PHOTOVOLTAIC ROOF MOUNT SYSTEM

14 MODULES-ROOF MOUNTED - 4.48 kW DC, 3.36 kW AC

43 DOONBEG DR, FUQUAY-VARINA, NC 27526 USA

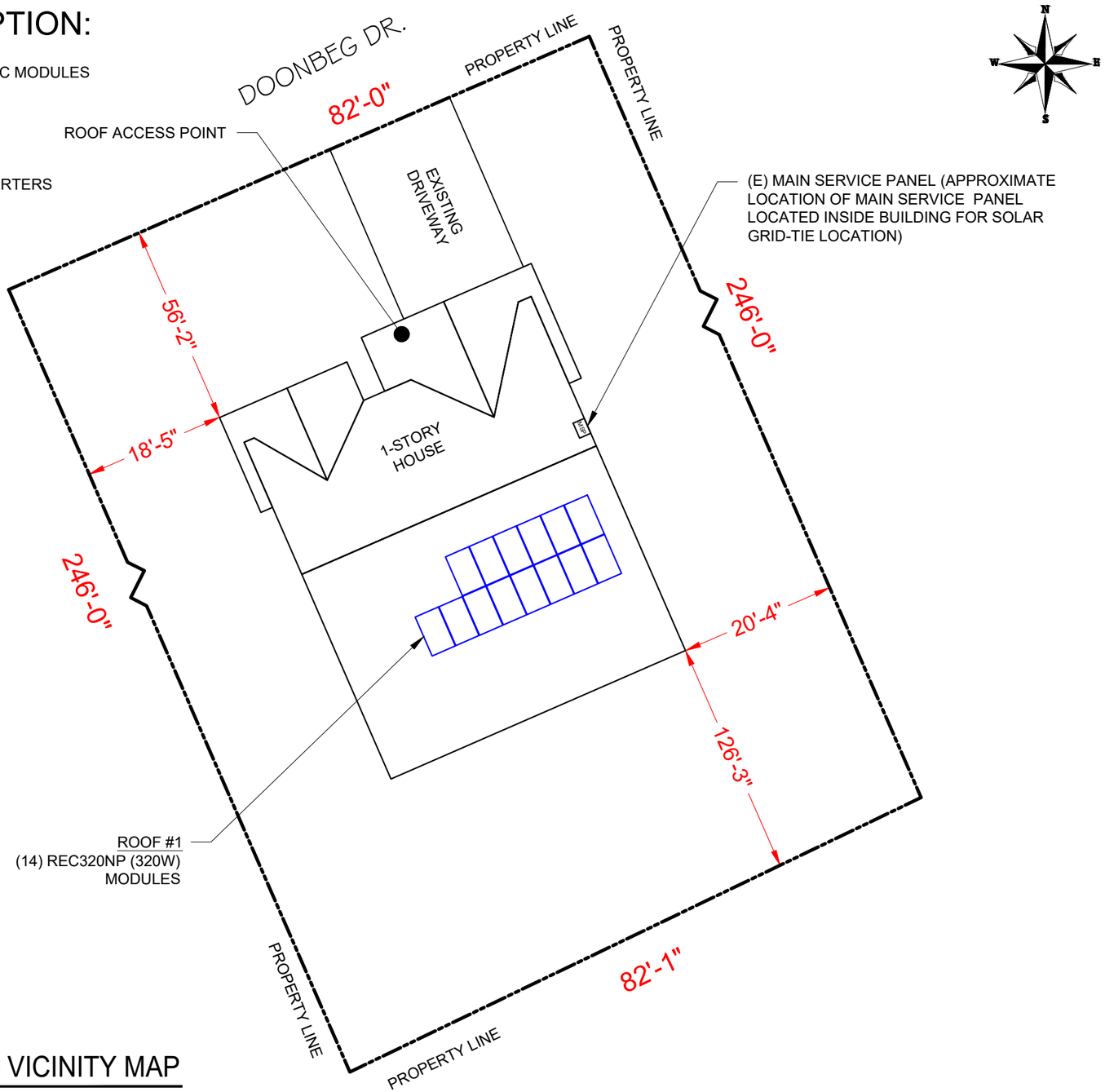
PROJECT DESCRIPTION:

14 x 320 REC320NP (320W) MODULES
ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES

SYSTEM SIZE: 4.48 kW DC STC
ARRAY AREA #1: 251.58 SQ FT.

