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January 30, 2024

Smartsun  
635 Old Barnwell Road  
West Columbia, SC 29170

Re: Engineering Services  
Huerta Residence  
3232 US-401, Lillington, NC  
11.700 kW System

To Whom It May Concern:

We have received information regarding solar panel installation on the roof of the above referenced structure. Our evaluation of the structure is to verify the existing capacity of the roof system and its ability to support the additional loads imposed by the proposed solar system.

**A. Site Assessment Information**

1. Site visit documentation identifying attic information including size and spacing of framing for the existing roof structure.
2. Design drawings of the proposed system including a site plan, roof plan and connection details for the solar panels. This information will be utilized for approval and construction of the proposed system.

**B. Description of Structure:**

**Roof Framing:** Assumed prefabricated wood trusses at 16" on center. All truss members are constructed of 2x4 dimensional lumber.

**Roof Material:** Composite Asphalt Shingles

**Roof Slope:** 23 degrees

**Attic Access:** Inaccessible

**Foundation:** Permanent

**C. Loading Criteria Used**

- **Dead Load**
  - Existing Roofing and framing = 7 psf
  - New Solar Panels and Racking = 3 psf
  - TOTAL = 10 PSF
- **Live Load** = 20 psf (reducible) – 0 psf at locations of solar panels
- **Ground Snow Load** = 15 psf
- **Wind Load** based on ASCE 7-10
  - Ultimate Wind Speed = 117 mph (based on Risk Category II)
  - Exposure Category C

*Analysis performed of the existing roof structure utilizing the above loading criteria is in accordance with the 2018 North Carolina Residential Code (2015 IRC), including provisions allowing existing structures to not require strengthening if the new loads do not exceed existing design loads by 105% for gravity elements and 110% for seismic elements. This analysis indicates that the existing framing will support the additional panel loading without damage, if installed correctly.*

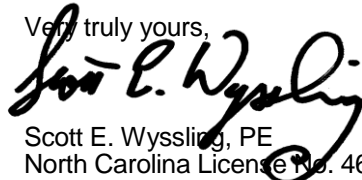
**D. Solar Panel Anchorage**

1. The solar panels shall be mounted in accordance with the most recent Unirac installation manual. If during solar panel installation, the roof framing members appear unstable or deflect non-uniformly, our office should be notified before proceeding with the installation.
2. The maximum allowable withdrawal force for a  $5/16$ " lag screw is 229 lbs per inch of penetration as identified in the National Design Standards (NDS) of timber construction specifications. Based on a minimum penetration depth of  $2\frac{1}{2}$ ", the allowable capacity per connection is greater than the design withdrawal force (demand). Considering the variable factors for the existing roof framing and installation tolerances, the connection using one  $5/16$ " diameter lag screw with a minimum of  $2\frac{1}{2}$ " embedment will be adequate and will include a sufficient factor of safety.
3. Considering the wind speed, roof slopes, size and spacing of framing members, and condition of the roof, the panel supports shall be placed no greater than 48" on center.

Based on the above evaluation, this office certifies that with the racking and mounting specified, the existing roof system will adequately support the additional loading imposed by the solar system. This evaluation is in conformance with the 2018 North Carolina Residential Code (2015 IRC), current industry standards, and is based on information supplied to us at the time of this report.

Should you have any questions regarding the above or if you require further information do not hesitate to contact me.

Very truly yours,



Scott E. Wyssling, PE  
North Carolina License No. 46546  
North Carolina COA P-2308



Wyssling Consulting, PLLC  
76 N Meadowbrook Drive Alpine UT 84004  
North Carolina COA # P-2308

# NEW PV ROOF MOUNT SYSTEM DESIGN

## SCOPE OF WORK

(30) JINKO JKM390M-72HBL-V  
 (1) SOLAREEDGE SE10000H-US  
 ROOF MOUNT: UNIRAC FLASH KIT PRO  
 MOUNTING RAILS: UNIRAC SM LIGHT

## SITE CONDITION

ASCE 7-10 WIND SPEED -117  
 EXPOSURE CATEGORY - C  
 RISK CATEGORY - II  
 SNOW LOAD - 15 LBS/SQFT

## UTILITY COMPANY

DUKE ENERGY PROGRESS

## INTERCONNECTION TYPE

PROTECTED LOAD SIDE TAP

## CODE REFERENCES

2020 NATIONAL ELECTRICAL CODE  
 2015 NORTH CAROLINA FIRE CODE  
 2015 NORTH CAROLINA BULDING CODE  
 2015 NORTH CAROLINA RESIDENTIAL CODE

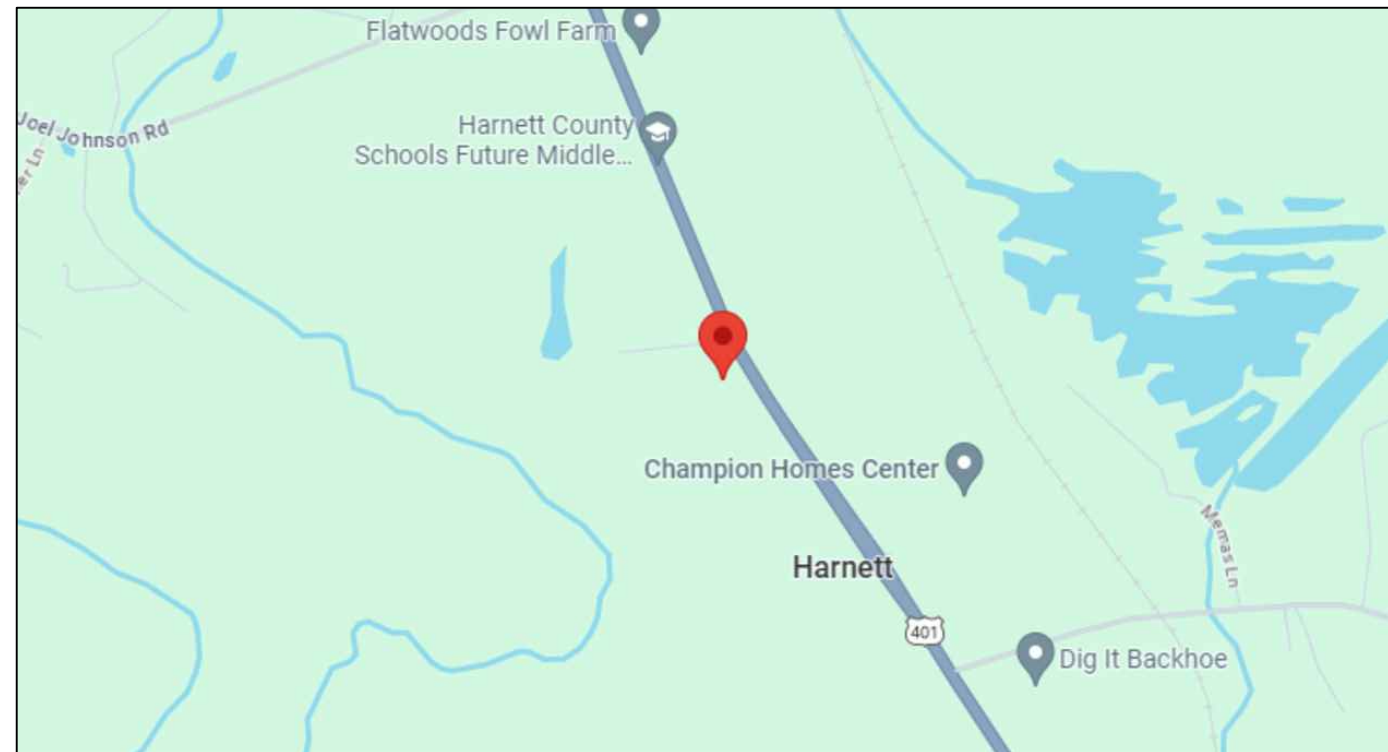
## SHEET INDEX

PV1.1 - 1.2: PROJECT INFORMATION  
 PV2.1: SITE INFORMATION  
 PV3.1: STRUCTURAL INFORMATION  
 PV4.1 - 4.2: ELECTRICAL INFORMATION, LABELS  
 PV5.1 - 5.5: DETAILS & SPECS

