

# PROJECT DESCRIPTION:

20 X 320 HANWHA QCELL Q.PEAK DUO-G5 320 MODULES  
GROUND MOUNTED SOLAR PHOTOVOLTAIC MODULES

SYSTEM SIZE: 6.40 kW DC STC  
ARRAY AREA: #1 - 362.80 SQ FT

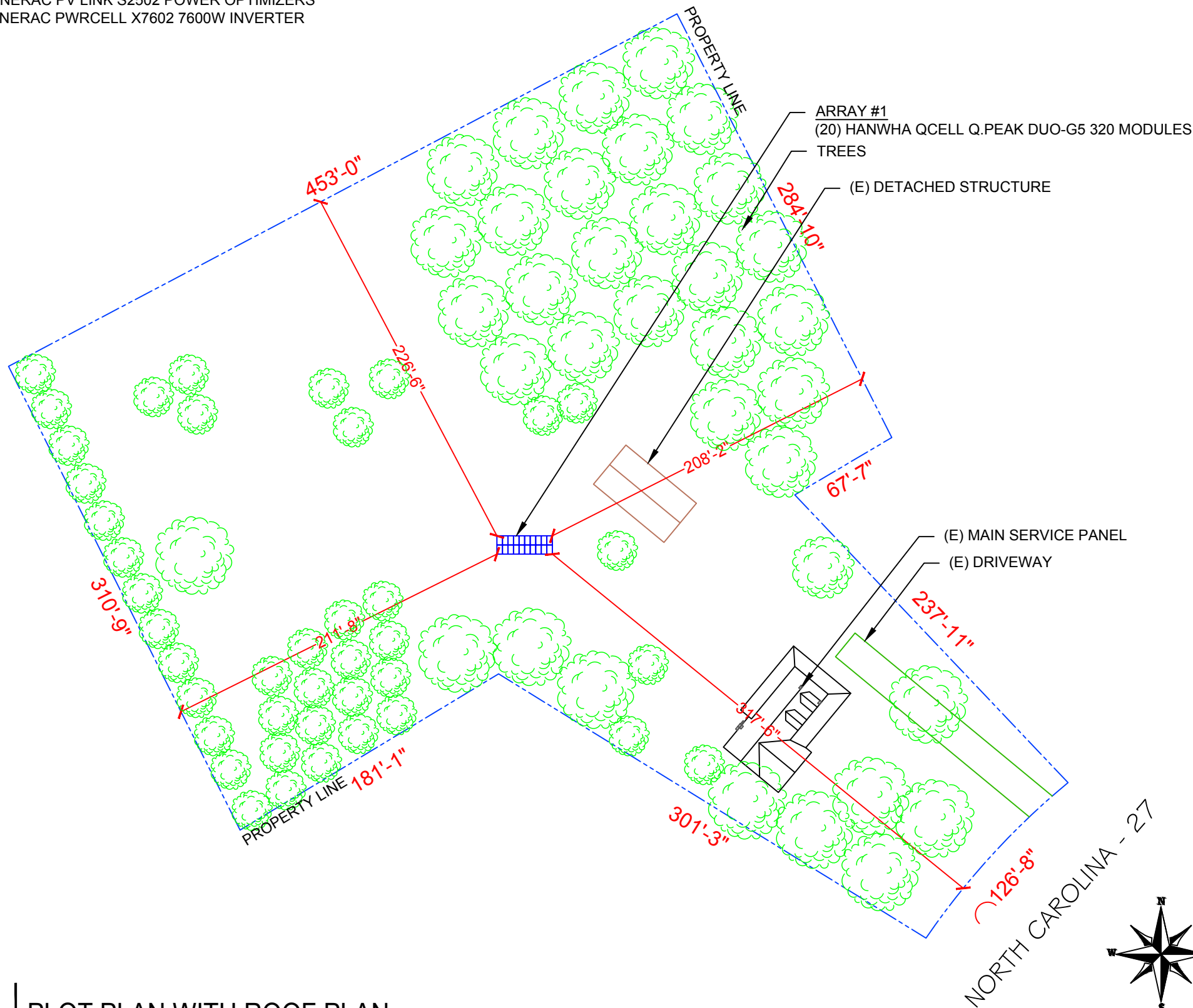
### EQUIPMENT SUMMARY

20 HANWHA QCELL Q.PEAK DUO-G5 320 MODULES  
03 GENERAC PV LINK S2502 POWER OPTIMIZERS  
01 GENERAC PWRCELL X7602 7600W INVERTER

**AUTHORITIES HAVING JURISDICTION**  
BUILDING : HARNETT COUNTY  
ZONING : HARNETT COUNTY  
UTILITY : CENTRAL EMC

**APPLICABLE CODES & STANDARDS**  
NCBC 2018  
NEC 2017

**DESIGN SPECIFICATIONS**  
OCCUPANCY : II  
CONSTRUCTION : SINGLE-FAMILY  
ZONING : RESIDENTIAL  
GROUND SNOW LOAD : 10 PSF  
WIND EXPOSURE : B  
WIND SPEED : 117 MPH



**1 PLOT PLAN WITH ROOF PLAN**

PV-1

SCALE: 1/72"=1'-0"

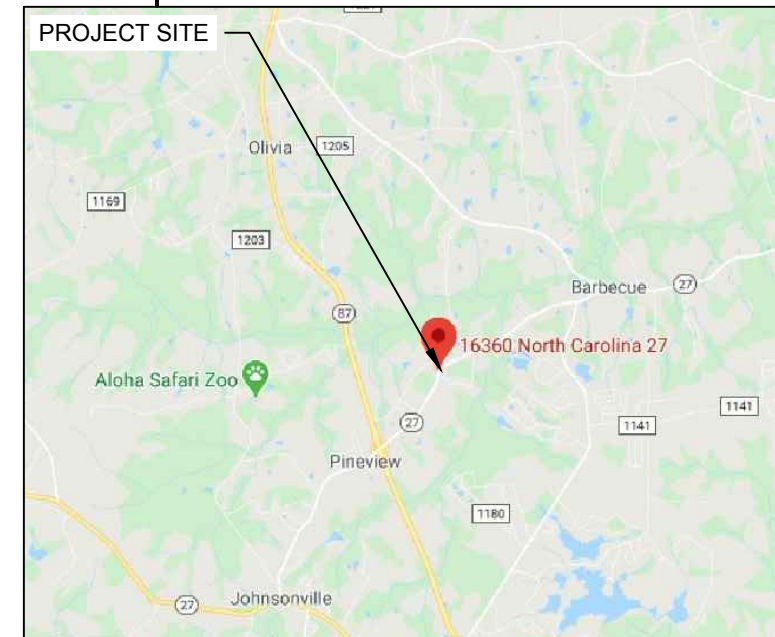
NOTE: GROUND MOUNT LOCATION TBD ON-SITE



**2 HOUSE PHOTO**

PV-1

SCALE: NTS



**3 VICINITY MAP**

PV-1

SCALE: NTS

### SHEET INDEX

PV-1	PLOT PLAN & VICINITY MAP
PV-2	ROOF PLAN & MODULES
PV-2A	STRING LAYOUT
PV-3A	GROUNDING DETAILS
PV-3B	GROUNDING DETAILS
PV-3C	GROUNDING DETAILS
PV-4	ELECTRICAL LINE DIAGRAM
PV-5	WIRING CALCULATIONS
PV-6 to 11	EQUIPMENT SPECIFICATIONS



POWER HOME SOLAR, LLC  
"POWER YOUR FUTURE"  
919 N. MAIN ST.  
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Email: info@powerhome.com  
Web: www.powerhome.com

### REVISIONS

DESCRIPTION	DATE	REV

Signature with Seal

DATE: 7/29/2020

PROJECT NAME & ADDRESS

**ROBLEY Q RUSSELL JR.**  
**RESIDENCE**  
16360 NORTH CAROLINA - 27,  
SANFORD, NC 27332

SHEET NAME  
**PLOT PLAN & VICINITY MAP**

SHEET SIZE

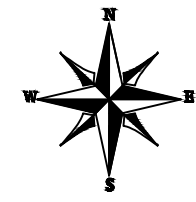
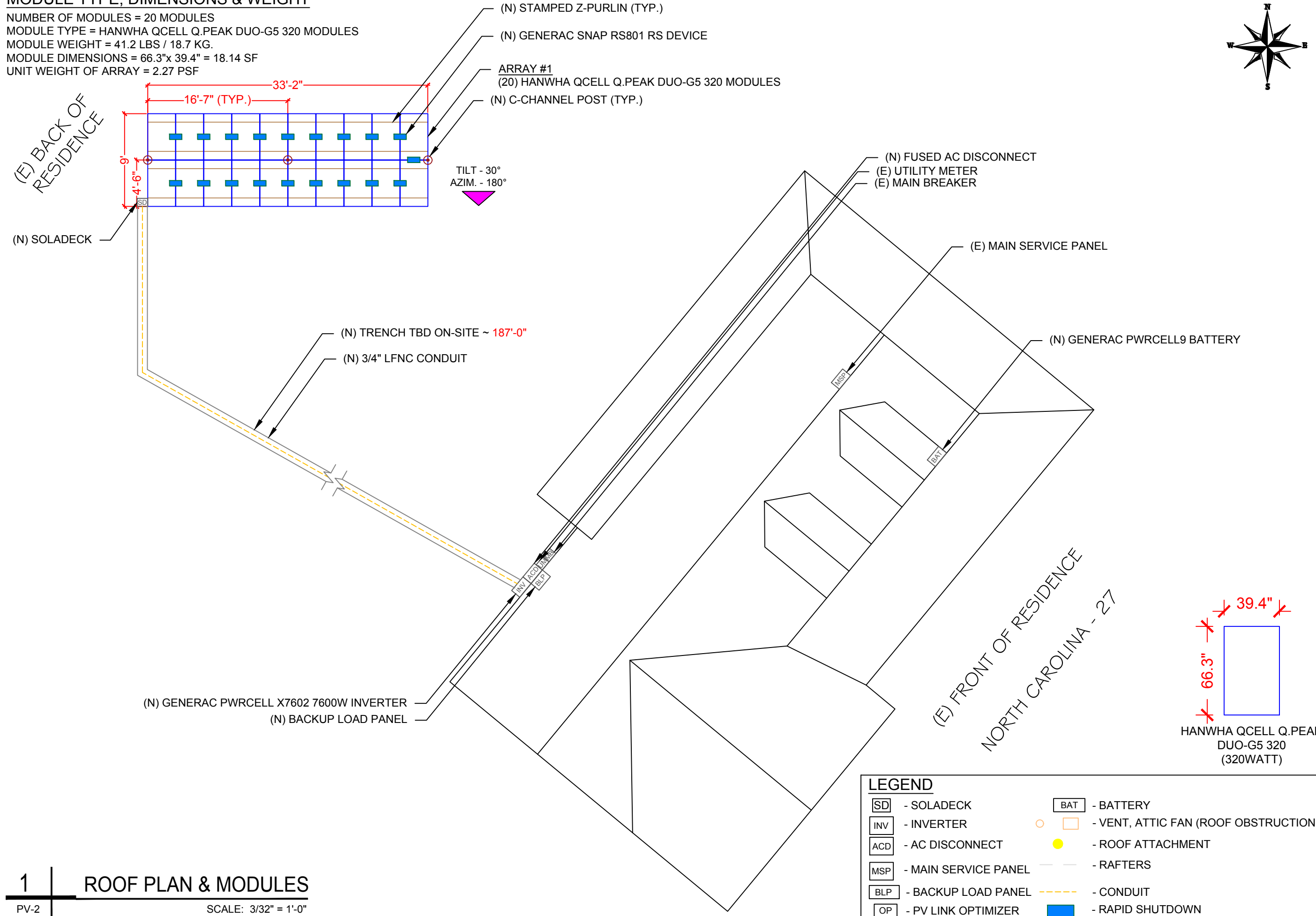
**ANSI B**  
**11" X 17"**