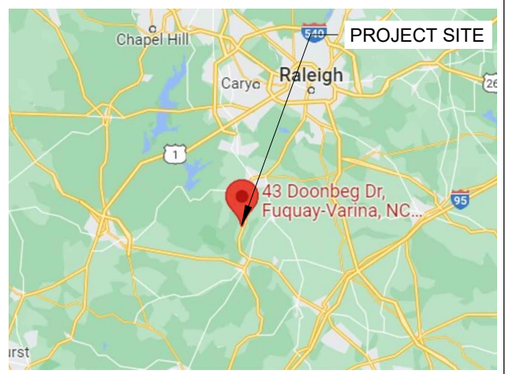
EQUIPMENT SUMMARY

14	REC320NP (320W) MODULES
14	ENPHASE IQ7-60-2-US MICROINVERTERS



1 | SITE PLAN WITH VICINITY MAP
PV-1 SCALE: 1/16" = 1'-0"

2 | HOUSE PHOTO
PV-1 SCALE: NTS



3 | VICINITY MAP
PV-1 SCALE: NTS

SHEET INDEX

GOVERNING CODES:
NORTH CAROLINA BUILDING CODE (NCBC 2018)
NORTH CAROLINA RESIDENTIAL CODE (NCRC 2018)
NORTH CAROLINA PLUMBING CODE (NCPC 2018)
NORTH CAROLINA MECHANICAL CODE (NCMC 2018)
NATIONAL ELECTRICAL CODE (2017)

pure Energy
Smart. Green. It's Time.