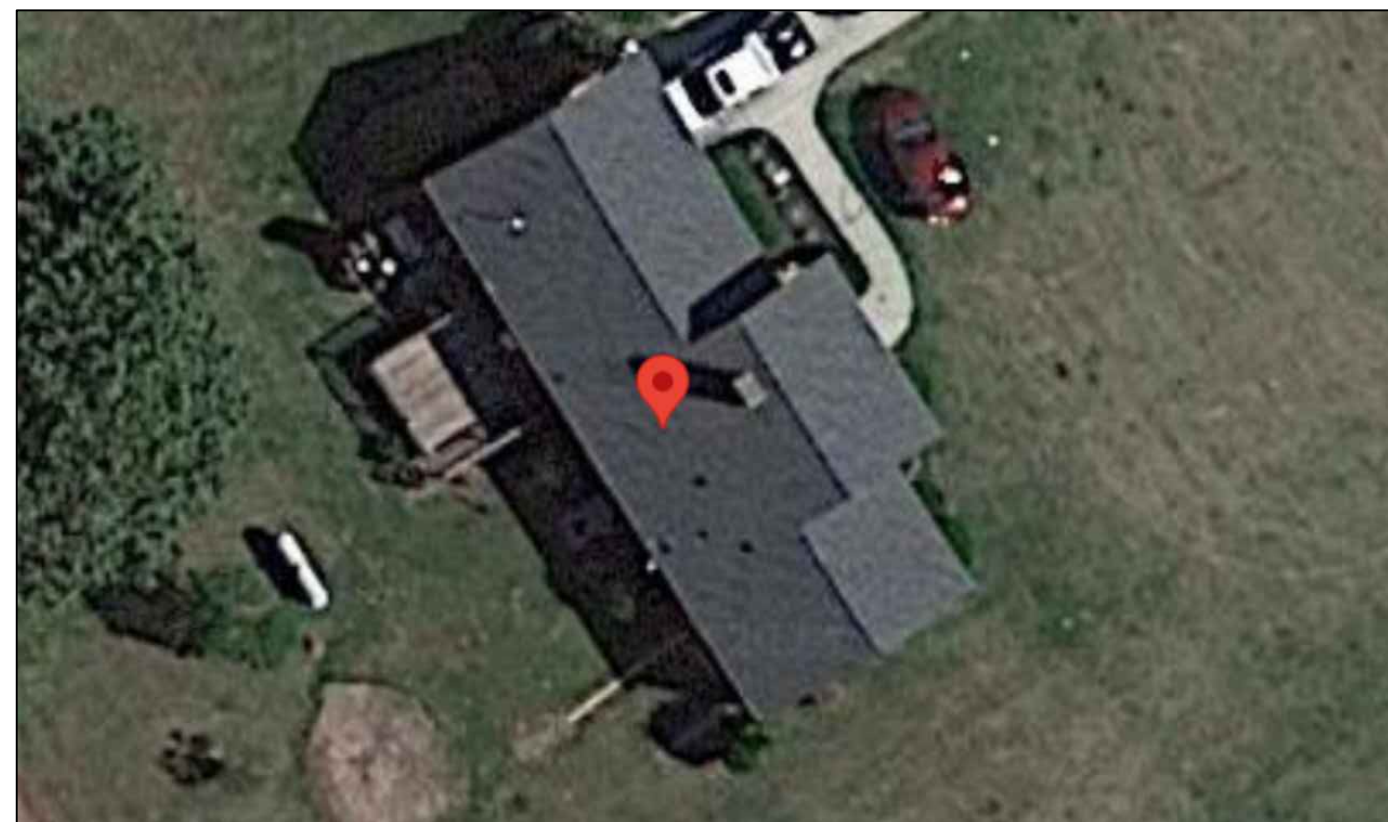
## LEGEND

● - ROOF ACCESS POINT	CP - COMBINER PANEL	BAT - ENERGY STORAGE
(E) - EXISTING	G - GAS METER	GEN - GENERATOR
(N) - NEW	LC - LOAD CENTER	MBE - MAIN BREAKER ENCLOSURE
M - UTILITY METER	SUB - SUBPANEL	ATS - AUTOMATIC TRANSFER SWITCH
P - PRODUCTION METER	JB - JUNCTION BOX	ESS - ENPOWER SMART SWITCH
MSP - MAIN SERVICE PANEL	AC - AC DISCONNECT	INV - INVERTER
■ - FIRE CODE SETBACKS	— - APPROX. CONDUIT/ATTIC RUN	

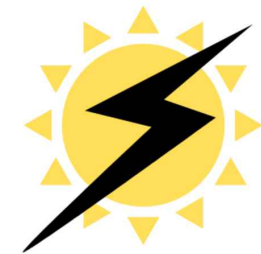
## VICINITY MAP



## PROPERTY MAP



CONTRACTOR



635 OLD BARNWELL ROAD  
 WEST COLUMBIA SC 29170

JOB TITLE

NEW SOLAR PV ROOF  
 MOUNT SYSTEM  
 11.7 KW DC INPUT  
 10 KW AC EXPORT

FERNANDO POMPA HUERTA  
 3832 US-401,  
 LILLINGTON, NC, 27546



Wyssling Consulting, PLLC  
 76 N Meadowbrook Drive Alpine UT 84004  
 North Carolina COA # P-2308  
 Signed 1/30/2024

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ENGINEERING STAMP:

DRAWN BY: LEONI MARLOU EBO

DATE: 01 - 26 - 2023

REVISIONS		
DESCRIPTION	DATE	REV

PROJECT INFORMATION

# PV1.1





Simulation updated ✓ Size 11.70kW Production 55% Savings 69%

Production Utility Bill Savings

ANNUAL PRODUCTION

30 Panels 14,978kWh Energy 55% Energy Offset

MONTHLY PRODUCTION (KWH)



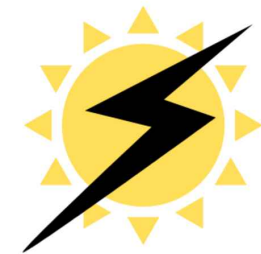
AURORA SOLAR SHADE ANALYSIS  
 FERNANDO POMPA HUERTA  
 3832 US-401,  
 LILLINGTON, NC, 27546  
 11.7 KW DC STC  
 10 KW AC

MODULES  
 (30) JINKO JKM390M-72HBL-V  
 INVERTERS:  
 (1) SOLAREEDGE SE10000H-US  
 OPTIMIZERS:  
 (30) S440 POWER OPTIMIZERS

THE SYSTEM HAS A FIRST YEAR ANNUAL ENERGY PRODUCTION OF: 14978 KWH/YEAR

THIS PRODUCTION IS AN ESTIMATE PREPARED USING AURORA SOLAR SHADE ANALYSIS SOFTWARE. ALL SOLAR SYSTEMS EXPERIENCE PERFORMANCE DEGRADATION OVER THEIR LIFETIME. THIS IS USUALLY APPROXIMATELY 1% PER YEAR, BUT VARIES BASED ON EQUIPMENT USED AND ENVIRONMENTAL CONDITIONS.

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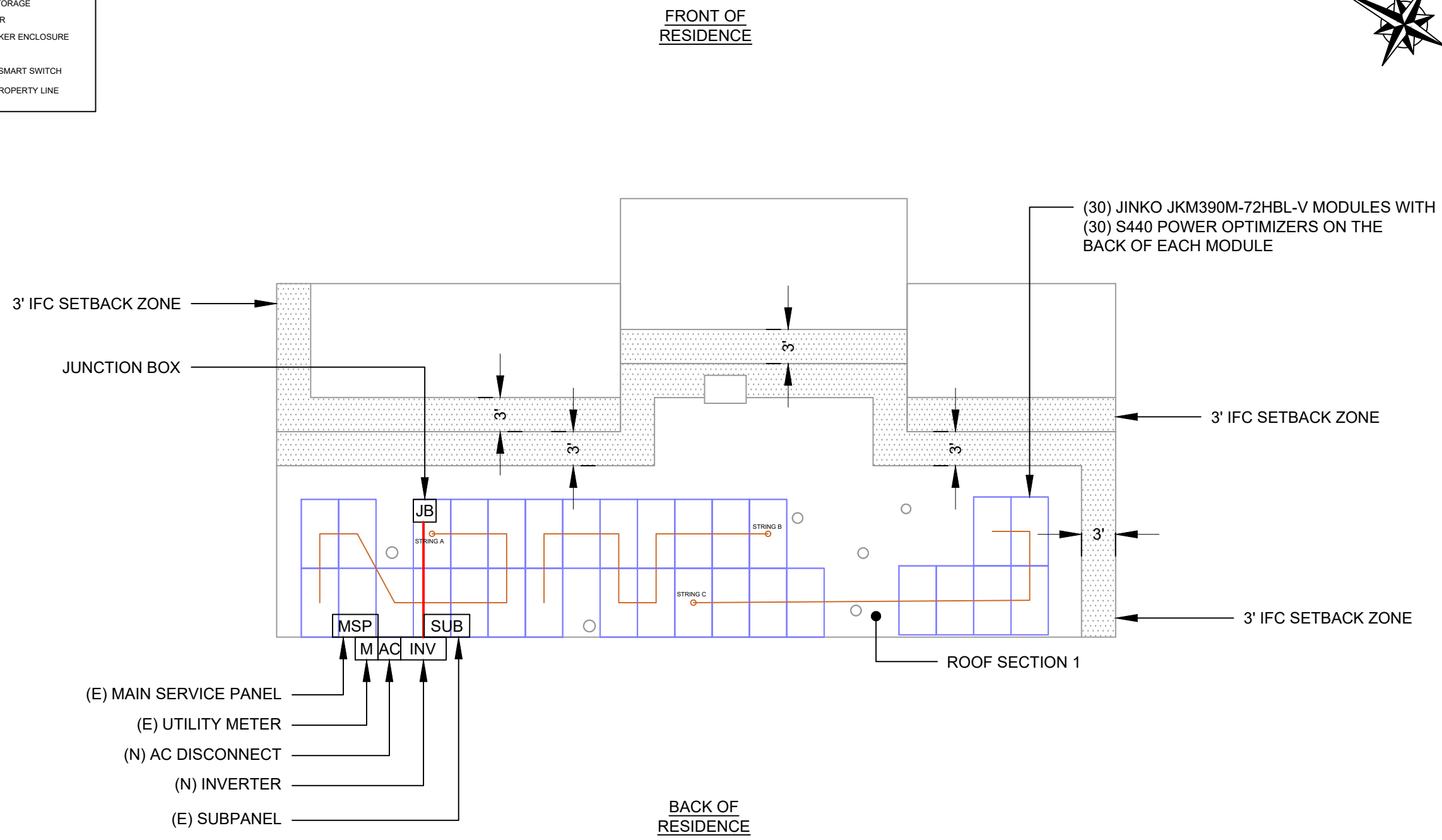
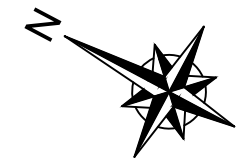
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DESCRIPTION	DATE	REV