SHEET NUMBER

**PV-1**

**MODULE TYPE, DIMENSIONS & WEIGHT**

NUMBER OF MODULES = 20 MODULES  
 MODULE TYPE = HANWHA QCELL Q.PEAK DUO-G5 320 MODULES  
 MODULE WEIGHT = 41.2 LBS / 18.7 KG.  
 MODULE DIMENSIONS = 66.3"x 39.4" = 18.14 SF  
 UNIT WEIGHT OF ARRAY = 2.27 PSF



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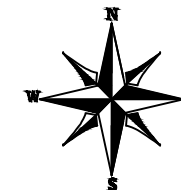
SHEET NAME  
**ROOF PLAN & MODULES**

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

SHEET NUMBER  
**PV-2**

**LEGEND**

[SD] - SOLADECK	[BAT] - BATTERY
[INV] - INVERTER	○ [ ] - VENT, ATTIC FAN (ROOF OBSTRUCTION)
[ACD] - AC DISCONNECT	● - ROOF ATTACHMENT
[MSP] - MAIN SERVICE PANEL	- - - - - RAFTERS
[BLP] - BACKUP LOAD PANEL	- - - - - CONDUIT
[OP] - PV LINK OPTIMIZER	[ ] - RAPID SHUTDOWN



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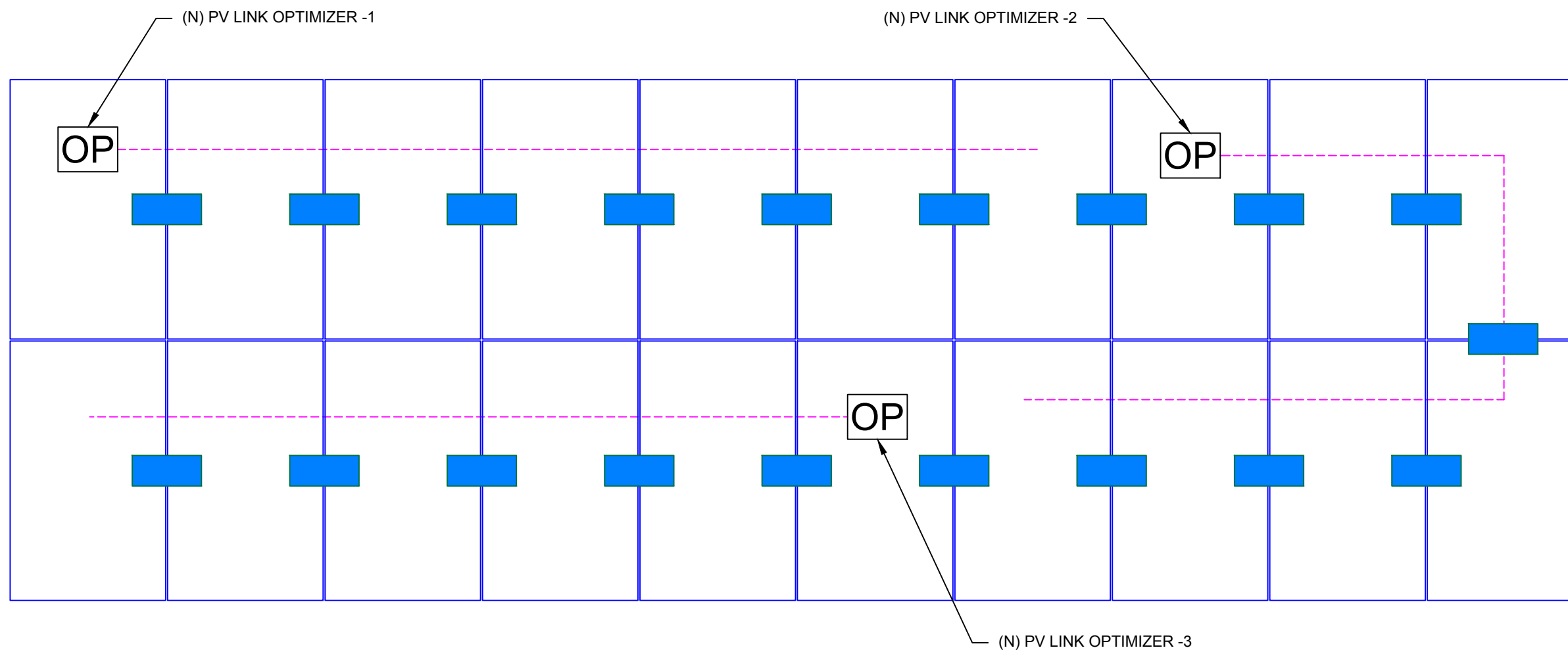
PROJECT NAME & ADDRESS

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SHEET NAME  
**STRING LAYOUT**

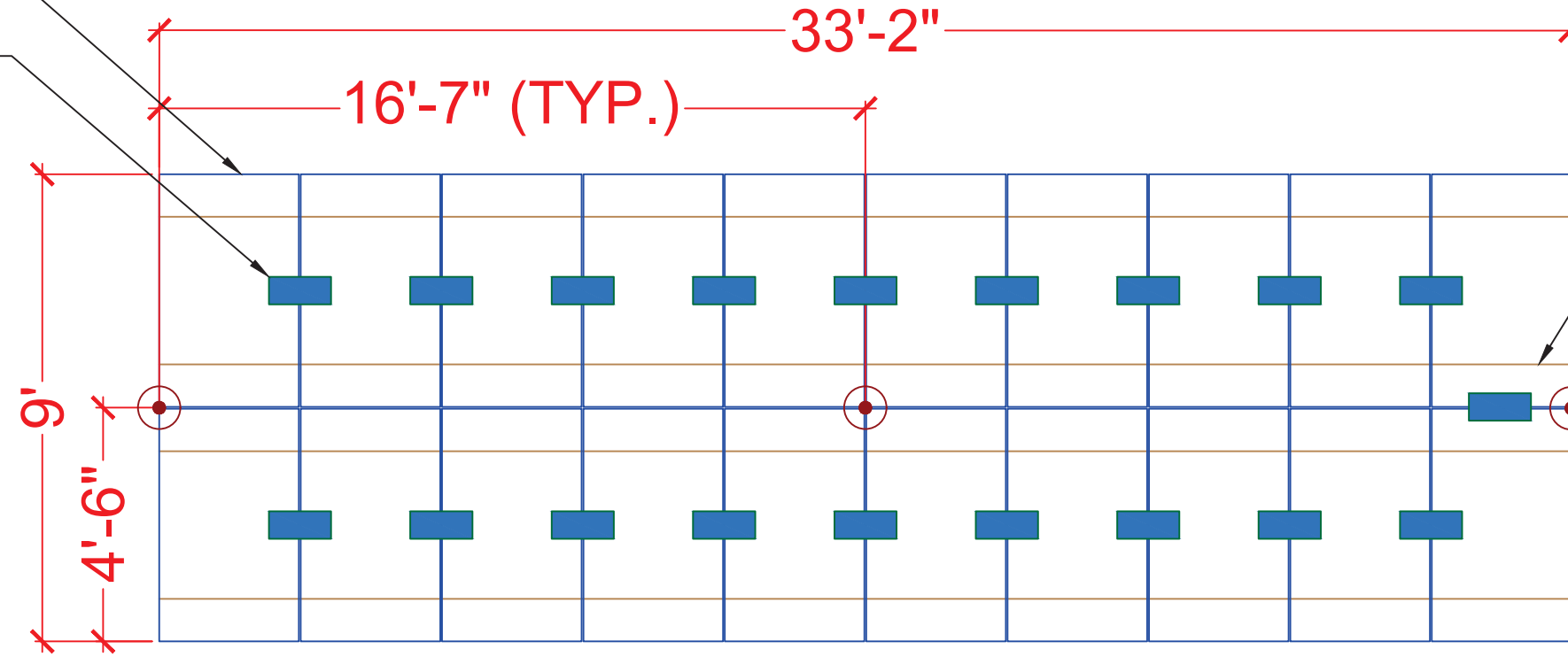
SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-2A**