PE SOLAR
ATTN KIM JONES
400 DOMINION DRIVE STE 105
MORRISVILLE, NC 25760

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	07/21/2022	00

Signature with Seal

NORTH CAROLINA PROFESSIONAL SEAL 050296 ENGINEER ARASH ZANDIEH
Exp. 12/31/2022

PROJECT NAME
SAM KWON RESIDENCE
43 DOONBEG DR,
FUQUAY-VARINA, NC 27526 USA

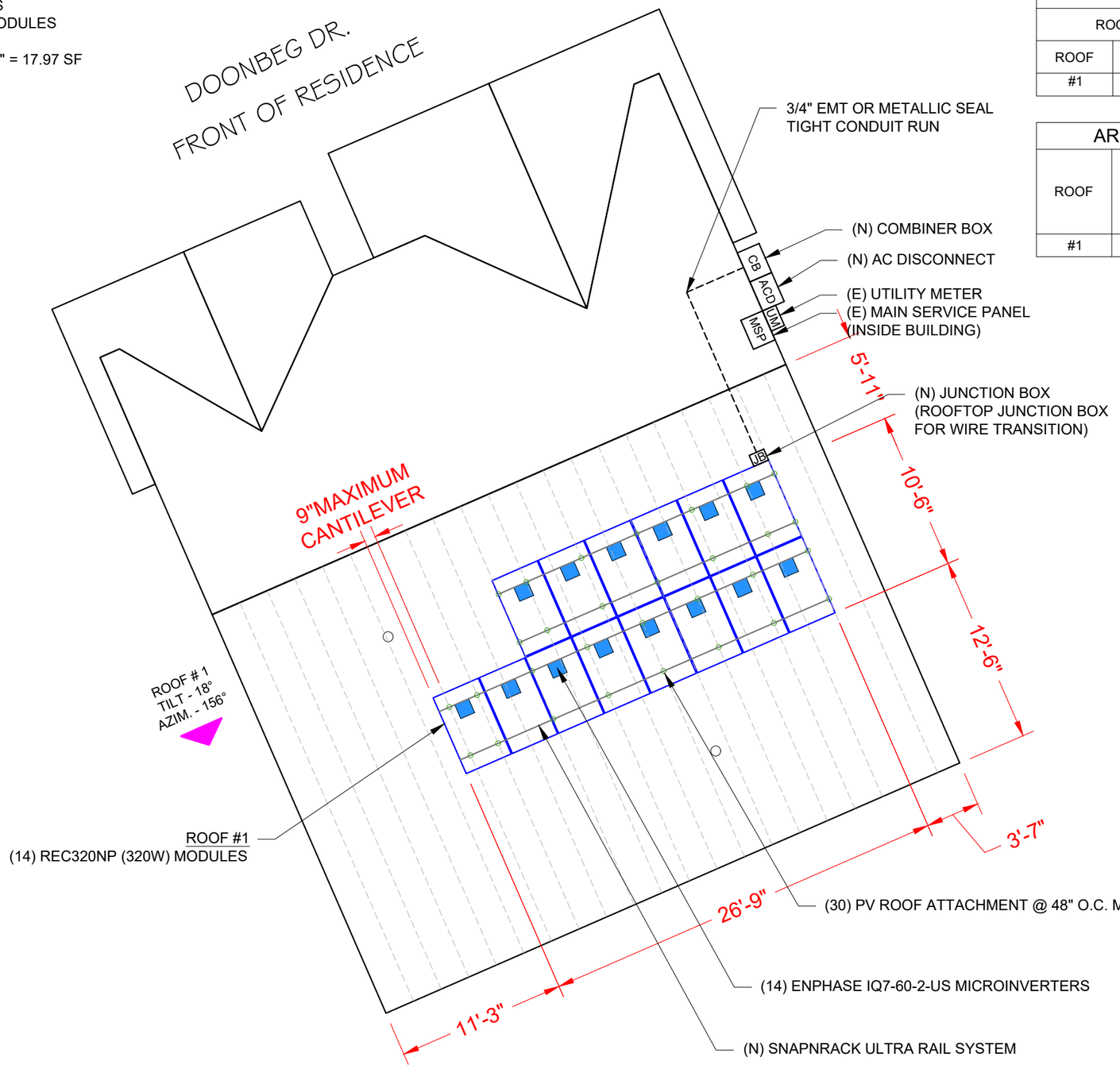
SHEET NAME
SITE PLAN & VICINITY MAP

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-1

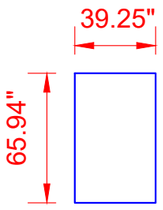
MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 14 MODULES
MODULE TYPE = REC320NP (320W) MODULES
MODULE WEIGHT = 39.7 LBS / 18.0KG.
MODULE DIMENSIONS = 65.94" x 39.25" = 17.97 SF
UNIT WEIGHT OF ARRAY = 2.21 PSF



ROOF DESCRIPTION				
ROOF TYPE			ASPHALT SHINGLE ROOF	
ROOF	ROOF TILT	AZIMUTH	TRUSS SIZE	TRUSS SPACING
#1	18°	156°	2"X4"	24" O.C.

ARRAY AREA & ROOF AREA CALC'S				
ROOF	# OF MODULES	ARRAY AREA (Sq. Ft.)	ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
#1	14	251.58	1202.24	21

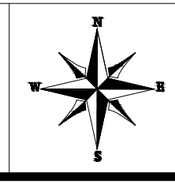


REC320NP (320W) MODULES

LEGEND

- JB - JUNCTION BOX
- CB - COMBINER BOX
- ACD - AC DISCONNECT
- MSP - MAIN SERVICE PANEL
- UM - UTILITY METER
- MICROINVERTER
- TRUSS
- CONDUIT
- VENT (ROOF OBSTRUCTIONS)

1 ROOF PLAN AND MODULES
PV-2 SCALE: 1/8" = 1'-0"



pure Energy
Smart. Green. It's Time.
PE SOLAR
ATTN KIM JONES
400 DOMINION DRIVE STE 105
MORRISVILLE, NC 25760

