



Scott E. Wyssling, PE, PP, CME

**Scott E. Wyssling, PE**  
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Alpine, UT 84004  
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March 25, 2021

1505 King Street Ext. #114  
Suite 114  
Palmetto Solar  
Charleston, NC 29405

Re: Engineering Services  
Thompson Residence  
195 Moonlight Drive, Fuquay Varina, NC  
15.200 kW System

To Whom it May Concern,

Pursuant to your request, we have reviewed the following information regarding solar panel installation on the roof of the above referenced home:

1. Site Visit/Verification Form prepared by a Palmetto Solar representative identifying specific site information including size and spacing of rafters 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 was prepared by Palmetto Solar and will be utilized for approval and construction of the proposed system.
3. Photographs of the interior and exterior of the roof system identifying existing structural members and their conditions.

Based on the above information we have evaluated the structural capacity of the existing roof system to support the additional loads imposed by the solar panels and have the following comments related to our review and evaluation:

**Description of Residence:**

The existing residence is typical wood framing construction with the roof system consisting of 2 x 8 dimensional lumber at 16" on center. The attic space is unfinished and photos indicate that there was free access to visually inspect the size and condition of the roof rafters. All wood material utilized for the roof system is assumed to be Doug-Fir #2 or better with standard construction components. The existing roofing material consists of composite asphalt shingles. Photos of the dwelling also indicate that there is a permanent foundation.

**A. Loading Criteria Used**

- 115 MPH wind loading based on ASCE 7-16 Exposure Category "C" at a slope of 25 degrees
- 7 PSF = Dead Load roofing/framing                      Live Load = 20 PSF                      Snow Load = 15 PSF
- 3 PSF = Dead Load solar panels/mounting hardware

*Total Dead Load = 10 PSF*

*The above values are within acceptable limits of recognized industry standards for similar structures in accordance with the North Carolina Residential Code (2018 IRC). Analysis performed of the existing roof structure utilizing the above loading criteria indicates that the existing rafters will support the additional panel loading without damage, if installed correctly.*

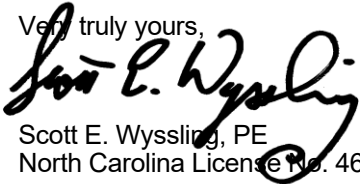
**B. Solar Panel Anchorage**

1. The solar panels shall be mounted in accordance with the most recent “*SnapNrack Installation Manual*”, which can be found on the SnapNrack website (<http://snapnrack.com/>). 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. Maximum allowable pullout per lag screw is 235 lbs/inch of penetration as identified in the National Design Standards (NDS) of timber construction specifications for Doug-Fir (North Lumber) *assumed*. Based on our evaluation, the pullout value, utilizing a penetration depth of 2 ½”, is less than what is allowable per connection and therefore is adequate. Based on the variable factors for the existing roof framing and installation tolerances, using a thread depth of 2 ½” with a minimum size of 5/16” lag screw per attachment point for panel anchor mounts should be adequate with a sufficient factor of safety.
3. Considering the roof slopes, the size, spacing, condition of roof, the panel supports shall be placed no greater than 48” o/c.
4. Panel supports connections shall be staggered to distribute load to adjacent rafters.

Based on the above evaluation, it is the opinion of this office that with appropriate panel anchors being utilized the roof system will adequately support the additional loading imposed by the solar panels. This evaluation is in conformance with the North Carolina Residential Code and the 2018 IRC, current industry and standards, and 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 Firm License No. 46546





**CONTRACTOR INFORMATION:**

ENCOR SOLAR, LLC  
3401 N. Thanksgiving Way #450  
Lehi, UT 84043  
License # 297625

**SITE INFORMATION:**

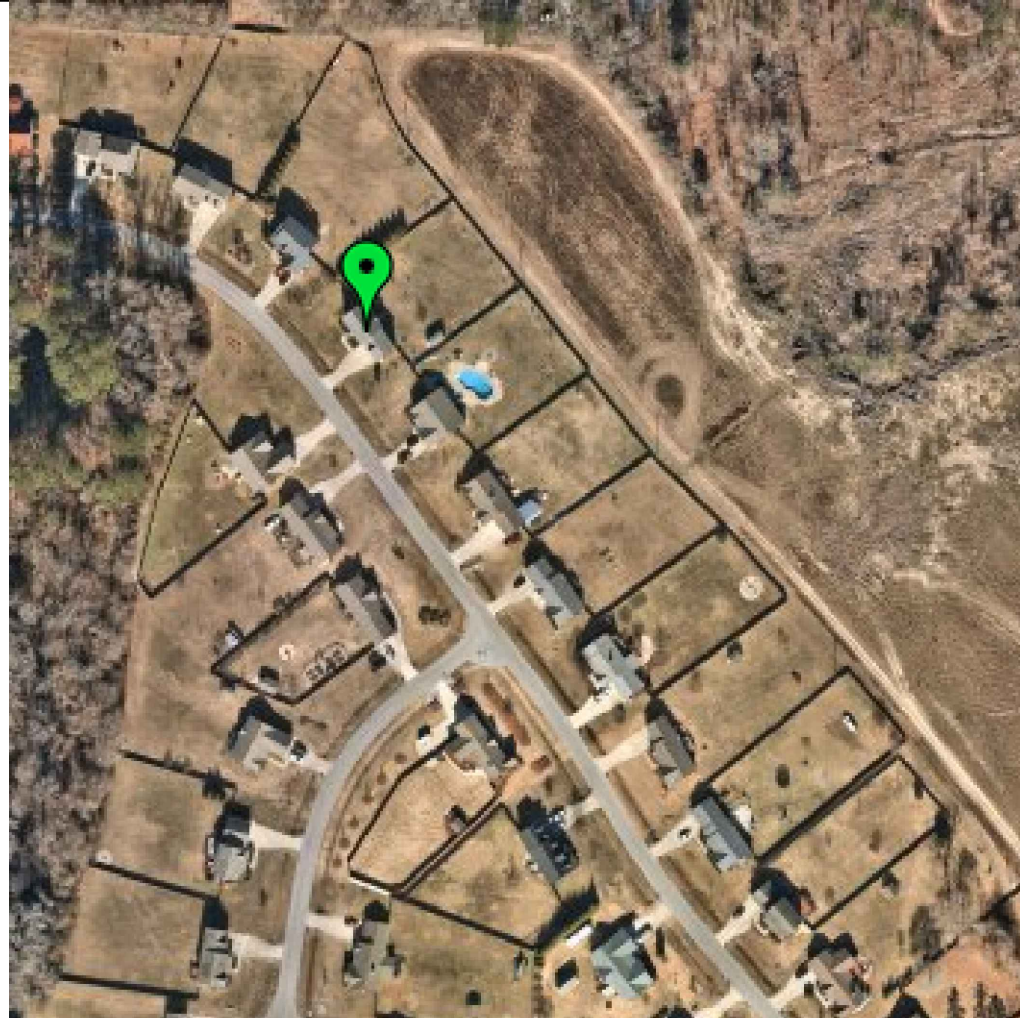
Thaddeus Thompson  
195 Moonlight Dr, Fuquay Varina, NC 27526  
MAX CONTINUOUS AC SYSTEM SIZE: 15.2 kW AC  
DC SYSTEM SIZE: 15.36 kW DC  
Lat, Long: 35.5386386, -78.7724808  
(48) Hanwha Q.PEAK DUO-G5 320 PV MODULES  
(2) SolarEdge SE7600H-US (240V) INVERTERS  
Duke Energy Progress NC

DATE: March 25, 2021

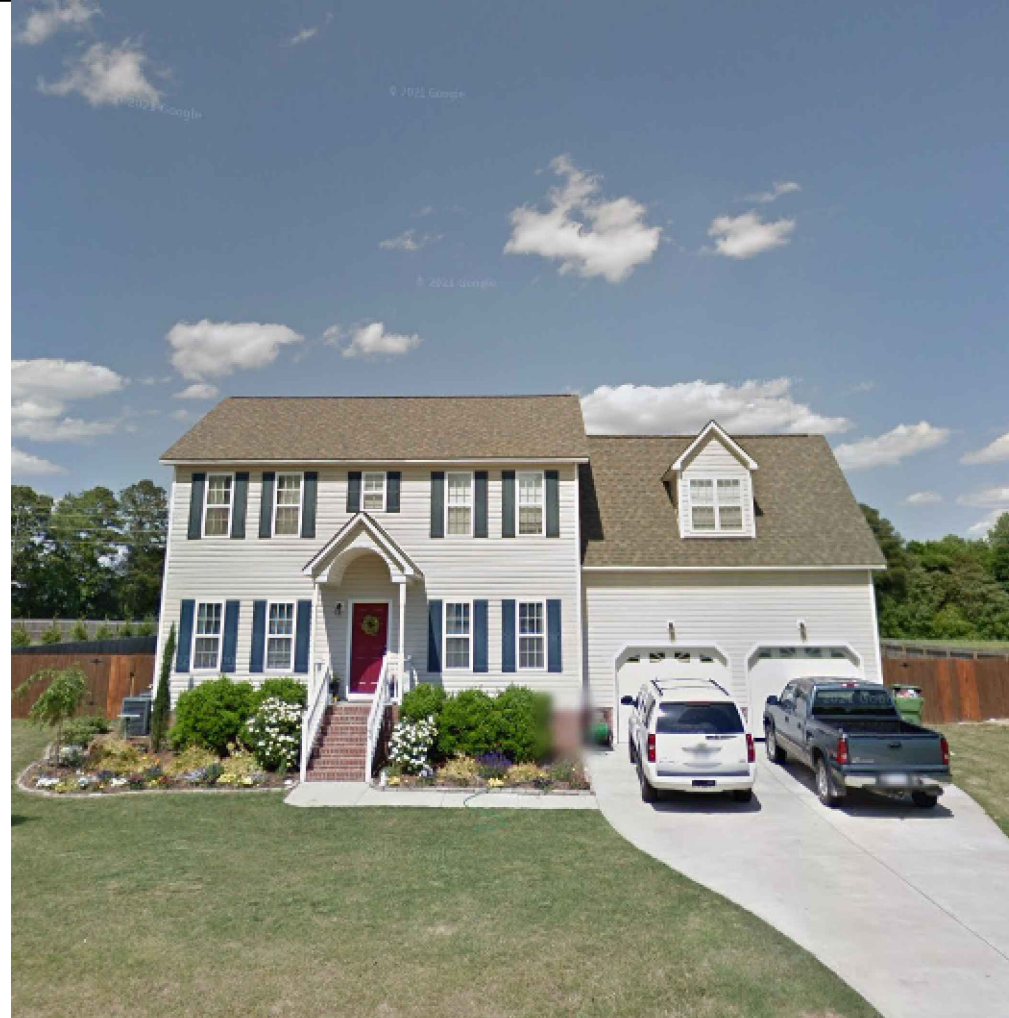
PAGE: PV01 SHEET NAME: COVER PAGE

DRAWN BY: SoloCAD

AERIAL VIEW:

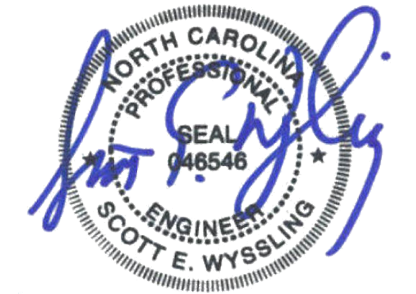


STREET VIEW:



**SHEET INDEX:**

- PV01 COVER PAGE
- PV02 PROPERTY PLAN
- PV03 ROOF PLAN
- PV04 ROOF ATTACHMENTS + BOM
- PV05 MOUNTING DETAIL
- PV06 ELECTRICAL DIAGRAM
- PV07 LABELS
- PV08 PLACARD
- PV09 SITE PHOTOS



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**GENERAL NOTES:**

1. INSTALLATION OF SOLAR PHOTOVOLTAIC SYSTEM SHALL BE IN ACCORDANCE WITH NEC ARTICLE 690, AND ALL OTHER APPLICABLE NEC CODES WHERE NOTED OR EXISTING.
2. PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL COMPLY WITH NEC ARTICLE 110.
3. ALL WIRES, INCLUDING THE GROUNDING ELECTRODE CONDUCTOR SHALL BE PROTECTED FROM PHYSICAL DAMAGE IN ACCORDANCE WITH NEC ARTICLE 250
4. THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE; THIS SYSTEM IS UTILITY INTERACTIVE PER UL 1741 AND DOES NOT INCLUDE STORAGE BATTERIES OR OTHER ALTERNATIVE STORAGE SOURCES.
5. ALL DC WIRES SHALL BE SIZED ACCORDING TO [NEC 690.8]
6. DC CONDUCTORS SHALL BE WITHIN PROTECTED RACEWAYS IN ACCORDANCE WITH [NEC 690.31]
7. ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH LOCAL JURISDICTIONAL BUILDING CODE.

**DESCRIPTION OF DESIGN:**

INSTALLATION OF GRID-TIED, UTILITY INTERACTIVE PHOTOVOLTAIC SYSTEM

**EQUIPMENT:**

MAX CONTINUOUS AC SYSTEM SIZE: 15.2 kW AC  
DC SYSTEM SIZE: 15.36 kW DC  
(48) Hanwha Q.PEAK DUO-G5 320 PV MODULES  
(2) SolarEdge SE7600H-US (240V) INVERTERS  
RACKING: SnapNrack - 48" O.C.

**APPLICABLE GOVERNING CODES:**

- 2018 NC RBC
- 2018 IRC
- 2018 IFC
- 2017 NEC
- 2018 IBC

**SITE SPECIFICATIONS:**

OCCUPANCY: R-3  
ZONING: RESIDENTIAL





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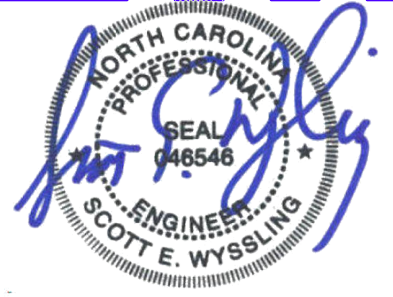
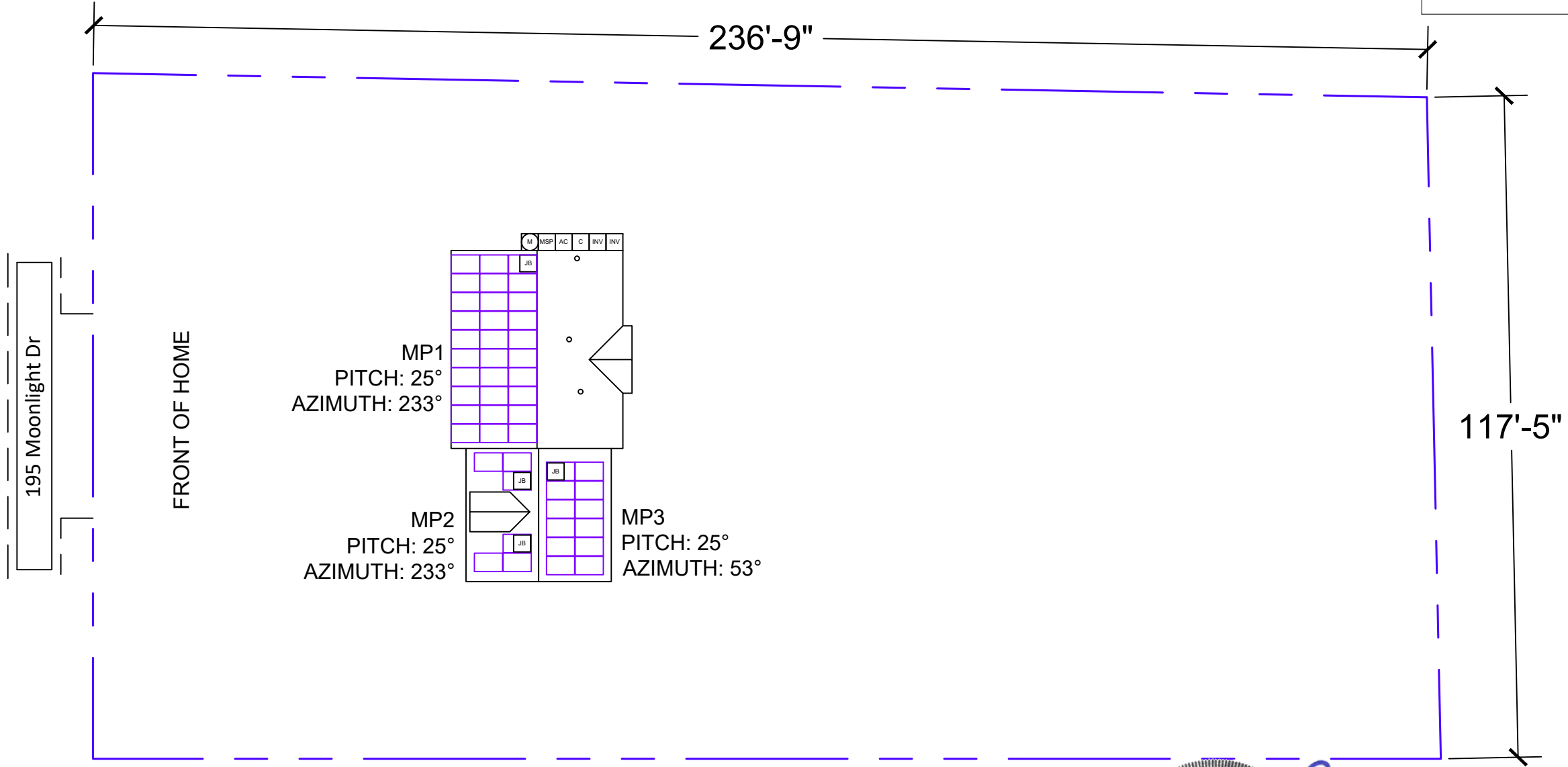
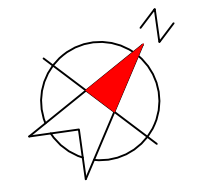
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 (2) SolarEdge SE7600H-US (240V) INVERTERS  
 Duke Energy Progress NC

DATE: March 25, 2021  
 PAGE: PV02 SHEET NAME: PROPERTY PLAN  
 DRAWN BY: SoloCAD SCALE: 1" = 22.88'

**EQUIPMENT LEGEND:**

- UTILITY METER
- MAIN SERVICE PANEL
- VISIBLE, LOCKABLE, LABELED AC DISCONNECT
- METER SOCKET (FOR UTILITY PV METER)
- INVERTER
- COMBINER BOX
- LOAD CENTER
- FIRE ACCESS PATHWAY (3' TYP)
- PROPERTY LINE
- BATTERY(IES)

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



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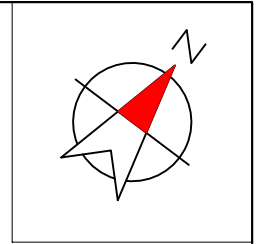




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DATE: March 25, 2021  
 PAGE: PV03 SHEET NAME: ROOF PLAN  
 DRAWN BY: SoloCAD



**EQUIPMENT LEGEND:**

	UTILITY METER
	MAIN SERVICE PANEL
	VISIBLE, LOCKABLE, LABELED AC DISCONNECT
	METER SOCKET (FOR UTILITY PV METER)
	INVERTER
	COMBINER BOX
	LOAD CENTER
	FIRE ACCESS PATHWAY (3' TYP)
	BATTERY(IES)