PROJECT INFORMATION

PV1.2

**LEGEND**

● - ROOF ACCESS POINT	⊠ - GAS METER
(E) - EXISTING	⊠ - LOAD CENTER
(N) - NEW	⊠ - SUBPANEL
⊠ - UTILITY METER	⊠ - JUNCTION BOX
⊠ - PRODUCTION METER	⊠ - APPROX. CONDUIT/ATTIC RUN
⊠ - MAIN SERVICE PANEL	⊠ - ENERGY STORAGE
⊠ - AC DISCONNECT	⊠ - GENERATOR
⊠ - COMBINER PANEL	⊠ - MAIN BREAKER ENCLOSURE
⊠ - ENVOY	⊠ - INVERTER
⊠ - FIRE CODE SETBACKS	⊠ - ENPOWER SMART SWITCH
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ROOF AREAS	
ROOF SECTION 1 - SURFACE AREA	1616 SQ.FT
ROOF SECTION 1 - SOLAR COVERAGE	650 SQ.FT
ROOF SECTION 1 - PERCENTAGE COVER	40%
ROOF TOTAL SURFACE AREA	1616 SQ.FT
ROOF TOTAL SOLAR COVERAGE	650 SQ.FT
ROOF TOTAL PERCENTAGE COVER	40%

**1 SITE PLAN**  
SCALE: 3/32" = 1'-0"

NOTE: PROVIDE ADDITIONAL JUNCTION BOXED AS REQUIRED TO COMBINE MODULES ON DIFFERENT ARRAYS INTO A SINGLE STRING.

NOTE: NFPA-1//FFPC 11.12.2.2 ZONES THAT ARE DIMENSIONED AS 18" MEET REQUIREMENTS PER CODE AND INDICATE A 3' SETBACK SPLIT BETWEEN A HIP OR VALLEY.

NFPA-1//FFPC SECTION 11.12.2.2 REQUIRED 3 FEET ACCESS, PATHWAYS, AND SETBACKS. DO NOT PLACE ANY PV MODULES IN THIS SPACE.

CONTRACTOR

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WEST COLUMBIA SC 29170

JOB TITLE

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11.7 KW DC INPUT  
10 KW AC EXPORT

FERNANDO POMPA HUERTA  
3832 US-401,  
LILLINGTON, NC, 27546



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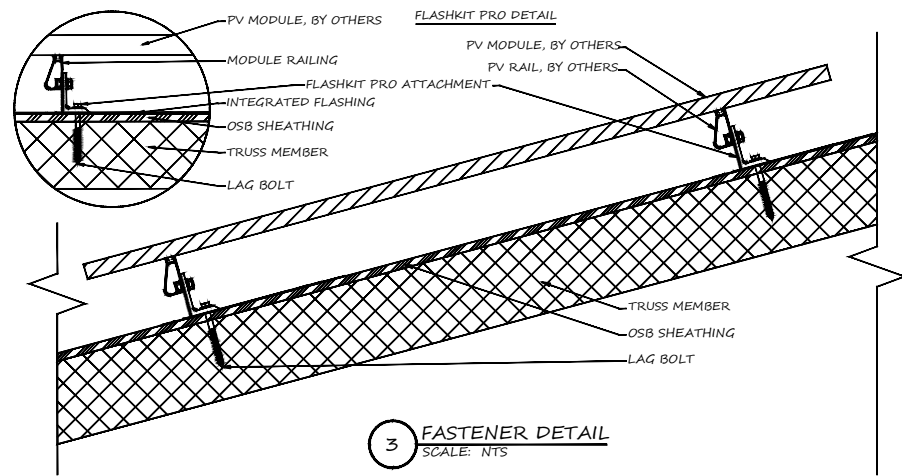
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SITE INFORMATION

**PV2.1**





ROOF INFO									FT	SQ.FT	LBS	
Layout	Count	Azimuth	Tilt	Solar Access	Roof Type	Portrait	Landscape	Count	Rail Length	Array Area	Array Weight	Surface Area
Roof Section 1	30	238	5/12 (22.62°)	94	Comp Shingle		86	86	200	650	400	1615.94

DEAD LOAD CALCULATIONS			
LOAD	QTY	WEIGHT	TOTAL
MODULE	30	49.6	1488
MICROINVERTER	30	2.38	71.4
RAILS LINEAR FT	1133	0.5	566.5
ATTACHMENT	86	0.74	63.64
TOTAL ARRAY WEIGHT			2189.54
AREA NAME	QTY	FT2	TOTAL FT2
MODULES	30	21.66	649.77
POINT LOAD (TOTAL ARRAY WEIGHT / # OF ATTACHMENTS)			25.45976744
DISTRIBUTED LOAD (TOTAL WEIGHT / ARRAY AREA)			3.37

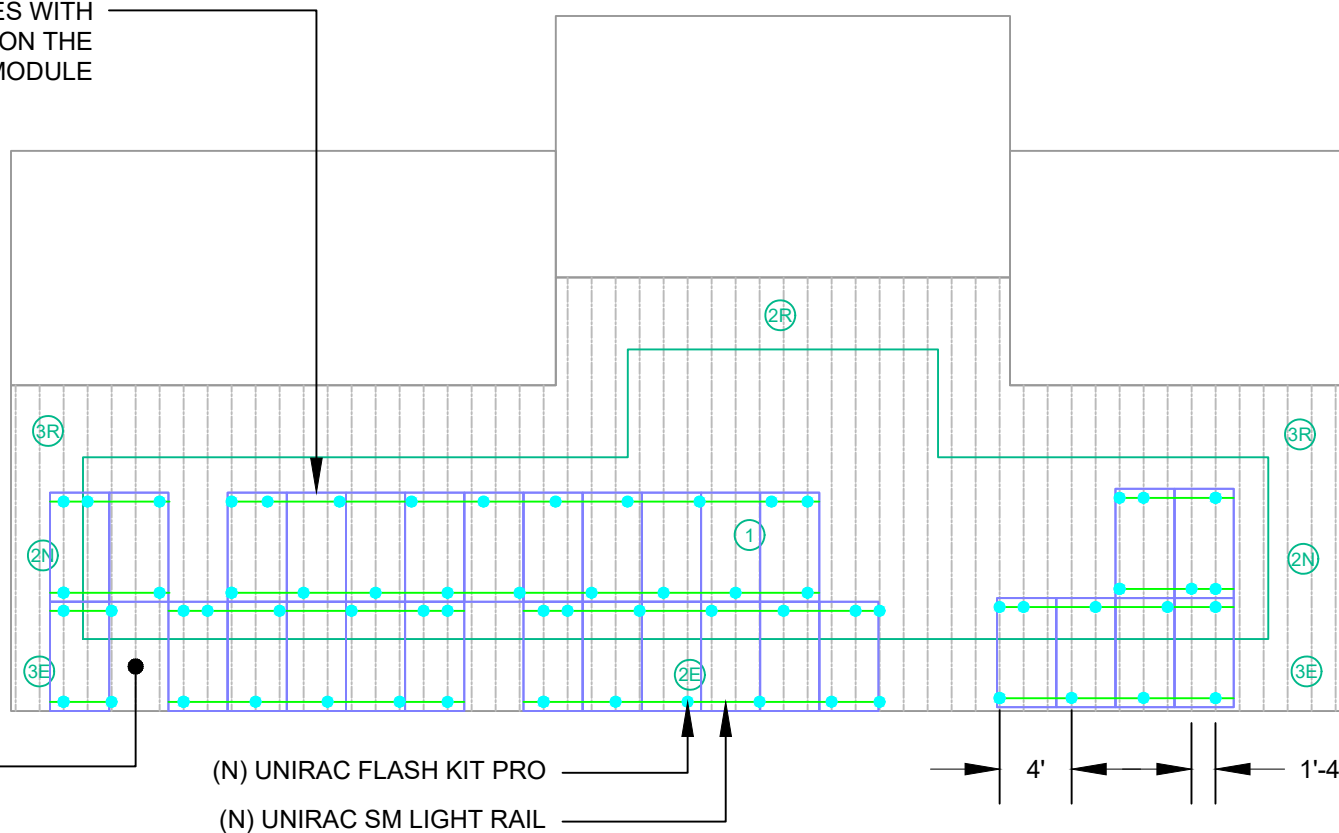
ROOF SUMMARY	
STRUCTURE	
TYPE	TRUSS
MATERIAL	SOUTHERN PINE #2
SIZE	2"x4"
SPACING	16"
DECKING:	
TYPE	OSB
MATERIAL	WOOD COMPOSITE
THICKNESS	7/16"
WEIGHT	1.6 LBS/SQFT
ROOFING:	
TYPE	ARCH SHINGLE
MATERIAL	ASPHALT
WEIGHT	2.3 LBS/SQFT