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	07/21/2022	00

Signature with Seal

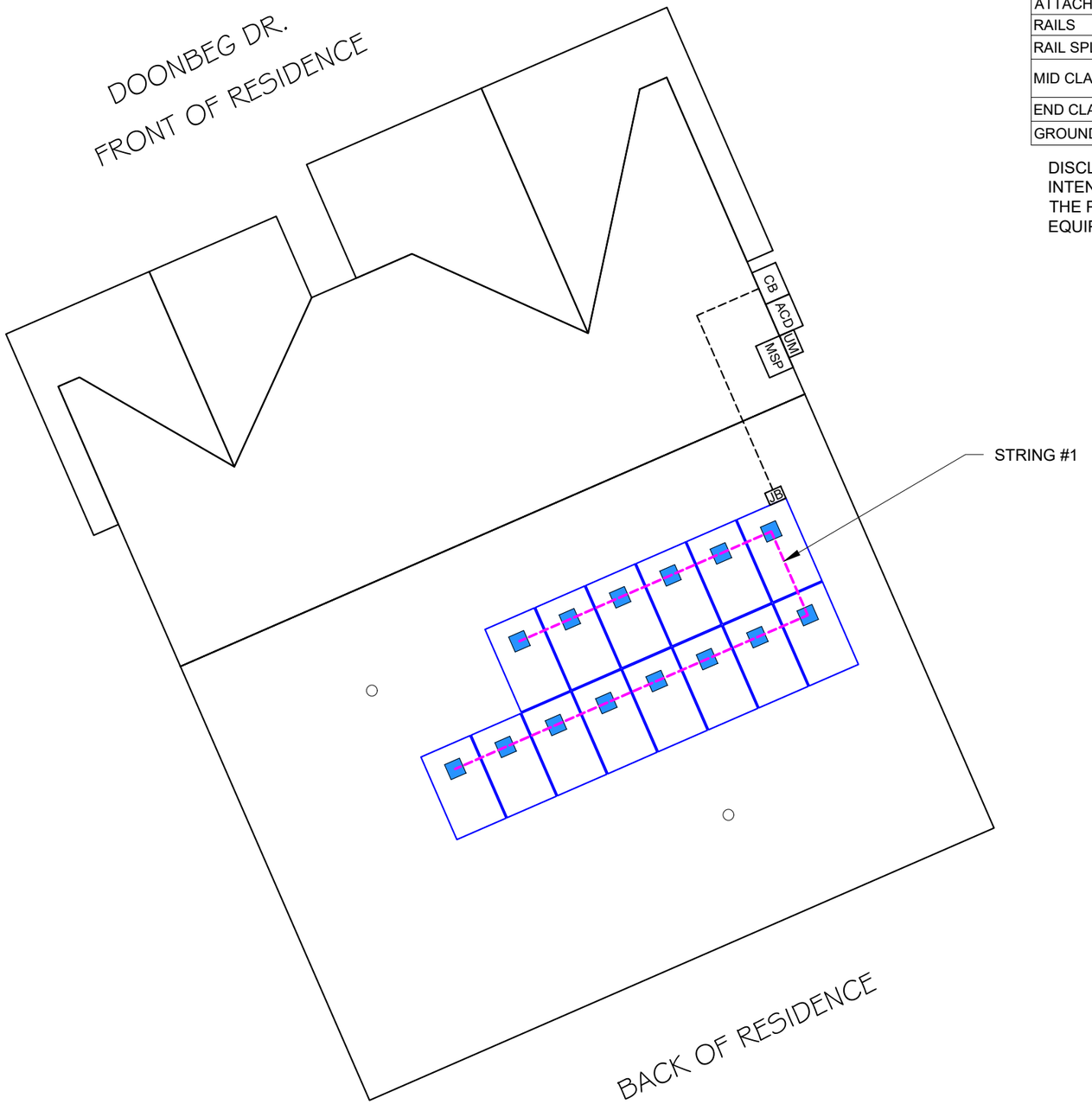
NORTH CAROLINA PROFESSIONAL SEAL 050296 ENGINEER ARASH ZANDIEH
Exp. 12/31/2022

PROJECT NAME
SAM KWON RESIDENCE
43 DOONBEG DR,
FUQUAY-VARINA, NC 27526 USA

SHEET NAME
ROOF PLAN & MODULES

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-2



BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULE	14	REC320NP (320W) MODULES
INVERTER	14	ENPHASE IQ7-60-2-US MICROINVERTERS
AC DISCONNECT	1	60A FUSED, (2P) 20A FUSES, 240V NEMA 3R, UL LISTED
ATTACHMENT	30	SNAPNRACK, ULTRA RAIL COMP KIT
RAILS	8	SNAPNRACK, UR-60 RAIL, 172IN, MILL (232-02539)
RAIL SPLICE	4	SNAPNRACK, UR-60 SPLICE, SILVER (242-01270)
MID CLAMPS	24	SNAPNRACK, ULTRA RAIL MID CLAM , BLACK (242-02071)
END CLAMPS	8	UNIVERSAL END CLAM (242-02215)
GROUNDING LUG	2	GROUNDING LUG R, 6-12 AWG (242-02101)

