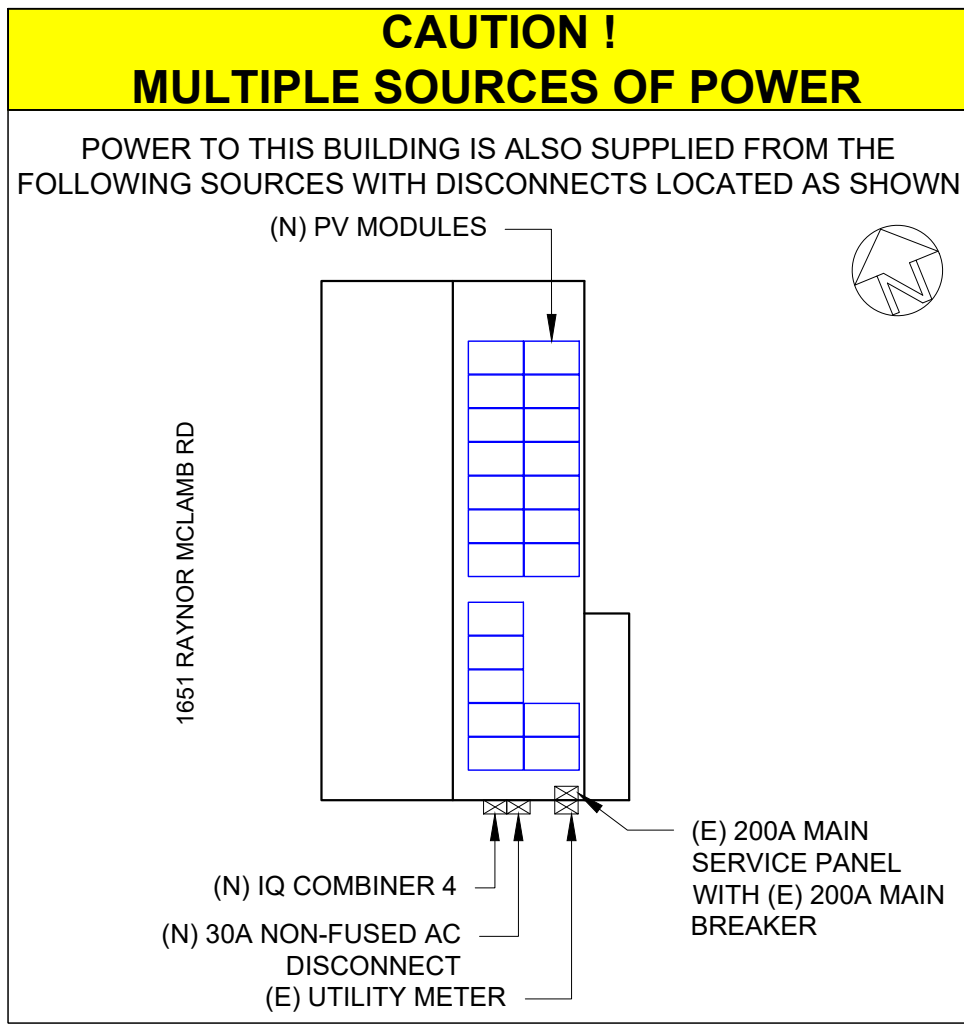
LABEL LOCATION:
MSP (PER CODE: NEC 705.12(D) & NEC 690.59)

⚠ WARNING
THE DISCONNECTION OF THE GROUNDED CONDUCTOR(S) MAY RESULT IN OVERVOLTAGE ON THE EQUIPMENT

LABEL LOCATION:
INVERTER
PER CODE: NEC 690.31(E)



LABEL LOCATION:
ON OR NO MORE THAT 1 M (3 FT) FROM THE SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED.
PER CODE(S): NEC 2020: IFC 690.56(C)



LIGHTING ELECTRIC

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1651 RAYNOR MCLAMB RD,
LINDEN, NC 28356 USA
APN# 0545-78-5655.000
UTILITY: N/A
AHJ: HARNETT COUNTY

SHEET NAME
WARNING LABELS & PLACARD

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-5

Q.PEAK DUO BLK ML-G10+ SERIES



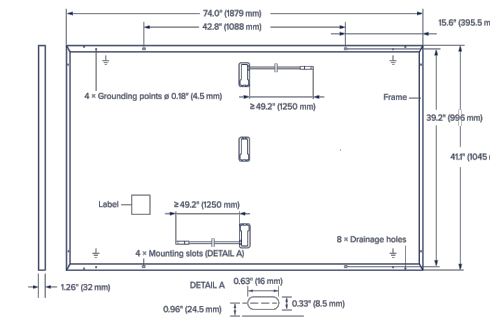
385-410 Wp | 132 Cells
20.9% Maximum Module Efficiency

MODEL Q.PEAK DUO BLK ML-G10+

Q.PEAK DUO BLK ML-G10+ SERIES

Mechanical Specification

Format	74.0 in × 41.1 in × 1.26 in (including frame) (1879 mm × 1045 mm × 32 mm)
Weight	48.5 lbs (22.0 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodised aluminium
Cell	6 × 22 monocrystalline Q.ANTUM solar half cells
Junction box	2.09-3.98 in × 1.26-2.36 in × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), IP67, with bypass diodes
Cable	4 mm ² Solar cable; (+) ≥ 49.2 in (1250 mm), (-) ≥ 49.2 in (1250 mm)
Connector	Stäubli MC4; IP68



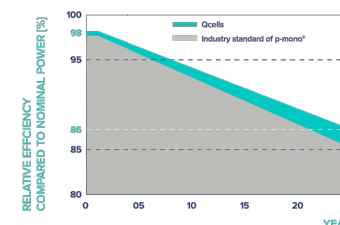
Electrical Characteristics

POWER CLASS		385	390	395	400	405	410	
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC ¹ (POWER TOLERANCE +5 W/-0 W)								
Minimum	Power at MPP ¹	P _{MPP} [W]	385	390	395	400	405	410
	Short Circuit Current ¹	I _{SC} [A]	11.04	11.07	11.10	11.14	11.17	11.20
	Open Circuit Voltage ¹	V _{OC} [V]	45.19	45.23	45.27	45.30	45.34	45.37
	Current at MPP	I _{MPP} [A]	10.59	10.65	10.71	10.77	10.83	10.89
	Voltage at MPP	V _{MPP} [V]	36.36	36.62	36.88	37.13	37.39	37.64
	Efficiency ¹	η [%]	≥19.6	≥19.9	≥20.1	≥20.4	≥20.6	≥20.9

MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT ²								
Minimum	Power at MPP	P _{MPP} [W]	288.8	292.6	296.3	300.1	303.8	307.6
	Short Circuit Current	I _{SC} [A]	8.90	8.92	8.95	8.97	9.00	9.03
	Open Circuit Voltage	V _{OC} [V]	42.62	42.65	42.69	42.72	42.76	42.79
	Current at MPP	I _{MPP} [A]	8.35	8.41	8.46	8.51	8.57	8.62
	Voltage at MPP	V _{MPP} [V]	34.59	34.81	35.03	35.25	35.46	35.68

¹Measurement tolerances P_{MPP} ±3%; I_{SC}, V_{OC} ±5% at STC: 1000 W/m², 25±2°C, AM 1.5 according to IEC 60904-3 • ²800 W/m², NMOT, spectrum AM 1.5

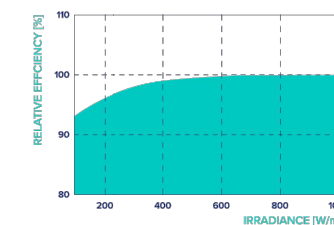
Qcells PERFORMANCE WARRANTY



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 Qcells sales organisation of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25°C, 1000 W/m²).

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I _{SC}	α [%/K]	+0.04	Temperature Coefficient of V _{OC}	β [%/K]	-0.27
Temperature Coefficient of P _{MPP}	γ [%/K]	-0.34	Nominal Module Operating Temperature	NMOT [°F]	109±5.4 (43±3°C)

Properties for System Design

Maximum System Voltage	V _{sys} [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 ³	[lbs/ft ²]	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 ³	[lbs/ft ²]	113 (5400 Pa)/84 (4000 Pa)		

Qualifications and Certificates

UL 61730, CE-compliant, Quality Controlled PV - TÜV Rheinland, IEC 61215:2016, IEC 61730:2016, U.S. Patent No. 9,893,215 (solar cells),



6 busbar cell technology

12 busbar cell technology



Breaking the 20% efficiency barrier

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



A reliable investment

Inclusive 25-year product warranty and 25-year linear performance warranty¹.



Enduring high performance

Long-term yield security with Anti LeTID Technology, Anti PID Technology² and Hot-Spot Protect.



Extreme weather rating

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



Innovative all-weather technology

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



The most thorough testing programme in the industry

Qcells 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.

¹ See data sheet on rear for further information.

² APT test conditions according to IEC/TS 62804-1:2015, method A (-1500 V, 96 h)

³ See Installation Manual

The ideal solution for:

Rooftop arrays on residential buildings



Qcells pursues minimizing paper output in consideration of the global environment.

Note: Installation instructions must be followed. Contact our technical service for further information on approved installation of this product. Harwha Q CELLS America Inc. 400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | TEL +1 949 748 59 96 | EMAIL hcq-inquiry@qcells.com | WEB www.qcells.com



LIGHTING ELECTRIC

230 Blacksnake Rd,
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LICENSE : NC-29517

VERSION

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INITIAL RELEASE	10/19/2023	UR

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APN# 0545-78-5655.000
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AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-6

Specifications subject to technical changes © Qcells Q.PEAK DUO_BLK_ML-G10+_series_385-410_2023-01_Rev03_NA





IQ8 Series 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.

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IQ8SE-DS-0001-01-EN-US-2021-10-19

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

IQ8 Series Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US ⁽¹⁾
Commonly used module pairings ²	W	235 – 350	235 – 440	260 – 460	295 – 500	320 – 540+	295 – 500+
Module compatibility		60-cell/120 half-cell		60-cell/120 half-cell and 72-cell/144 half-cell			
MPPT voltage range	V	27 – 37	29 – 45	33 – 45	36 – 45	38 – 45	38 – 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 ³ [module Isc]	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	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US
Peak output power	VA	245	300	330	366	384	366
Max continuous output power	VA	240	290	325	349	380	360
Nominal (L-L) voltage/range ⁴	V			240 / 211 – 264		208 / 183 – 250	
Max continuous output current	A	1.0	1.21	1.35	1.45	1.58	1.73
Nominal frequency	Hz			60			
Extended frequency range	Hz			50 – 68			
Max units per 20 A (L-L) branch circuit ⁵		16	13	11	11	10	9
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	97.6	97.6	97.6	97.4
CEC weighted efficiency	%	97	97	97	97.5	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					
Acoustic noise at 1 m		<60 dBA					
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) The IQ8H-208 variant will be operating in grid-tied mode only at 208V AC. (2) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility> (3) Maximum continuous input DC current is 10.6A (4) Nominal voltage range can be extended beyond nominal if required by the utility. (5) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

IQ8SE-DS-0001-01-EN-US-2021-10-19

LIGHTING ELECTRIC

230 Blacksnake Rd.
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VERSION

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1651 RAYNOR MCLAMB RD,
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SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-7

IQ Combiner 4/4C



The **IQ Combiner 4/4C** with IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure. It 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 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
- Supports Wi-Fi, Ethernet, or cellular connectivity
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Mounts on single stud with centered brackets
- Supports bottom, back and side conduit entry
- Allows up to four 2-pole branch circuits for 240VAC 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
- X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C comply with IEEE 1547:2018 (UL 1741-SB, 3rd Ed.)

IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 X-IQ-AM1-240-4 X2-IQ-AM1-240-4 (IEEE 1547:2018)	IQ Combiner 4 with 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 and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C X-IQ-AM1-240-4C X2-IQ-AM1-240-4C (IEEE 1547:2018)	IQ Combiner 4C with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ± 0.5%) and consumption monitoring (± 2.5%). Includes 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)	
Supported microinverters	IQ6, IQ7, and IQ8. (Do not mix IQ6/7 Microinverters with IQ8)
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 - 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
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)
X-IQ-NA-HD-125A	Hold-down kit for Eaton circuit breaker with screws
Consumption monitoring CT (CT-200-SPLIT/CT-200-CLAMP)	A pair of 200A split core current transformers
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240VAC, 60 Hz
Eaton BR series busbar rating	125A
Max. continuous current rating	65A
Max. continuous current rating (input from PV/storage)	64A
Max. fuse/circuit rating (output)	90A
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
IQ Gateway breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200A solid core pre-installed and wired to IQ Gateway
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 cm x 49.5 cm x 16.8 cm (14.75 in x 19.5 in x 6.63 in). Height is 53.5 cm (21.06 in) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40°C to +46°C (-40°F to 115°F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20A to 50A breaker inputs: 14 to 4 AWG copper conductors • 60A 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	Up to 3,000 meters (9,842 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	IEEE 802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Mobile Connect cellular modem is required for all Enphase Energy System installations.
Ethernet	Optional, IEEE 802.3, Cat5E (or Cat6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	CA Rule 21 (UL 1741-SA) IEEE 1547:2018 - UL 1741-SB, 3 rd Ed. (X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C) CAN/CSA C22.2 No. 107.1, Title 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

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IQ-C-4-4C-DS-0103-EN-US-12-29-2022

LIGHTING ELECTRIC

230 Blacksnake Rd.
Stanley, NC 28164-1622
LICENSE : NC-29517

VERSION

DESCRIPTION	DATE	REV
INITIAL RELEASE	10/19/2023	UR

PROJECT NAME

KIDDIAN GONZALEZ
1651 RAYNOR MCLAMB RD,
LINDEN, NC 28356 USA
APN# 0545-78-5655.000
UTILITY: N/A
AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-8



To learn more about Enphase offerings, visit enphase.com
IQ-C-4-4C-DS-0103-EN-US-12-29-2022



Enphase Q Cable Accessories

The **Enphase Q Cable™** and accessories are part of the latest generation Enphase IQ System™. These accessories provide simplicity, reliability, and faster installation times.