ROOF MOUNT, FASTENER AND RAIL	
ROOF MOUNT:	
MAKE	UNIRAC
MODEL	FLASH KIT PRO
MATERIAL	ALUMINUM
FASTENER:	
MAKE	GENERIC
MODEL	LAG BOLT
MATERIAL	SS LAG W/EPDM WASHER
SIZE	5/16" X4"
GENERAL	
WEIGHT	1 LBS
FASTENERS PER MOUNT	1 PER MOUNT
MAX. PULL-OUT FORCE	800 LBS
SAFETY FACTOR	2
DESIGN PULL-OUT FORCE	400 LBS
LAG BOLT EMBEDDED WITH 2.5" OF THREAD IN WOOD TRUSSES MEMBER	
MOUNTING RAIL:	
MAKE	Unirac
MODEL	SM Light
MATERIAL	ALUMINUM
WEIGHT	1 LBS
SPACING	48"

ATTACHMENTS	
ROOF MOUNT	86
RAIL COUNT	15
SPLICE BAR	12
MID CLAMPS	46
END CLAMPS	28

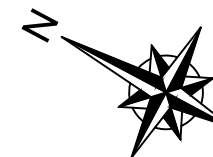
PV MODULES	
MAKE	JINKO
MODEL	JKM390M-72HBL-V
WIDTH	39 INCHES
LENGTH	79 INCHES
THICKNESS	2 INCHES
WEIGHT	50 LBS

(30) JINKO JKM390M-72HBL-V MODULES WITH  
(30) S440 POWER OPTIMIZERS ON THE  
BACK OF EACH MODULE



LEGEND	
● - ROOF ACCESS POINT	[G] - GAS METER
(E) - EXISTING	[LC] - LOAD CENTER
(N) - NEW	[SUB] - SUBPANEL
[M] - UTILITY METER	[JB] - JUNCTION BOX
[P] - PRODUCTION METER	[BAT] - ENERGY STORAGE
[MSP] - MAIN SERVICE PANEL	[GEN] - GENERATOR
[AC] - AC DISCONNECT	[MBE] - MAIN BREAKER ENCLOSURE
[CP] - COMBINER PANEL	[INV] - INVERTER
[ENV] - ENVOY	[ESS] - ENPOWER SMART SWITCH
[ ] - FIRE CODE SETBACKS	- - - - - APPROX. PROPERTY LINE
	- - - - - APPROX. CONDUIT/ATTIC RUN

ROOF SECTION  
SCALE: 3/32" = 1'-0"



CONTRACTOR

635 OLD BARNWELL ROAD  
WEST COLUMBIA SC 29170

JOB TITLE

NEW SOLAR PV ROOF  
MOUNT SYSTEM  
11.7 KW DC INPUT  
10 KW AC EXPORT

FERNANDO POMPA HUERTA  
3832 US-401,  
LILLINGTON, NC, 27546

SEAL  
040548  
SCOTT E. WYSSLING

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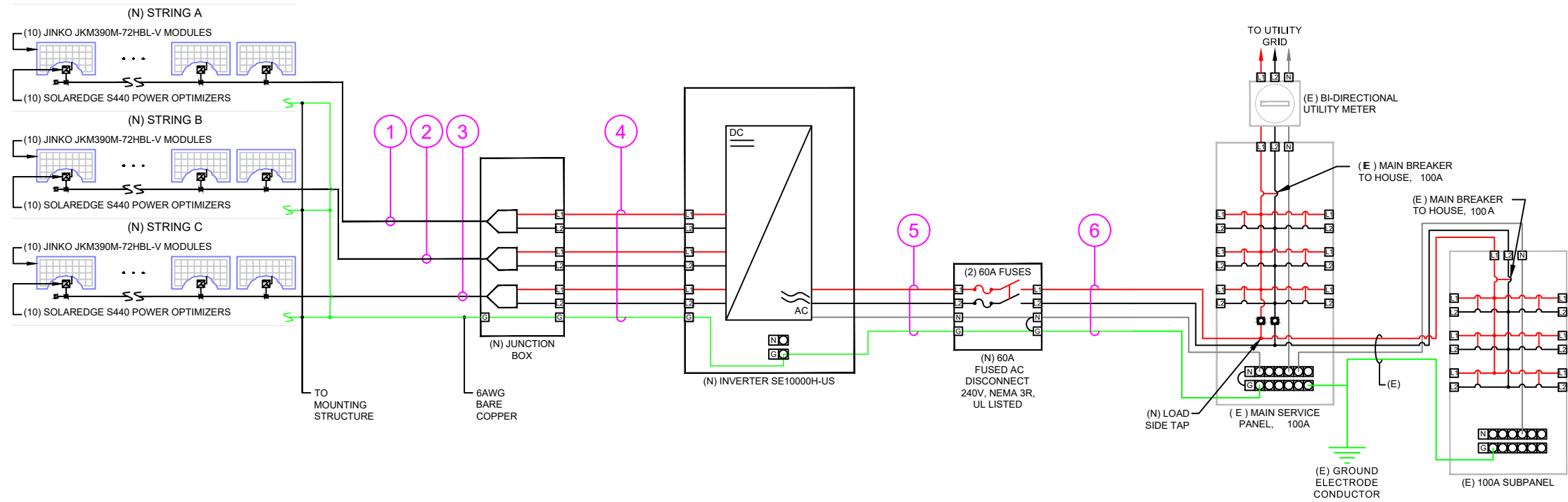
STRUCTURAL  
INFORMATION

PV3.1

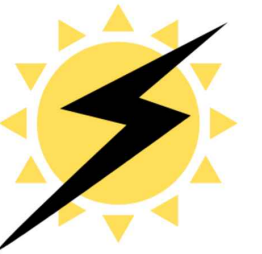
ID	INITIAL CONDUCTOR LOCATION	FINAL CONDUCTOR LOCATION	MIN. CONDUCTOR SIZE (AWG)		MIN. DIA CONDUIT SIZE (IN.)	# OF PARALLEL CIRCUITS	CURRENT-CARRYING CONDUCTORS IN CONDUIT	OCPD (A)	MIN. EGC SIZE (AWG)		TEMP. CORR. FACTOR		CONDUIT FILL FACTOR	CONT. CURRENT (A)	MAX. CURRENT (A)	BASE AMP. (A)	DERATED AMP. (A)	TERM. AMP. RATING (A)	LENGTH (FT)	VOLTAGE DROP (%)
1	STRING A	JUNCTION BOX	10	PV WIRE	N/A	1	2	N/A	6	BARE COPPER	0.76	55°C	N/A	15.73	19.66	40	N/A	N/A	55.00	0.90
2	STRING B	JUNCTION BOX	10	PV WIRE	N/A	1	2	N/A	6	BARE COPPER	0.76	55°C	N/A	15.73	19.66	40	N/A	N/A	55.00	0.90
3	STRING C	JUNCTION BOX	10	PV WIRE	N/A	1	2	N/A	6	BARE COPPER	0.76	55°C	N/A	15.73	19.66	40	N/A	N/A	55.00	0.90
4	JUNCTION BOX	IQ COMBINER	10	THWN-2 COPPER	0.75 LTNM	3	6	20	10	THWN-2 COPPER	0.76	55°C	0.8	15.73	19.66	40	24.3	35	35.00	0.57
5	IQ COMBINER	AC DISCONNECT	8	THWN-2 COPPER	0.75 LTNM	1	3	60	10	THWN-2 COPPER	0.96	33°C	1	47.19	58.99	55	52.8	50	5.00	0.15
6	AC DISCONNECT	MSP	6	THWN-2 COPPER	0.75 LTNM	1	3	60	6	THWN-2 COPPER	0.96	33°C	1	47.19	58.99	75	72.0	65	5.00	0.10