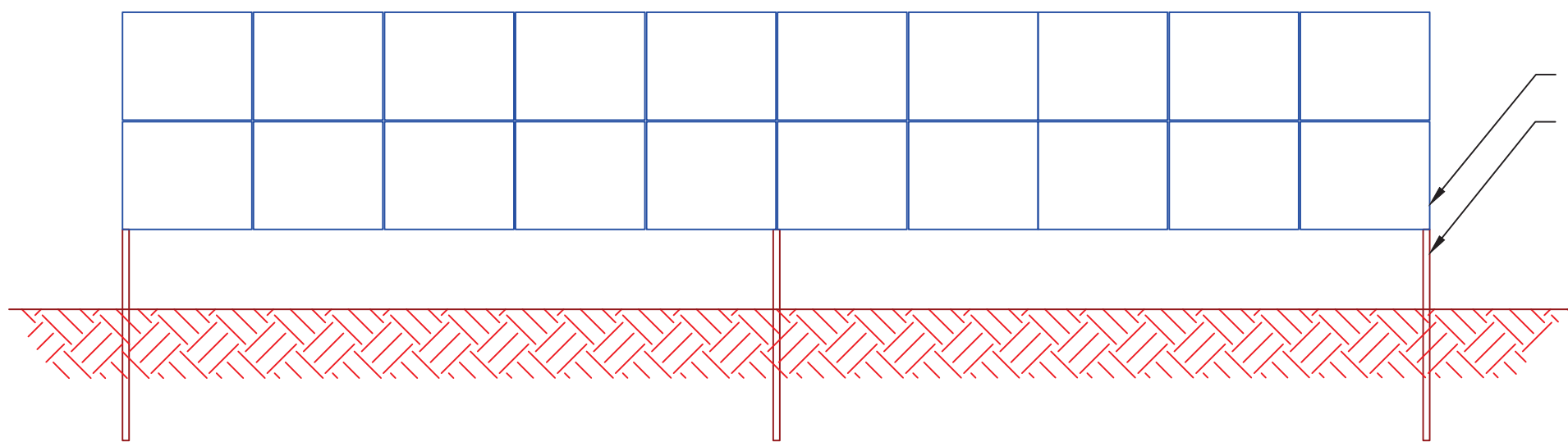
ARRAY #1  
 (20) HANWHA QCELL Q.PEAK DUO-G5 320  
 MODULES  
 (N) GENERAC SNAP RS801 RS DEVICE



DATE: 08-03-2020  
 THIS SEAL AND  
 CERTIFICATION  
 IS LIMITED TO THE  
 STRUCTURAL  
 SYSTEM ONLY.

1 GROUNDING DETAIL (Top View)

PV-3A SCALE: 1/4" = 1'-0"



**FIELD NOTE: (1) STRONGBACK  
 REQUIRED PER SPAN**

STRUCTURAL SHEET 1 OF 2  
 LANCE J. WILKES PE# 045591  
 1400 MARKET PLACE BLVD. SUITE #235  
 CUMMING, GA 30041  
 (678) 653-4510

2 GROUNDING DETAIL (Front View)

PV-3A SCALE: 1/4" = 1'-0"

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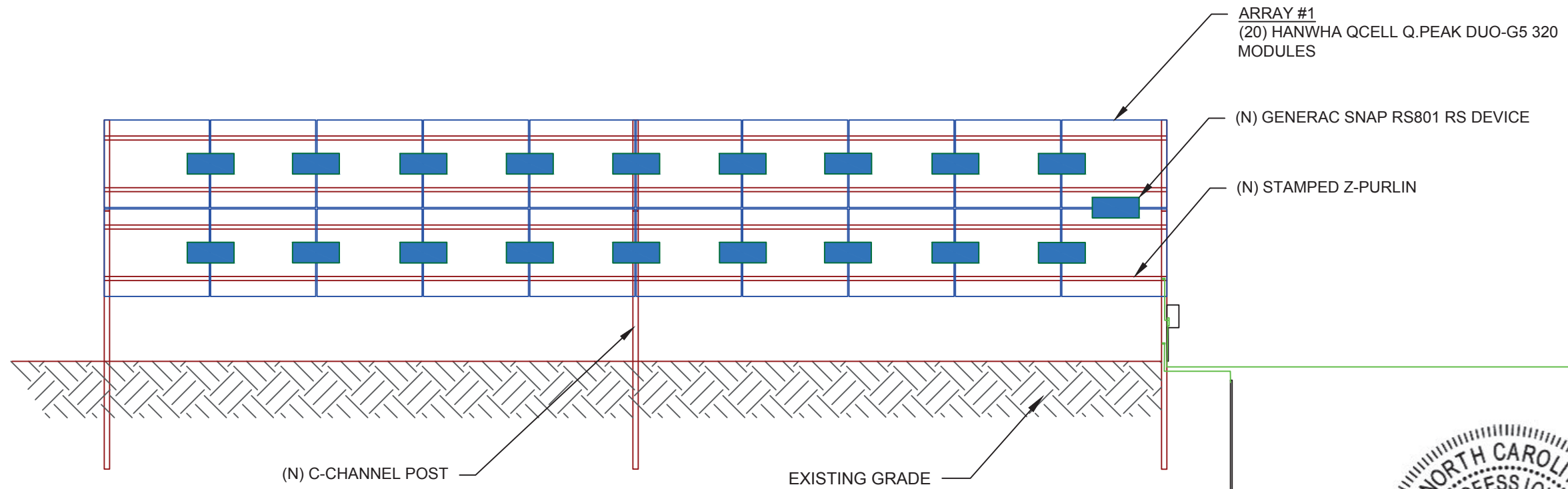
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PROJECT NAME & ADDRESS  
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SHEET NAME  
**GROUNDING  
 DETAIL**

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

SHEET NUMBER  
**PV-3A**



**1** | GROUNDING DETAIL (Rear View)

PV-3B

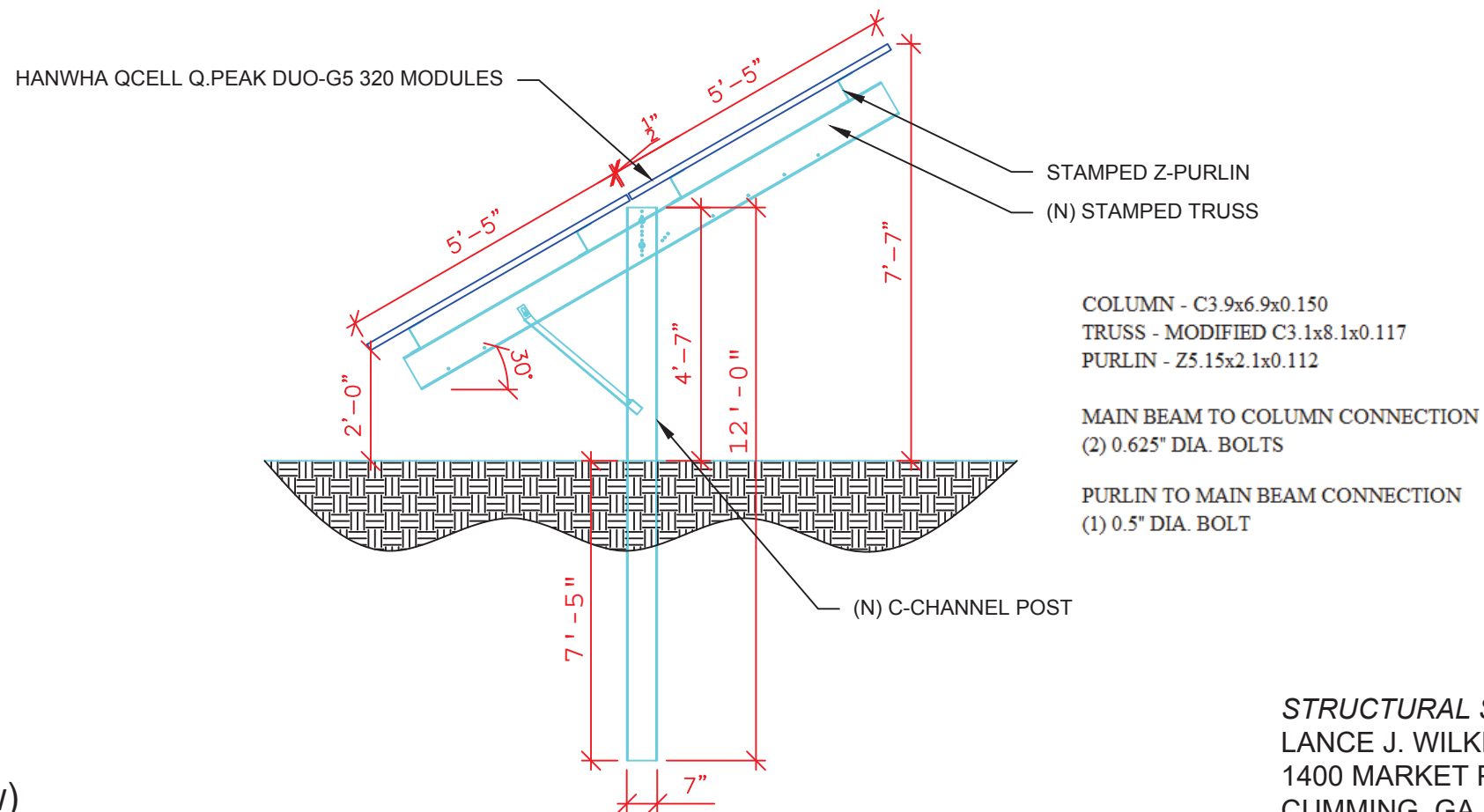
SCALE: 1/4" = 1'-0"

IBC 2015	
1603.1.1 Floor Live Load	N/A
1603.1.2 Roof Live Load	20 psf (Reducible)
1603.1.3 Roof Snow Load	
$P_g =$	10 psf
$P_f =$	7.56 psf
$C_e =$	0.9
$I_s =$	1.00
$C_t =$	1.2
1603.1.4 Wind Load	
$V =$	117 MPH
$I_w =$	1.00
Exposure	B
1603.1.5 Earthquake Design Data	
$S_{D3} =$	0.213
$S_{D1} =$	0.147
Site Class	D
$I_e =$	1.00
SDC	C
Base Shear V	34.00 lb
Soil Assumed to be Stiff	