Enphase Q Cable

- Two-wire, double-insulated Enphase Q Cable is 50% lighter than the previous generation Enphase cable
- New cable numbering and plug and play connectors speed up installation and simplify wire management
- Link connectors eliminate cable waste

Field-Wireable Connectors

- Easily connect Q cables on the roof without complex wiring
- Make connections from any open connector and center feed any section of cable within branch limits
- Available in male and female connector types

Enphase Q Cable Accessories

CONDUCTOR SPECIFICATIONS

Certification	UL3003 (raw cable), UL 9703 (cable assemblies), DG cable
Flame test rating	FT4
Compliance	RoHS, OIL RES I, CE, UV Resistant, combined UL for Canada and United States
Conductor type	THHN/THWN-2 dry/wet
Disconnecting means	The AC and DC bulkhead connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.





Q CABLE TYPES / ORDERING OPTIONS

Connectorized Models	Size / Max Nominal Voltage	Connector Spacing	PV Module Orientation	Connector Count per Box
Q-12-10-240	12 AWG / 277 VAC	1.3 m (4.2 ft)	Portrait	240
Q-12-17-240	12 AWG / 277 VAC	2.0 m (6.5 ft)	Landscape (60-cell)	240
Q-12-20-200	12 AWG / 277 VAC	2.3 m (7.5 ft)	Landscape (72-cell)	200

ENPHASE Q CABLE ACCESSORIES

Name	Model Number	Description
Raw Q Cable	Q-12-RAW-300	300 meters of 12 AWG cable with no connectors
Field-wireable connector (male)	Q-CONN-10M	Make connections from any open connector
Field-wireable connector (female)	Q-CONN-10F	Make connections from any Q Cable open connector
Cable Clip	Q-CLIP-100	Used to fasten cabling to the racking or to secure looped cabling
Disconnect tool	Q-DISC-10	Disconnect tool for Q Cable connectors, DC connectors, and AC module mount
Q Cable sealing caps (female)	Q-SEAL-10	One needed to cover each unused connector on the cabling
Terminator	Q-TERM-10	Terminator cap for unused cable ends
Enphase EN4 to MC4 adaptor ¹	ECA-EN4-S22	Connect PV module using MC4 connectors to IQ micros with EN4 (TE PV4-S SOLARLOK). 150mm/5.9" to MC4.
Enphase EN4 non-terminated adaptor ¹	ECA-EN4-FW	For field wiring of UL certified DC connectors. EN4 (TE PV4-S SOLARLOK) to non-terminated cable. 150mm/5.9"
Enphase EN4 to MC4 adaptor (long) ¹	ECA-EN4-S22-L	Longer adapter cable for EN4 (TE PV4-S SOLARLOK) to MC4. Use with split cell modules or PV modules with short DC cable. 600mm/23.6"
Replacement DC Adaptor (MC4)	Q-DCC-2	DC adaptor to MC4 (max voltage 100 VDC)
Replacement DC Adaptor (UTX)	Q-DCC-5	DC adaptor to UTX (max voltage 100 VDC)

1. Qualified per UL subject 9703.

	TERMINATOR Terminator cap for unused cable ends, sold in packs of ten (Q-TERM-10)		SEALING CAPS Sealing caps for unused aggregator and cable connections (Q-BA-CAP-10 and Q-SEAL-10)
	DISCONNECT TOOL Plan to use at least one per installation, sold in packs of ten (Q-DISC-10)		CABLE CLIP Used to fasten cabling to the racking or to secure looped cabling, sold in packs of one hundred (Q-CLIP-100)

To learn more about Enphase offerings, visit enphase.com

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LIGHTING ELECTRIC

230 Blacksnake Rd.
 Stanley, NC 28164-1622
 LICENSE : NC-29517

VERSION

DESCRIPTION	DATE	REV
INITIAL RELEASE	10/19/2023	UR

PROJECT NAME

KIDDIAN GONZALEZ
 1651 RAYNOR MCLAMB RD,
 LINDEN, NC 28356 USA
 APN# 0545-78-5655.000
 UTILITY: N/A
 AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

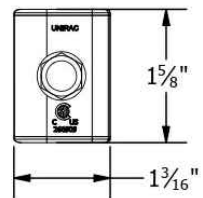
ANSI B
 11" X 17"

SHEET NUMBER

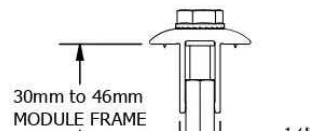
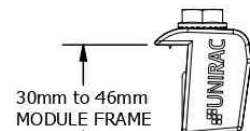
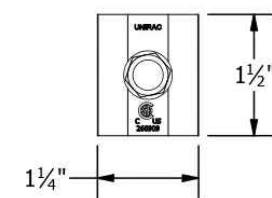
PV-9

PART # TABLE	
P/N	DESCRIPTION
302045M	UNIVERSAL AF MID CLAMP - MILL
302045D	UNIVERSAL AF MID CLAMP - DRK
302050M	UNIVERSAL AF END CLAMP - MILL
302050D	UNIVERSAL AF END CLAMP - DRK