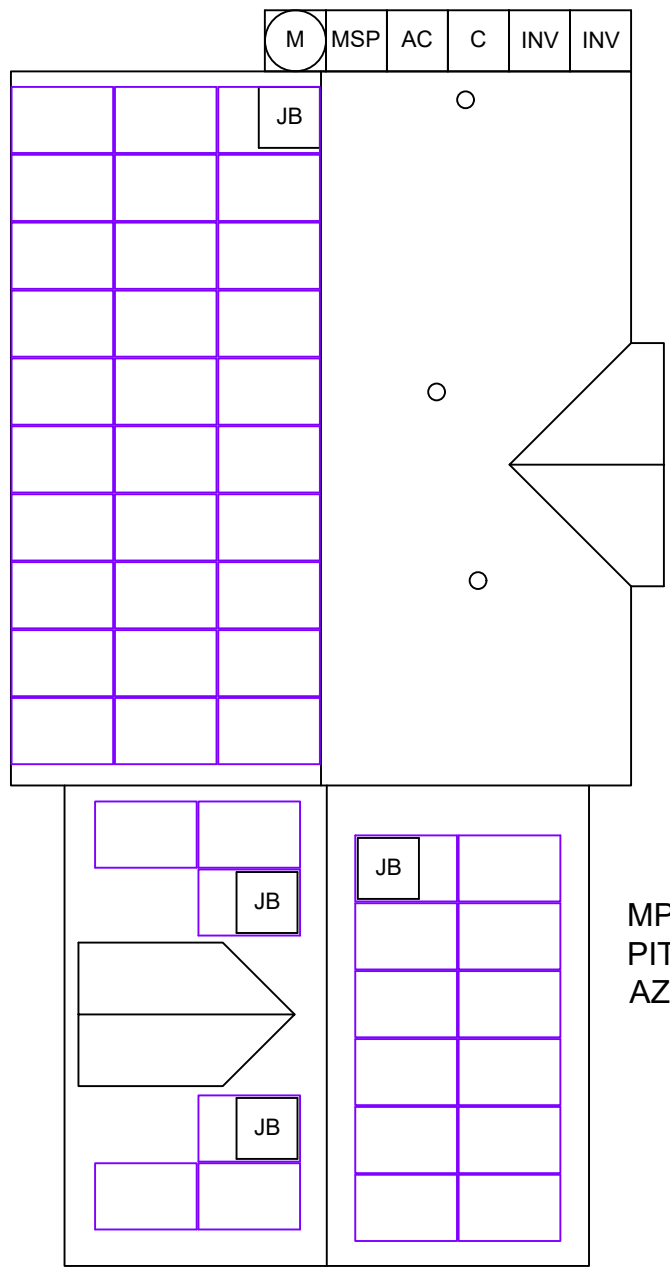
VISIBLE, LOCKABLE, LABELED AC DISCONNECT LOCATED WITHIN 10' OF UTILITY METER

MP1  
 PITCH: 25°  
 AZIMUTH: 233°

FRONT OF HOME

MP2  
 PITCH: 25°  
 AZIMUTH: 233°

MP3  
 PITCH: 25°  
 AZIMUTH: 53°



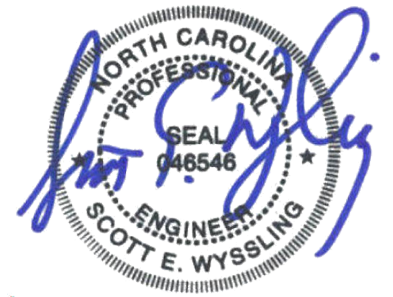
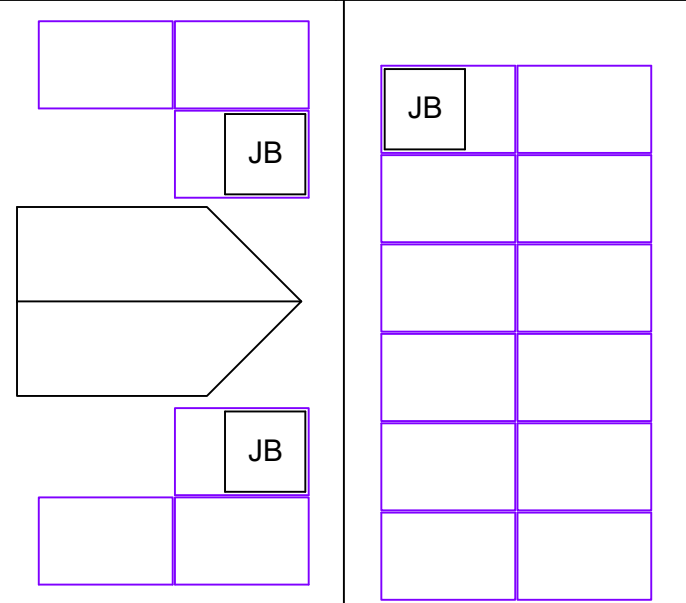
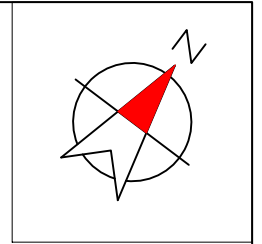
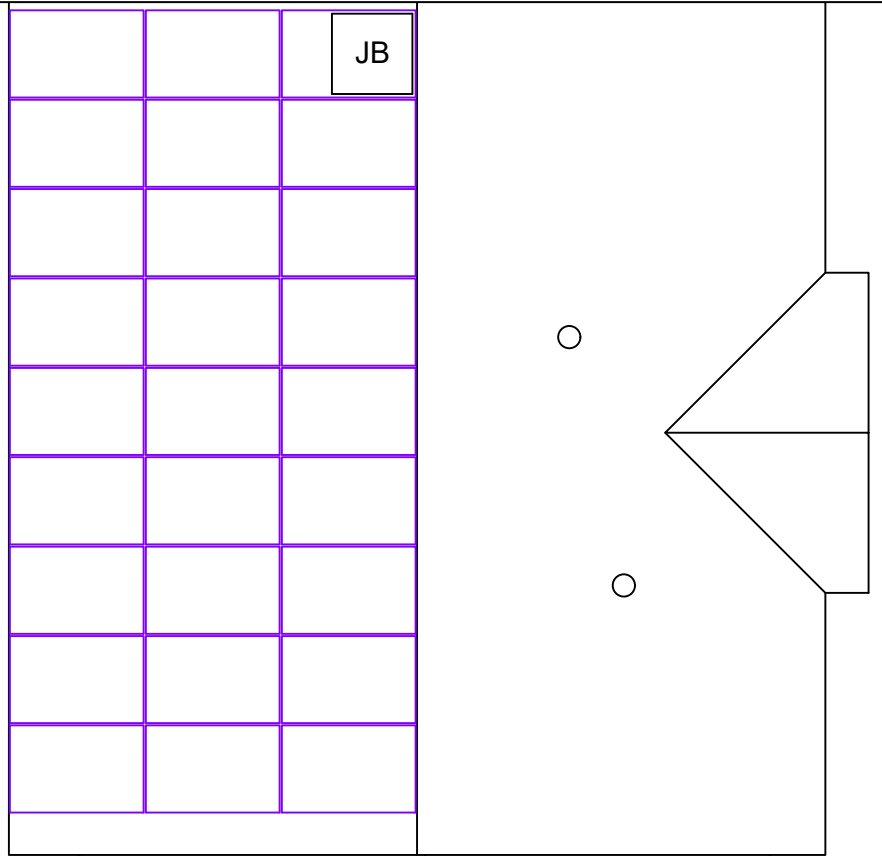
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DATE: March 25, 2021  
 PAGE: PV04 SHEET NAME: ROOF ATTACHMENTS + BOM  
 DRAWN BY: SoloCAD