**LIST OF EQUIPMENT**

EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULE	30	JINKO JKM390M-72HBL-V
POWER OPTIMIZER	30	SOLAREEDGE S440 POWER OPTIMIZER
JUNCTION BOX	1	JUNCTION BOX, NEMA 3R, UL LISTED
INVERTER	1	SOLAREEDGE SE10000H-US
AC DISCONNECT	1	60A FUSED AC DISCONNECT, 240V, NEMA 3R, UL LISTED
SUBPANEL	1	100A SUBPANEL



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REVISIONS

DESCRIPTION	DATE	REV

ELECTRICAL  
INFORMATION

**PV4.1**

MODULE OPTIMIZER	
MAKE	SOLAREEDGE
MODEL	S440
DC INPUT:	
RATED POWER	440 WATTS
VOLT. RANGE	8-60
MAX. SCC	14.5 AMPS
MAX. DC INPUT CURRENT	14.5 AMPS
DC OUTPUT:	
MAX. CURRENT	15 AMPS
MX. VOLT.	60 VOLTS
MAX. SYSTEM VOLT.	1000 VOLTS
MIN. STRING	8 OPTIMIZERS
MAX. STRING	25 OPTIMIZERS
MAX. POWER	
INVERTERS: SE3800H-SE6000H	5700 WATTS
INVERTERS: SE7600H-SE114000H	6000 WATTS

DC/ AC INVERTER (NEW)	
MANUFACTURER/ MODEL	SOLAREEDGE SE10000H-US (240V)
MAX AC OUTPUT	42
AC OUTPUT VOLTAGE	240
MAX DC INPUT VOLTAGE	480
MAX INPUT CURRENT	27
WEIGHTED CEC EFFICIENCY	99%
INVERTER WATTAGE	10000 W

**NOTES:**

- USE MODEL SE10000H-US INVERTER WITH REVENUE GRADE PRODUCTION AND CONSUMPTION METER

AC DISCONNECT	
MAKE	N/A
MODEL	N/A
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
BUS RATING	60 AMPS
UL LIST. (Y/N)	YES
FUSED (Y/N)	YES
FUSE RATING	40 AMPS

**NOTES:**

- LOAD-BREAK RATED
- VISIBLE OPEN
- LOCKABLE IN OPEN POSITION
- INSTALL ADJACENT TO METER
- DISCONNECT TO BE READILY ACCESSIBLE TO UTILITY COMPANY PERSONNEL AT ALL TIMES
- SERVICE RATED
- PROVIDE NEUTRAL/GROUND BONDING JUMPER

MD PANEL (EXISTING)	
MAKE	N/A
MODEL	120/240
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
BUS RATING	100 AMPS
UL LIST. (Y/N)	YES
MAIN BREAKER (Y/N)	NO
BREAKER RATING	100 AMPS

**NOTES:**

- BACK-FEED SOLAR OUTPUT VIA FEEDER TAP INSIDE OF METER/ 6-THROW DISCONNECT COMBO
- SUBPANEL FED VIA 100A BREAKER IN 6-THROW DISCONNECT

SUBPANEL (EXISTING)	
MAKE	N/A
MODEL	N/A
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
BUS RATING	100 AMPS
UL LIST. (Y/N)	YES
FUSED (Y/N)	100 AMPS
FUSE RATING	N/A

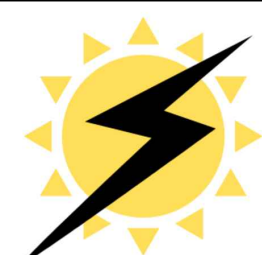
**JUNCTION BOX**

MAKE	SOLADECK
MODEL	0783-3R
PRO. RATING	NEMA 3R
VOLT. RATING	600 VOLTS
AMP RATING	120 AMPS
UL LISTING	UL 50

**NOTES:**

- PROVIDE ADDITIONAL JUNCTION BOXED AS REQUIRED TO COMBINE MODULES ON DIFFERENT ARRAYS INTO A SINGLE STRING

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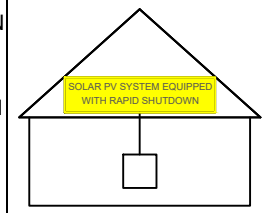
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## EQUIPMENT LABELS

**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



NEC 690.56 (C)(1)(a)  
PLACE WITHIN 3FT OF SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED AND SHALL INDICATE THE LOCATIONS OF RAPID SHUTDOWN SWITCHES

**WARNING: PHOTOVOLTAIC POWER SOURCE**

NEC 690.31 (G)(3)&(4)  
PLACE ON ALL JUNCTION BOXES, EXPOSED RACEWAYS, AND OTHER WIRING METHODS EVERY 10' AND ON EVERY SECTION SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS.

**RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM**

NEC 690.56 (C)(3)  
PLACE ON RAPID SHUTDOWN SWITCH OR EQUIPMENT WITH INTEGRATED RAPID SHUTDOWN \*REFLECTIVE\*

**! WARNING**

**DUAL POWER SUPPLY**

SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM

NEC 705.12 (B)(3)  
PLACE ON ALL EQUIPMENT THAT IS SUPPLIED BY BOTH POWER SOURCES

**! WARNING**

**ELECTRIC SHOCK HAZARD**

TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

NEC 690.13 (B)  
PLACE ON PV SYSTEM DISCONNECTING MEANS.

**EQUIPMENT LABEL NOTES**

- LABELS SHOWN ARE 1/2 THEIR ACTUAL REQUIRED SIZE.
- LABEL MATERIAL SHALL BE SUITABLE FOR THE EQUIPMENT ENVIRONMENT.
- CONDUIT SHALL BE MARKED WITH REQUIRED LABEL EVERY 10 FEET.

**PHOTOVOLTAIC POWER SOURCE**

OPERATING AC VOLT. 240 VAC

MAXIMUM OPERATING AC OUTPUT CURRENT 42 AMPS

NEC 690.54  
PLACE ON INTERCONNECTION DISCONNECTING MEANS

**DIRECT CURRENT PHOTOVOLTAIC POWER SOURCE**

MAXIMUM VOLTAGE 600 VDC

MAX CIR. CURRENT 37.5 AMPS

NEC 690.53  
PLACE ON ALL DC DISCONNECTING MEANS

**PV SYSTEM DISCONNECT**

NEC 690.13 (B)  
PLACE ON PV SYSTEM DISCONNECTING MEANS.

## CONSTRUCTION NOTES

- ALL WORK AND EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST NATIONAL, STATE, AND LOCAL CODES AND ORDINANCES
- FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS, BEST PRACTICES, AND SPECIFICATIONS
- WIRES SHALL BE RATED AND LABELED "SUNLIGHT RESISTANT" WHERE EXPOSED TO AMBIENT CONDITIONS
- THE PHOTOVOLTAIC SYSTEM SHALL NOT EXCEED 600 VOLTS OR 800 AMPS
- EACH ELECTRICAL APPLIANCE SHALL BE PROVIDED WITH A NAMEPLATE GIVING THE IDENTIFYING NAME AND THE RATING IN VOLTS AND AMPERES, OR VOLTS AND WATTS. IF THE APPLIANCE IS TO BE USED ON A SPECIFIC FREQUENCY OR REQUENCIES, IT SHALL BE SO MARKED. WHERE MOTOR OVERLOAD PROTECTION EXTERNAL TO THE APPLIANCES IS REQUIRED, THE APPLIANCE SHALL BE SO MARKED
- WHERE APPLICABLE, GROUNDING ELECTRODE CONDUCTOR TO BE CONTINUOUS. GROUNDING CRIMPS TO BE IRREVERSIBLE
- IN ONE- AND TWO-FAMILY DWELLINGS, LIVE PARTS IN PHOTOVOLTAIC SOURCE CIRCUITS AND PHOTOVOLTAIC OUTPUT CIRCUITS OVER 150 VOLTS TO GROUND, SHALL ONLY BE ACCESSIBLE TO QUALIFIED PERSONS WHILE ENERGIZED.
- PHOTOVOLTAIC SYSTEMS SHALL BE PERMANENTLY MARKED AT VARIOUS EQUIPMENT LOCATIONS TO IDENTIFY THAT A PHOTOVOLTAIC SYSTEM IS INSTALLED AND THAT VARIOUS DANGERS ARE PRESENT.
- EACH PHOTOVOLTAIC SYSTEM DISCONNECTING MEANS SHALL BE PERMANENTLY MARKED TO IDENTIFY IT AS A PHOTOVOLTAIC SYSTEM DISCONNECT
- WHERE ALL TERMINALS OF A DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION, A WARNING SIGN SHALL BE MOUNTED ON OR ADJACENT TO THE DISCONNECT
- A PERMANENT LABEL FOR THE DIRECT-CURRENT PHOTOVOLTAIC POWER SOURCE SHALL BE PROVIDED BY THE INSTALLED AT THE DC DISCONNECT MEANS
- A PERMANENT PLAQUE OR DIRECTORY, DENOTING ALL ELECTRIC POWER SOURCES SERVING THE PREMISES, SHALL BE INSTALLED AT EACH SERVICE EQUIPMENT LOCATION AND AT LOCATIONS OF ALL POWER PRODUCTION SOURCES.
- A PERMANENT PLAQUE OR DIRECTORY SHALL BE PROVIDED DENOTING THE LOCATIONS OF THE SERVICE DISCONNECT MEANS AND THE PHOTOVOLTAIC SYSTEM DISCONNECT MEANS IF THEY ARE NOT LOCATED AT THE SAME LOCATION.
- ALL MODULE GROUND CONNECTIONS SHALL BE MADE IN ACCORDANCE WITH NEC SECTION 690.4 (C)

