



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

September 2022

Property Owner: Jorge Morales

Property Address: 120 Vista Ridge Trail, Sanford, NC 27332

**RE: Goundmount Installation**

I have reviewed the address referenced above to determine the adequacy of the existing area supports the proposed installation of an array of solar panels in the ground.

The photovoltaic ground mount structure offered by Unirac is found to be of sufficient capacity for the design loads when installed in accordance with the drawings and calculations attached, and manufacturer's instructions. The foundation shall be installed as marked on the drawings to the depth specified in the drawing table. To the best of my professional knowledge and belief, the product and system installation will be in compliance with all state and local building codes and guidelines at the time of our review.

**Evaluation Criteria:**

Windspeed: 116

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

Risk Category: ~~KK~~

Wind Exposure Category: C

Ground Snow Load: 10 PSF

Footing Depth: 5.63'

P/UNgi Spacing: 76.86" E-W Leg Spacing : 86.03"

**Connection of Array to Ground:**

Manufacturer: UNIRAC

Model: ULA (Unirac Large Array)

Foundation Type: Drilled Cast-In-Hole Concrete Pile

**Limitations**

Unirac's ground mount system is to be installed per manufacturer's specifications and in accordance with accepted industry-wide safety standards. Electrical engineering is beyond our scope of the installation.

This item has been digitally signed and sealed by Henry I. DiFranco, Jr., P.E. on September 26, 2022 Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

PRINCIPAL ENGINEERING, INC.  
1011 N. CAUSEWAY BLVD. STE 19  
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NORTH CAROLINA FIRM NO. C4113

**PRINCIPAL Infrastructure™**

Architecture ♦ Engineering ♦ Construction

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# PHOTOVOLTAIC GROUND MOUNT SYSTEM

48 MODULES-GROUND MOUNTED - 17.520 KW DC STC, 16.238 KW DC PTC, 13.920 KW AC

120 VISTA RIDGE TRAIL, SANFORD, NC 27332



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

## PROJECT DATA

PROJECT ADDRESS: 120 VISTA RIDGE TRAIL, SANFORD, NC 27332  
OWNER: JORGE MORALES  
CONTRACTOR: ADT SOLAR LLC  
PHONE: (985) 238-0864  
DESIGNER: ESR  
SCOPE: 17.520 KW DC GROUND MOUNT SOLAR PV SYSTEM WITH 48 HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W PV MODULES WITH 48 ENPHASE IQ8PLUS-72-2-US MICROINVERTERS

AUTHORITIES HAVING JURISDICTION:  
BUILDING: HARNETT, COUNTY OF (NC)  
ZONING: HARNETT, COUNTY OF (NC)  
UTILITY: DUKE ENERGY PROGRESS - EAST (NC)

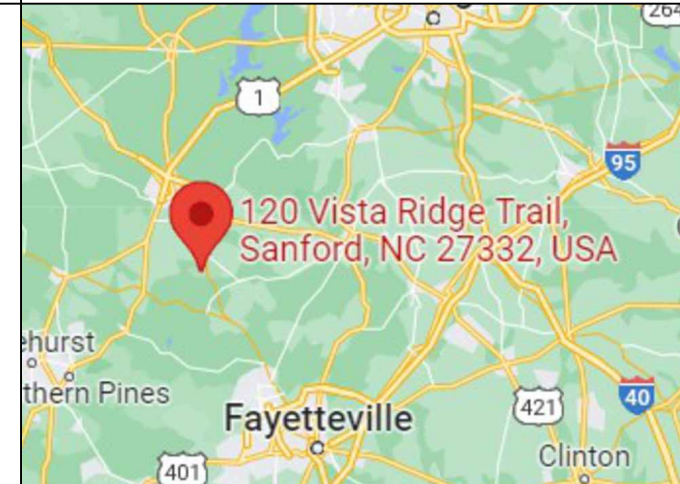
## SHEET INDEX

PV-1 COVER SHEET  
PV-2 SITE PLAN  
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## GENERAL NOTES

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

## VICINITY MAP



## HOUSE PHOTO



## CODE REFERENCES

PROJECT TO COMPLY WITH THE FOLLOWING:

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

## REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	09/23/2022	

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MANDEVILLE, LA 70471  
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INFO@PI-AEC.COM  
NORTH CAROLINA FIRM NO. C4113

## PROJECT NAME & ADDRESS

JORGE MORALES  
RESIDENCE  
120 VISTA RIDGE TRAIL,  
SANFORD, NC 27332

SHEET NAME  
COVER SHEET

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-1

# PROJECT DESCRIPTION:

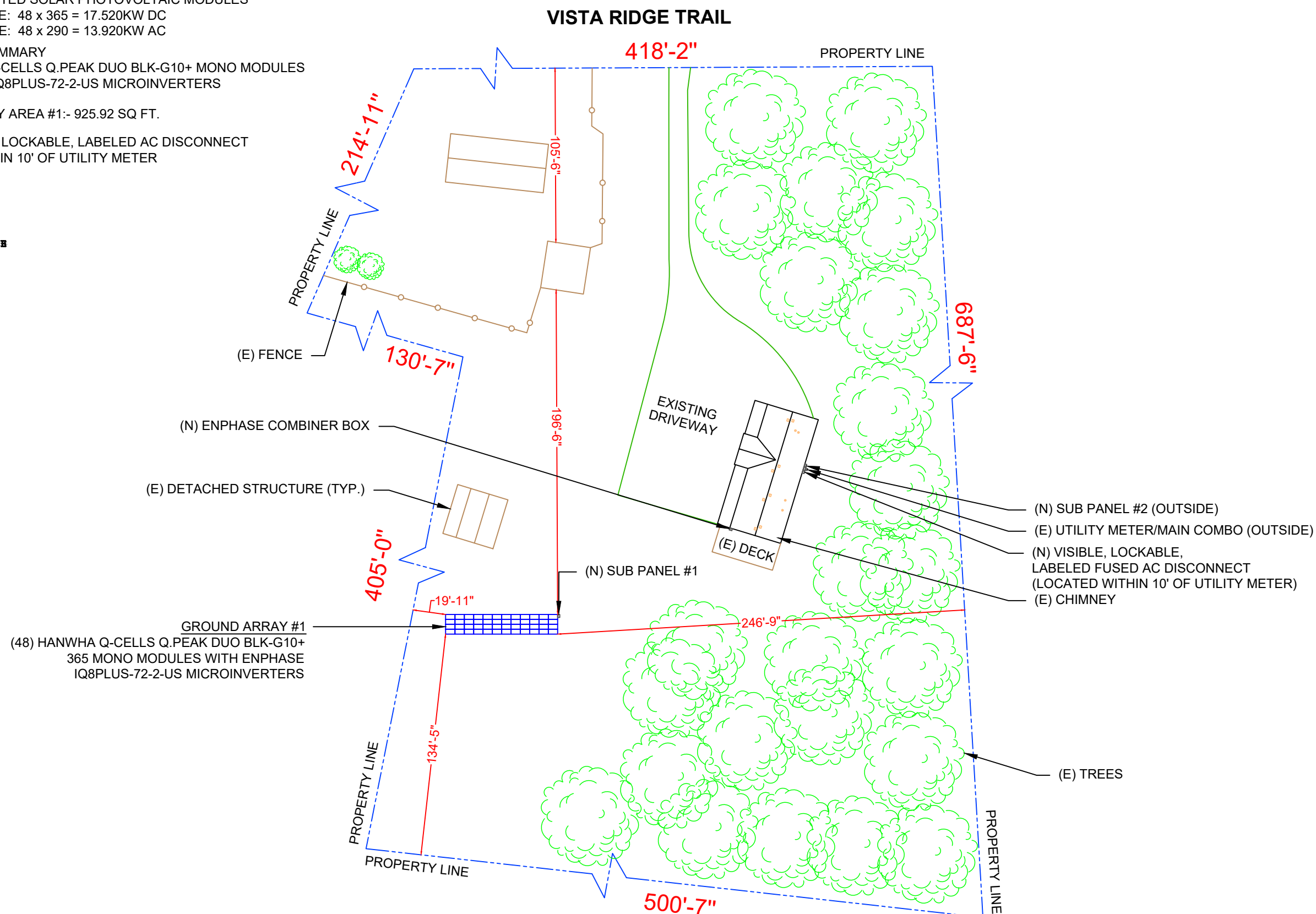
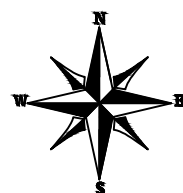
48 X HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W PV MODULES  
 GROUND MOUNTED SOLAR PHOTOVOLTAIC MODULES  
 DC SYSTEM SIZE: 48 x 365 = 17.520KW DC  
 AC SYSTEM SIZE: 48 x 290 = 13.920KW AC

## EQUIPMENT SUMMARY

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

GROUND ARRAY AREA #1:- 925.92 SQ FT.