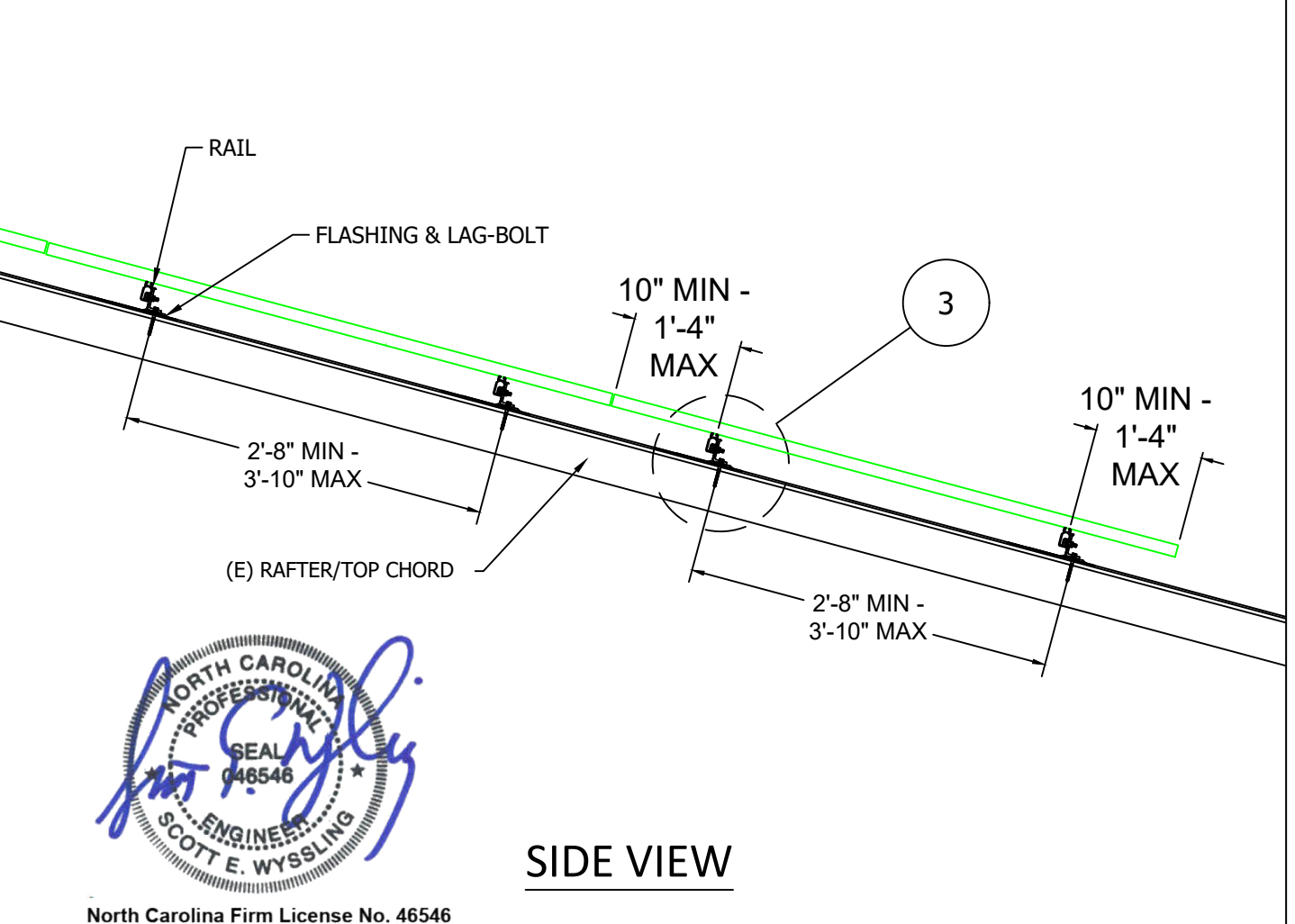
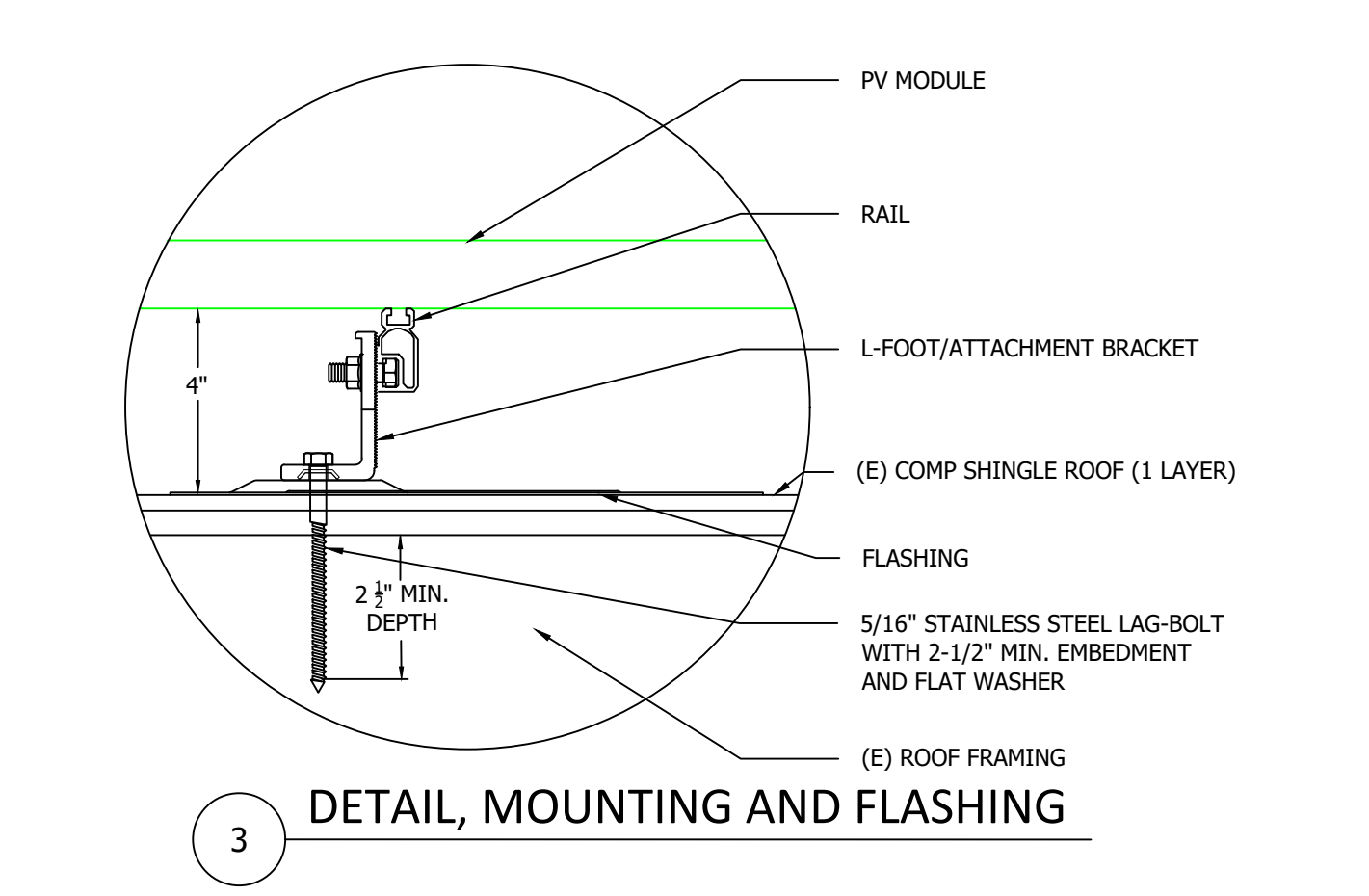
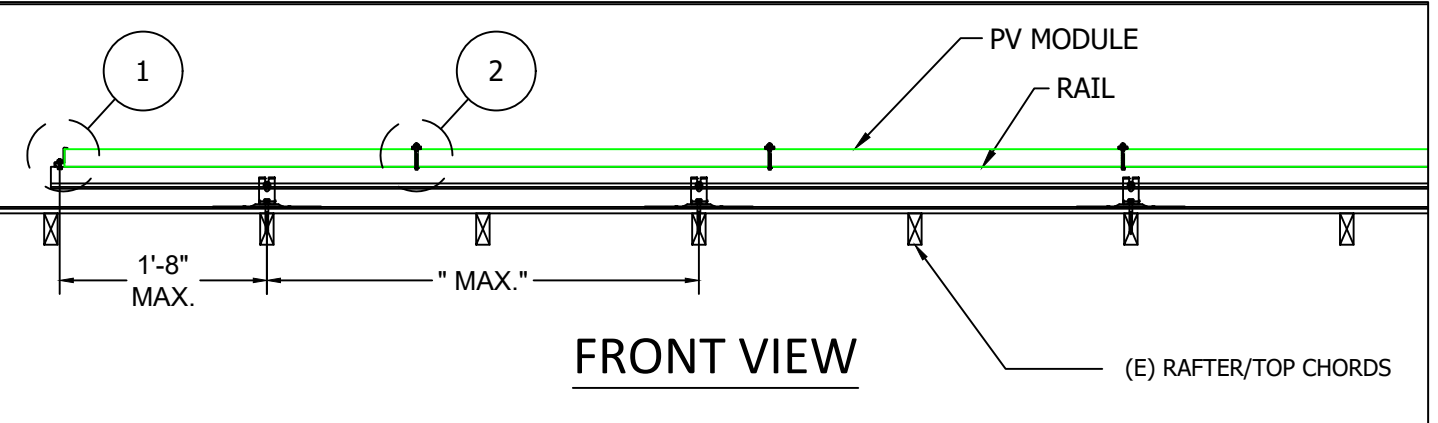
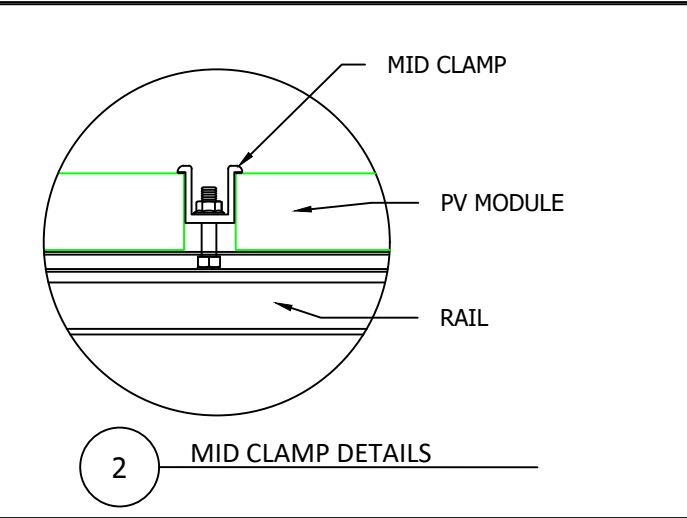
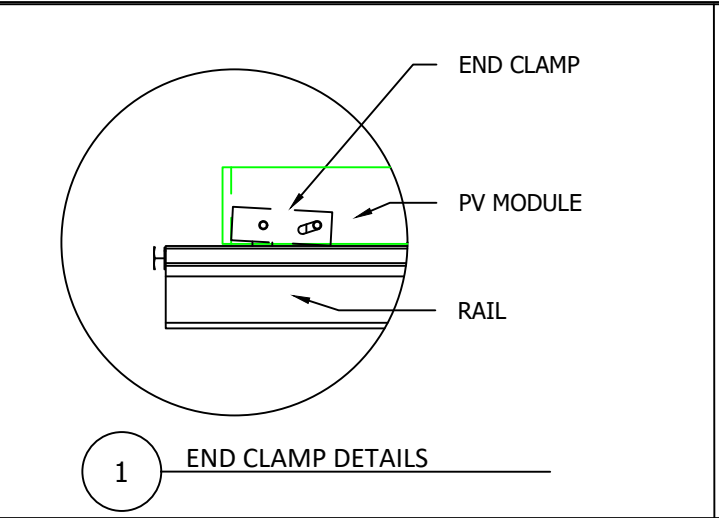
North Carolina Firm License No. 46546

EQUIPMENT INFORMATION:		ROOF INFO:		PHOTOVOLTAIC ARRAY STRUCTURAL CRITERIA:	
RAIL MANUFACTURER	SnapNrack	ROOF TYPE	asphalt_shingle	ROOF ATTACHMENT COUNT:	86
RAIL PART NUMBER	Standard Rail	ROOF FRAMING	traditional_framing	PV MODULE COUNT:	48
ATTACHMENTS	SnapNrack - SERIES 100	RAFTER/TOP CHORD SIZE	2x8	ARRAY AREA:	MODULE COUNT * 18.06ft <sup>2</sup> = 866.88
ATTACHMENT QTY	86	RAFTER/TOP CHORD SPACING	16	ROOF AREA:	1699 ft <sup>2</sup>
MIDCLAMP QTY	78	ATTACHMENT SPACING	48	PERCENT OF ROOF COVERED:	51%
ENDCLAMP QTY	36			ARRAY WEIGHT:	MODULE COUNT * 50lbs = 2400
SPLICE QTY	16			DISTRIBUTED LOAD:	ARRAY LBS/ATTACHMENTS = 27.91
				POINT LOAD: (lbs/ft <sup>2</sup> )	(ARRAY) WEIGHT/AREA = 2.77 lbs/ft <sup>2</sup>



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				POINT LOAD: (lbs/ft <sup>2</sup> )	(ARRAY) WEIGHT/AREA = 2.77 lbs/ft <sup>2</sup>

DATE: March 25, 2021  
 PAGE: PV05 SHEET NAME: MOUNTING DETAIL  
 DRAWN BY: SoloCAD





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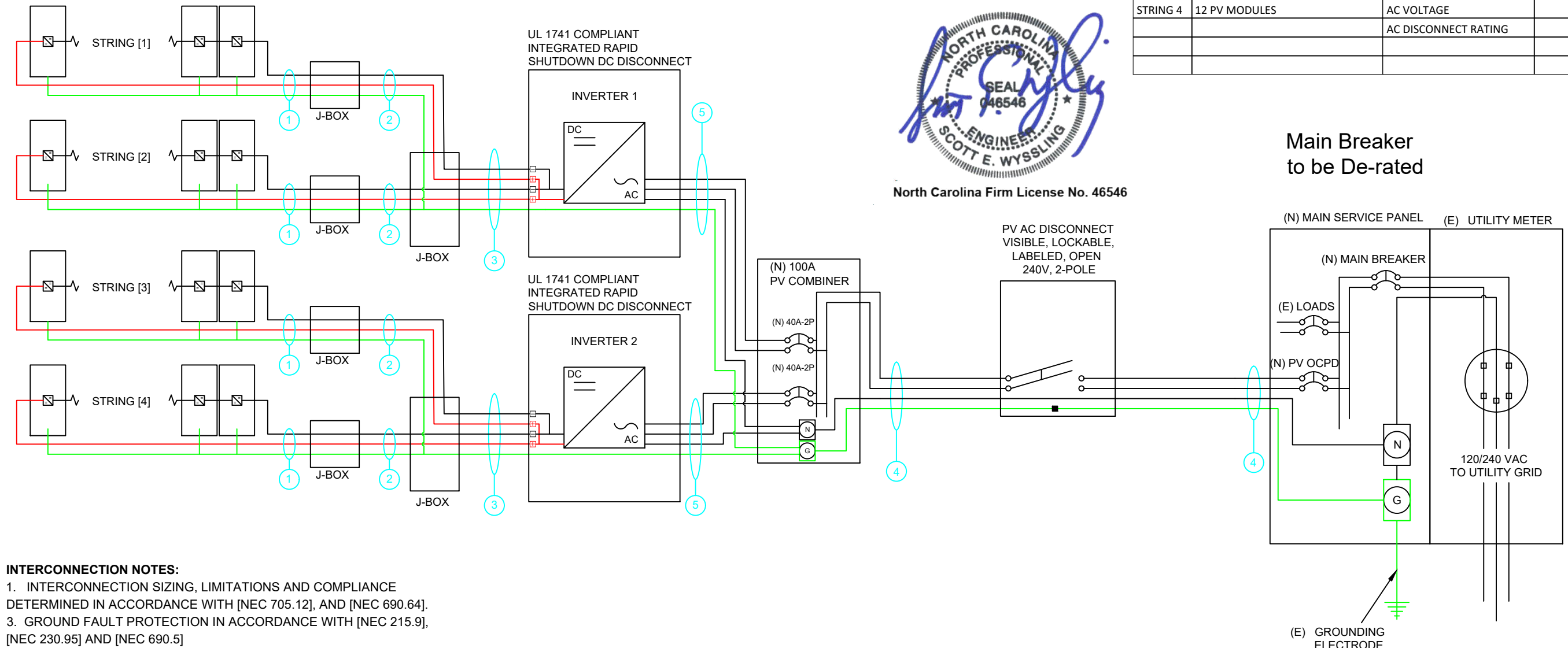
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DATE: March 25, 2021  
 PAGE: PV06 SHEET NAME: ELECTRICAL DIAGRAM  
 DRAWN BY: SoloCAD