**2** | GROUNDING DETAIL (Side View)

PV-3B

SCALE: NTS



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STRUCTURAL SHEET 2 OF 2  
 LANCE J. WILKES PE# 045591  
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 CUMMING, GA 30041  
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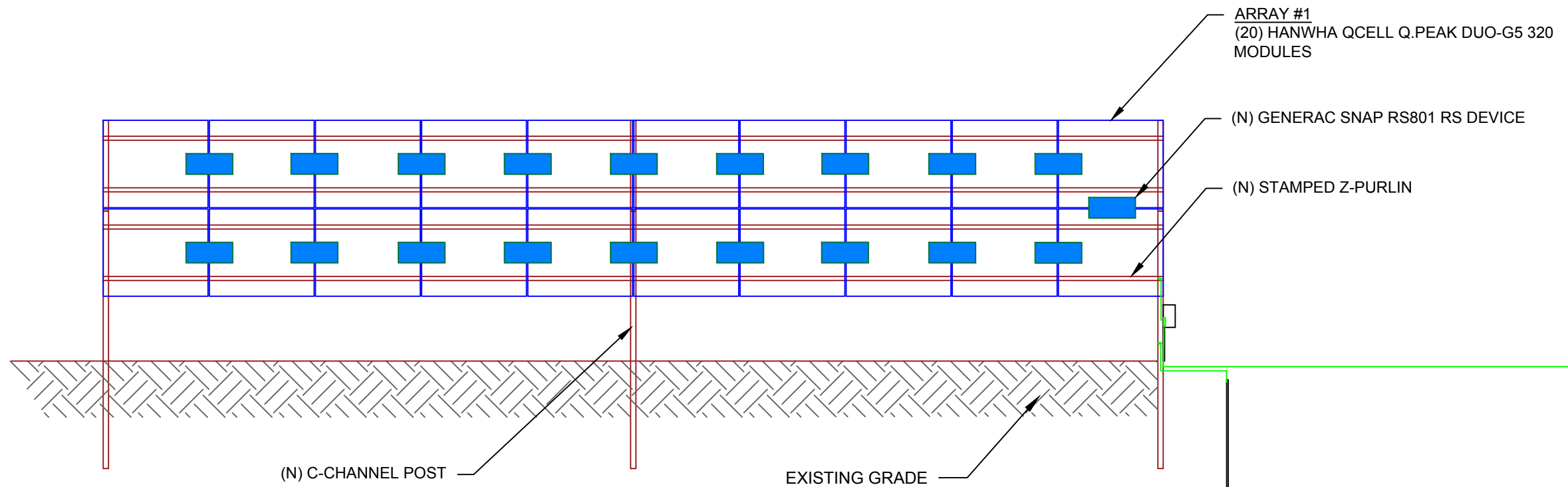
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SHEET NAME  
**GROUNDING  
 DETAIL**

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

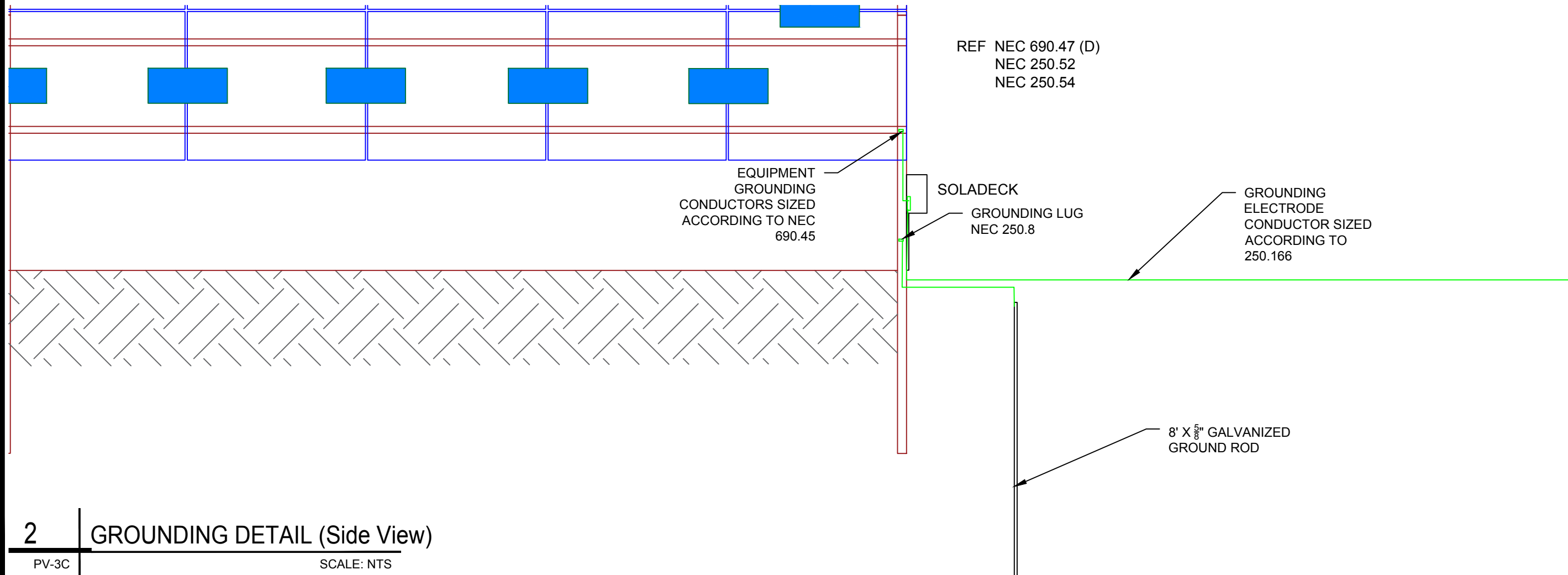
SHEET NUMBER  
**PV-3B**



**1** | GROUNDING DETAIL (Rear View)

PV-3C

SCALE: 1/4" = 1'-0"



**2** | GROUNDING DETAIL (Side View)

PV-3C

SCALE: NTS



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SHEET NAME

**GROUNDING  
 DETAIL**

SHEET SIZE

**ANSI B  
 11" X 17"**

SHEET NUMBER

**PV-3C**

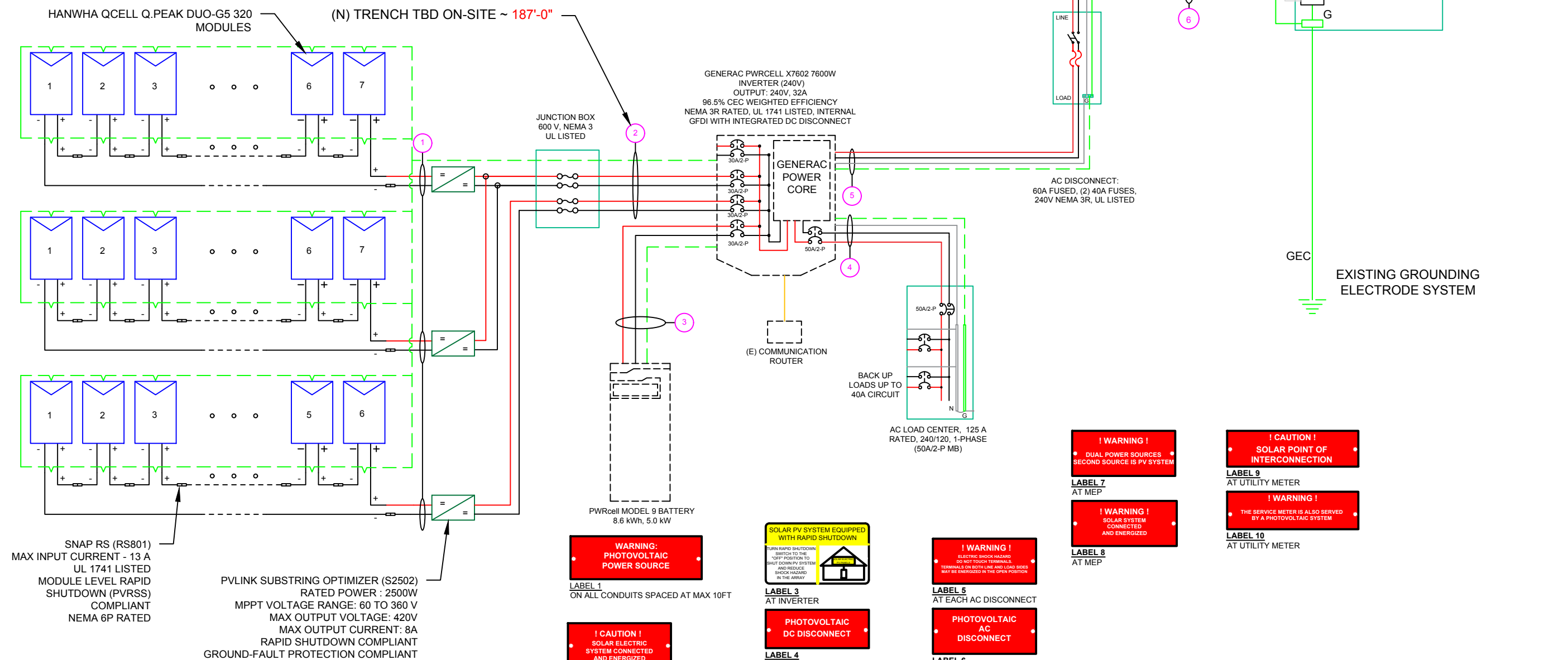
(20) HANWHA QCELL Q.PEAK DUO-G5 320 MODULES  
 (2) PV LINKS OF 7 MODULES &  
 (1) PV LINK OF 6 MODULES CONNECTED IN SERIES

**SERVICE INFO**

UTILITY PROVIDER: CITY OF SALEM  
 MAIN SERVICE VOLTAGE: 240V  
 MAIN PANEL BRAND: CUTLER-HAMMER  
 MAIN SERVICE PANEL: 200A  
 MAIN CIRCUIT BREAKER RATING: 200A  
 MAIN SERVICE LOCATION: NORTH-WEST  
 SERVICE FEED SOURCE: UNDERGROUND

**WIRE LEGEND**

- PV ARRAY +VE CONDUCTOR AND L1
- PV ARRAY -VE CONDUCTOR AND L2
- NEUTRAL CONDUCTOR
- EGC AND GEC
- SINGLE TWISTED PAIR, CAT 5 WIRE



SNAP RS (RS801)  
 MAX INPUT CURRENT - 13 A  
 UL 1741 LISTED  
 MODULE LEVEL RAPID  
 SHUTDOWN (PVRSS)  
 COMPLIANT  
 NEMA 6P RATED

PV LINK SUBSTRING OPTIMIZER (S2502)  
 RATED POWER : 2500W  
 MPPT VOLTAGE RANGE: 60 TO 360 V  
 MAX OUTPUT VOLTAGE: 420V  
 MAX OUTPUT CURRENT: 8A  
 RAPID SHUTDOWN COMPLIANT  
 GROUND-FAULT PROTECTION COMPLIANT