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



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



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**JORGE MORALES RESIDENCE**  
 120 VISTA RIDGE TRAIL,  
 SANFORD, NC 27332

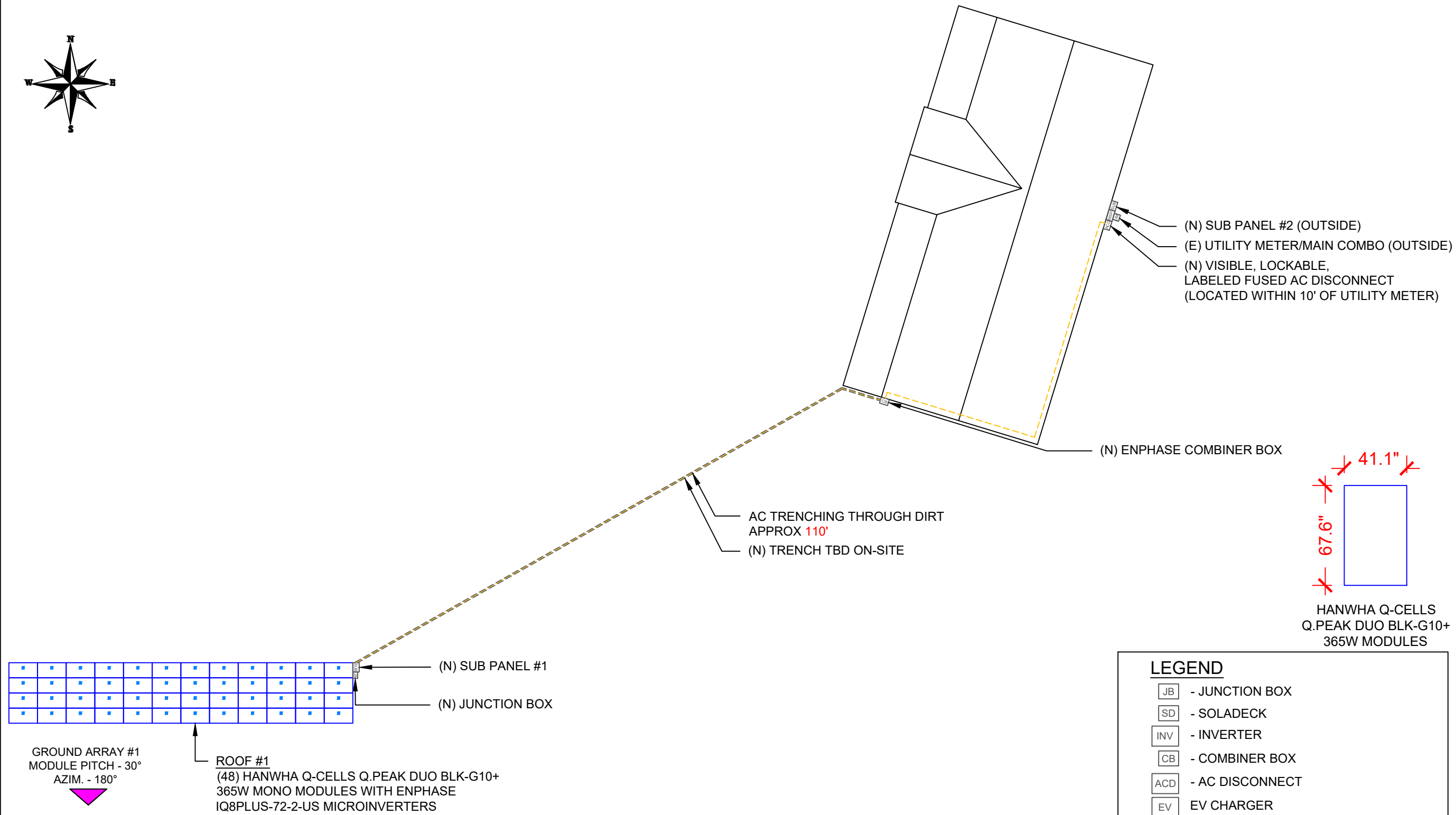
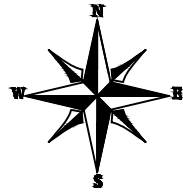
SHEET NAME  
**SITE PLAN**

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

SHEET NUMBER  
**PV-2**

**MODULE TYPE, DIMENSIONS & WEIGHT**

NUMBER OF MODULES = 48 MODULES  
 MODULE TYPE = HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES  
 MODULE WEIGHT = 43.8 LBS / 19.9KG.  
 MODULE DIMENSIONS = 67.6" x 41.1" = 19.29 SF



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PROJECT NAME & ADDRESS

**JORGE MORALES RESIDENCE**  
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 SANFORD, NC 27332

SHEET NAME  
**GROUND PLAN & MODULES**

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

SHEET NUMBER  
**PV-3**

**1 GROUND PLAN & MODULES**

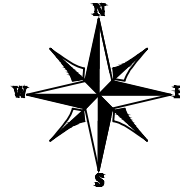
PV-3

SCALE: 13/256" = 1'-0"

**CIRCUIT LEGENDS**

- - - - - CIRCUIT #1
- - - - - CIRCUIT #2
- - - - - CIRCUIT #3
- - - - - CIRCUIT #4

DC SYSTEM SIZE: 48 x 365 = 17.520KW DC  
 AC SYSTEM SIZE: 48 x 290 = 13.920KW AC  
 (48) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES  
 WITH (48) ENPHASE IQ8PLUS-72-2-US MICROINVERTERS  
 LOCATED UNDER EACH PANEL (240V)