DISCLAIMER: MATERIALS REQUIRED LIST FOR CONCEPTUAL USE ONLY THE INTENT IS TO AID CONTRACTOR FOR ORDERING REQUIRED MATERIALS FOR THE PROJECT. CONTRACTOR RESPONSIBLE TO VERIFY PRIOR TO SOLAR EQUIPMENT ORDERING

1 STRING LAYOUT

PV-3 SCALE: 1/8" = 1'-0"

LEGEND

- VENT (ROOF OBSTRUCTION)
- STRINGS

pure Energy
Smart. Green. It's Time.

PE SOLAR
ATTN KIM JONES
400 DOMINION DRIVE STE 105
MORRISVILLE, NC 25760

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	07/21/2022	00

Signature with Seal

PROJECT NAME

SAM KWON RESIDENCE
43 DOONBEG DR,
FUQUAY-VARINA, NC 27526 USA

SHEET NAME
STRING LAYOUT

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-3

SNAPNRACK ULTRA RAIL UMBRELLA L FOOT WITH UMBRELLA FLASHING FOR COMPOSTION ROOF MOUNTING

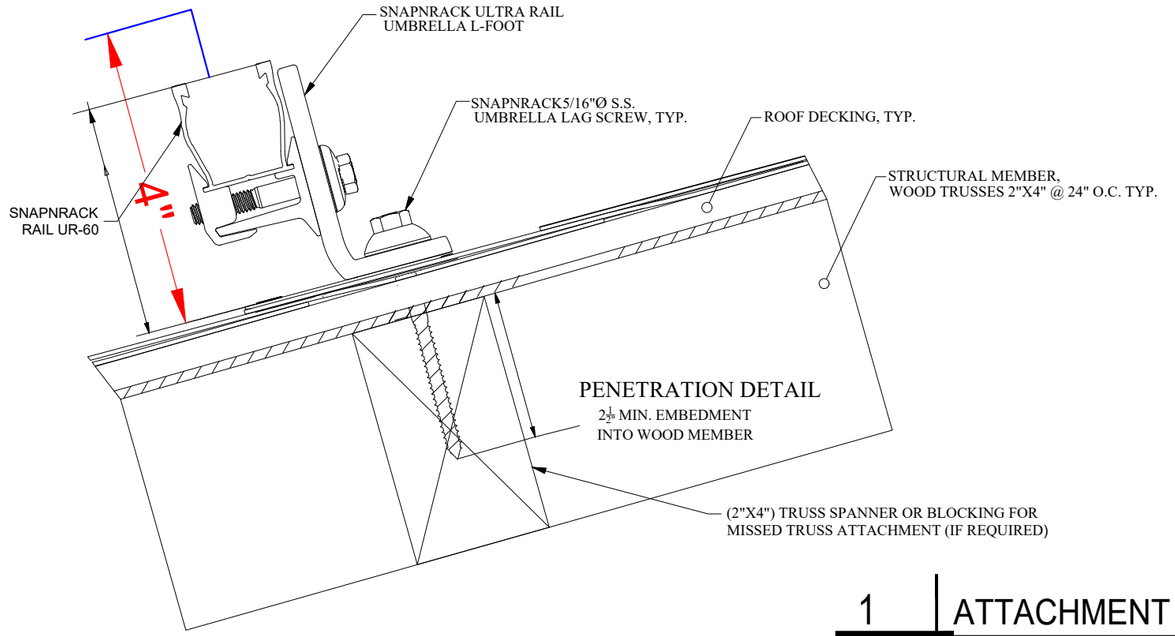
REFER TO SNAPNRACK ENGINEERING CHARTS FOR APPLICABLE RAIL SPANS. "BIN" NUMBER ON CHART SHOULD MATCH "BIN" NUMBER ON THIS DRAWING