**WARNING: PHOTOVOLTAIC POWER SOURCE**

LABEL 1  
 ON ALL CONDUITS SPACED AT MAX 10FT

**CAUTION! SOLAR ELECTRIC SYSTEM CONNECTED AND ENERGIZED**

LABEL 2  
 AT INVERTER

**SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN**

TURN RABBIT SHUTDOWN SWITCH TO THE OFF POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY

LABEL 3  
 AT INVERTER

**PHOTOVOLTAIC DC DISCONNECT**

LABEL 4  
 AT EACH DC DISCONNECT

**WARNING! ELECTRIC SHOCK HAZARD DO NOT TOUCH TERMINALS OR LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION**

LABEL 5  
 AT EACH AC DISCONNECT

**PHOTOVOLTAIC AC DISCONNECT**

LABEL 6  
 AT EACH AC DISCONNECT

**WARNING! DUAL POWER SOURCES SECOND SOURCE IS PV SYSTEM**

LABEL 7  
 AT MEP

**WARNING! SOLAR SYSTEM CONNECTED AND ENERGIZED**

LABEL 8  
 AT MEP

**CAUTION! SOLAR POINT OF INTERCONNECTION**

LABEL 9  
 AT UTILITY METER

**WARNING! THE SERVICE METER IS ALSO SERVED BY A PHOTOVOLTAIC SYSTEM**

LABEL 10  
 AT UTILITY METER

QTY	CONDUCTOR INFORMATION	CONDUIT TYPE	CONDUIT SIZE
(6)	#10AWG - PV WIRE/USE-2	N/A	N/A
(1)	#6AWG - BARE COPPER IN FREE AIR		
(4)	#10AWG - THWN-2	IMC OR PVC IN TRENCH/ LFNC	3/4"
(1)	#6AWG - THWN-2 GND		
(2)	#10AWG - THWN-2	EMT OR FLEX	3/4"
(1)	#10AWG - THWN-2 GND		
(3)	#6AWG - THWN-2	EMT OR FLEX	3/4"
(1)	#6AWG - THWN-2 GND		
(3)	#6AWG - THWN-2	EMT OR FLEX	3/4"
(1)	#6AWG - THWN-2 GND		
(3)	#6AWG - THWN-2	EMT OR FLEX	3/4"

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 SANFORD, NC 27332

SHEET NAME  
**ELECTRICAL LINE DIAGRAM**

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

SHEET NUMBER  
**PV-4**



SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	HANWHA QCELL Q.PEAK DUO-G5 320 MODULES
VMP	33.32V
IMP	9.60A
VOC	40.13V
ISC	10.09A
TEMP. COEFF. VOC	-0.28%/°C
PTC RATING	297W
MODULE DIMENSION	66.3"L x 39.4"W x 1.26"D (In Inch)

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	GENERAC PWRCELL X7602
AC POWER OUTPUT (LOADS/GRID)	7600VA
AC POWER OUTPUT (BACKUP)	8000VA
NOMINAL OUTPUT VOLTAGE	240 VAC
MAX OUTPUT CURRENT @240V (LOADS/GRID)	32A
MAX OUTPUT CURRENT @240V (BACKUP)	50A
NOMINAL DC INPUT VOLTAGE	380Vdc
MAX DC INPUT VOLTAGE	420Vdc
CEC WEIGHTED EFFICIENCY	96.5%
MAX DC POWER (PV)	10000W
MAX INPUT CURRENT (PV)	20Adc
CONT. PEAK POWER (BATTERY)	8000W

SERIES SUB STRING OPTIMIZER SPECIFICATIONS	
MANUFACTURER / MODEL #	PV LINK S2502
RATED POWER	2500W
MPPT VOLTAGE RANGE	60-360 Vmp
MAXIMUM INPUT VOLTAGE	420Voc
MAXIMUM OUTPUT	420 Adc
NOMINAL OUTPUT	380 Vdc
MAXIMUM OUTPUT CURRENT	8 A
MAXIMUM SHORT CIRCUIT CURRENT	18 A

BATTERY SPECIFICATIONS	
MANUFACTURER / MODEL #	GENERAC PWRCELL9 BATTERY
USABLE ENERGY	8.6kW
RATED CONTINUOUS POWER	3.4Kw
POWER: 60 MINUTES	4.2kW
POWER: 2 MINUTES	5.0kW
REBUS VOLTAGE: INPUT/ OUTPUT	360-420Vdc
MODULE VOLTAGE	46.8Vdc
ROUND-TRIP EFFICIENCY	96.5%

AMBIENT TEMPERATURE SPECS	
RECORD LOW TEMP	-13°
AMBIENT TEMP (HIGH TEMP 2%)	34°
CONDUIT HEIGHT	0.5"
ROOF TOP TEMP	56°

**DC CONDUCTOR AMPACITY CALCULATIONS:  
ARRAY TO JUNCTION BOX:**

EXPECTED WIRE TEMP (In Celsius)	56°
TEMP. CORRECTION PER NEC TABLE 310.15 (B)(2)(a)	0.71
NO. OF CURRENT CARRYING CONDUCTORS	6
CONDUIT FILL CORRECTION PER NEC TABLE 310.15(B)(3)(a)	0.8
CIRCUIT CONDUCTOR SIZE	10 AWG
CIRCUIT CONDUCTOR AMPACITY PER NEC TABLE 310.15(B)(16)	40A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B)	10A
1.25 X I <sub>max</sub>	
DERATED AMPACITY OF CIRCUIT CONDUCTOR	
TEMP. CORRECTION PER TABLE 310.15 (B)(2)(a) X CONDUIT FILL CORRECTION PER NEC 310.15(B)(3)(a) X CIRCUIT CONDUCTOR AMPACITY 310.15 (B)(16)	22.72A
Result should be greater than (10A) otherwise less the entry for circuit conductor size and ampacity	

**FROM JUNCTION BOX TO INVERTER:**

EXPECTED WIRE TEMP (In Celsius)	56°
TEMP. CORRECTION PER NEC TABLE 310.15 (B)(2)(a)	0.71
NO. OF CURRENT CARRYING CONDUCTORS	4
CONDUIT FILL CORRECTION PER NEC TABLE 310.15(B)(3)(a)	0.8
CIRCUIT CONDUCTOR SIZE	10 AWG
CIRCUIT CONDUCTOR AMPACITY PER NEC TABLE 310.15(B)(16)	40A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B)	20A
1.25 X I <sub>max</sub> X # of PV LINKS	
DERATED AMPACITY OF CIRCUIT CONDUCTOR	
TEMP. CORRECTION PER TABLE 310.15 (B)(2)(a) X CONDUIT FILL CORRECTION PER NEC 310.15(B)(3)(a) X CIRCUIT CONDUCTOR AMPACITY 310.15 (B)(16)	22.72A
Result should be greater than (20A) otherwise less the entry for circuit conductor size and ampacity	

**ELECTRICAL NOTES**

- 1.) ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- 2.) ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
- 3.) 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.
- 4.) WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- 5.) DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- 6.) WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- 7.) ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- 8.) MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
- 9.) MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
- 10.) THE POLARITY OF THE GROUNDED CONDUCTORS IS NEGATIVE

**FROM BATTERY TO INVERTER:**

EXPECTED WIRE TEMP (In Celsius)	34°
TEMP. CORRECTION PER NEC TABLE 310.15 (B)(2)(a)	0.96
NO. OF CURRENT CARRYING CONDUCTORS	2
CONDUIT FILL CORRECTION PER NEC TABLE 310.15(B)(3)(a)	1
CIRCUIT CONDUCTOR SIZE	10 AWG
CIRCUIT CONDUCTOR AMPACITY PER NEC TABLE 310.15(B)(16)	40A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B)	26.25A
1.25 X I <sub>max</sub>	
DERATED AMPACITY OF CIRCUIT CONDUCTOR	
TEMP. CORRECTION PER TABLE 310.15 (B)(2)(a) X CONDUIT FILL CORRECTION PER NEC 310.15(B)(3)(a) X CIRCUIT CONDUCTOR AMPACITY 310.15 (B)(16)	38.40A
Result should be greater than (26.25A) otherwise less the entry for circuit conductor size and ampacity	

**AC CONDUCTOR AMPACITY CALCULATIONS:  
FROM INVERTER TO BACK-UP PANEL:**

No. OF INVERTER	1
EXPECTED WIRE TEMP (In Celsius)	34°
TEMP. CORRECTION PER NEC TABLE 310.15(B)(2)(a)	0.96
NO. OF CURRENT CARRYING CONDUCTORS	3
CONDUIT FILL CORRECTION PER NEC TABLE 310.15(B)(3)(a)	1
CIRCUIT CONDUCTOR SIZE	6 AWG
CIRCUIT CONDUCTOR AMPACITY PER NEC TABLE 310.15(B)(16)	75A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B)	42.5A
1.25 X INVERTER OUTPUT CURRENT (BACKUP POWER)	
DERATED AMPACITY OF CIRCUIT CONDUCTOR	
TEMP. CORRECTION PER TABLE 310.15 (B)(2)(a) X CONDUIT FILL CORRECTION PER NEC 310.15(B)(3)(a) X CIRCUIT CONDUCTOR AMPACITY 310.15 (B)(16)	72A
Result should be greater than (42.5A) otherwise less the entry for circuit conductor size and ampacity	

**AC CONDUCTOR AMPACITY CALCULATIONS:  
FROM INVERTER TO MEP:**

No. OF INVERTER	1
EXPECTED WIRE TEMP (In Celsius)	34°
TEMP. CORRECTION PER NEC TABLE 310.15(B)(2)(a)	0.96
NO. OF CURRENT CARRYING CONDUCTORS	3
CONDUIT FILL CORRECTION PER NEC TABLE 310.15(B)(3)(a)	1
CIRCUIT CONDUCTOR SIZE	6 AWG
CIRCUIT CONDUCTOR AMPACITY PER NEC TABLE 310.15(B)(16)	75A

REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B)	40A
1.25 X MAX INVERTER OUTPUT CURRENT (LOADS/GRID)	
DERATED AMPACITY OF CIRCUIT CONDUCTOR	
TEMP. CORRECTION PER TABLE 310.15 (B)(2)(a) X CONDUIT FILL CORRECTION PER NEC 310.15(B)(3)(a) X CIRCUIT CONDUCTOR AMPACITY 310.15 (B)(16)	72A
Result should be greater than (40A) otherwise less the entry for circuit conductor size and ampacity	



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SHEET NAME  
**WIRING  
CALCULATIONS**

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

SHEET NUMBER  
**PV-5**





# Q.PEAK DUO-G5 315-330

## Q.ANTUM SOLAR MODULE

The new Q.PEAK DUO-G5 solar module from Q CELLS impresses thanks to innovative Q.ANTUM DUO Technology, which enables particularly high performance on a small surface. 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 19.9%.