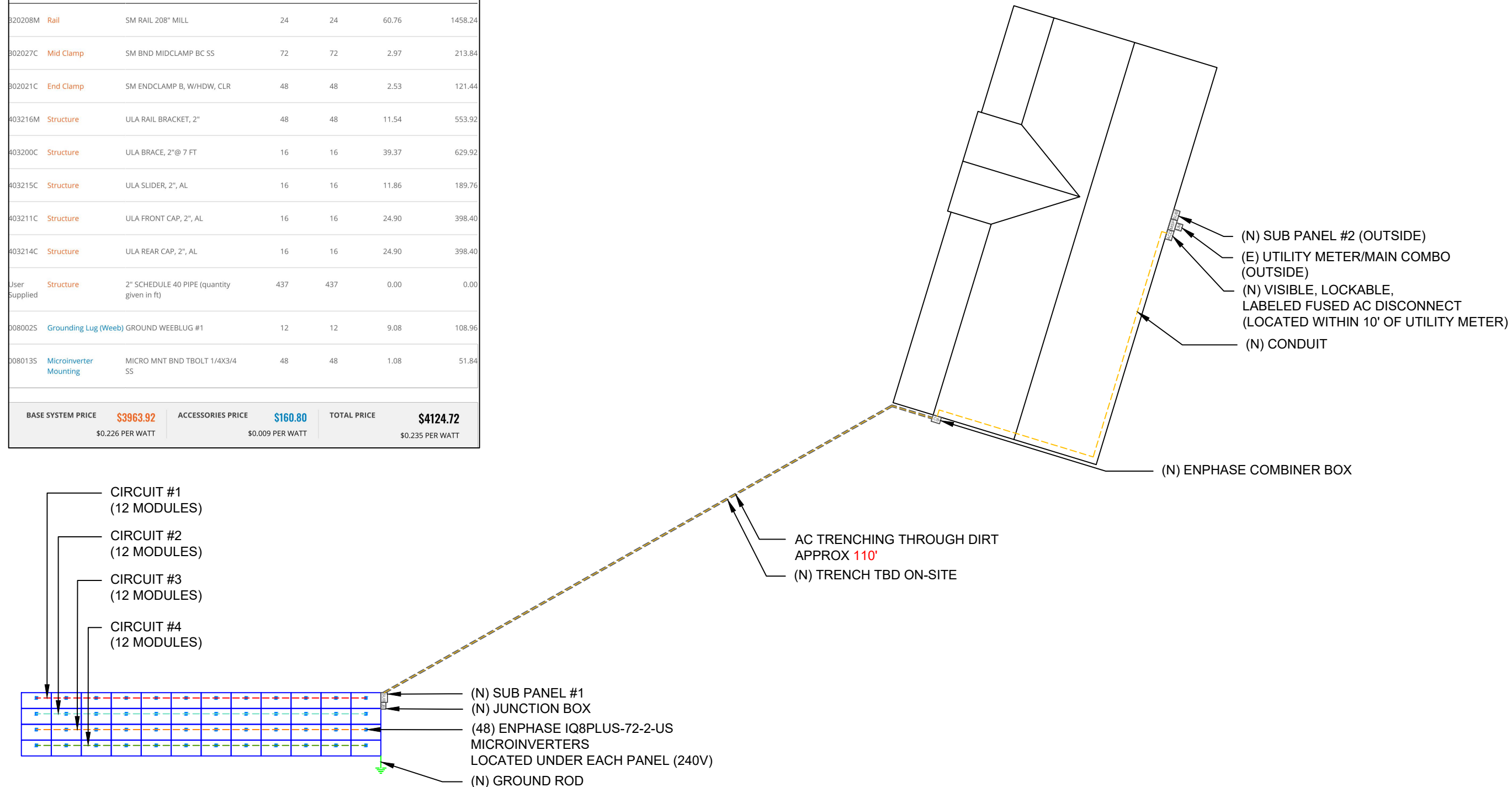


BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULE	48	HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W
MICRO INVERTERS	48	ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
JUNCTION BOX	1	6"X6"X4" UL LISTED, STEEL WATER TIGHT NEMA TYPE 3R, UL LISTED

**BILL OF MATERIALS**

LEGEND: ■ Base System Part ■ Accessory

PART NUMBER	PART TYPE	DESCRIPTION	QUANTITY	SUGGESTED QUANTITY	UNIT PRICE (USD)	TOTAL LIST PRICE (USD)
320208M	Rail	SM RAIL 208" MILL	24	24	60.76	1458.24
302027C	Mid Clamp	SM BND MIDCLAMP BC SS	72	72	2.97	213.84
302021C	End Clamp	SM ENDCLAMP B, W/HDW, CLR	48	48	2.53	121.44
403216M	Structure	ULA RAIL BRACKET, 2"	48	48	11.54	553.92
403200C	Structure	ULA BRACE, 2"@ 7 FT	16	16	39.37	629.92
403215C	Structure	ULA SLIDER, 2", AL	16	16	11.86	189.76
403211C	Structure	ULA FRONT CAP, 2", AL	16	16	24.90	398.40
403214C	Structure	ULA REAR CAP, 2", AL	16	16	24.90	398.40
User Supplied	Structure	2" SCHEDULE 40 PIPE (quantity given in ft)	437	437	0.00	0.00
008002S	Grounding Lug (Weeb)	GROUND WEEBLUG #1	12	12	9.08	108.96
008013S	Microinverter Mounting	MICRO MNT BND TBOLT 1/4X3/4 SS	48	48	1.08	51.84
<b>BASE SYSTEM PRICE</b>			<b>\$3963.92</b>	<b>ACCESSORIES PRICE</b>		<b>\$160.80</b>
			\$0.226 PER WATT			\$0.009 PER WATT
<b>TOTAL PRICE</b>					<b>\$4124.72</b>	
						\$0.235 PER WATT



**1** | **ARRAY PLAN WITH STRING LAYOUT**  
 PV-4 | SCALE: 1"=20'-0"



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REVISIONS		
DESCRIPTION	DATE	REV
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 985.624.5001  
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 NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS  
**JORGE MORALES RESIDENCE**  
 120 VISTA RIDGE TRAIL,  
 SANFORD, NC 27332

SHEET NAME  
**STRING LAYOUT**

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

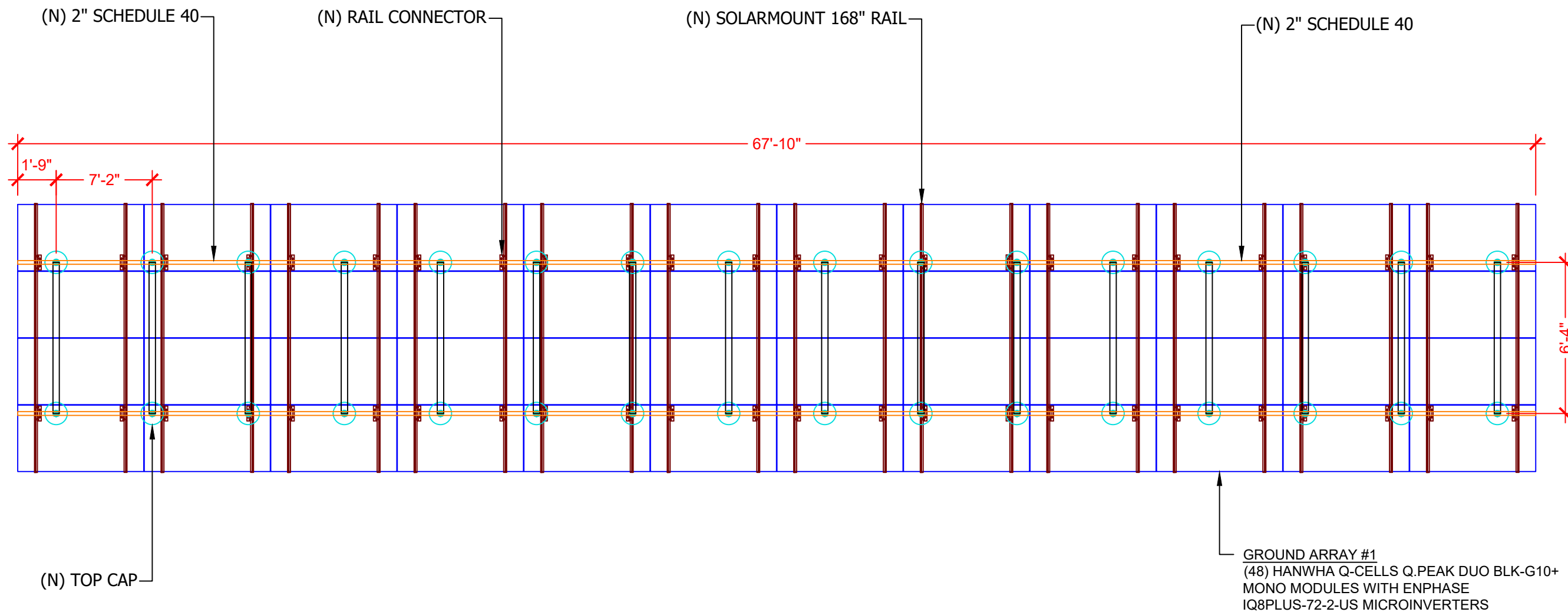
SHEET NUMBER  
**PV-4**

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



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**JORGE MORALES RESIDENCE**  
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SANFORD, NC 27332