**WIRE SCHEDULE**

<b>1</b>	(2) PV-WIRE - 10 AWG, USE-2, COPPER (OR CODE APPROVED EQUIVALENT) (1) 6 AWG BARE, COPPER (GROUND)	<b>2</b>	(1) 10 AWG THWN-2, or THHN, or 10/2 NM-B COPPER - (POSITIVE) (1) 10 AWG THWN-2, or THHN, or 10/2 NM-B COPPER - (NEGATIVE) (1) 10 AWG THWN-2, or THHN, or 10/2 NM-B COPPER - (GROUND) (1) 3/4" LIQUID TIGHT OR EMT OR FMC (OR CODE APPROVED EQUIVALENT)	<b>3</b>	(4) 10 AWG THHN/THWN-2, COPPER - (POSITIVE) (4) 10 AWG THHN/THWN-2 COPPER - (NEGATIVE) (1) 8 AWG THHN/THWN-2 (GROUND) CONDUIT: 1" LIQUID TIGHT OR EMT (OR CODE APPROVED EQUIVALENT)	<b>4</b>	(1) 4 AWG THWN-2 COPPER - (L1) (1) 4 AWG THWN-2 COPPER - (L2) (1) 4 AWG THWN-2 COPPER - (NEUTRAL) (1) 8 AWG THWN-2 COPPER - (GROUND) (1) CONDUIT: 1" LIQUID TIGHT OR EMT (OR CODE APPROVED EQUIVALENT)
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<b>5</b>	8 AWG THWN-2 COPPER CONDUCTORS 10 AWG THWN-2 COPPER (GROUND) 3/4" EMT (OR CODE APPROVED EQUIVALENT)	<b>STRINGS:</b>		<b>SERVICE EQUIPMENT &amp; PV OCPD RATINGS</b>	
		STRING 1	12 PV MODULES	MAIN BREAKER RATING	175A
		STRING 2	12 PV MODULES	MAIN SERVICE BUS RATING	225A
		STRING 3	12 PV MODULES	PV OCPD RATING	80A
		STRING 4	12 PV MODULES	AC VOLTAGE	240V
				AC DISCONNECT RATING	100A



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Main Breaker to be De-rated

- INTERCONNECTION NOTES:**
- INTERCONNECTION SIZING, LIMITATIONS AND COMPLIANCE DETERMINED IN ACCORDANCE WITH [NEC 705.12], AND [NEC 690.64].
  - GROUND FAULT PROTECTION IN ACCORDANCE WITH [NEC 215.9], [NEC 230.95] AND [NEC 690.5]
  - ALL EQUIPMENT TO BE RATED FOR BACKFEEDING.
  - PV BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUSBAR RELATIVE TO THE MAIN BREAKER.

- DISCONNECT NOTES**
- DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING LIVE ARE CONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS)
  - AC DISCONNECT MUST BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH

- GROUNDING & GENERAL NOTES:**
- PV INVERTER IS UNGROUNDED, TRANSFORMER-LESS TYPE.
  - DC GEC AND AC EGC TO REMAIN UNSPLICED, OR SPLICED TO EXISTING ELECTRODE
  - ANY EXISTING WIRING INVOLVED WITH PV SYSTEM CONNECTION THAT IS FOUND TO BE INADEQUATE PER CODE SHALL BE CORRECTED PRIOR TO FINAL INSPECTION.
  - JUNCTION BOX QUANTITIES, AND PLACEMENT SUBJECT TO CHANGE IN THE FIELD - JUNCTION BOXES DEPICTED ON ELECTRICAL DIAGRAM REPRESENT WIRE TYPE TRANSITIONS.
  - AC DISCONNECT NOTED IN EQUIPMENT SCHEDULE OPTIONAL IF OTHER AC DISCONNECTING MEANS IS LOCATED WITHIN 10' OF SERVICE DISCONNECT.

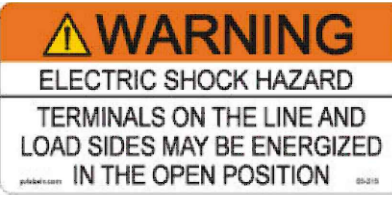
EQUIPMENT SCHEDULE:			
TYPE:	QTY:	DESCRIPTION:	RATING:
MODULES:	(48)	Hanwha Q.PEAK DUO-G5 320	320 W
INVERTERS:	(2)	SolarEdge SE7600H-US (240V)	15200 W
AC DISCONNECT(S):	(1)	PV AC DISCONNECT, 240V, 2-POLE	100 A
DC OPTIMIZERS:	(48)	SolarEdge P320	15 Adc



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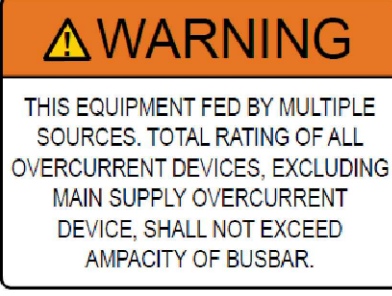
DATE: March 25, 2021  
 PAGE: PV07 SHEET NAME: LABELS  
 DRAWN BY: SoloCAD



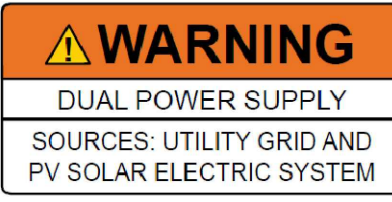
**LABEL 1**  
 FOR PV DISCONNECTING MEANS WHERE THE LINE AND LOAD TERMINALS MAY BE ENERGIZED IN THE OPEN POSITION.  
 [NEC 690.13(B)]



**LABEL 2**  
 PLACED ADJACENT TO THE BACK-FED BREAKER FROM THE INVERTER IF TIE IN CONSISTS OF LOAD SIDE CONNECTION TO BUSBAR.  
 [NEC 705.12(B)(2)(3)(b)]



**LABEL 3**  
 PLACED ADJACENT TO THE BACK-FED BREAKER FROM THE INVERTER IF TIE IN CONSISTS OF LOAD SIDE CONNECTION TO BUSBAR.  
 [NEC 705.12(B)(2)(3)(c)]



**LABEL 4**  
 EQUIPMENT CONTAINING OVERCURRENT DEVICES IN CIRCUITS SUPPLYING POWER TO A BUSBAR OR CONDUCTOR SUPPLIED FROM MULTIPLE SOURCES SHALL BE MARKED TO INDICATE THE PRESENCE OF ALL SOURCES. [NEC 705.12(B)(3)]

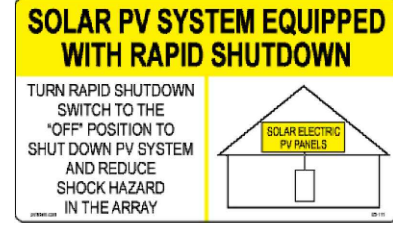


**LABEL 5**  
 AT POINT OF INTERCONNECTION, MARKED AT AC DISCONNECTING MEANS.  
 [NEC 690.54, NEC 690.13 (B)]

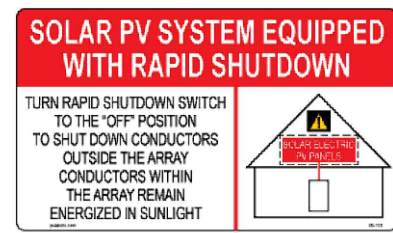
- LABELING NOTES:**
- LABELS CALLED OUT ACCORDING TO ALL COMMON CONFIGURATIONS. ELECTRICIAN TO DETERMINE EXACT REQUIREMENTS IN THE FIELD PER CURRENT NEC AND LOCAL CODES AND MAKE APPROPRIATE ADJUSTMENTS.
  - LABELING REQUIREMENTS BASED ON THE 2017 NATIONAL ELECTRIC CODE, OSHA STANDARD 19010.145, ANSI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



**LABEL 6**  
 AT DIRECT-CURRENT EXPOSED RACEWAYS, CABLE TRAYS, COVERS AND ENCLOSURES OF JUNCTION BOXES, AND OTHER WIRING METHODS; SPACED AT MAXIMUM 10FT SECTION OR WHERE SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS.  
 [NEC 690.31(G)(3&4)]



**LABEL 7**  
 FOR PV SYSTEMS THAT SHUT DOWN THE ARRAY AND CONDUCTORS LEAVING THE ARRAY: SIGN TO BE LOCATED ON OR NO MORE THAN 3 FT AWAY FROM SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED AND SHALL INDICATE THE LOCATION OF ALL IDENTIFIED RAPID SHUTDOWN SWITCHES IF NOT AT THE SAME LOCATION.  
 [NEC 690.56(C)(1)(A)]