UNIVERSAL AF
END CLAMP

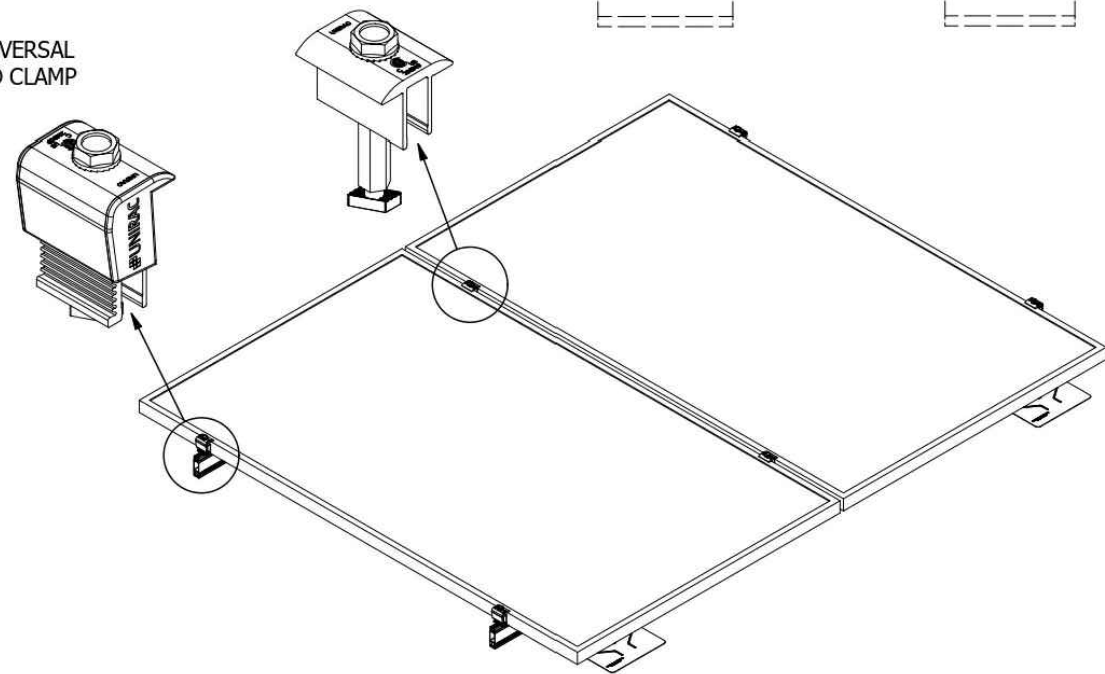


UNIVERSAL AF
MID CLAMP



UNIVERSAL
END CLAMP

UNIVERSAL
MID CLAMP



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

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	UNIVERSAL AF CLAMPS
REVISION DATE:	9/28/2020

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE
NOMINAL

PRODUCT PROTECTED BY
ONE OR MORE US PATENTS

LEGAL NOTICE

SM-A01B
SHEET

1/4" BOLT LOCATION

3/8" BOLT LOCATION

1 11/16"

3/4"

Standard Rail Lengths:
168"
240"

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

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DETAIL
DESCRIPTION:	LIGHT RAIL
REVISION DATE:	October 2016

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE NOMINAL

PRODUCT PROTECTED BY
ONE OR MORE US PATENTS

LEGAL NOTICE

SM-P02
SHEET

LIGHTING ELECTRIC

230 Blacksnake Rd.
Stanley, NC 28164-1622
LICENSE : NC-29517

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	10/19/2023	UR

PROJECT NAME

KIDDIAN GONZALEZ
1651 RAYNOR MCLAMB RD,
LINDEN, NC 28356 USA
APN# 0545-78-5655.000
UTILITY: N/A
AHJ: HARNETT COUNTY

SHEET NAME	SPEC SHEETS
SHEET SIZE	ANSI B 11" X 17"
SHEET NUMBER	PV-10

FLASHKIT PRO



FLASHKIT PRO is the complete attachment solution for composition shingle roofs. Featuring Unirac's patented SHED & SEAL technology, a weather proof system which provides the ultimate protection against roof leaks. Kitted in 10 packs for maximum convenience, flashings and hardware are available in Mill or Dark finishes. With FLASHKIT pro, you have everything you need for a quick, professional installation.



TRUSTED WATER SEAL FLASHINGS
FEATURING SHED & SEAL TECHNOLOGY



YOUR COMPLETE SOLUTION
Flashings, lags, continuous slot L-Feet and hardware



CONVENIENT 10 PACKS
Packaged for speed and ease of handling

FLASHKIT PRO

INSTALLATION GUIDE



FLASHKIT PRO IS THE COMPLETE FLASHING AND ATTACHMENT SOLUTION FOR COMPOSITION ROOFS.



INSTALL FLASHKIT PRO FLASHING



INSTALL L-FOOT



ATTACH L-FOOT TO RAIL

PRE-INSTALL

- Locate roof rafters and snap chalk lines to mark the installation point for each roof attachment.
- Drill a 7/32" pilot hole at each roof attachment. Fill each pilot hole with sealant.

STEP 1 INSTALL FLASHKIT PRO FLASHING

- Add a U-shaped bead of roof sealant to the underside of the flashing with the open side of the U pointing down the roof slope. Slide the aluminum flashing underneath the row of shingles directly up slope from the pilot hole as shown. Align the indicator marks on the lower end of the flashing with the chalk lines on the roof to center the raised hole in the flashing over the pilot hole in the roof. When installed correctly, the flashing will extend under the two courses of shingles above the pilot hole.

STEP 2 INSTALL L-FOOT

- Fasten L-foot and Flashing into place by passing the included lag bolt and pre-installed stainless steel-backed EPDM washer through the L-foot EPDM grommet, and the raised hole in the flashing, into the pilot hole in the roof rafter.

- Drive the lag bolt down until the L-foot is held firmly in place. It is normal for the EPDM on the underside of the stainless steel backed EPDM washer to compress and expand beyond the outside edge of the steel washer when the proper torque is applied.

TIP:

- Use caution to avoid over-torqueing the lag bolt if using an impact driver.
- Repeat Steps 1 and 2 at each roof attachment point.

STEP 3 ATTACH L-FOOT TO RAIL

- Insert the included 3/8"-16 T-bolts into the lower slot on the Rail (sold separately), spacing the bolts to match the spacing between the roof attachments.
- Position the Rail against the L-Foot and insert the threaded end of the T-Bolt through the continuous slot in the L-Foot. Apply anti-seize to bolt threads to prevent galling of the T-bolt and included 3/8" serrated flange nut. Place the 3/8" flange nut on the T-bolt and finger tighten. Repeat STEP 3 until all L-Feet are secured to the Rail with a T-bolt. Adjust the level and height of the Rail and torque each bolt to 30ft-lbs.