SHEET NAME  
**MOUNTING DETAIL-1**

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

SHEET NUMBER  
**PV-5**

**1** | **ARRAY PLAN WITH MOUNTING DETAIL (TOP)**

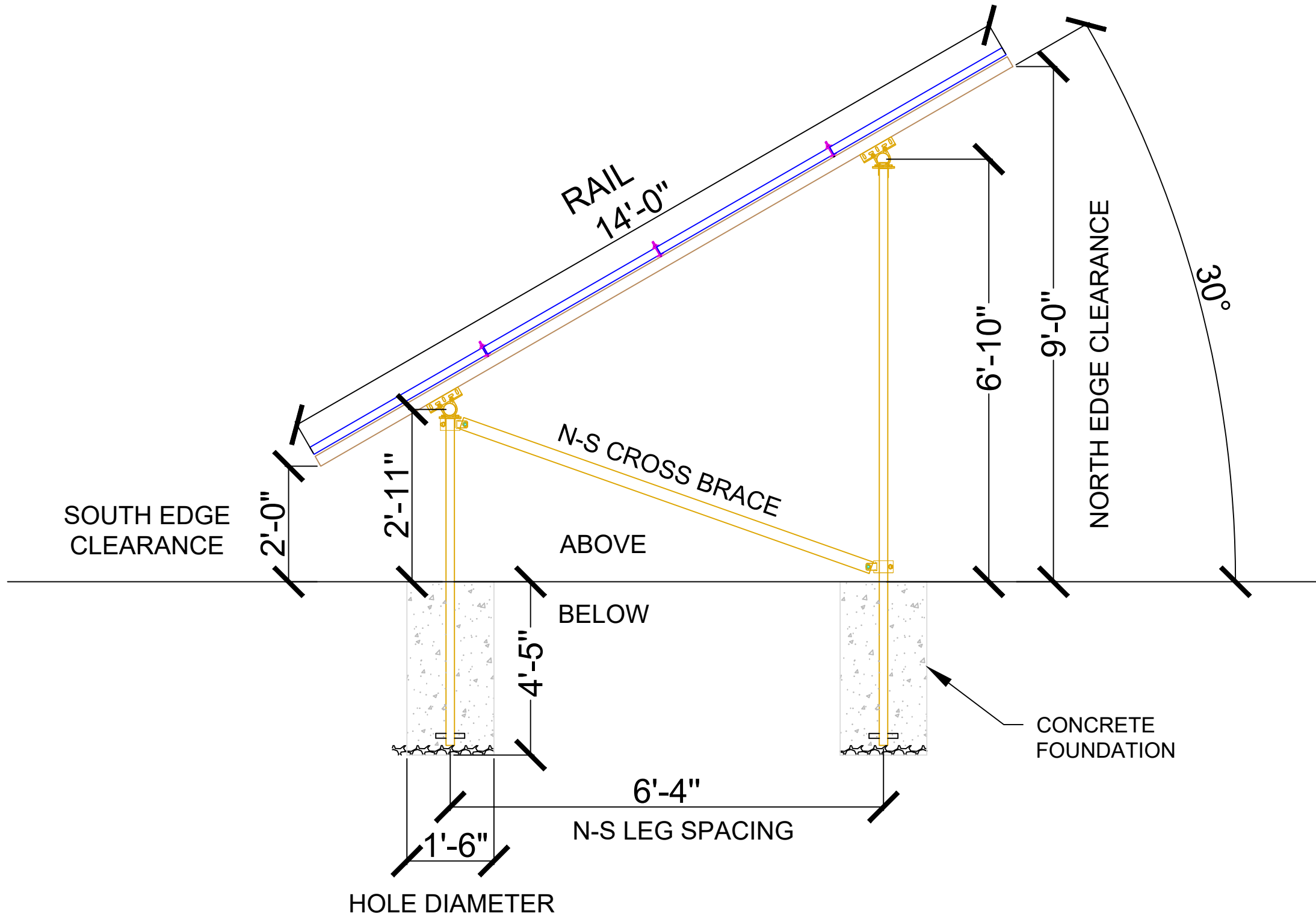
PV-5

SCALE: N.T.S



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**JORGE MORALES RESIDENCE**  
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 SANFORD, NC 27332

SHEET NAME  
**MOUNTING DETAIL-2**

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

SHEET NUMBER  
**PV-5A**

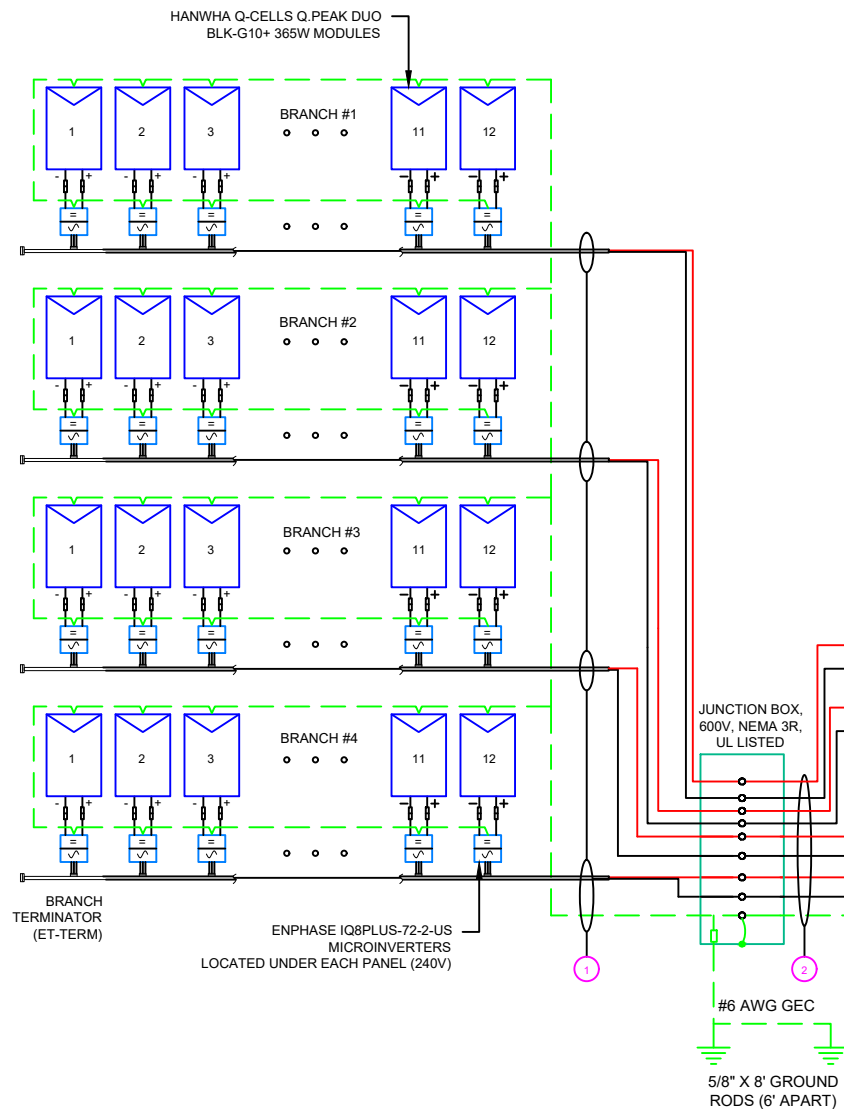
**1** | **ARRAY PLAN WITH MOUNTING DETAIL (SIDE VIEW)**

PV-5A

SCALE: N.T.S

DC SYSTEM SIZE: 48 x 365 = 17.520KW DC  
 AC SYSTEM SIZE: 48 x 290 = 13.920KW AC

(48) HANWHA Q-CELLS Q.PEAK DUO BLK-G10+ 365W MONO MODULES WITH (48) ENPHASE IQ8PLUS-72-2-US MICROINVERTERS LOCATED UNDER EACH PANEL (240V)  
 (4) BRANCH CIRCUITS OF 12 MODULES CONNECTED IN PARALLEL