ENGINEERING STAMP:

DRAWN BY: LEONI MARLOU EBO

DATE: 01 - 26 - 2023

REVISIONS

DESCRIPTION	DATE	REV

ELECTRICAL INFORMATION

PV4.2



EAGLE  
MODULES

THE MOST  
DEPENDABLE  
SOLAR PRODUCT

## EAGLE G2 BLACK

380-400 WATT • MONO PERC HALF-CELL MODULE

Positive power tolerance of 0~+3%

\*PRELIMINARY VERSION

- NYSE-listed since 2010, Bloomberg Tier 1 manufacturer
- Top performance in the strictest 3<sup>rd</sup> party labs
- Automated manufacturing utilizing artificial intelligence
- Vertically integrated, tight controls on quality
- Premium solar module factory in Jacksonville, Florida

### KEY FEATURES

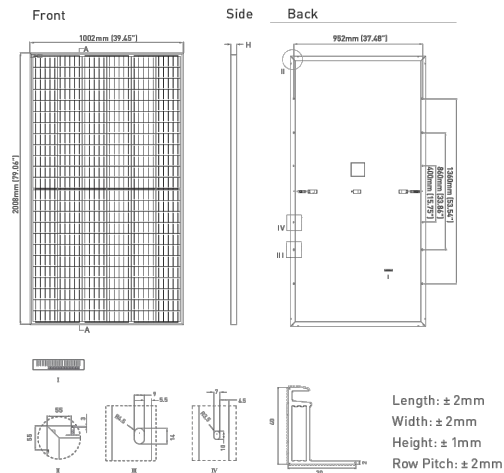
- Superior Aesthetics**  
Black backsheet and black frame create ideal look for residential applications.
- Diamond Half-Cell Technology**  
World-record breaking efficient mono PERC half-cells deliver high power in a small footprint.
- Thick and Tough**  
Fire Type 1 rated module engineered with a thick frame, 3.2mm front side glass, and thick backsheet for added durability.
- Shade Tolerant**  
Twin array design allows continued performance even with shading by trees or debris.
- Protected Against All Environments**  
Certified to withstand humidity, heat, rain, marine environments, wind, hailstorms, and packed snow.
- Warranty**  
12-year product and 25-year linear power warranty.

- ISO9001:2008 Quality Standards
- ISO 45001 2018 Occupational Health & Safety Standards
- ISO14001:2004 Environmental Standards
- IEC61215, IEC61730 certification pending
- UL1703/61730 certification pending

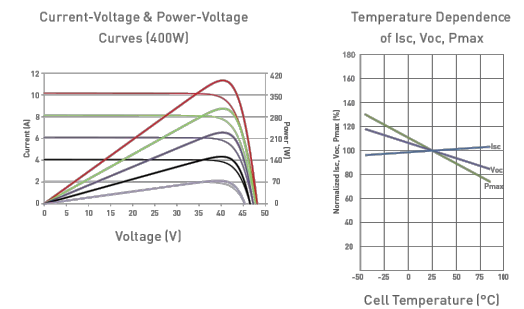
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**Jinko** Solar

### ENGINEERING DRAWINGS



### ELECTRICAL PERFORMANCE & TEMPERATURE DEPENDENCE



### ELECTRICAL CHARACTERISTICS

Module Type	JKM380M-72HBL-V		JKM385M-72HBL-V		JKM390M-72HBL-V		JKM395M-72HBL-V		JKM400M-72HBL-V	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	380Wp	279Wp	385Wp	283Wp	390Wp	287Wp	395Wp	291Wp	400Wp	294Wp
Maximum Power Voltage (Vmp)	39.10V	36.5V	39.37V	36.8V	39.64V	37.0V	39.90V	37.4V	40.16V	37.6V
Maximum Power Current (Imp)	9.72A	7.67A	9.78A	7.71A	9.84A	7.75A	9.90A	7.77A	9.96A	7.82A
Open-circuit Voltage (Voc)	48.2V	45.4V	48.4V	45.6V	48.6V	45.8V	48.8V	46.0V	49.1V	46.2V
Short-circuit Current (Isc)	10.30A	8.32A	10.38A	8.38A	10.46A	8.45A	10.54A	8.51A	10.61A	8.57A
Module Efficiency STC (%)	18.89%		19.14%		19.38%		19.63%		19.88%	

\*STC: Irradiance 1000W/m<sup>2</sup> Cell Temperature 25°C AM = 1.5  
 NOCT: Irradiance 800W/m<sup>2</sup> Ambient Temperature 20°C AM = 1.5 Wind Speed 1m/s

\*Power measurement tolerance: ±3%

\*PRELIMINARY VERSION  
 The company reserves the final right for explanation on any of the information presented hereby. JKM380-400M-72HBL-V-D1-US

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**Jinko** Solar

### MECHANICAL CHARACTERISTICS

Cells	Mono PERC Diamond Cell (158.75 x 158.75mm)
No. of Half Cells	144 (6 x 24)
Dimensions	2008 x 1002 x 40mm (79.06 x 39.45 x 1.57in)
Weight	22.5kg (49.6lbs)
Front Glass	3.2mm, Anti-Reflection Coating High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminum Alloy
Junction Box	IP68 Rated
Output Cables	12 AWG, 1400mm (55.12in)
Connector	Staubli MC4 Series
Fire Type	Type 1
Pressure Rating	5400Pa (Snow) & 2400Pa (Wind)
Hailstone Test	50mm Hailstones at 35m/s

### TEMPERATURE CHARACTERISTICS

Temperature Coefficients of Pmax	-0.35%/°C
Temperature Coefficients of Voc	-0.29%/°C
Temperature Coefficients of Isc	0.048%/°C
Nominal Operating Cell Temperature (NOCT)	45±2°C

### MAXIMUM RATINGS

Operating Temperature (°C)	-40°C~+85°C
Maximum System Voltage	1500VDC (UL and IEC)
Maximum Series Fuse Rating	20A

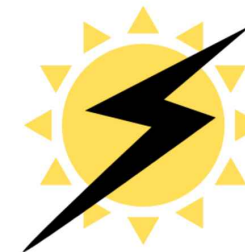
### PACKAGING CONFIGURATION

[Two pallets = One stack]  
 27pcs/pallet, 54pcs/stack, 594pcs/40' HQ Container

### WARRANTY

12-year product and 25-year linear power warranty  
 1<sup>st</sup> year degradation not to exceed 2.5%, each subsequent year not to exceed 0.6%, minimum power at year 25 is 83.1% or greater.

CONTRACTOR



635 OLD BARNWELL ROAD  
 WEST COLUMBIA SC 29170

JOB TITLE

NEW SOLAR PV ROOF  
 MOUNT SYSTEM  
 11.7 KW DC INPUT  
 10 KW AC EXPORT

FERNANDO POMPA HUERTA  
 3832 US-401,  
 LILLINGTON, NC, 27546

ENGINEERING STAMP:

DRAWN BY: LEONI MARLOU EBO

DATE: 01 - 26 - 2023

REVISIONS

DESCRIPTION	DATE	REV

LABELS,  
 DETAILS & SPECS

PV5.1

# Single Phase Inverter with HD-Wave Technology

for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US



INVERTERS

## Optimized installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking efficiency
- Fixed voltage inverter for longer strings
- Integrated arc fault protection and rapid shutdown for NEC 2014 and 2017, per article 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Extremely small
- Built-in module-level monitoring
- Outdoor and indoor installation
- Optional: Revenue grade data, ANSI C12.20 Class 0.5 (0.5% accuracy)