**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 and 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.

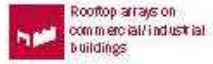


**A RELIABLE INVESTMENT**  
Inclusive 12-year product warranty and 25-year linear performance guarantee<sup>2</sup>.



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

THE IDEAL SOLUTION FOR:



Engineered in Germany

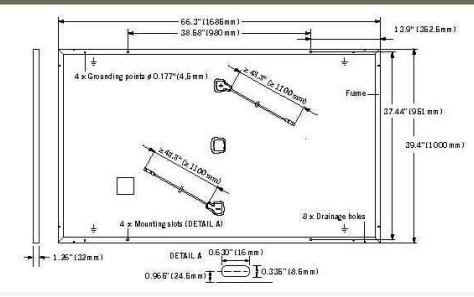


<sup>1</sup> APT test conditions according to IEC/TS 62804-1:2015, method B (-1500V, 168h)  
<sup>2</sup> See data sheet on rear for further information.



### 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

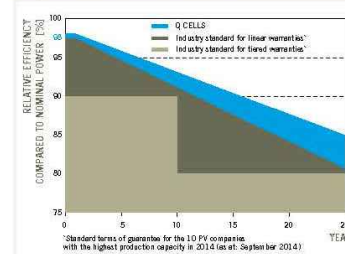


### ELECTRICAL CHARACTERISTICS

POWER CLASS		315	320	325	330	
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC <sup>1</sup> (POWER TOLERANCE +5 W / -0 W)						
Minimum	Power at MPP <sup>1</sup>	$P_{MPP}$ [W]	315	320	325	330
	Short Circuit Current <sup>1</sup>	$I_{SC}$ [A]	10.04	10.09	10.14	10.20
	Open Circuit Voltage <sup>1</sup>	$V_{OC}$ [V]	39.87	40.13	40.40	40.66
	Current at MPP <sup>1</sup>	$I_{MPP}$ [A]	9.55	9.60	9.66	9.71
	Voltage at MPP	$V_{MPP}$ [V]	32.98	33.32	33.65	33.98
	Efficiency <sup>1</sup>	$\eta$ [%]	≥ 18.7	≥ 19.0	≥ 19.3	≥ 19.6
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT <sup>2</sup>						
Minimum	Power at MPP	$P_{MPP}$ [W]	235.3	239.0	242.8	246.5
	Short Circuit Current	$I_{SC}$ [A]	8.09	8.13	8.17	8.22
	Open Circuit Voltage	$V_{OC}$ [V]	37.52	37.77	38.02	38.27
	Current at MPP	$I_{MPP}$ [A]	7.52	7.56	7.60	7.64
	Voltage at MPP	$V_{MPP}$ [V]	31.30	31.62	31.94	32.25

<sup>1</sup> Measurement tolerances  $P_{MPP} \pm 3\%$ ;  $I_{SC}, V_{OC} \pm 5\%$  at STC: 1000 W/m<sup>2</sup>, 25 ± 2°C, AM 1.5 G according to IEC 60904-3 · <sup>2</sup> 800 W/m<sup>2</sup>, NMOT, spectrum AM 1.5 G

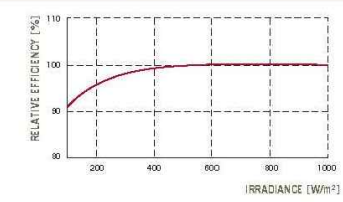
### Q CELLS PERFORMANCE WARRANTY



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 $I_{SC}$	$\alpha$ [%/K]	+0.04	Temperature Coefficient of $V_{OC}$	$\beta$ [%/K]	-0.28
Temperature Coefficient of $P_{MPP}$	$\gamma$ [%/K]	-0.37	Normal 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)	Safety Class	II
Maximum Series Fuse Rating [A DC]	20	Fire Rating	C (IEC) / TYPE 1 (UL)
Max. Design Load, push <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 <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 61730:201, 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-G5\_315-330\_2018-03\_Rev03\_NA



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DESCRIPTION	DATE	REV

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DATE: 7/29/2020

### PROJECT NAME & ADDRESS

ROBLEY Q RUSSELL JR.  
RESIDENCE  
16360 NORTH CAROLINA - 27,  
SANFORD, NC 27332

SHEET NAME  
EQUIPMENT SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-6



# GENERAC<sup>®</sup> PWRCELL

7.6kW 1Ø, 11.4kW 3Ø PWRcell Inverter with CTs  
Model: APKE00014, APKE00013  
Certification Model Reference: X7602, X11402



Solar + storage is simple with the Generac PWRcell™ Inverter. This bi-directional, REbus™-powered inverter offers a simple, efficient design for integrating smart batteries with solar. Ideal for self-supply, backup power, zero-export and energy cost management, the PWRcell Inverter is the industry's most feature-rich line of inverters, available in single-phase and three-phase models.

## FEATURES & BENEFITS

- Single inverter for grid-tied solar with smart battery integration
- Simplified system design: No autotransformer or battery inverter needed
- User-selectable modes for backup power, self-supply, time-of-use and zero-export
- Free system monitoring included via PWRview™ Web Portal and Mobile App

AC OUTPUT/GRID-TIE	MODEL APKE00014	MODEL APKE00013
RATED AC POWER OUTPUT:	7600W	11400W
AC OUTPUT VOLTAGE:	120/240, 1Ø VAC	120/208, 3Ø VAC
AC FREQUENCY:	60 Hz	60 Hz
MAXIMUM CONTINUOUS OUTPUT CURRENT:	32 A, RMS	32 A, RMS
GROUND-FAULT ISOLATION DETECTION:	Included	Included
CHARGE BATTERY FROM AC:	Yes	Yes
THD (CURRENT):	< 2%	< 2%
TYPICAL NIGHTTIME POWER CONSUMPTION:	< 7W	< 7W

AC OUTPUT/BACKUP	MODEL APKE00014	MODEL APKE00013
RATED AC BACKUP POWER OUTPUT (ISLANDED):	8000W	8000W
MAXIMUM AC BACKUP POWER OUTPUT:	10000W	10000W
AC BACKUP OUTPUT VOLTAGE:	120/240, 1Ø VAC	120/240, 1Ø VAC
AC FREQUENCY:	60 Hz	60 Hz
AC CIRCUIT BREAKER:	50 A	50 A
THD (VOLTAGE):	< 2%	< 2%
AUTOMATIC SWITCHOVER TIME:	< 1 Seconds	< 1 Seconds
TYPICAL NIGHTTIME POWER CONSUMPTION:	30W	30W

DC INPUT	MODEL APKE00014	MODEL APKE00013
DC INPUT VOLTAGE RANGE:	360-420 VDC	360-420 VDC
NOMINAL DC BUS VOLTAGE:	380 VDC	380 VDC
MAX IMPORT CURRENT <sup>1</sup> :	20 A	30 A
MAX INPUT CURRENT <sup>2</sup> :	30 A	30 A
REVERSE-POLARITY PROTECTION:	Yes	Yes
GROUND-FAULT ISOLATION DETECTION:	Yes	Yes
TRANSFORMERLESS, UNGROUNDED:	Yes	Yes
TYPICAL NIGHTTIME POWER CONSUMPTION:	< 7W	< 7W

DC INPUT/ BATTERY	MODEL APKE00014	MODEL APKE00013
MAXIMUM CONTINUOUS POWER:	8000W	8000W
INTERNAL DC DISTRIBUTION BREAKERS:	4x 2p30A	4x 2p30A
DC FUSES ON PLUS AND MINUS:	40 A	40 A
2-POLE DISCONNECTION:	Yes	Yes

EFFICIENCY	MODEL APKE00014	MODEL APKE00013
PEAK EFFICIENCY:	97%	98%
CEC WEIGHTED EFFICIENCY:	96.50%	97.50%

<sup>1</sup>Inverter limits DC current import to AC power rating. Total DC current from multiple DC inputs may safely exceed this value up to Max. Input Current. The inverter safely limits the amount utilized  
<sup>2</sup>Per input, four DC inputs total

## Specifications

FEATURES AND MODES	
ISLANDING <sup>3</sup> :	Yes
GRID SELL:	Yes
SELF CONSUMPTION:	Yes
PRIORITIZED CHARGING FROM RENEWABLES:	Yes
GRID SUPPORT - ZERO EXPORT:	Yes

ADDITIONAL FEATURES	
SUPPORTED COMMUNICATION INTERFACES:	REbus™, CANbus, RS485 <sup>4</sup> , Ethernet
SYSTEM MONITORING:	PWRview™ Web Portal and Mobile App
BACKUP LOADS DISCONNECT <sup>5</sup> :	Yes
MANUAL INVERTER BYPASS SWITCH:	Automatic
WARRANTY:	10 Years

STANDARDS COMPLIANCE	
SAFETY:	UL1741 SA, CSA 22.2
GRID CONNECTION STANDARDS:	IEEE1547, Rule 21, Rule 14H, CSIP
EMISSIONS:	FCC Part 15 Class B

DIMENSIONS AND INSTALLATION SPECIFICATIONS	
ENCLOSURE KNOCKOUTS - QTY, SIZE - IN (MM):	6 x Combo 3/4" x 1" (19 x 25.4) 7 x Combo 1/2" x 3/4" (12.7 x 19)
DIMENSIONS L x W x H - IN (MM):	24.5" x 19.25" x 8" (622.3 x 488.9 x 203.2)
WEIGHT - LB (KG):	62.7 (28.4)
COOLING:	Forced convection
NOISE:	< 40 dBA
OPERATING TEMPERATURE - FAHRENHEIT (CELSIUS):	-4 to 122 °F (-20 to 50 °C) <sup>5</sup>
PROTECTION RATING:	NEMA 3R

INSTALLATION GUIDELINES	
BATTERY TYPES SUPPORTED:	PWRcell™ Battery
MODULE STRING SIZE PER PV LINK OPTIMIZER:	Varies, refer to PV Link Installation Manual
MAXIMUM RECOMMENDED DC POWER FROM PV:	15kW

<sup>3</sup>3Ø inverters offer islanding for 1Ø loads

<sup>4</sup>Modbus

<sup>5</sup>Reduced power at extreme temperatures

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DESCRIPTION	DATE	REV

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DATE: 7/29/2020

PROJECT NAME & ADDRESS

ROBLEY Q RUSSELL JR.  
RESIDENCE  
16360 NORTH CAROLINA - 27,  
SANFORD, NC 27332

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-7

**GENERAC**

# SnapRS™

Inline Disconnect Switch  
Model: APKE00011  
Certification Model Reference: RS801



Generac SnapRS are a simple way to satisfy rapid shutdown compliance for solar + storage systems. Generac SnapRS are 2017/2020 NEC 690.12 compliant, don't require any extra hardware to mount, and need no pairing or fussy digital communications.