LIGHTING ELECTRIC

230 Blacksnake Rd.
Stanley, NC 28164-1622
LICENSE : NC-29517

VERSION

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INITIAL RELEASE	10/19/2023	UR

PROJECT NAME

KIDDIAN GONZALEZ
1651 RAYNOR MCLAMB RD,
LINDEN, NC 28356 USA
APN# 0545-78-5655.000
UTILITY: N/A
AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

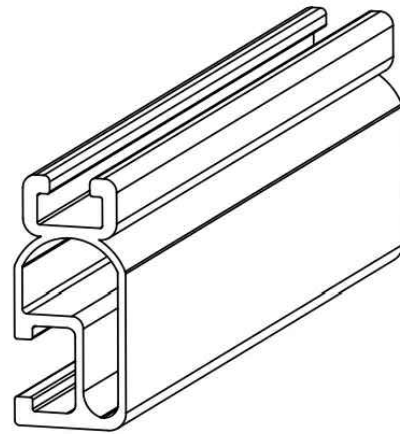
PV-11

THE COMPLETE ROOF ATTACHMENT SOLUTION

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

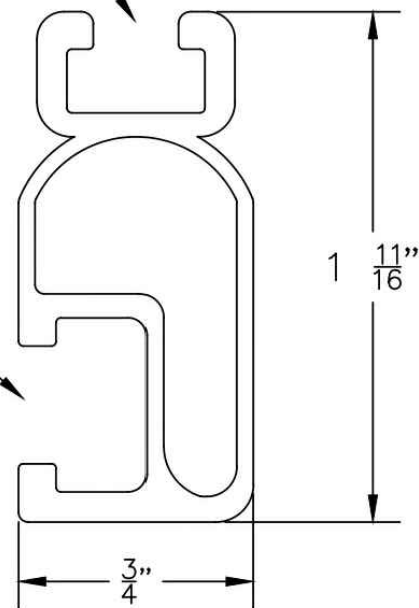
FASTER INSTALLATION. 25-YEAR WARRANTY.

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



1/4" BOLT LOCATION

3/8" BOLT LOCATION



Standard Rail Lengths:

168"
240"

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

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DETAIL
DESCRIPTION:	LIGHT RAIL
REVISION DATE:	October 2016

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE NOMINAL

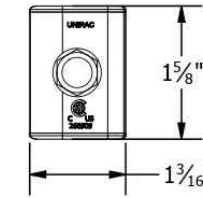
PRODUCT PROTECTED BY
ONE OR MORE US PATENTS

LEGAL NOTICE

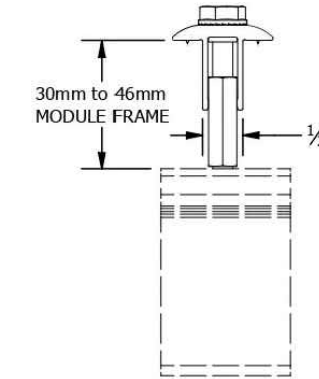
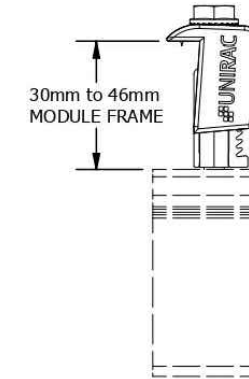
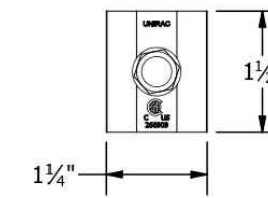
SM-P02
SHEET

PART # TABLE	
P/N	DESCRIPTION
302045M	UNIVERSAL AF MID CLAMP - MILL
302045D	UNIVERSAL AF MID CLAMP - DRK
302050M	UNIVERSAL AF END CLAMP - MILL
302050D	UNIVERSAL AF END CLAMP - DRK

UNIVERSAL AF
END CLAMP

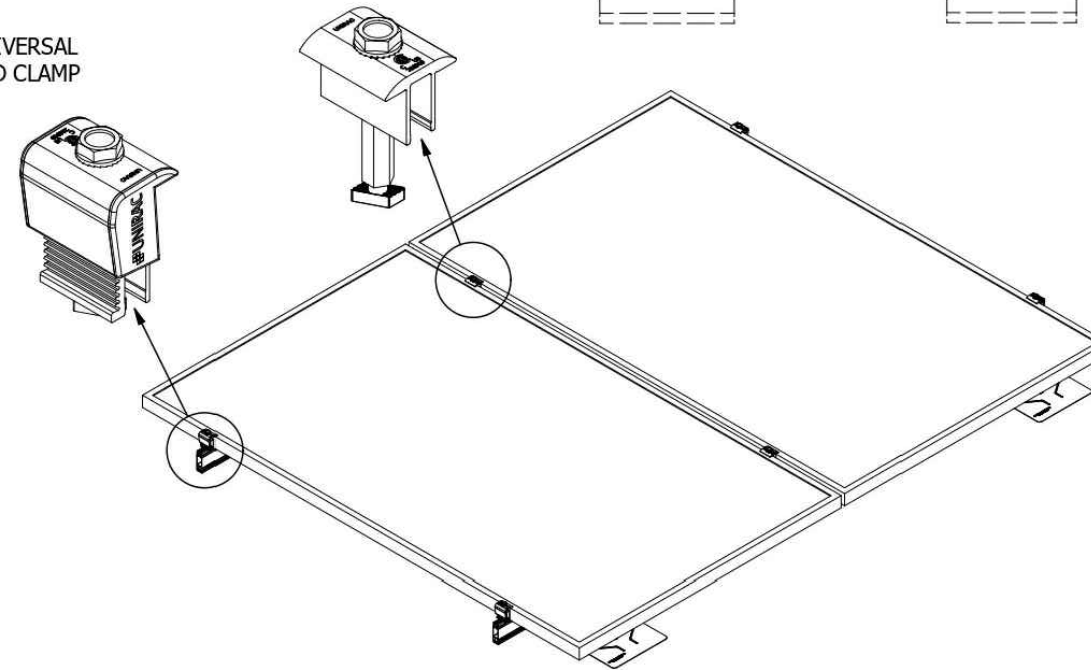


UNIVERSAL AF
MID CLAMP



UNIVERSAL
END CLAMP

UNIVERSAL
MID CLAMP



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

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	UNIVERSAL AF CLAMPS
REVISION DATE:	9/28/2020

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE
NOMINAL

PRODUCT PROTECTED BY
ONE OR MORE US PATENTS
LEGAL NOTICE

SM-A01B
SHEET

LIGHTING ELECTRIC

230 Blacksnake Rd.
Stanley, NC 28164-1622
LICENSE : NC-29517

VERSION

DESCRIPTION	DATE	REV
INITIAL RELEASE	10/19/2023	UR

PROJECT NAME

KIDDIAN GONZALEZ
1651 RAYNOR MCLAMB RD,
LINDEN, NC 28356 USA
APN# 0545-78-5655.000
UTILITY: N/A
AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-11.1

SYSTEM LEVEL FIRE CLASSIFICATION

The system fire class rating requires installation in the manner specified in the SOLARMOUNT Installation Guide. SOLARMOUNT has been classified to the system level fire portion of UL2703. SOLARMOUNT has achieved system level performance for steep sloped roofs. The fire classification rating is only valid on roof pitches greater than 2:12 (slopes > 2 inches per foot, or 9.5 degrees). The system is to be mounted over fire resistant roof covering rated for the application. There is no required minimum or maximum height limitation above the roof deck to maintain the system fire rating for SOLARMOUNT. Module Types, System Level Fire Ratings, and Mitigation Requirements are listed below:

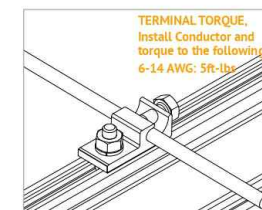
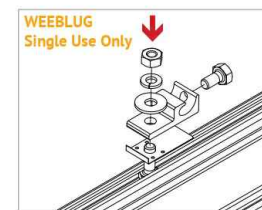
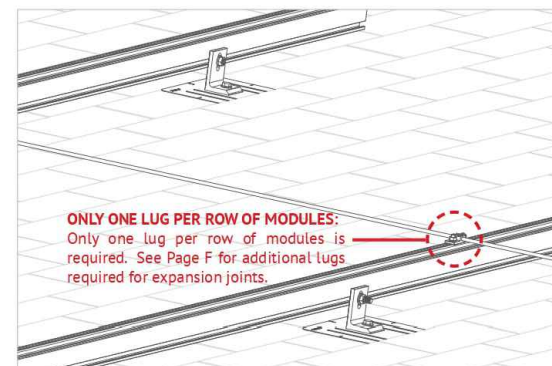
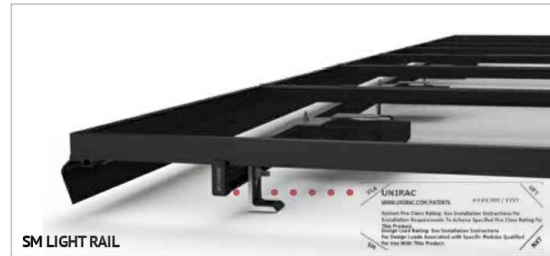
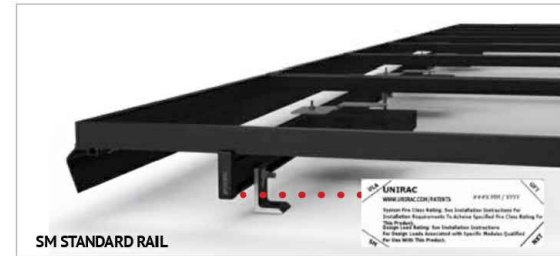
Rail Type	Module Fire Types	System Level Fire Rating	Rail Direction	Module Orientation	Mitigation Required
Standard & HD Rails	1, 2, 3 with Metal Frame, 10 with Metal Frame, 19, 22, 25, 29, & 30	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required
Light Rail	1 & 2	Class A, Class B & Class C	East-West	Landscape OR Portrait	None Required
			North-South	Landscape OR Portrait	None Required
Standard, Light, & HD Rails	4 & 5	Class A, Class B & Class C	East-West	Landscape OR Portrait	Trim Installation per Solar Mount Installation Guide
			North-South	Landscape OR Portrait	

This racking system may be used to ground and/or mount a PV module complying with UL1703 or UL61730 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions.

UL2703 CERTIFICATION MARKING LABEL

Unirac SOLARMOUNT is listed to UL 2703. Certification marking is embossed on all mid clamps as shown. Labels with additional information will be provided. After the racking system is fully assembled, a single label should be applied to the SOLARMOUNT rail at the edge of the array. Before applying the label, the corners of the label that do not pertain to the system being installed must be removed so that only the installed system type is showing.

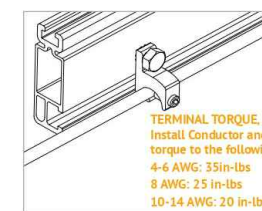
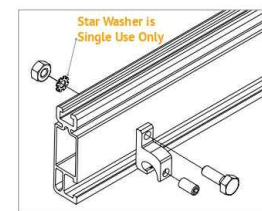
Note: The sticker label should be placed such that it is visible, but not outward facing.



GROUNDING LUG MOUNTING DETAILS:
Details are provided for both the WEEB and IlSCO products. The WEEB Lug has a grounding symbol located on the lug assembly. The IlSCO lug has a green colored set screw for grounding indication purposes. Installation must be in accordance with NFPA NEC 70, however the electrical designer of record should refer to the latest revision of NEC for actual grounding conductor cable size.
Required if not using approved integrated grounding microinverters

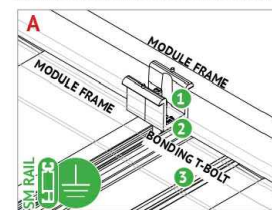
GROUNDING LUG - BOLT SIZE & DRILL SIZE		
GROUND LUG	BOLT SIZE	DRILL SIZE
WEEBLug	1/4"	N/A - Place in Top SM Rail Slot
ILSCO Lug	#10-32	7/32"

- Torque value depends on conductor size.
- See product data sheet for torque value.



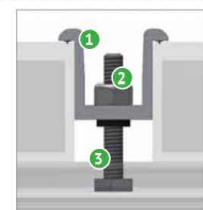
ILSCO LAY-IN LUG CONDUCTOR - UNIRAC P/N 008009P: Alternate Grounding Lug - Drill, deburr hole and bolt thru both rail walls per table.
TORQUE VALUE 5 ft lbs. (See Note on PG. A)
See ILSCO product data sheet for more details, Model No. GBL-4DBT.

NOTE: ISOLATE COPPER FROM ALUMINUM CONTACT TO PREVENT CORROSION

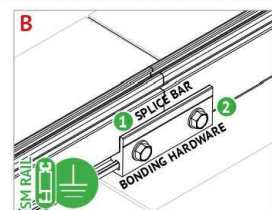


BONDING MIDCLAMP ASSEMBLY

- 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



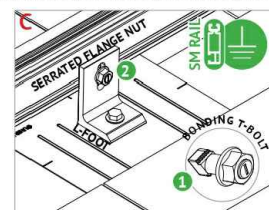
BONDING MIDCLAMP ASSEMBLY



BONDING RAIL SPLICE BAR

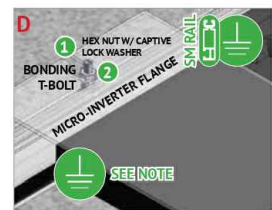
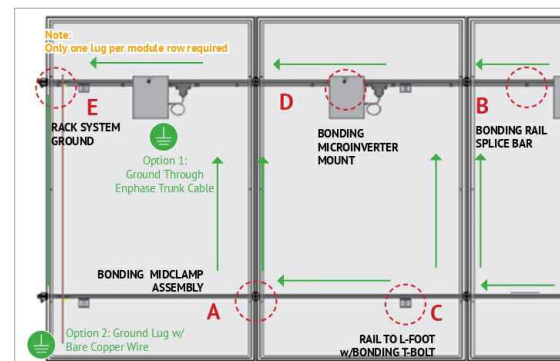
- 1 Bonding Hardware creates bond between splice bar and each rail section
- 2 Aluminum splice bar spans across rail gap to create rail to rail bond. Rail on at least one side of splice will be grounded.