5/16"Ø S.S. UMBRELLA LAG SCREW MUST EMBED A MIN. OF 2½" INTO STRUCTURAL MEMBER

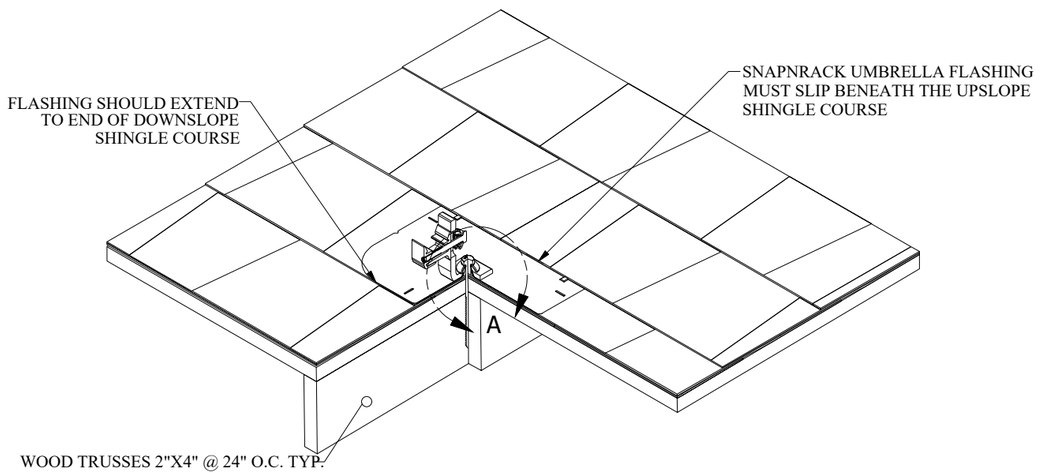
REFER TO SNAPNRACK INSTALLATION MANUAL FOR 5/16"Ø HARDWARE TORQUE SPECIFICATIONS