## FEATURES & BENEFITS

- Fast, easy, and simple to install
- One SnapRS device per PV module
- Achieves PVRSS Compliance
- Low cost, high efficiency solution

## SYSTEM DESIGN

Snap a Generac SnapRS disconnect device (RS) to the negative lead (-) of each module in the solar array for simple module-level rapid shutdown compliance. SnapRS devices isolate array voltage when a rapid shutdown is initiated at a PWRcell™ Inverter. When rapid shutdown is initiated, SnapRS units isolate each PV module in the array, reducing array voltage to <80V in seconds.

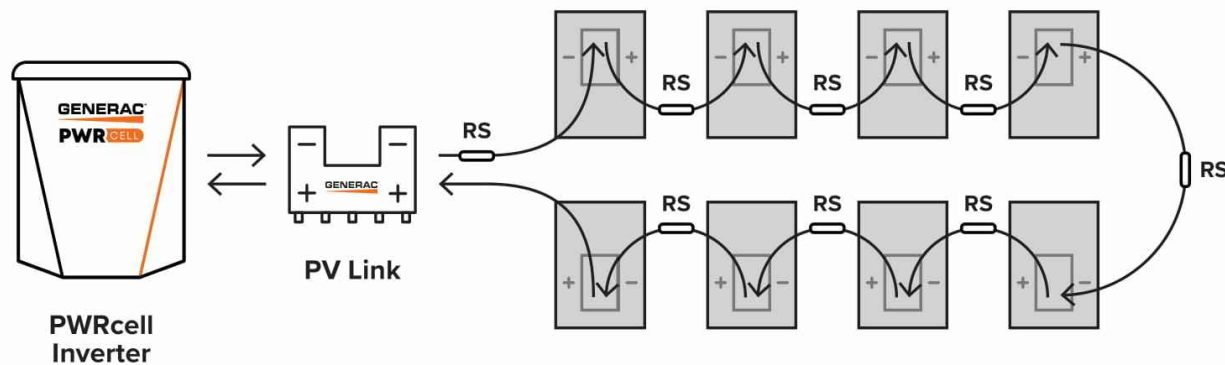


Diagram is applicable for most 60 cell PV modules. Modules with higher cell count may require a different arrangement. Contact Generac for more details.

## Specifications

SnapRS™ (APKE00011)	
PV MODULE MAX VOC:	75 V
EFFICIENCY:	99.8%*
MAX INPUT CURRENT:	13 A
SHUTDOWN TIME:	< 10 Seconds
ENCLOSURE RATING:	NEMA 6P
OPERATING TEMPERATURE - FAHRENHEIT (CELSIUS):	-40 to 158 °F (-40 to 70 °C)
CERTIFICATIONS:	UL1741
PROTECTIONS:	PVRSE
WEIGHT - LB (KG):	0.17 (0.08)
DIMENSIONS, L x W x H - IN (MM):	7" x 1" x 1" (177.8 x 25.4 x 25.4)
WARRANTY:	25 Years

\*When used with a 50V panel

Connect one SnapRS device to the negative lead of each PV module in the PV Link controlled array for complete PV Rapid shutdown performance



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RESIDENCE  
16360 NORTH CAROLINA - 27,  
SANFORD, NC 27332

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-8



**GENERAC**

# PWRCELL

Model APKE00007, PWRcell Battery Cabinet  
 Model A0000391219, 2.85kWh PWRcell Battery Module  
 Certification Model Reference: BJ-DCB05ZKAX  
 Model APKE00008, PWRcell Spacer Kit  
 Model APKE00009, PWRcell Upgrade Kit  
 Certification Model Reference for Battery Configurations:  
 PWRcell 9, PWRcell 12, PWRcell 15, PWRcell 17

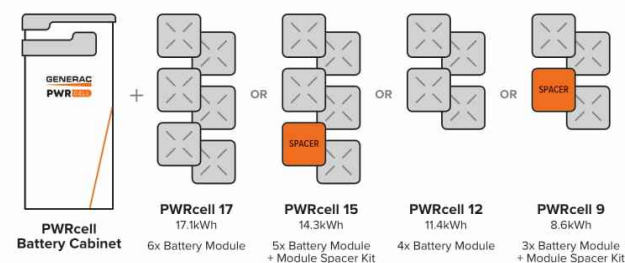
The PWRcell™ Battery Cabinet is a modular smart battery platform that allows for a range of configurations to suit any need, small or large. No other smart battery offers the power and flexibility of PWRcell. Whether for backup power or smart energy management, PWRcell has power and capacity options for every need, without sacrificing flexibility or function.



## PWRcell BATTERY CABINET DESIGN

The PWRcell Battery Cabinet allows system owners the flexibility to scale from the economical 8.6kWh PWRcell 9 to the massive 17.1kWh PWRcell 17 by installing additional battery modules to the PWRcell Battery Cabinet. When needs change, an existing PWRcell Battery Cabinet can be upgraded with additional modules. Use the graphic below and the chart on the back of this sheet to understand what components you need for your chosen PWRcell configuration.

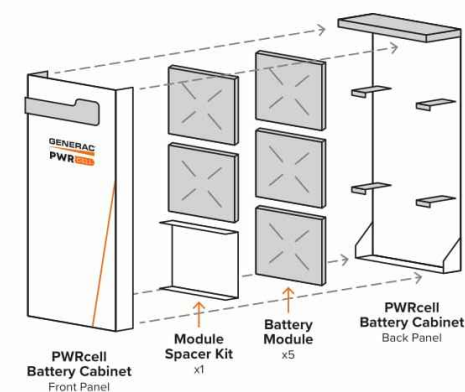
## BATTERY CONFIGURATION GUIDE



## FEATURES & BENEFITS

- Connect 2 PWRcell Battery Cabinets to a single PWRcell Inverter for 34.2kWh of storage
- Best-in-class battery backup power
- Plug-and-play with PWRcell Inverter and PV Link™
- Time-of-use (TOU) and zero-export ready
- Residential and commercial application ready

## BATTERY CABINET ASSEMBLY



## Specifications

PWRcell™ BATTERY CONFIGURATIONS	9	12	15	17
BATTERY MODULES:	3	4	5	6
USABLE ENERGY:	8.6kWh	11.4kWh	14.3kWh	17.1kWh
POWER - RATED CONTINUOUS:	3.4kW	4.5kW	5.6kW	6.7kW
POWER - 60 MINUTES:	4.2kW	5.6kW	7.0kW	8.4kW
POWER - 2 MINUTES:	5.0kW	6.7kW	8.4kW	10.0kW
REbus™ VOLTAGE - INPUT/OUTPUT:	360-420 VDC			
MODULE VOLTAGE:	46.8 VDC			
ROUND-TRIP EFFICIENCY:	96.50%			
OPERATING TEMPERATURE - FAHRENHEIT (CELSIUS):	41 to 113 °F (5 to 45 °C)			
RECOMMENDED AMBIENT TEMPERATURE - FAHRENHEIT (CELSIUS):	55 to 86 °F (13 to 30 °C)			
MAXIMUM INSTALLATION ALTITUDE - FT (M):	9834 (3000)			
DIMENSIONS, L x W x H - IN (MM):	22" x 10" x 68" (559 x 254 x 1727)			
WEIGHT, ENCLOSURE - LB (KG):	115 (52)			
WEIGHT, INSTALLED - LB (KG):	280 (127)	335 (152)	390 (178)	445 (202)
WARRANTY - LI-ION MODULES:	10 Years, (7.56MWh)			
WARRANTY - ELECTRONICS AND ENCLOSURE:	10 Years			
COMMUNICATION PROTOCOL:	REbus™ DC Nanogrid™			
COMPLIANCE:	UL 9540, UL 1973, UL 1642, CSA 22.2			

## UPGRADING PWRcell

Inside of the PWRcell Battery Cabinet, battery modules are stacked two deep on three levels, allowing for up to six modules to be connected in series. You can upgrade an existing PWRcell Battery Cabinet by adding Battery Modules and a Module Spacer (APKE00008) if required. PWRcell 9 and PWRcell 15 require a module spacer.

Generac offers a convenient PWRcell Battery Upgrade Kit (APKE00009) to help replace lost or misplaced hardware. A PWRcell Battery Upgrade Kit may be purchased from your Generac distributor.

Refer to the table to the right for material requirements related to upgrading the PWRcell Battery Cabinet.

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## UPGRADE MATERIAL REQUIREMENTS

STARTING CONFIGURATION	ENDING CONFIGURATION		
	PWRcell 17	PWRcell 15	PWRcell 12
PWRcell 9	+ 3 x PWRCell Mod + 2 x APKE00009*	+ 2 x PWRCell Mod + 1 x APKE00009*	+ 1 x PWRCell Mod + 1 x APKE00009*
PWRcell 12	+ 2 x PWRCell Mod + 1 x APKE00009*	+ 1 x PWRCell Mod + 1 x APKE00008	
PWRcell 15	+ 1 x PWRCell Mod + 1 x APKE00009*		

\*APKE00009 (Upgrade kit) only required if original hardware is unavailable

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 SANFORD, NC 27332

SHEET NAME  
**EQUIPMENT SPECIFICATION**

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

SHEET NUMBER  
**PV-9**



**GENERAC**

# PV Link™

2500W MPPT Substring Optimizer  
 Model: APKE00010  
 Certification Model Reference: S2502

PV Link is the simple solar optimizer for quick installation and long-lasting performance. Connect PV modules to each PV Link to overcome shading and challenging roof lines.