**INTERCONNECTION NOTES:**

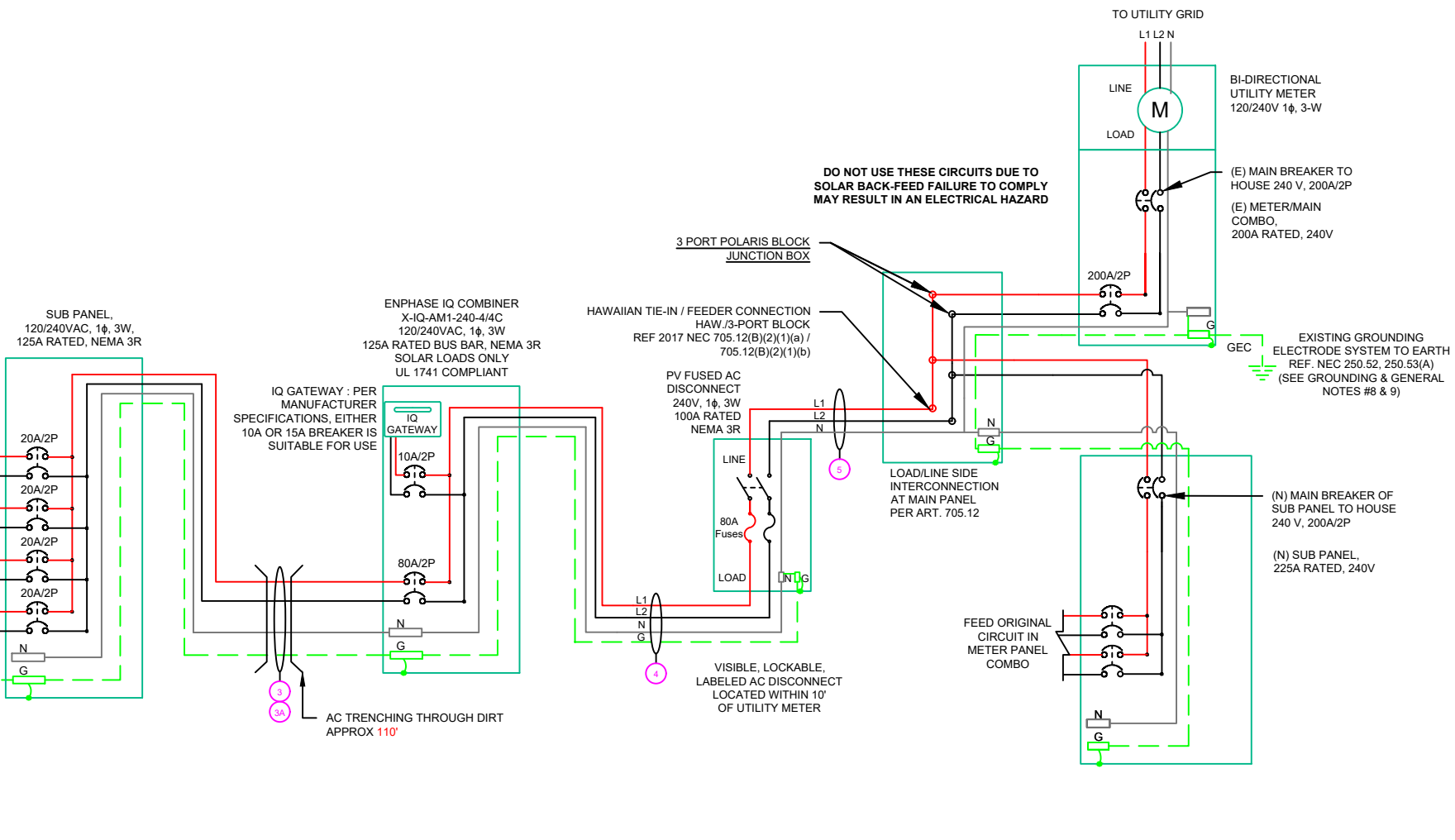
1. INTERCONNECTION SIZING, LIMITATIONS AND COMPLIANCE DETERMINED IN ACCORDANCE WITH [NEC 705.12], AND [NEC 690.59].
2. GROUND FAULT PROTECTION IN ACCORDANCE WITH [NEC 215.9], [NEC 230.95].
3. ALL EQUIPMENT TO BE RATED FOR BACKFEEDING.
4. PV BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUSBAR RELATIVE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

**DISCONNECT NOTES:**

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

**GROUNDING & GENERAL NOTES:**

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



**(GN) GENERAL NOTES :**

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

QTY	CONDUCTOR INFORMATION	CONDUIT TYPE	CONDUIT SIZE
(8)	#12AWG - PV WIRE/USE-2	N/A	N/A
(1)	#6AWG - BARE COPPER IN FREE AIR	N/A	N/A
(8)	#8AWG - THWN-2 (L1,L2)	EMT, LFNC OR PVC	1"
(1)	#10AWG - THWN-2 GND		
(3)	#3/0AWG - THWN-2 (L1,L2,N)	PVC (MIN. 18" DEPTH)	2"
(1)	#6AWG - THWN-2 GND		
(3)	#250AWG - USE-2, AL (L1,L2,N)	DIRECT BURIAL (MIN. 24" DEPTH)	N/A
(1)	#250AWG - USE-2, AL GND		
(3)	#1/0AWG - THWN-2 (L1,L2,N)	EMT, LFNC OR PVC	1 1/2"
(1)	#6AWG - THWN-2 GND		
(2)	#4AWG - THWN-2 (L1,L2)	EMT, LFNC OR PVC	1"
(1)	#4AWG - THWN-2 N		

1 ELECTRICAL LINE DIAGRAM

PV-6

SCALE: NTS



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 120 VISTA RIDGE TRAIL,  
 SANFORD, NC 27332

SHEET NAME  
 ELECTRICAL LINE  
 DIAGRAM

SHEET SIZE

ANSI B  
 11" X 17"

SHEET NUMBER

PV-6



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

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

AMBIENT TEMPERATURE SPECS	
RECORD LOW TEMP	-9°C
AMBIENT TEMP (HIGH TEMP 2%)	36°C
MODULE TEMPERATURE COEFFICIENT OF Voc	-0.27%/°C

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

**OPTION-1  
(CU CONDUCTORS IN TRENCH)**

AC CALCULATIONS																						
CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FULL LOAD AMPS "FLA" (A)	FLA*1.25 (A)	OC PD SIZE (A)	NEUTRAL SIZE	GROUND SIZE	CONDUCTOR SIZE	75°C AMPACITY (A)	AMPACITY CHECK #1	AMBIENT TEMP. (°C)	TOTAL CC CONDUCTORS IN RACEWAY	90°C AMPACITY (A)	DERATION FACTOR FOR AMBIENT TEMPERATURE NEC 310.15(B)(2)(a)	DERATION FACTOR FOR CONDUCTORS PER RACEWAY NEC 310.15(B)(3)(a)	90°C AMPACITY DERATED (A)	AMPACITY CHECK #2	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/KFT)	VOLTAGE DROP AT FLA (%)	CONDUIT SIZE	CONDUIT FILL (%)
CIRCUIT 1	JUNCTION BOX	240	14.52	18.15	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	36	2	30	0.91	1	27.3	PASS			1.01	N/A	#N/A
CIRCUIT 2	JUNCTION BOX	240	14.52	18.15	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	36	2	30	0.91	1	27.3	PASS			1.01	N/A	#N/A
CIRCUIT 3	JUNCTION BOX	240	14.52	18.15	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	36	2	30	0.91	1	27.3	PASS			1.01	N/A	#N/A
CIRCUIT 4	JUNCTION BOX	240	14.52	18.15	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	36	2	30	0.91	1	27.3	PASS			1.01	N/A	#N/A
JUNCTION BOX	SUB PANEL	240	14.52	18.15	20	N/A	CU #10 AWG	CU #8 AWG	50	PASS	36	8	55	0.91	0.7	35.035	PASS	12	0.778	0.113	1" PVC	37.72837
SUB PANEL	COMBINER PANEL	240	58.08	72.6	80	CU #3/0 AWG	CU #6 AWG	CU #3/0 AWG	200	PASS	36	2	225	0.91	1	204.75	PASS	110	0.0766	0.408	2" PVC	25.96171
COMBINER PANEL	AC DISCONNECT	240	58.08	72.6	80	CU #1/0 AWG	CU #6 AWG	CU #1/0 AWG	150	PASS	36	2	170	0.91	1	154.7	PASS	58	0.122	0.342	1 1/2" PVC	30.57402
AC DISCONNECT	POI	240	58.08	72.6	80	CU #4 AWG	N/A	CU #4 AWG	85	PASS	36	2	95	0.91	1	86.45	PASS	5	0.308	0.075	1" PVC	29.71154