RAIL CAN BE MOUNTED ON EITHER SIDE OF THE L-FOOT

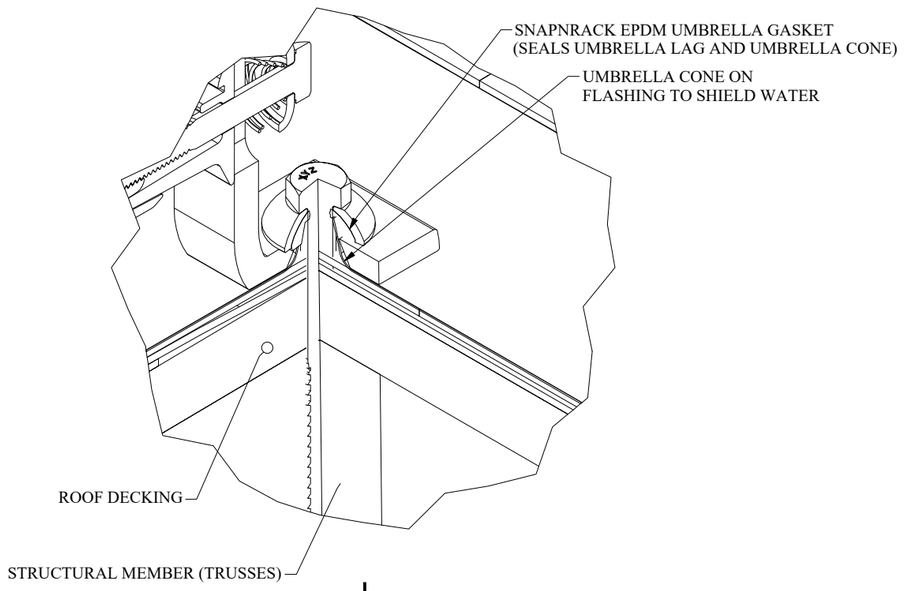
FOR LEVELING DETAILS, REFER TO SNAPNRACK DETAIL DRAWING "SNR-DC-00332 ULTRA RAIL, COMPONENT DETAIL, LEVELING EXTENSION KIT"



1 ATTACHMENT DETAIL
PV-4 SCALE: NTS



2 ENLARGED DETAIL A
PV-4 SCALE: NTS



3 SECTION VIEW DETAIL
PV-4 SCALE: NTS

pure Energy
Smart. Green. It's Time.

PE SOLAR
ATTN KIM JONES
400 DOMINION DRIVE STE 105
MORRISVILLE, NC 25760

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	07/21/2022	00

Signature with Seal

NORTH CAROLINA PROFESSIONAL SEAL 050296 ENGINEER ARASH ZANDIEH

Exp. 12/31/2022

PROJECT NAME

SAM KWON RESIDENCE
43 DOONBEG DR,
FUQUAY-VARINA, NC 27526 USA

SHEET NAME
ATTACHMENT DETAILS

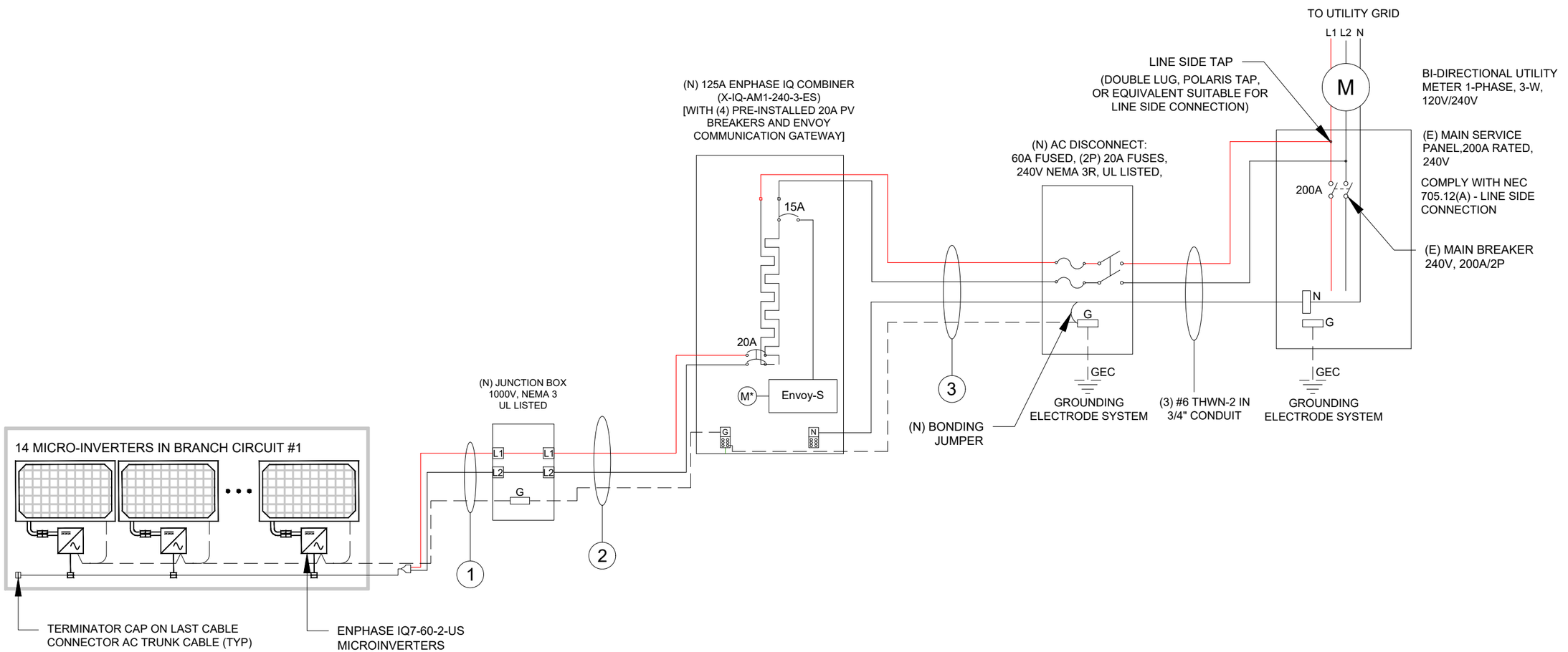
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-4