## FEATURES & BENEFITS

- Fast, simple installation
- Lower failure risk than module-level optimizers
- 2017/2020 NEC rapid shutdown compliant with SnapRS™
- Quick connections with MC4 connectors
- Exports up to 2500W
- Compatible with PWRcell™ Inverters
- Cost-effective solution for high-performance PV
- Ground-fault protection

## SINGLE-STRING PV ARRAY WITH SnapRS DEVICES

Where PV module-level rapid shutdown is required (NEC 690.12), a SnapRS device (RS) is installed to negative (-) lead of each PV module.

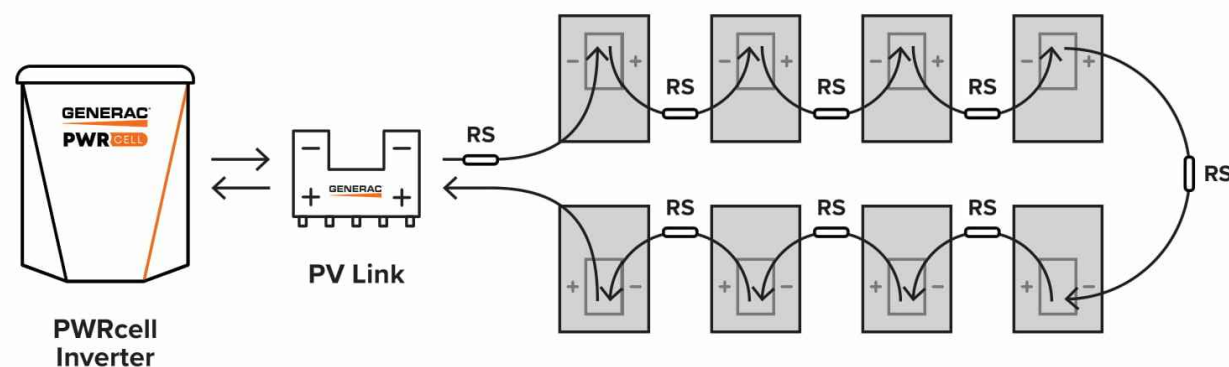
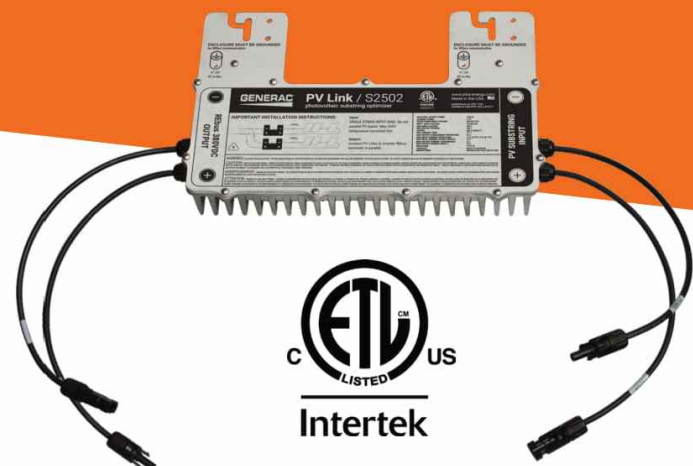


Diagram is applicable for most 60 cell PV modules. Modules with higher cell count may require a different arrangement. Contact Generac for more details.



## Specifications

PV Link™ (APKE00010)	
RATED POWER*:	2500W
PEAK EFFICIENCY:	99%
MPPT VOLTAGE RANGE:	60-360 VMP
MAX INPUT VOLTAGE:	420 VOC; max when cold
MAX OUTPUT:	420 VOC
NOMINAL OUTPUT (REbus™):	380 VDC
MAX OUTPUT CURRENT (CONTINUOUS):	8 A
MAX OUTPUT CURRENT (FAULT):	10 A
MAX INPUT CURRENT (CONTINUOUS):	13 A @ 50°C, 10 A @ 70°C
MAX INPUT SHORT CIRCUIT CURRENT (ISC):	18 A
STANDBY POWER:	< 1 W
PROTECTIONS:	Ground-fault, Arc-fault (Arc-fault Type 1 AFCI, Integrated), PVRSE
MAX OPERATING TEMP: FAHRENHEIT (CELSIUS)	158 °F (70 °C)
SYSTEM MONITORING:	PWRview™ Web Portal and Mobile App
ENCLOSURE:	Type 3R
WEIGHT - LB (KG):	7.3 lb (3.3 kg)
DIMENSIONS, L x W x H - IN (MM):	15.4" x 2" x 9.6" (391.2 x 50.8 x 243.8)
COMPLIANCE:	UL 1741, CSA 22.2
WARRANTY:	25 Years

\*PV Link can tolerate higher than rated power at its input if Max Input Voltage and Short Circuit Current specifications are not exceeded



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SHEET NAME  
**EQUIPMENT  
 SPECIFICATION**

SHEET SIZE

**ANSI B  
 11" X 17"**

SHEET NUMBER

**PV-10**





# Sinclair Designs & Engineering

## Your One-Stop-Shop for Solar Racking Solutions

Carport Systems   Pole Mount Trackers   Ground Mount Systems   Commercial Roof Mount Systems



T - Y - L - A Carports   Fixed, Single, Dual Axis Sun Trackers   5 - 45 Degree GroPost/Ballastund Mount Systems   5 - 7 - 10 Degree Roof Mounts

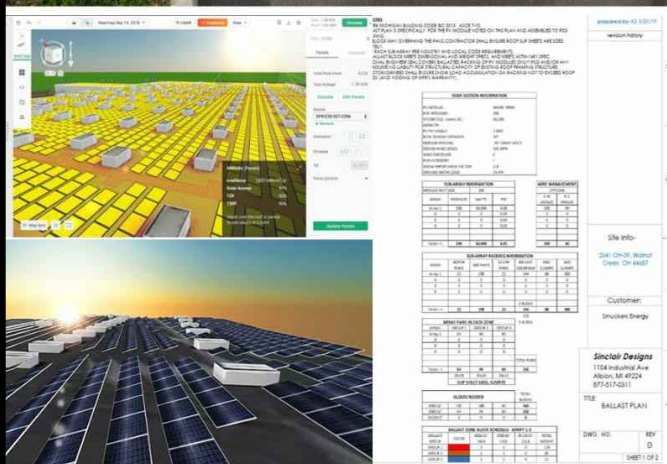
**SDE: Project Development Support (Using Aurora PV Software & Solid-Works)**

**Our NABCEP certified PV designers and Engineers can support you through every phase of your project.**

**Preliminary Designs for Quick Proposals: 3D Modeling, PV Production, Shade Analysis, & Site Drawings**

**Ballast Calculations with PSF Analysis**

**Accurate Component Pricing & Project Bill of Materials**



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## Integrated Project Development & System Manufacturing

### Sky Rack 2.0 Ground Mount System



**Introducing the New Sky Rack 2.0 Ground Mount**  
 The new design increases the overall structural integrity of the assembly and provides more efficient installation techniques.

Based on your module choice and the size of the project, this system can offer a direct hardware to module solution; eliminating the need to purchase expensive panel clamp kits (10% Savings).

APPLICATION	OPEN FIELD		
Tilt Angle	5-45 Degrees	Terrain	5 Degree E/W
Module Orientation	2 High Portrait	Wire Management	Included
Wind Load	115 MPH	Warranty	25 Years
Snow Load	60 PSF	Material	11GA G90 CHEM TREAT Steel
Ground Clearance	24in Standard (Customer Req)	Manufacturing	Made in Michigan, USA

#### 4 Main Components For Efficient Installation

- 1. 4 x 7 IN C-CHANNEL POST**  
Optional Lengths = 8 - 17 Feet
- 2. SLR-STRUT-50**  
Reinforcement Brace
- 3. TRUSS - 120**  
5-40 Degree Angle Adjustment
- 4. Z-PURLIN-(2-5 Panel Lengths Available)**  
Wire Tie Management Holes  
Additional Slots for direct module tie-in

#### Additional Components Available to Increase Spec Requirements

- Z-PURLIN BRACE**  
For high wind/heavy snow areas
- SLR-DBL L STRUT- 50**  
For high wind/heavy snow areas
- SLR-STRONGBACK**  
For high wind/heavy snow areas
- Z-PURLIN CANTILEVER-44**  
Allows additional modules to be installed at the beginning and end of each array.

#### Minimal Hardware Requirements For Efficient Installation

- ALL HDW & CLAMP KITS ARE STORED IN HIGH VOLUMES**
- 2x 5/8-11 x 1 3/4 Serrated Flanged Heads
  - 7x 1/2-13 x 1 1/2 Serrated Flanged Heads
  - AK Solar UL-467 SS MID CLAMP KITS
  - AK Solar UL-467 SS END CLAMP KITS
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**PRODUCT AVAILABILITY:** All racking systems are manufactured "IN HOUSE" from "Prime" 11 Gage Grade 50 USA Steel. This allows us to control 100% of the production schedule and deploy your system ahead of the installation date. We inventory 1-2 Megawatts of racking product to maintain an average lead time of 7-10 days.



**Need Installation Support? Our new business partners can provide geotechnical support and offer installation pricing for all of our racking systems. Together, we are on track to install over 80 Megawatts of power throughout the USA in 2019.**

**POWERHOME**

POWER HOME SOLAR, LLC  
 "POWER YOUR FUTURE"  
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 MOORESVILLE, NC 28115  
 Phone: 704-800-6591 (OFFICE)  
 Email: info@powerhome.com  
 Web: www.powerhome.com

REVISIONS		
DESCRIPTION	DATE	REV

Signature with Seal

DATE: 7/29/2020

PROJECT NAME & ADDRESS

**ROBLEY Q RUSSELL JR.**  
**RESIDENCE**  
 16360 NORTH CAROLINA - 27,  
 SANFORD, NC 27332

SHEET NAME  
**EQUIPMENT SPECIFICATION**

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

SHEET NUMBER  
**PV-11**