Circuit 1 Voltage Drop	1.948
Circuit 2 Voltage Drop	1.948
Circuit 3 Voltage Drop	1.948
Circuit 4 Voltage Drop	1.948

**OPTION-2  
(AL CONDUCTORS IN TRENCH)**

AC CALCULATIONS																						
CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FULL LOAD AMPS "FLA" (A)	FLA*1.25 (A)	OC PD SIZE (A)	NEUTRAL SIZE	GROUND SIZE	CONDUCTOR SIZE	75°C AMPACITY (A)	AMPACITY CHECK #1	AMBIENT TEMP. (°C)	TOTAL CC CONDUCTORS IN RACEWAY	90°C AMPACITY (A)	DERATION FACTOR FOR AMBIENT TEMPERATURE NEC 310.15(B)(2)(a)	DERATION FACTOR FOR CONDUCTORS PER RACEWAY NEC 310.15(B)(3)(a)	90°C AMPACITY DERATED (A)	AMPACITY CHECK #2	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/KFT)	VOLTAGE DROP AT FLA (%)	CONDUIT SIZE	CONDUIT FILL (%)
CIRCUIT 1	JUNCTION BOX	240	14.52	18.15	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	36	2	30	0.91	1	27.3	PASS			1.01	N/A	#N/A
CIRCUIT 2	JUNCTION BOX	240	14.52	18.15	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	36	2	30	0.91	1	27.3	PASS			1.01	N/A	#N/A
CIRCUIT 3	JUNCTION BOX	240	14.52	18.15	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	36	2	30	0.91	1	27.3	PASS			1.01	N/A	#N/A
CIRCUIT 4	JUNCTION BOX	240	14.52	18.15	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	36	2	30	0.91	1	27.3	PASS			1.01	N/A	#N/A
JUNCTION BOX	SUB PANEL	240	14.52	18.15	20	N/A	CU #10 AWG	CU #8 AWG	50	PASS	36	8	55	0.91	0.7	35.035	PASS	12	0.778	0.113	1" PVC	37.72837
SUB PANEL	COMBINER PANEL	240	58.08	72.6	80	AL #250 AWG	AL #250 AWG	AL #250 AWG	205	PASS	36	2	230	0.91	1	209.3	PASS	110	0.0847	0.451	N/A	#N/A
COMBINER PANEL	AC DISCONNECT	240	58.08	72.6	80	CU #1/0 AWG	CU #6 AWG	CU #1/0 AWG	150	PASS	36	2	170	0.91	1	154.7	PASS	58	0.122	0.342	1 1/2" PVC	30.57402
AC DISCONNECT	POI	240	58.08	72.6	80	CU #4 AWG	N/A	CU #4 AWG	85	PASS	36	2	95	0.91	1	86.45	PASS	5	0.308	0.075	1" PVC	29.71154

Circuit 1 Voltage Drop	1.991
Circuit 2 Voltage Drop	1.991
Circuit 3 Voltage Drop	1.991
Circuit 4 Voltage Drop	1.991

**ELECTRICAL NOTES**

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



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	09/23/2022	

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

PROJECT NAME & ADDRESS

JORGE MORALES  
RESIDENCE  
120 VISTA RIDGE TRAIL,  
SANFORD, NC 27332

SHEET NAME  
WIRING CALCULATIONS

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-7

**CAUTION:  
AUTHORIZED SOLAR  
PERSONNEL ONLY!**

LABEL-1:  
LABEL LOCATION:  
AC DISCONNECT

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

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

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

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

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

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

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

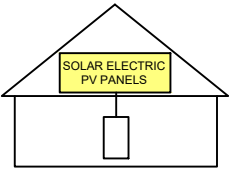
LABEL- 5:  
LABEL LOCATION:  
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)  
SUBPANEL (ONLY IF SOLAR IS BACK-FED)  
CODE REF: NEC 705.12(D) & NEC 690.59

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

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

**SOLAR PV SYSTEM EQUIPPED  
WITH RAPID SHUTDOWN**

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



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

**RAPID SHUTDOWN SWITCH  
FOR SOLAR PV SYSTEM**

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

**PHOTOVOLTAIC**  
**AC DISCONNECT**

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

**PHOTOVOLTAIC  
AC DISCONNECT**

NOMINAL OPERATING AC VOLATGE **240 V**  
RATED AC OUTPUT CURRENT **58.08 A**

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

**MAIN PHOTOVOLTAIC  
SYSTEM DISCONNECT**

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

**DO NOT USE THESE CIRCUITS  
DUE TO SOLAR BACK-FEED.  
FAILURE TO COMPLY MAY  
RESULT IN AN ELECTRICAL  
HAZARD.**

LABEL- 12:  
LABEL LOCATION:  
MAIN SERVICE PANEL  
CODE REF: 705.12(B)(3)(3)

**WARNING**  
**THIS EQUIPMENT FED BY MULTIPLE SOURCE.  
TOTAL RATING OF ALL OVERCURRENT DEVICE  
EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE  
SHALL NOT EXCEED AMPACITY OF BUSBAR.**

LABEL- 13:  
LABEL LOCATION:  
MAIN SERVICE PANEL  
CODE REF: 705.12(B)(3)(3)



22171 MCH RD  
MANDEVILLE, LA 70471  
PHONE: 9152011490

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985.624.5001  
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NORTH CAROLINA FIRM NO. C4113

PROJECT NAME & ADDRESS  
**JORGE MORALES  
RESIDENCE**  
**120 VISTA RIDGE TRAIL,  
SANFORD, NC 27332**

SHEET NAME  
**LABELS**

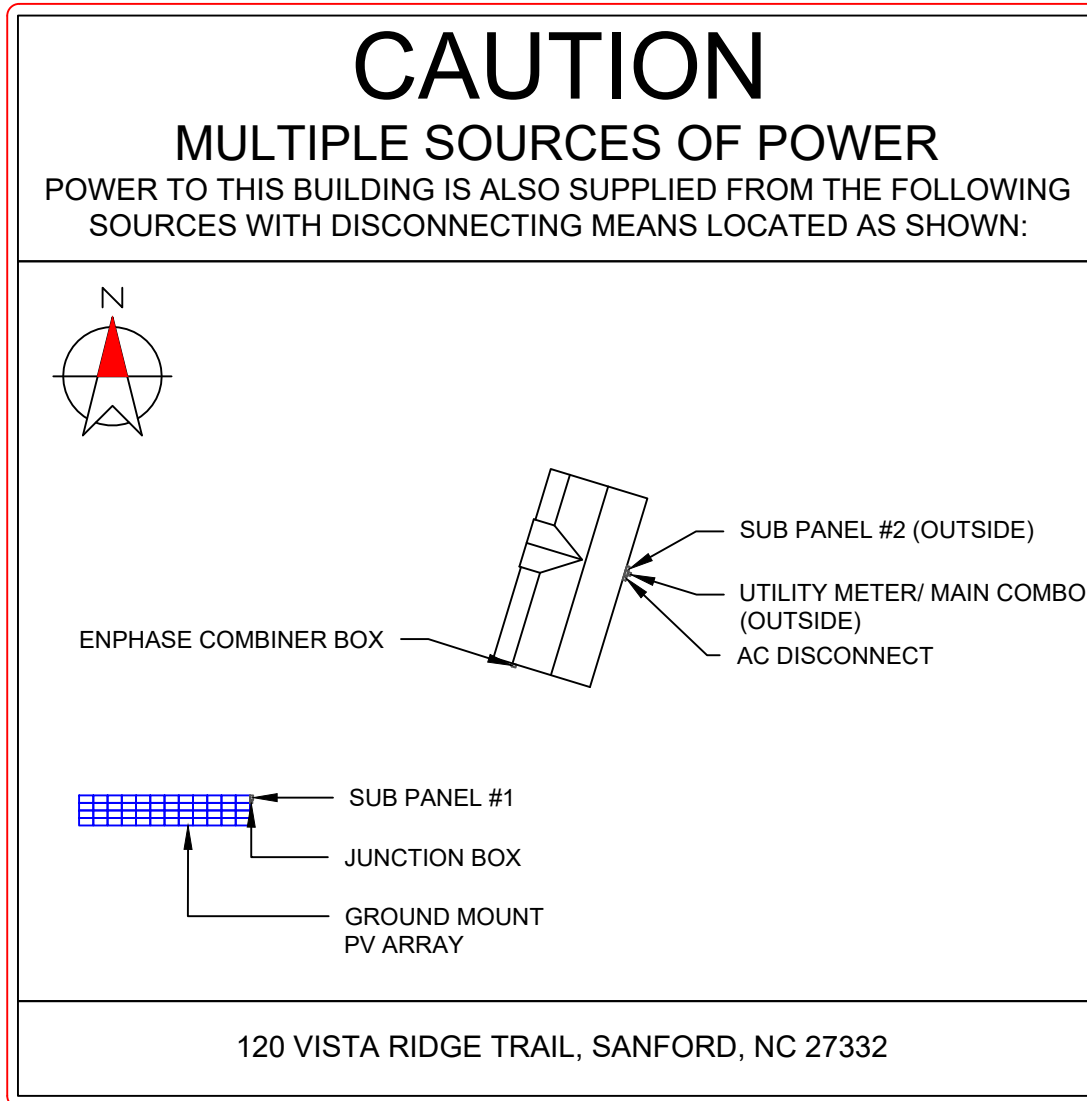
SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-8**