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.



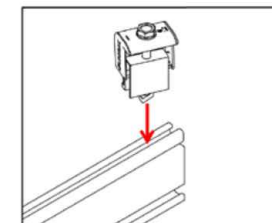
BONDING MICROINVERTER MOUNT

- 1 Hex nut with captive lock washer bonds 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

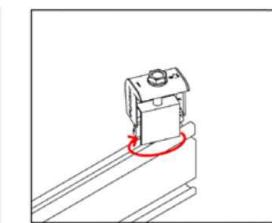


RACK SYSTEM GROUND

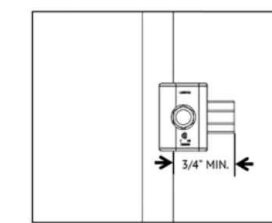
- 1 WEEB washer dimples pierce anodized rail to create bond between rail and lug
- 2 Solid copper wire connected to lug is routed to provide final system ground connection. NOTE: IlSCO lug can also be used when secured to the side of the rail. See page K for details



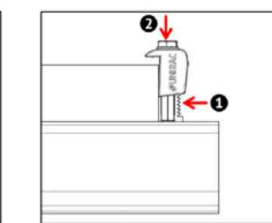
1. Position clamp to align T-bolt with rail slot. Lower clamp and insert T-bolt into rail slot.



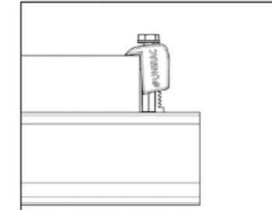
2. Rotate clamp clockwise 2/3 of a turn to engage T-bolt inside rail slot.



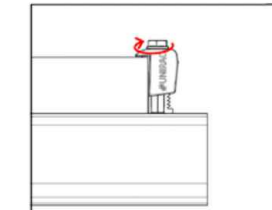
3. Place module at least 3/4" from end of rail and position clamp against module frame.



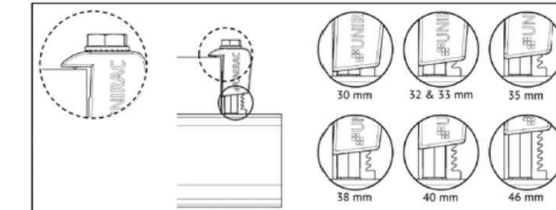
4. While applying pressure to hold the clamp against the module, push down on the module side of the clamp cap.



5. When the cap contacts the module frame, release and it will re-engage to the clamp base.



6. Tighten bolt and torque to 15 ft-lbs.



7. Confirm clamp is engaged in correct module height position and that the top of the cap is sitting level with the module frame.

NOTE: When installing 46mm modules, loosen bolt by 1 turn before positioning clamp against module frame. Do not force clamp onto module frame as this may damage the bonding pin.

LIGHTING ELECTRIC

230 Blacksnake Rd,
Stanley, NC 28164-1622
LICENSE : NC-29517

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	10/19/2023	UR

PROJECT NAME

KIDDIAN GONZALEZ
1651 RAYNOR MCLAMB RD,
LINDEN, NC 28356 USA
APN# 0545-78-5655.000
UTILITY: N/A
AHJ: HARNETT COUNTY

SHEET NAME
SPEC SHEETS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-12



Certificate of Compliance

Certificate: 70131735 Master Contract: 266909
 Project: 80128750 Date Issued: 2022-06-08
 Issued To: Unirac
 1411 Broadway NE
 Albuquerque, New Mexico, 87102
 United States

Attention: Rob D'Anastasio

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.

Issued by: Michael Hoffnagle
Michael Hoffnagle



PRODUCTS

CLASS - C531302 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems
 CLASS - C531382 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems -
 Certified to US Standards



Certificate: 70131735
 Project: 80128750

Master Contract: 266909
 Date Issued: 2022-06-08

Models:	SM	-	SOLARMOUNT Flush-to-Roof is an extruded aluminum rail PV racking system that is installed parallel to the roof in landscape or portrait orientations.
	ULA	-	Unirac Large Array is a ground mount system using the SolarMount (SM) platform for the bonding and grounding of PV modules.

Solarmount

The system listed is designed to provide bonding/grounding, and mechanical stability for photovoltaic modules. The system is secured to the roof with the L-Foot components through the roofing material to building structure. Modules are secured to the racking system with stainless steel or aluminum mid clamps and Aluminum end clamps. The modules are bonded to the racking system with the stainless-steel bonding mid clamps with piercing points. The system is grounded with 10 AWG copper wire to bonding/grounding lugs. Fire ratings of Class A with Type 1, 2, 3 (with metallic frame), 4 (with trim), 5 (with trim), 10(with metallic frame), 19, 22, 25, 29, or 30 for steep slope. Tested at 5" interstitial gap which allows installation at any stand-off height.

The grounding of the system is intended to comply with the latest edition of the National Electrical Code, to include NEC 250 & 690. Local codes compliance is required, in addition to national codes. All grounding/bonding connections are to be torqued in accordance with the Installation Manual and the settings used during the certification testing for the current edition of the project report.

The system may employ optimizers/micro-inverters and used for grounding when installed per installation instructions.

UL 2703 Mechanical Load ratings:

Downward Design Load (lb/ft ²)	113.5
Upward Design Load (lb/ft ²)	50.7
Down-Slope Load (lb/ft ²)	16.13

Test Loads:

Downward Load (lb/ft ²)	170.20
Upward Load (lb/ft ²)	76.07
Down-Slope Load (lb/ft ²)	24.2

LIGHTING ELECTRIC

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SPEC SHEETS

SHEET SIZE

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SHEET NUMBER

PV-13



Descriptive Report and Test Results

MASTER CONTRACT: 266909
REPORT: 70131735
PROJECT: 80128750

Edition 1: September 20, 2017; Project 70131735– Albuquerque
Issued by Michael Hoffnagle

Edition 17: April 22, 2022; Project 80116723 - Irvine
Prepared By: Michael Hoffnagle
Authorized By: Michael Hoffnagle

Edition 18: June 8, 2022; Project 80128750 - Irvine
Prepared By: Michael Hoffnagle
Authorized By: Michael Hoffnagle

Report pages reissued

Contents: Certificate of Compliance - Pages 1 to 6
Supplement to Certificate of Compliance - Pages 1 to 3
Description and Tests - Pages 1 to 27
Att1 Installation Manual SM– Pages 1 to 36
Att2 Schematics SM/ULA– Pages 1 to 72
Att3 Installation Manual ULA– Pages 1 to 22
Att4 RM5_Installation Guide - 1 to 19
Att5 RMDT_Installation Guide - 1 to 20
Att6 RM series schematics – 1 to 32
Att7 Installation Manual, GFT Shared Rail – Pages 1 to 40
Att8 Installation Manual, GFT 4-Rail – Pages 1 to 39
Att9 GFT Schematics – Pages 1 to 42
Att10 NXT Horizon Installation Manual – Pages 1 to 22
Att11 Schematics NXT Horizon – Pages 1 to 13

PRODUCTS

CLASS - C531302 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems
CLASS - C531382 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems -
Certified to US Standards

The reader is responsible for any liability arising from actions taken in interpreting or applying the results presented in this report. This report shall not be reproduced except in full, without written approval from CSA Group Testing & Certification Inc. The results of this report only relate to those items tested.