solaredge.com



## Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US

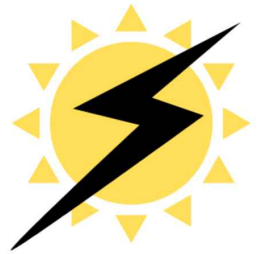
	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US		
<b>OUTPUT</b>									
Rated AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA	
Maximum AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA	
AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac	
AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229)	-	✓	-	✓	-	-	✓	Vac	
AC Frequency (Nominal)	59.3 - 60 - 60.5 <sup>1)</sup>							Hz	
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5	A	
Maximum Continuous Output Current @208V	-	16	-	24	-	-	48.5	A	
GFDI Threshold	1							A	
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes								
<b>INPUT</b>									
Maximum DC Power @240V	4650	5900	7750	9300	11800	15500	17650	W	
Maximum DC Power @208V	-	5100	-	7750	-	-	15500	W	
Transformer-less, Ungrounded	Yes								
Maximum Input Voltage	480							Vdc	
Nominal DC Input Voltage	380							Vdc	
Maximum Input Current @240V <sup>2)</sup>	8.5	10.5	13.5	16.5	20	27	30.5	Adc	
Maximum Input Current @208V <sup>3)</sup>	-	9	-	13.5	-	-	27	Adc	
Max. Input Short Circuit Current	45							Adc	
Reverse-Polarity Protection	Yes								
Ground-Fault Isolation Detection	600ka Sensitivity								
Maximum Inverter Efficiency	99			99.2				%	
CEC Weighted Efficiency	99						99 @ 240V 98.5 @ 208V	%	
Nighttime Power Consumption	< 2.5							W	
<b>ADDITIONAL FEATURES</b>									
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)								
Revenue Grade Data, ANSI C12.20	Optional <sup>4)</sup>								
Rapid Shutdown - NEC 2014 and 2017 690.12	Automatic Rapid Shutdown upon AC Grid Disconnect								
<b>STANDARD COMPLIANCE</b>									
Safety	UL1741, UL1741 SA, UL1699B, CSA C22.2, Canadian AFCI according to T.I.L. M-07								
Grid Connection Standards	IEEE1547, Rule 21, Rule 14 (HI)								
Emissions	FCC Part 15 Class B								
<b>INSTALLATION SPECIFICATIONS</b>									
AC Output Conduit Size / AWG Range	1" Maximum / 14-6 AWG				1" Maximum / 14-4 AWG				
DC Input Conduit Size / # of Strings / AWG Range	1" Maximum / 1-2 strings / 14-6 AWG				1" Maximum / 1-3 strings / 14-6 AWG				
Dimensions with Safety Switch (HxWxD)	17.7 x 14.6 x 6.8 / 450 x 370 x 174				21.3 x 14.6 x 7.3 / 540 x 370 x 185				in / mm
Weight with Safety Switch	22 / 10	25.1 / 11.4	26.2 / 11.9	38.8 / 17.6				lb / kg	
Noise	< 25							<50	dB(A)
Cooling	Natural Convection								
Operating Temperature Range	-13 to +140 / -25 to +60 <sup>5)</sup> (-40°F / -40°C option) <sup>6)</sup>							°F / °C	
Protection Rating	NEMA 4X (Inverter with Safety Switch)								

<sup>1)</sup> For other regional settings please contact SolarEdge support  
<sup>2)</sup> A higher current source may be used; the inverter will limit its input current to the values stated  
<sup>3)</sup> Revenue grade inverter P/N: SExxxxH-US000NNC2  
<sup>4)</sup> For power de-rating information refer to: <https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf>  
<sup>5)</sup> -40 version P/N: SExxxxH-US000NNU4

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RoHS

CONTRACTOR



635 OLD BARNWELL ROAD  
WEST COLUMBIA SC 29170

JOB TITLE

NEW SOLAR PV ROOF  
MOUNT SYSTEM  
11.7 KW DC INPUT  
10 KW AC EXPORT

FERNANDO POMPA HUERTA  
3832 US-401,  
LILLINGTON, NC, 27546

ENGINEERING STAMP:

DRAWN BY: LEONI MARLOU EBO

DATE: 01 - 26 - 2023

REVISIONS

DESCRIPTION	DATE	REV

EQUIPMENT  
SPEC SHEETS

PV5.2

# Power Optimizer For Residential Installations

S440 / S500 / S500B / S650B



POWER OPTIMIZER

## Enabling PV power optimization at the module level

- Specifically designed to work with SolarEdge residential inverters
- Mitigates all types of module mismatch loss, from manufacturing tolerance to partial shading
- Detects abnormal PV connector behavior, preventing potential safety issues\*
- Faster installations with simplified cable management and easy assembly using a single bolt
- Module-level voltage shutdown for installer and firefighter safety
- Flexible system design for maximum space utilization
- Superior efficiency (99.5%)
- Compatible with bifacial PV modules

\* Functionality subject to inverter model and firmware version

[solaredge.com](http://solaredge.com)



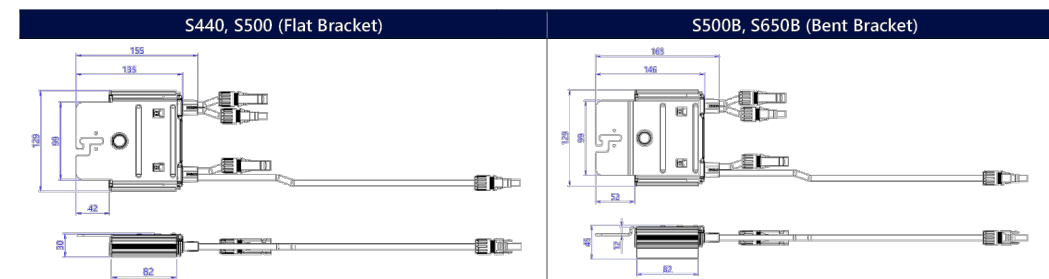
## Power Optimizer For Residential Installations S440 / S500 / S500B / S650B

	S440	S500	S500B	S650B	UNIT
<b>INPUT</b>					
Rated Input DC Power <sup>(1)</sup>	440	500		650	W
Absolute Maximum Input Voltage (Voc)	60	125		85	Vdc
MPPT Operating Range	8 – 60	12.5 – 105		12.5 – 85	Vdc
Maximum Short Circuit Current (Isc) of Connected PV Module	14.5	15			Adc
Maximum Efficiency		99.5			%
Weighted Efficiency		98.6			%
Overvoltage Category		II			
<b>OUTPUT DURING OPERATION</b>					
Maximum Output Current		15			Adc
Maximum Output Voltage	60		80		Vdc
<b>OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM INVERTER OR INVERTER OFF)</b>					
Safety Output Voltage per Power Optimizer		1 ± 0.1			Vdc
<b>STANDARD COMPLIANCE<sup>(2)</sup></b>					
EMC	FCC Part 15 Class B, IEC61000-6-2, IEC61000-6-3, CISPR11, EN-55011				
Safety	IEC62109-1 (class II safety), UL1741				
Material	UL94 V-0, UV Resistant				
RoHS	Yes				
Fire Safety	VDE-AR-E 2100-712:2018-12				
<b>INSTALLATION SPECIFICATIONS</b>					
Maximum Allowed System Voltage		1000			Vdc
Dimensions (W x L x H)	129 x 155 x 30		129 x 165 x 45		mm
Weight	720		790		gr
Input Connector		MC4 <sup>(3)</sup>			
Input Wire Length		0.1			m
Output Connector		MC4			
Output Wire Length		(+) 2.3, (-) 0.10			m
Operating Temperature Range <sup>(4)</sup>		-40 to +85			°C
Protection Rating		IP68			
Relative Humidity		0 – 100			%

(1) Rated power of the module at STC will not exceed the Power Optimizer Rated Input DC Power. Modules with up to +5% power tolerance are allowed.  
 (2) For details about CE compliance, see Declaration of Conformity – CE.  
 (3) For other connector types please contact SolarEdge.  
 (4) Power de-rating is applied for ambient temperatures above +85°C for S440 and S500, and for ambient temperatures above +75°C for S500B. Refer to the Power Optimizers Temperature De-Rating Technical Note for details.

PV System Design Using a SolarEdge Inverter <sup>(5)</sup>		SolarEdge Home Wave Inverter Single Phase	SolarEdge Home Short String Inverter Three Phase	Three Phase for 230/400V Grid	Three Phase for 277/480V Grid
Minimum String Length (Power Optimizers)	S440, S500	8	9	16	18
	S500B, S650B	6	8	14	
Maximum String Length (Power Optimizers)		25	20	50	
Maximum Continuous Power per String		5700	5625	11,250	12,750
Maximum Allowed Connected Power per String <sup>(6)</sup> (In multiple string designs, the maximum is permitted only when the difference in connected power between strings is 2,000W or less)		6800 <sup>(7)</sup>	See <sup>(6)</sup>	13,500	15,000
Parallel Strings of Different Lengths or Orientations		Yes			

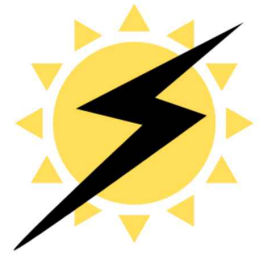
(5) It is not allowed to mix S-series and P-series Power Optimizers in new installations in the same string.  
 (6) If the inverter's rated AC power ≤ maximum continuous power per string, then the maximum connected power per string will be able to reach up to the inverters maximum input DC power. Refer to the Single String Design Guidelines application note.  
 (7) For inverters with a rated AC power ≥ 8000W that are connected to at least two strings.