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 MANDEVILLE, LA 70471  
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 NORTH CAROLINA FIRM NO. C4113

**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])

PROJECT NAME & ADDRESS

**JORGE MORALES  
 RESIDENCE**

**120 VISTA RIDGE TRAIL,  
 SANFORD, NC 27332**

SHEET NAME  
**PLACARD**

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

SHEET NUMBER  
**PV-9**

**LABELING NOTES:**

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



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

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

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

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

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

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

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

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

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

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

**CIRCLE WEATHER CONDITIONS:**

SUNNY    OVERCAST    LIGHT RAIN

HEAVY RAIN    FOGGY    WINDY

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

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

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

**ADDRESS OF NEAREST MEDICAL CARE FACILITY:**

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

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

**CREW SIGNATURES:**

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

**PROJECT ADDRESS:**



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 MANDEVILLE, LA 70471  
 PHONE: 9152011490

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DATE: 09/23/2022

PROJECT NAME & ADDRESS  
**JORGE MORALES  
 RESIDENCE**  
 120 VISTA RIDGE TRAIL,  
 SANFORD, NC 27332

SHEET NAME  
**JHA FORM**

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

SHEET NUMBER  
**PV-10**

1-10    11-20    21-30    31-40    41-50    51-60    61-70    71-80    81-90    91-100    101-110    111-120    121-130

1												
2												
3												
4												
5												

# MICRO INVERTER CHART

■	■	■	■	■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■	■	■	■	■
■	■	■	■	■	■	■	■	■	■	■	■



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 120 VISTA RIDGE TRAIL,  
 SANFORD, NC 27332

SHEET NAME  
**MICRO INVERTER CHART**

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

SHEET NUMBER  
**PV-11**



powered by  
**Q.ANTUM DUO Z**

# Q.PEAK DUO BLK-G10+ 360-380

ENDURING HIGH PERFORMANCE



**BREAKING THE 21% EFFICIENCY BARRIER**  
Q.ANTUM DUO Z Technology with zero gap cell layout boosts module efficiency up to 20.9%.



**THE MOST THOROUGH TESTING PROGRAMME IN THE INDUSTRY**  
Q CELLS is the first solar module manufacturer to pass the most comprehensive quality programme in the industry: The new "Quality Controlled PV" of the independent certification institute TÜV Rheinland.



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



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



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



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



6 BUSBAR CELL TECHNOLOGY

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

**THE IDEAL SOLUTION FOR:**



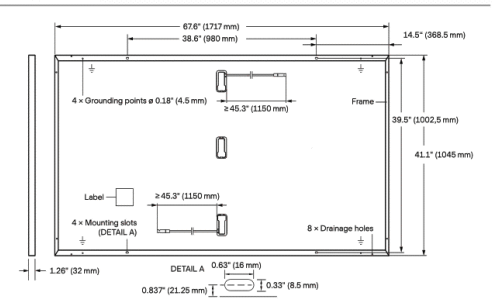
Rooftop arrays on residential buildings

Engineered in Germany



**MECHANICAL SPECIFICATIONS**

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

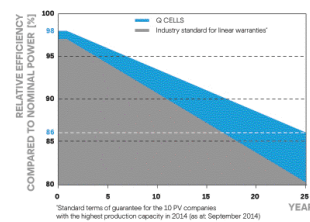


**ELECTRICAL CHARACTERISTICS**

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

<sup>1</sup> Measurement tolerances P<sub>MPP</sub> ± 3%; I<sub>SC</sub>; V<sub>OC</sub> ± 5% at STC: 1000 W/m<sup>2</sup>, 25 ± 2 °C, AM 1.5 according to IEC 60904-3 • 2800 W/m<sup>2</sup>, NMOT, spectrum AM 1.5

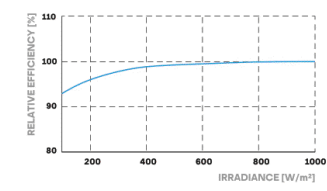
**Q CELLS PERFORMANCE WARRANTY**



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

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

**PERFORMANCE AT LOW IRRADIANCE**



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 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]	-0.27
Temperature Coefficient of P <sub>MPP</sub>	γ [%/K]	-0.35	Nominal Module Operating Temperature	NMOT [°F]	109 ± 5.4 (43 ± 3 °C)

**PROPERTIES FOR SYSTEM DESIGN**

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

<sup>3</sup> See Installation Manual

**QUALIFICATIONS AND CERTIFICATES**

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



**Hanwha Q CELLS America Inc.**

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MANDEVILLE, LA 70471  
PHONE: 9152011490

**REVISIONS**

DESCRIPTION	DATE	REV
INITIAL DESIGN	09/23/2022	

DATE: 09/23/2022

**PROJECT NAME & ADDRESS**

**JORGE MORALES  
RESIDENCE**  
120 VISTA RIDGE TRAIL,  
SANFORD, NC 27332

SHEET NAME  
**EQUIPMENT  
SPECIFICATION**

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

SHEET NUMBER  
**PV-12**

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



DATA SHEET



## IQ8 and IQ8+ Microinverters

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



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



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



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



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

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IQ8SP-DS-0002-01-EN-US-2022-03-17

### Easy to install

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

### High productivity and reliability

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

### Microgrid-forming

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

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

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

## IQ8 and IQ8+ Microinverters

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

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

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JORGE MORALES  
 RESIDENCE  
 120 VISTA RIDGE TRAIL,  
 SANFORD, NC 27332

SHEET NAME  
 EQUIPMENT  
 SPECIFICATION

SHEET SIZE  
 ANSI B  
 11" X 17"

SHEET NUMBER  
 PV-13

# Enphase IQ Combiner 4/4C

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



X-IQ-AM1-240-4C

X-IQ-AM1-240-4



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

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

### Smart

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

### Simple

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

### Reliable

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



## Enphase IQ Combiner 4/4C

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

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

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REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	09/23/2022	