34 Bunsen, Irvine, CA, U.S.A. 92618
Telephone: 949.733.4300 1.800.463.6727 Fax: 949.733.4320 www.csagroup.org



Electrical Bonding and Grounding Test Modules

The list below is not exhaustive of compliant modules but shows those that have been evaluated and found to be electrically compatible with the SOLARMOUNT system.

Manufacture	Module Model / Series	Manufacture	Module Model / Series	Manufacture	Module Model / Series
LG Electronics (cont.)	LGxxxN2T-J5 LGxxxN1K/N1W/N2T/N2W-L5 LGxxxM1C/N1C/Q1C/Q1K-N5 LGxxxN1C/N1K/N2W/Q1C/Q1K-V5 LGxxxN3K-V6	Phono Solar	PSxxxM1-20/U PSxxxM1H-20/U PSxxxM1-20UH PSxxxM1H-20UH	Q.Cells (cont.)	Q.PEAK DUO XL-(G10/G10.2/G10.3/G10.4/ G10.d) Q.PEAK DUO XL-G10.3/BFG Q.PEAK DUO XL-G10.d/BFG Q.PEAK DUO XL-(G11.2/G11.3) Q.PEAK DUO XL-G11.3/BFG
LONGI	LR4-60(HPB/HPH) LR4-72(HPH) LR6-60 LR6-60(BK/HPB/HPH/HV/PB/PE/PH) LR6-72 LR6-72(BK/HV/PB/PE/PH) RealBlack LR4-60HPB RealBlack LR6-60HPB	Phono Solar (cont.)	PSxxxM1-20/UH PSxxxM1H-20/UH PSxxxM-24/T PSxxxMH-24/T PSxxxM-24/TH PSxxxMH-24/TH	REC	RECOxxxAA (BLK/Pure) RECOxxxNP (N-PEAK) RECOxxxP2 (Black) RECOxxxPE, RECOxxxPE72 RECOxxxTP, RECOxxxTP72 RECOxxxTP2(M/BLK2) RECOxxxTP25(M)72 RECOxxxTP3M (Black) RECOxxxTP4 (Black)
Meyer Burger	Meyer Burger Black, Meyer Burger White	Prism Solar	P72 Series	Renesola	All 60-cell modules
Mission Solar Energy	MSE Mono, MSE Perc		Plus, Pro, Peak, G3, G4, Peak G5(SC), G6(+)(SQ)(AC), G7, G8(+), Plus, Pro, Peak L-G2, L-G4, L-G5 Peak L-G5, L-G6, L-G7, L-G8(BFF) Q.PEAK DUO (BLK)-G6+ Q.PEAK DUO BLK-G6+/TS Q.PEAK DUO (BLK)-G7 Q.PEAK DUO L-(G7/G7.1/G7.2/G7.3/G7.7) Q.PEAK DUO (BLK) G8(+) Q.PEAK DUO L-(G8/G8.1/G8.2/G8.3) Q.PEAK DUO (BLK) ML-G9(+) Q.PEAK DUO XL-(G9/G9.2/G9.3) Q.PEAK DUO XL-G9.3/BFG Q.PEAK DUO-G10- Q.PEAK DUO BLK G10(+)	Risen	RSM Series
Mitsubishi	MIE & MLE Series	Q.Cells	Q.PEAK DUO BLK-G6+/TS Q.PEAK DUO (BLK)-G7 Q.PEAK DUO L-(G7/G7.1/G7.2/G7.3/G7.7) Q.PEAK DUO (BLK) G8(+) Q.PEAK DUO L-(G8/G8.1/G8.2/G8.3) Q.PEAK DUO (BLK) ML-G9(+) Q.PEAK DUO XL-(G9/G9.2/G9.3) Q.PEAK DUO XL-G9.3/BFG Q.PEAK DUO-G10- Q.PEAK DUO BLK G10(+)	S-Energy	SN72 & SN60 Series
Neo Solar Power Co.	D6M Series		Q.PEAK DUO (BLK) ML-G10(a)(+)	SEG Solar	SEG-xxx-BMD-HV
Panasonic	VBHNxxxSA06/SA06B/SA11/SA11B VBHNxxxSA15/SA15B/SA16/SA16B, VBHNxxxKA, VBHNxxxKA03/04, VBHNxxxSA17/SA17G/SA17E/SA18/SA18E, VBHNxxxZA01/ZA02/ZA03/VBHNxxxZA04 EVPVxxx EVPVxxx(H/K/PK)		Q.PEAK DUO BLK G10(+) Q.PEAK DUO BLK G10+/AL Q.PEAK DUO (BLK) ML-G10(a)(+)	Seraphim	SEG-(6PA/6PB/6MA/6MA-HV/6MB/E01/E11) SRP-(6QA/6QB) SRP-xxx-6MB-HV, SRP-320-375-BMB-HV, SRP-xxx-BMC-HV, SRP-390-450-BMA-HV, SRP-xxx-BMZ-HV, SRP-390-405-BMD-HV
Peimar	S6xxxM (FB/BF) SMxxxM			Sharp	NU-SA & NU-SC Series
				Silfab	SLA-M, SLA-R, SLG-M, SLG-P & BC Series SILxxx(BL/NL/NT/HL/ML/BK/NX/NU/HQ)

- Unless otherwise noted, all modules listed above include all wattages and specific models within that series. Variable wattages are represented as "xxx"
- Items in parenthesis are those that may or may not be present in a compatible module's model ID
- Slashes "/" between one or more items indicates that either of those items may be the one that is present in a module's model ID
- The frame profile must not have any feature that might interfere with the bonding devices that are integrated into the racking system
- Use with a maximum over current protection device OCPD of 30A
- Listed models can be used to achieve a Class A fire system rating for steep slope applications. See Appendix A, page A

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PV-14