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CONTRACTOR



635 OLD BARNWELL ROAD  
WEST COLUMBIA SC 29170

JOB TITLE

NEW SOLAR PV ROOF  
MOUNT SYSTEM  
11.7 KW DC INPUT  
10 KW AC EXPORT

FERNANDO POMPA HUERTA  
3832 US-401,  
LILLINGTON, NC, 27546

ENGINEERING STAMP:

DRAWN BY: LEONI MARLOU EBO

DATE: 01 - 26 - 2023

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EQUIPMENT  
SPEC SHEETS

PV5.3



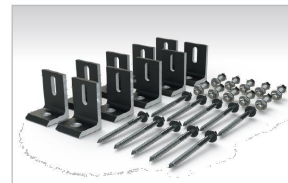
# FLASHKIT PRO



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

## THE COMPLETE ROOF ATTACHMENT SOLUTION

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

# 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-torquing the lag bolt if using an impact driver.
- Repeat Steps 1 and 2 at each roof attachment point.

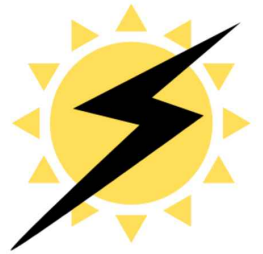
### STEP 3 ATTACH L-FOOT TO RAIL

- 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.

## FASTER INSTALLATION. 25-YEAR WARRANTY.

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

CONTRACTOR



635 OLD BARNWELL ROAD  
WEST COLUMBIA SC 29170

JOB TITLE

NEW SOLAR PV ROOF  
MOUNT SYSTEM  
11.7 KW DC INPUT  
10 KW AC EXPORT

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DRAWN BY: LEONI MARLOU EBO

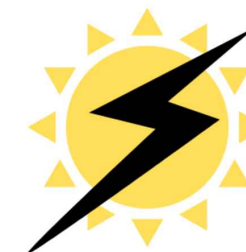
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DESCRIPTION	DATE	REV

EQUIPMENT  
SPEC SHEET

# PV5.4



635 OLD BARNWELL ROAD  
WEST COLUMBIA SC 29170

JOB TITLE

NEW SOLAR PV ROOF  
MOUNT SYSTEM  
11.7 KW DC INPUT  
10 KW AC EXPORT

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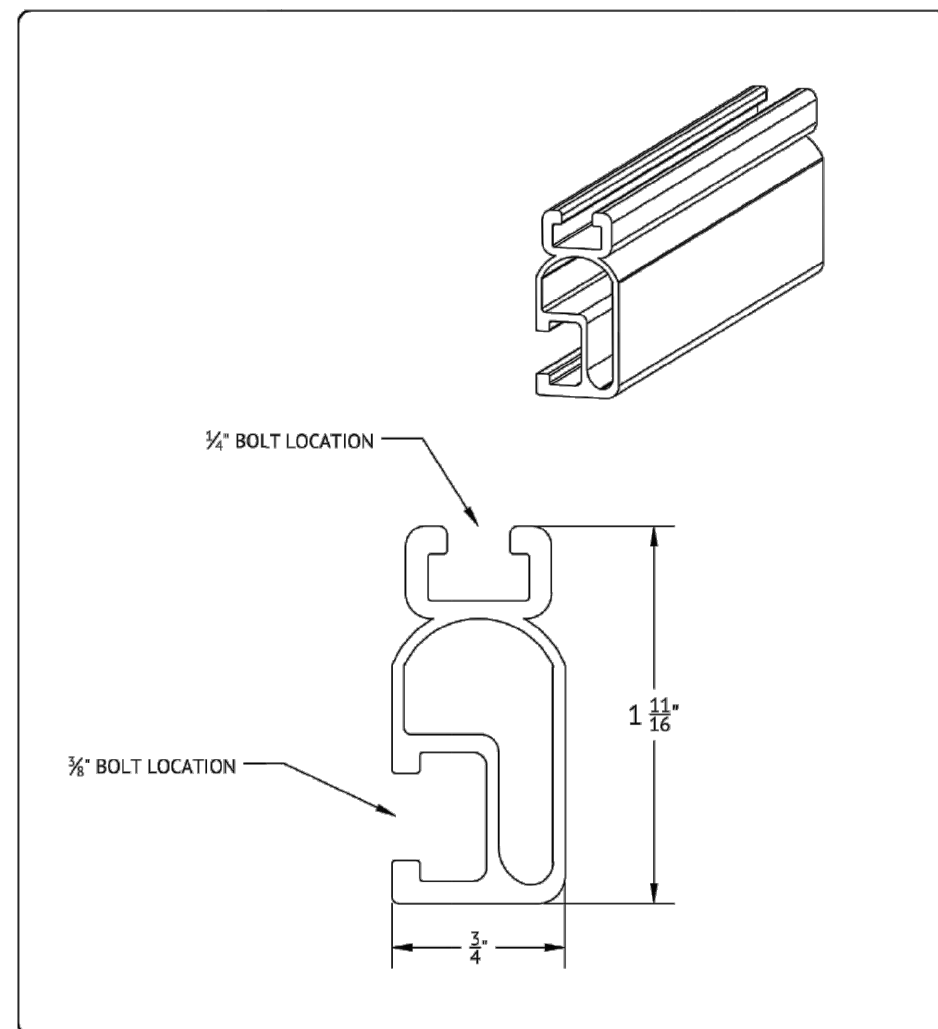
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REVISIONS		
DESCRIPTION	DATE	REV

EQUIPMENT  
SPEC SHEET

PV5.5



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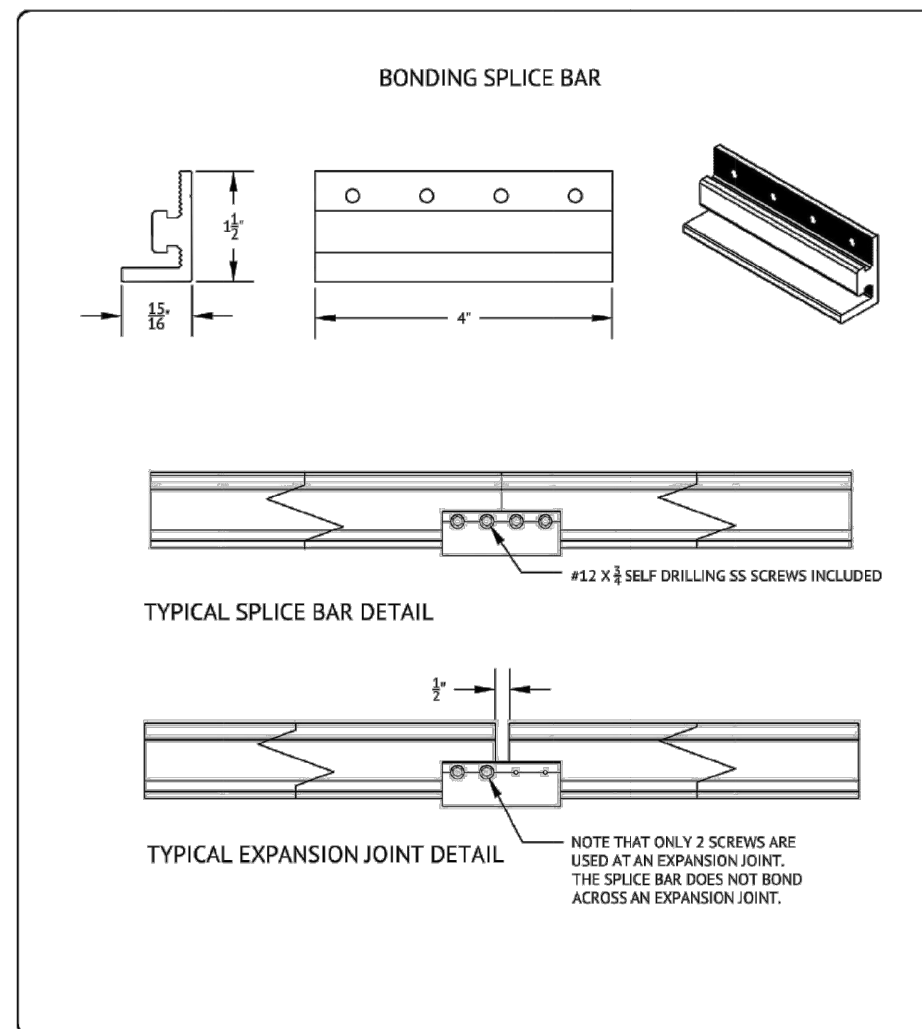
<b>PRODUCT LINE:</b>	SOLARMOUNT
<b>DRAWING TYPE:</b>	PART DETAIL
<b>DESCRIPTION:</b>	LIGHT RAIL
<b>REVISION DATE:</b>	APRIL 2016

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE NOMINAL

PRODUCT PROTECTED BY ONE  
OR MORE US PATENTS

LEGAL NOTICE

**SM-P02**  
SHEET



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

<b>PRODUCT LINE:</b>	SOLARMOUNT
<b>DRAWING TYPE:</b>	PART & ASSEMBLY
<b>DESCRIPTION:</b>	BONDING SPLICE BAR
<b>REVISION DATE:</b>	APRIL 2016

DRAWING NOT TO SCALE  
ALL DIMENSIONS ARE NOMINAL

PRODUCT PROTECTED BY ONE OR MORE  
US PATENTS

LEGAL NOTICE

**SM-A01**  
SHEET