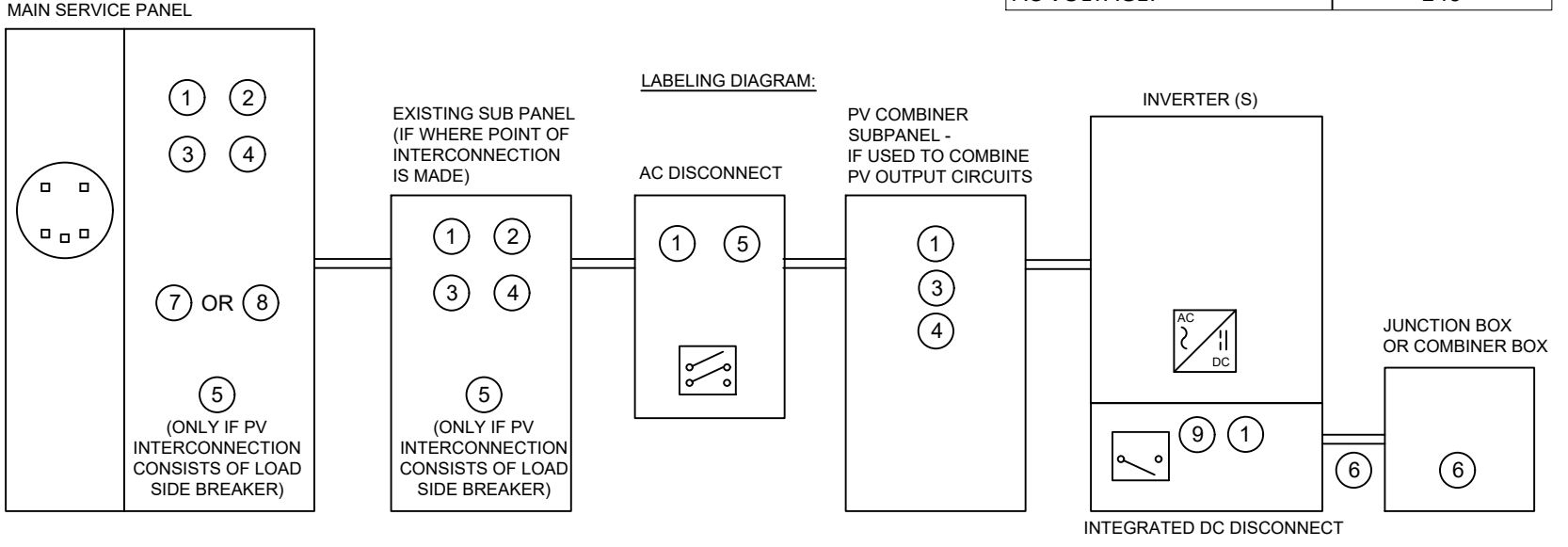


**LABEL 8**  
 FOR PV SYSTEMS THAT ONLY SHUT DOWN CONDUCTORS LEAVING THE ARRAY: SIGN TO BE LOCATED ON OR NO MORE THAN 3 FT AWAY FROM SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED AND SHALL INDICATE THE LOCATION OF ALL IDENTIFIED RAPID SHUTDOWN SWITCHES IF NOT AT THE SAME LOCATION.  
 [NEC 690.56(C)(1)(b)]



**LABEL 9**  
 SIGN LOCATED AT RAPID SHUT DOWN DISCONNECT SWITCH [NEC 690.56(C)(3)].

LABEL VALUES:	
DESCRIPTION	VALUE:
DC IMP:	9.47
DC VMP:	33.8
DC VOC:	40.56
DC ISC:	SEE DATASHEET
DC SYSTEM SIZE (W):	15360
AC OPERATING CURRENT:	SEE DATASHEET
AC VOLTAGE:	240



\*ELECTRICAL DIAGRAM SHOWN ABOVE IS FOR LABELING PURPOSES ONLY. NOT AN ACTUAL REPRESENTATION OF EQUIPMENT AND CONNECTIONS TO BE INSTALLED. LABEL LOCATIONS PRESENTED MAY VARY DEPENDING ON TYPE OF INTERCONNECTION METHOD AND LOCATION PRESENTED ON THE ELECTRICAL DIAGRAM PAGE.



**CONTRACTOR INFORMATION:**

ENCOR SOLAR, LLC  
3401 N. Thanksgiving Way #450  
Lehi, UT 84043  
License # 297625

**SITE INFORMATION:**

Thaddeus Thompson  
195 Moonlight Dr , Fuquay Varina , NC 27526  
MAX CONTINUOUS AC SYSTEM SIZE: 15.2 kW AC  
DC SYSTEM SIZE: 15.36 kW DC  
Lat, Long: 35.5386386 , -78.7724808  
(48) Hanwha Q.PEAK DUO-G5 320 PV MODULES  
(2) SolarEdge SE7600H-US (240V) INVERTERS  
Duke Energy Progress NC

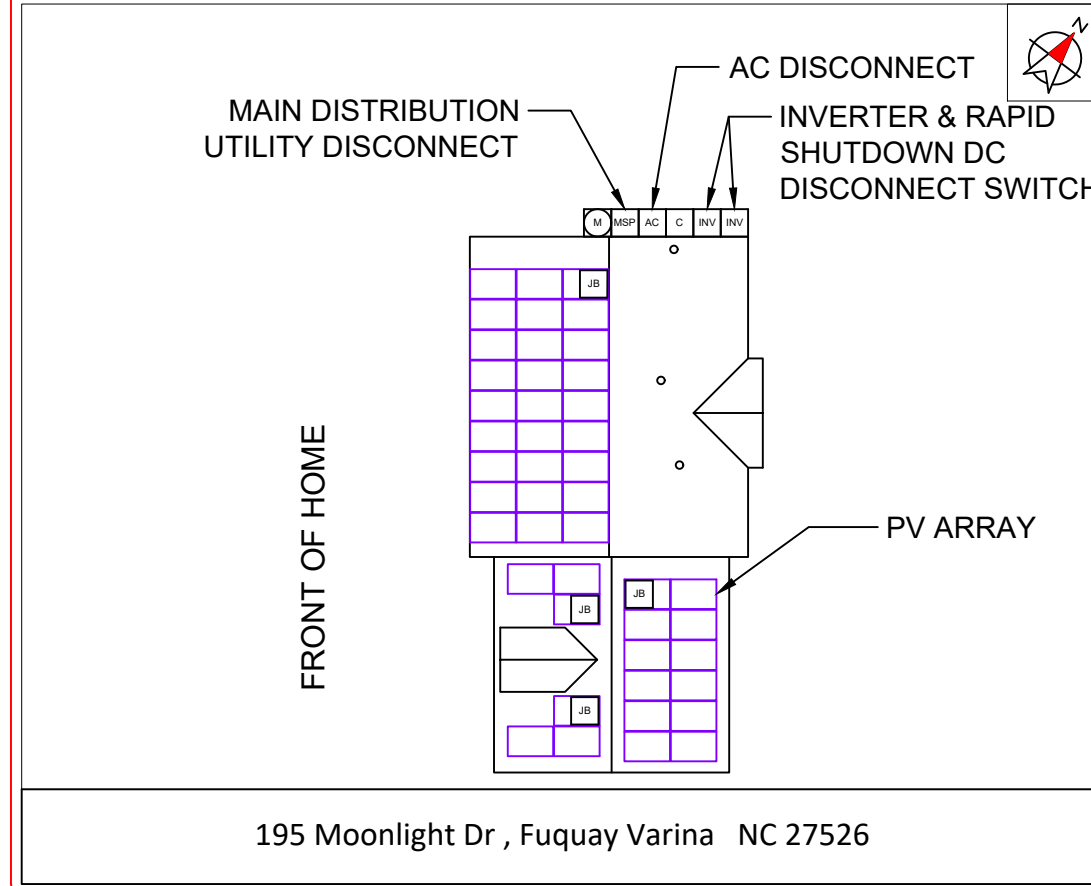
DATE: March 25, 2021

PAGE: PV08 SHEET NAME: PLACARD

DRAWN BY: SoloCAD

# CAUTION

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM ROOF MOUNTED SOLAR ARRAYS WITH SAFETY DISCONNECTS AS SHOWN:



**DIRECTORY**

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

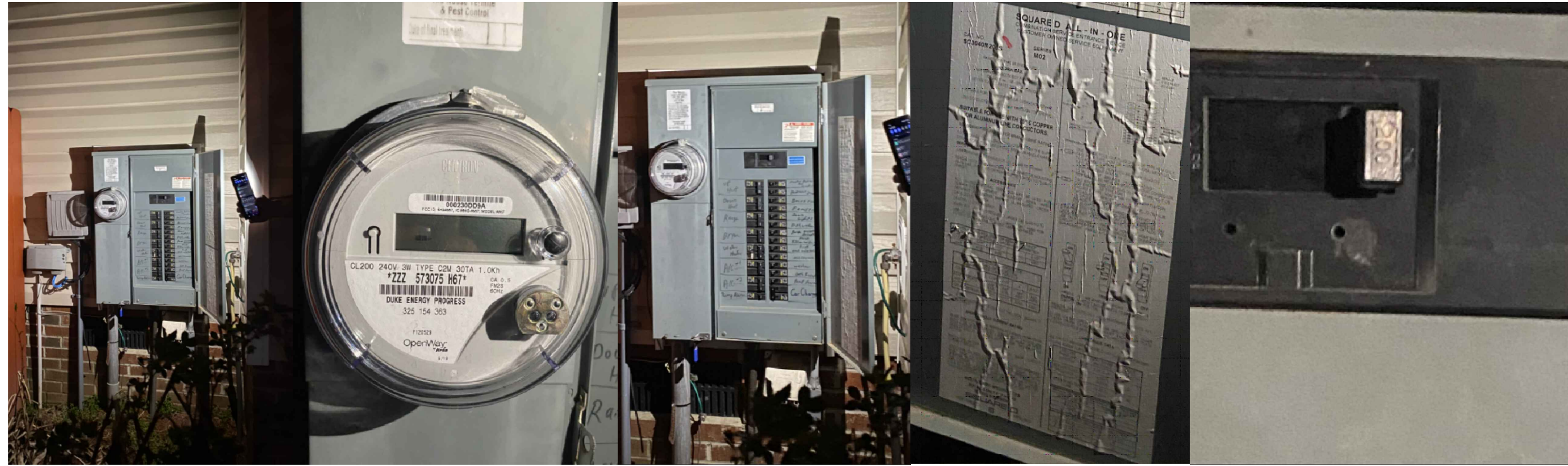
(ALL PLAQUES AND SIGNAGE WILL BE INSTALLED AS OUTLINED WITHIN: NEC 690.56(B)&(C), [NEC 705.10])





**CONTRACTOR INFORMATION:**  
**ENCOR SOLAR, LLC**  
 3401 N. Thanksgiving Way #450  
 Lehi, UT 84043  
 License # 297625

**SITE PHOTOS:**



**SITE INFORMATION:**  
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 (2) SolarEdge SE7600H-US (240V) INVERTERS  
 Duke Energy Progress NC

DATE: March 25, 2021  
 PAGE: PV09 SHEET NAME: SITE PHOTOS  
 DRAWN BY: SoloCAD





The new **Q.PEAK DUO BLK-G5** solar module from Q CELLS impresses with its outstanding visual appearance and particularly high performance on a small surface thanks to the innovative **Q.ANTUM DUO** Technology. Q.ANTUM's world-record-holding cell concept has now been combined with state-of-the-art circuitry half cells and a six-busbar design, thus achieving outstanding performance under real conditions — both with low-intensity solar radiation as well as on hot, clear summer days.



**Q.ANTUM TECHNOLOGY: LOW LEVELIZED COST OF ELECTRICITY**  
Higher yield per surface area, lower BOS costs, higher power classes, and an efficiency rate of up to 19.3%.