DATE: 09/23/2022		

PROJECT NAME & ADDRESS  
**JORGE MORALES  
RESIDENCE**  
120 VISTA RIDGE TRAIL,  
SANFORD, NC 27332

SHEET NAME  
**EQUIPMENT  
SPECIFICATION**

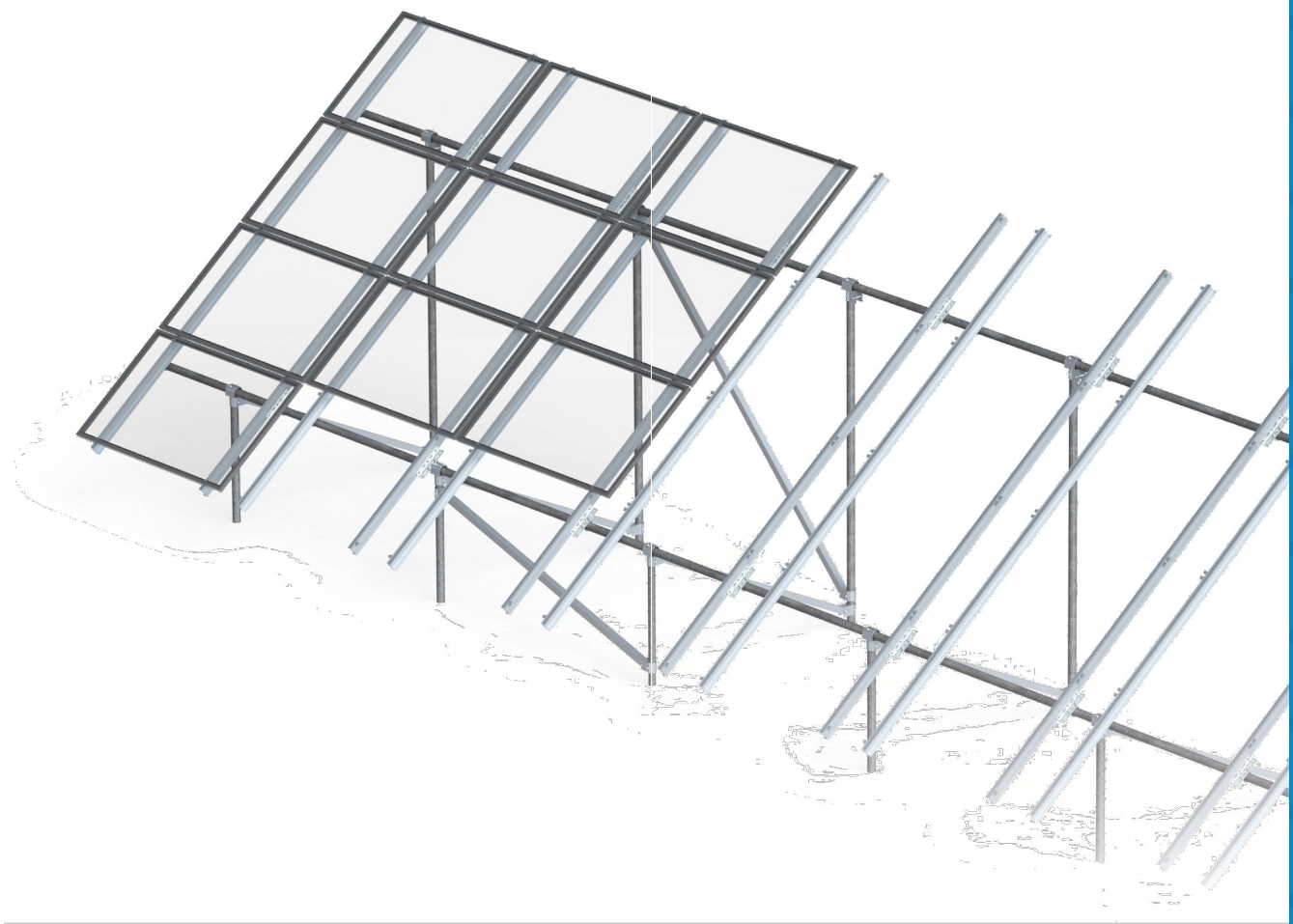
SHEET SIZE  
**ANSI B  
11" X 17"**

SHEET NUMBER  
**PV-14**



# UNIRAC LARGE ARRAY

**UNIRAC LARGE ARRAY (ULA)** will support a wider range of site and climatic challenges than any other PV structure on the market. ULA aluminum components merge with **SOLARMOUNT** rails and installer-supplied steel pipe to form durable, rigid truss structures that can accommodate uneven, rocky, or sloping terrain. Modular design and project flexibility is only limited by the size of the ground site.



## FLEXIBILITY FOR ANY SIZE PROJECT

MODULAR DESIGN • FLEXIBILITY • AVAILABILITY • QUALITY PROVIDER

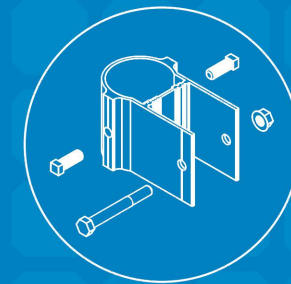
# UNIRAC LARGE ARRAY

## MODULAR DESIGN & FLEXIBILITY MADE TO MEET YOUR NEEDS

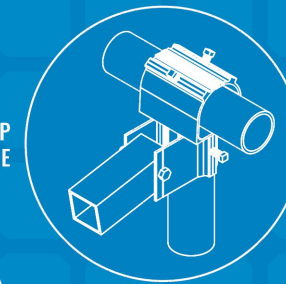
The size of a ULA is limited only by the size of your ground site. ULA supports a wide range of site and climatic challenges. Aluminum components merge with SOLARMOUNT rails and installer-supplied Schedule 40 or 80 steel pipe (available anywhere) to create a durable structure that can accommodate uneven, rocky or sloping terrain. ULA is capable of withstanding Zone 4 seismic events or extreme wind or snow loads. Increase your leading edge height or optimize your tilt angle to clear ground obstructions.

## AVAILABILITY NATIONWIDE NETWORK

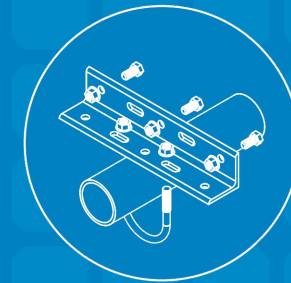
Unirac maintains the largest network of stocking distributors for our racking solutions. Our partners have distinguished their level of customer support, availability, and overall value, thereby providing the highest level of service to users of Unirac products. Count on our partners for fast and accurate delivery to meet your project needs. Visit [Unirac.com](http://Unirac.com) for a list of distributors.



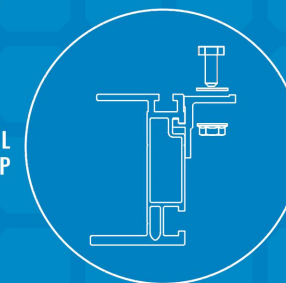
SLIDER



FRONT CAP  
W/ CROSS BRACE



RAIL BRACKET



SOLARMOUNT HD RAIL  
W/ BOTTOM MOUNT CLIP

## UNIRAC CUSTOMER SERVICE MEANS THE HIGHEST LEVEL OF PRODUCT SUPPORT



UNMATCHED  
EXPERIENCE



CERTIFIED  
QUALITY



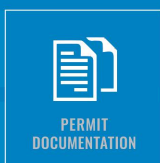
ENGINEERING  
EXCELLENCE



BANKABLE  
WARRANTY



DESIGN  
TOOLS



PERMIT  
DOCUMENTATION

### TECHNICAL SUPPORT

Unirac's technical support team is dedicated to answering questions & addressing issues in real time. An online library of documents including engineering reports, stamped letters and technical data sheets greatly simplifies your permitting and project planning process.

### CERTIFIED QUALITY PROVIDER

Unirac is the only PV mounting vendor with ISO certifications for 9001:2015, 14001:2015 and OHSAS 18001:2007, which means we deliver the highest standards for fit, form, and function. These certifications demonstrate our excellence and commitment to first class business practices.

### BANKABLE WARRANTY

Don't leave your project to chance, Unirac has the financial strength to back our products and reduce your risk. Have peace of mind knowing you are receiving products of exceptional quality. ULA is covered by a twenty five (25) year limited product warranty.

PROTECT YOUR REPUTATION WITH QUALITY RACKING SOLUTIONS BACKED BY ENGINEERING EXCELLENCE AND A SUPERIOR SUPPLY CHAIN

PUB2017FEB28 - DIGITAL UPDATE



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REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	09/23/2022	

DATE: 09/23/2022		
------------------	--	--

PROJECT NAME & ADDRESS		
JORGE MORALES RESIDENCE	120 VISTA RIDGE TRAIL, SANFORD, NC 27332	

SHEET NAME EQUIPMENT SPECIFICATION
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SHEET SIZE ANSI B 11" X 17"
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SHEET NUMBER PV-15
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