**INNOVATIVE ALL-WEATHER TECHNOLOGY**  
Optimal yields, whatever the weather with excellent low-light and temperature behavior.



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



**EXTREME WEATHER RATING**  
High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (4000 Pa) regarding IEC.



**A RELIABLE INVESTMENT**  
Inclusive 12-year product warranty and 25-year linear performance guarantee<sup>2</sup>.



**STATE OF THE ART MODULE TECHNOLOGY**  
Q.ANTUM DUO combines cutting edge cell separation and innovative wiring with Q.ANTUM Technology.



<sup>1</sup> APT test conditions according to IEC/TS 62804-1:2015, method B (-1500V, 168h)  
<sup>2</sup> See data sheet on rear for further information.

**THE IDEAL SOLUTION FOR:**

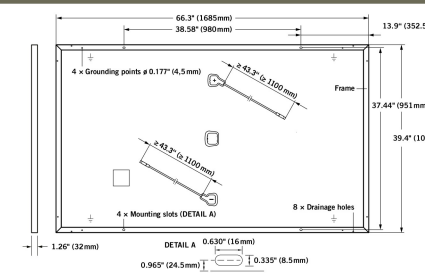


Engineered in **Germany**



**MECHANICAL SPECIFICATION**

<b>Format</b>	66.3 in × 39.4 in × 1.26 in (including frame) (1685 mm × 1000 mm × 32 mm)
<b>Weight</b>	41.2 lbs (18.7 kg)
<b>Front Cover</b>	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
<b>Back Cover</b>	Composite film
<b>Frame</b>	Black anodized aluminum
<b>Cell</b>	6 × 20 monocrystalline Q.ANTUM solar half-cells
<b>Junction box</b>	2.76-3.35 in × 1.97-2.76 in × 0.51-0.83 in (70-85 mm × 50-70 mm × 13-21 mm), decentralized, IP67
<b>Cable</b>	4 mm <sup>2</sup> Solar cable; (+) ≥ 43.3 in (1100 mm), (-) ≥ 43.3 in (1100 mm)
<b>Connector</b>	Multi-Contact MC4, IP68

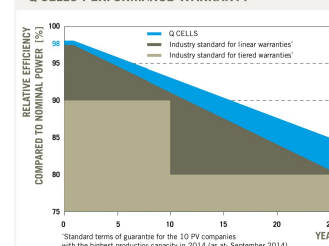


**ELECTRICAL CHARACTERISTICS**

POWER CLASS		300	305	310	315	320	
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC <sup>1</sup> (POWER TOLERANCE +5 W / -0 W)							
Minimum	Power at MPP <sup>1</sup>	P <sub>MPP</sub> [W]	300	305	310	315	320
	Short Circuit Current <sup>1</sup>	I <sub>SC</sub> [A]	9.72	9.78	9.83	9.89	9.94
	Open Circuit Voltage <sup>1</sup>	V <sub>OC</sub> [V]	39.48	39.75	40.02	40.29	40.56
	Current at MPP	I <sub>MPP</sub> [A]	9.25	9.31	9.36	9.41	9.47
	Voltage at MPP	V <sub>MPP</sub> [V]	32.43	32.78	33.12	33.46	33.80
	Efficiency <sup>1</sup>	η [%]	≥ 17.8	≥ 18.1	≥ 18.4	≥ 18.7	≥ 19.0
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT <sup>2</sup>							
Minimum	Power at MPP	P <sub>MPP</sub> [W]	224.1	227.8	231.6	235.3	239.1
	Short Circuit Current	I <sub>SC</sub> [A]	7.83	7.88	7.92	7.97	8.01
	Open Circuit Voltage	V <sub>OC</sub> [V]	37.15	37.40	37.66	37.91	38.17
	Current at MPP	I <sub>MPP</sub> [A]	7.28	7.32	7.37	7.41	7.45
	Voltage at MPP	V <sub>MPP</sub> [V]	30.78	31.11	31.44	31.76	32.08

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

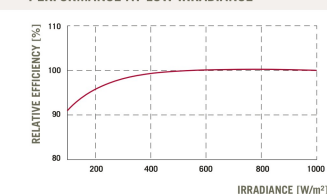
**Q CELLS PERFORMANCE WARRANTY**



At least 98% of nominal power during first year. Thereafter max. 0.54% degradation per year. At least 93.1% of nominal power up to 10 years. At least 85% of nominal power up to 25 years.

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

**PERFORMANCE AT LOW IRRADIANCE**



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

**TEMPERATURE COEFFICIENTS**

Temperature Coefficient of I <sub>SC</sub>	α	[%/K]	+0.04	Temperature Coefficient of V <sub>OC</sub>	β	[%/K]	-0.28
Temperature Coefficient of P <sub>MPP</sub>	γ	[%/K]	-0.37	Normal Operating Module Temperature	NMOT	[°F]	109 ± 5.4 (43 ± 3°C)

**PROPERTIES FOR SYSTEM DESIGN**

Maximum System Voltage V <sub>sys</sub>	[V]	1000 (IEC) / 1000 (UL)	Safety Class	II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating	C (IEC) / TYPE 1 (UL)
Max. Design Load, Push / Pull (UL) <sup>2</sup>	[lbs/ft <sup>2</sup> ]	75 (3600 Pa) / 55 (2667 Pa)	Permitted module temperature on continuous duty	-40°F up to +185°F (-40°C up to +85°C)
Max. Test Load, Push / Pull (UL) <sup>2</sup>	[lbs/ft <sup>2</sup> ]	113 (5400 Pa) / 84 (4000 Pa)		<sup>2</sup> see installation manual

**QUALIFICATIONS AND CERTIFICATES**

UL 1703; VDE Quality Tested; CE-compliant; IEC 61215:2016; IEC 61730:2016, Application class A



**PACKAGING INFORMATION**

Number of Modules per Pallet	32
Number of Pallets per 53' Trailer	30
Number of Pallets per 40' High Cube Container	26
Pallet Dimensions (L × W × H)	69.3 in × 45.3 in × 46.9 in (1760 mm × 1150 mm × 1190 mm)
Pallet Weight	1415 lbs (642 kg)

**NOTE:** Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS America Inc.  
300 Spectrum Center Drive, Suite 1250, Irvine, CA 92618, USA | TEL +1 949 748 59 96 | EMAIL inquiry@us.q-cells.com | WEB www.q-cells.us

Specifications subject to technical changes © Hanwha Q CELLS Q.PEAK DUO BLK-G5\_300-320\_2018-03\_Rev02\_NA

# Single Phase Inverter with HD-Wave Technology

for North America

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

12-25  
YEAR  
WARRANTY



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				400			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>2)</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>3)</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 (H)								
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				dBA
Cooling	Natural Convection								
Operating Temperature Range	-13 to +140 / -25 to +60 <sup>4)</sup> (-40°F / -40°C option) <sup>5)</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



# Power Optimizer

For North America

P320 / P340 / P370 / P400 / P405 / P505



POWER OPTIMIZER

## PV power optimization at the module-level

- Specifically designed to work with SolarEdge inverters
- Up to 25% more energy
- Superior efficiency (99.5%)
- Mitigates all types of module mismatch losses, from manufacturing tolerance to partial shading
- Flexible system design for maximum space utilization
- Fast installation with a single bolt
- Next generation maintenance with module-level monitoring
- Meets NEC requirements for arc fault protection (AFCI) and Photovoltaic Rapid Shutdown System (PVRSS)
- Module-level voltage shutdown for installer and firefighter safety

solaredge.com



# / Power Optimizer For North America

P320 / P340 / P370 / P400 / P405 / P505

Optimizer model (typical module compatibility)	P320 (for 60-cell modules)	P340 (for high-power 60-cell modules)	P370 (for higher-power 60 and 72-cell modules)	P400 (for 72 & 96-cell modules)	P405 (for thin film modules)	P505 (for higher current modules)	
<b>INPUT</b>							
Rated Input DC Power <sup>(1)</sup>	320	340	370	400	405	505	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	48		60	80	125 <sup>(2)</sup>	87 <sup>(2)</sup>	Vdc
MPPT Operating Range	8 - 48		8 - 60	8 - 80	12.5 - 105	12.5 - 87	Vdc
Maximum Short Circuit Current (Isc)	11			10.1		14	Adc
Maximum DC Input Current	13.75			12.5		17.5	Adc
Maximum Efficiency	99.5						%
Weighted Efficiency	98.8					98.6	%
Overvoltage Category	II						
<b>OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREEDGE INVERTER)</b>							
Maximum Output Current	15						Adc
Maximum Output Voltage	60			85			Vdc
<b>OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREEDGE INVERTER OR SOLAREEDGE INVERTER OFF)</b>							
Safety Output Voltage per Power Optimizer	1 ± 0.1						Vdc
<b>STANDARD COMPLIANCE</b>							
EMC	FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3						
Safety	IEC62109-1 (class II safety), UL1741						
Material	UL94 V-0, UV Resistant						
RoHS	Yes						
<b>INSTALLATION SPECIFICATIONS</b>							
Maximum Allowed System Voltage	1000						Vdc
Compatible inverters	All SolarEdge Single Phase and Three Phase inverters						
Dimensions (W x L x H)	129 x 153 x 27.5 / 5.1 x 6 x 1.1		129 x 153 x 33.5 / 5.1 x 6 x 1.3	129 x 159 x 49.5 / 5.1 x 6.3 x 1.9	129 x 162 x 59 / 5.1 x 6.4 x 2.3		mm / in
Weight (including cables)	630 / 1.4		750 / 1.7	845 / 1.9	1064 / 2.3		gr / lb
Input Connector	Single or dual MC4 <sup>(3)</sup>						
Input Wire Length	0.16 / 0.52						m / ft
Output Wire Type / Connector	Double Insulated / MC4						
Output Wire Length	0.9 / 2.95		1.2 / 3.9				m / ft
Operating Temperature Range	-40 - +85 / -40 - +185						°C / °F
Protection Rating	IP68 / NEMA6P						
Relative Humidity	0 - 100						%

<sup>(1)</sup> Rated power of the module at STC will not exceed the optimizer "Rated Input DC Power". Modules with up to +5% power tolerance are allowed

<sup>(2)</sup> NEC 2017 requires max input voltage be not more than 80V

<sup>(3)</sup> For other connector types please contact SolarEdge

PV System Design Using a SolarEdge Inverter <sup>(4)(5)</sup>	Single Phase HD-Wave	Single phase	Three Phase 208V	Three Phase 480V	
Minimum String Length (Power Optimizers)	P320, P340, P370, P400 P405 / P505	8	10	18	
Maximum String Length (Power Optimizers)		6	13 (12 with SE3K)	14	
Maximum String Length (Power Optimizers)		25	25	50 <sup>(6)</sup>	
Maximum Power per String	5700 (6000 with SE7600-US - SE11400-US)	5250	6000 <sup>(7)</sup>	12750 <sup>(8)</sup>	W
Parallel Strings of Different Lengths or Orientations	Yes				

<sup>(4)</sup> For detailed string sizing information refer to: [http://www.solaredge.com/sites/default/files/string\\_sizing\\_na.pdf](http://www.solaredge.com/sites/default/files/string_sizing_na.pdf)

<sup>(5)</sup> It is not allowed to mix P405/P505 with P320/P340/P370/P400 in one string

<sup>(6)</sup> A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement

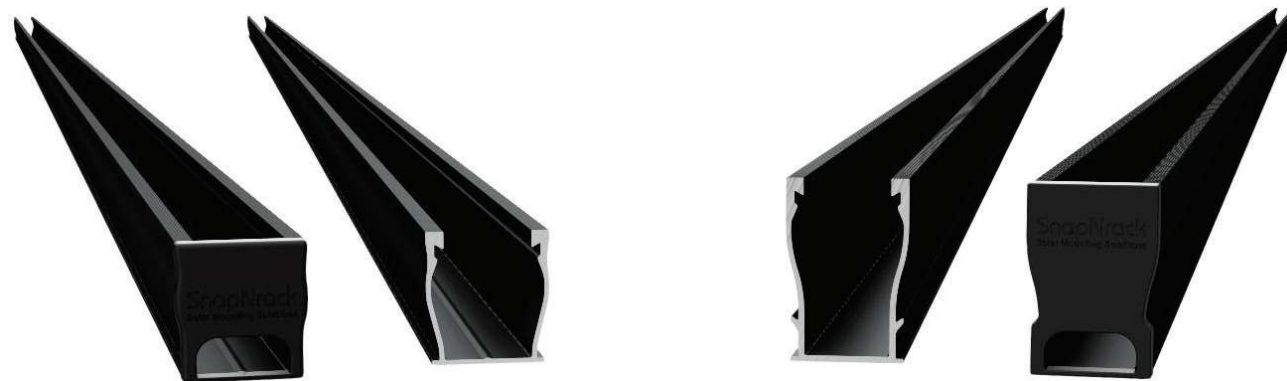
<sup>(7)</sup> For SE14.4KUS/SE43.2KUS: It is allowed to install up to 6,500W per string when 3 strings are connected to the inverter (3 strings per unit for SE43.2KUS) and when the maximum power difference between the strings is up to 1,000W

<sup>(8)</sup> For SE30KUS/SE33.3KUS/SE66.6KUS/SE100KUS: It is allowed to install up to 15,000W per string when 3 strings are connected to the inverter (3 strings per unit for SE66.6KUS/SE100KUS) and when the maximum power difference between the strings is up to 2,000W

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CE RoHS

# Ultra Rail




## The Ultimate Value in Rooftop Solar

 Industry leading Wire Management Solutions

 Mounts available for all roof types

 Single Tool Installation

 All SnapNrack Module Clamps & Accessories are compatible with both rail profiles

**Start Installing Ultra Rail Today**

**RESOURCES**  
**DESIGN**  
**WHERE TO BUY**

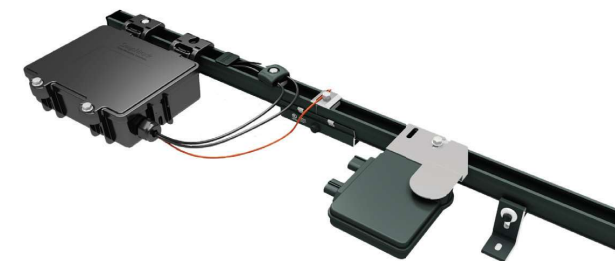
[snapnrack.com/resources](http://snapnrack.com/resources)  
[snapnrack.com/configurator](http://snapnrack.com/configurator)  
[snapnrack.com/where-to-buy](http://snapnrack.com/where-to-buy)

## SnapNrack Ultra Rail System

A sleek, straightforward rail solution for mounting solar modules on all roof types. Ultra Rail features two rail profiles; UR-40 is a lightweight rail profile that is suitable for most geographic regions and maintains all the great features of SnapNrack rail, while UR-60 is a heavier duty rail profile that provides a larger rail channel and increased span capabilities. Both are compatible with all existing mounts, module clamps, and accessories for ease of install.

### The Entire System is a Snap to Install

- New Ultra Rail Mounts include snap-in brackets for attaching rail
- Compatible with all the SnapNrack Mid Clamps and End Clamps customers love
- Universal End Clamps and snap-in End Caps provide a clean look to the array edge



### Unparalleled Wire Management

- Open rail channel provides room for running wires resulting in a long-lasting quality install
- Industry best wire management offering includes Junction Boxes, Universal Wire Clamps, MLPE Attachment Kits, and Conduit Clamps
- System is fully bonded and listed to UL 2703 Standard

### Heavy Duty UR-60 Rail

- UR-60 rail profile provides increased span capabilities for high wind speeds and snow loads
- Taller, stronger rail profile includes profile-specific rail splice and end cap
- All existing mounts, module clamps, and accessories are retained for the same great install experience



# Quality. Innovative. Superior.

SnapNrack Solar Mounting Solutions are engineered to optimize material use and labor resources and improve overall installation quality and safety.

877-732-2860

[www.snapnrack.com](http://www.snapnrack.com)

[contact@snapnrack.com](mailto:contact@snapnrack.com)

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## Series 100 Residential Roof Mount System

The SnapNrack Series 100 Roof Mount System is engineered to optimize material use, labor resources and aesthetic appeal. This innovative system simplifies the process of installing solar modules, shortens installation times, and lowers installation costs; maximizing productivity and profits.

The Series 100 Roof Mount System boasts unique, pre-assembled, stainless steel “Snap-In” hardware and watertight flash attachments. This system is installed with a single tool. No cutting or drilling means less rail waste. It is fully integrated with built-in wire management, solutions for all roof types, one-size-fits-all features, and can withstand extreme environmental conditions. Series 100 is listed to UL Standard 2703 for Grounding/Bonding, Fire Classification and Mechanical Loading. UL 2703 Certification and Compliance ensures that SnapNrack installers can continue to provide the best in class installations in quality, safety and efficiency.

- Appealing design with built-in aesthetics
- No grounding lugs required for modules
- All bonding hardware is fully integrated
- Rail splices bond rails together, no rail jumpers required
- No drilling of rail or reaching for other tools required
- Class A Fire Rating for Type 1 and 2 modules



### System Features Include



Snap in Hardware



Single Tool Installation



Easy Leveling



No Cutting or Drilling



Integrated Wire Management



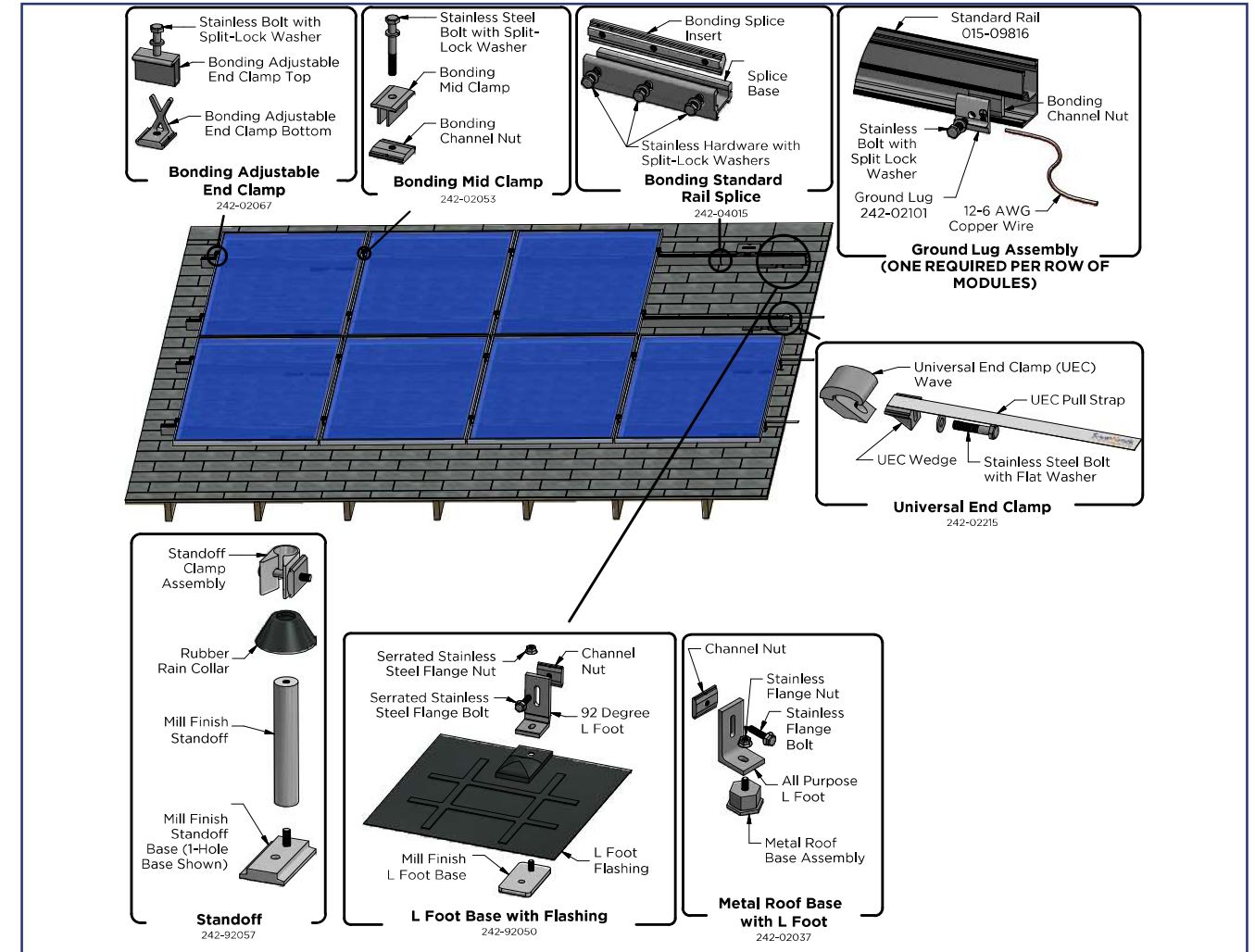
Preassembled hardware



Integrated bonding



UL 2703 Certified



### SERIES 100 TECHNICAL DATA

#### Materials

- 6000 Series aluminum
- Stainless steel
- Galvanized steel and aluminum flashing
- Silver and black anodized aluminum

#### Material Finish

- Mill finish on select products
- Silver or black coated hardware

Note: Appearance of mill finish products may vary and change over time.

#### Wind Loads

110 – 190 mph (ASCE 7-10)

#### Snow Loads

0 – 120 psf

#### Array Pitch

0 – 60 degrees