(14) REC320NP (320W) MODULES
(14) ENPHASE IQ7-60-2-US MICROINVERTERS
(1) BRANCH CIRCUIT OF 14 MODULES WITH MICROINVERTERS
(CONNECTED IN SERIES PER BRANCH CIRCUIT)

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	ENPHASE IQ7-60-2-US
NOMINAL OUTPUT VOLTAGE	240V
NOMINAL OUTPUT CURRENT	1.0A

SYSTEM SIZE:
TOTAL DC SYSTEM SIZE: 4.48 kW DC
TOTAL AC SYSTEM SIZE: 3.36 KW AC
MAXIMUM AC POWER: 240 VA
MAXIMUM AC CURRENT: 1.0 A



Conduit Conductor Schedule (ALL CONDUCTORS MUST BE COPPER)					
Tag # ◯	Description	Wire Gauge	# of Conductors/Color	Conduit Type	Conduit Size
1	PV WIRE	10 AWG	2 (1V+, 1V-)	N/A-Free Air	N/A-Free Air
1	Bare Copper Ground (EGC/GEC)	6 AWG	1 BARE	N/A-Free Air	N/A-Free Air
2	THWN-2	10 AWG	2 (1V+, 1V-) B/R	EMT OR METALLIC SEAL TIGHT	3/4"
2	THWN-2 - Ground (EGC/GEC)	8 AWG	1 (GRN)	EMT OR METALLIC SEAL TIGHT	3/4"
3	THWN-2	10 AWG	3 (1L1, 1L2, 1N) B/R/W	EMT OR METALLIC SEAL TIGHT	3/4"
3	THWN-2 - Ground (GEC)	8 AWG	1 (GRN)	EMT OR METALLIC SEAL TIGHT	3/4"

1 ELECTRICAL LINE DIAGRAM
PV-5 SCALE: NTS

PE SOLAR
ATTN KIM JONES
400 DOMINION DRIVE STE 105
MORRISVILLE, NC 25760

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	07/21/2022	00

Signature with Seal

PROJECT NAME
SAM KWON RESIDENCE
43 DOONBEG DR,
FUQUAY-VARINA, NC 27526 USA

SHEET NAME
ELECTRICAL LINE DIAGRAM

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-5

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER	REC SOLAR
MODEL #	REC320NP
PMAX	320W
VMP	34.2V
IMP	9.37A
VOC	40.8V
ISC	10.18A
MODULE DIMENSION	65.94"L x 39.25"W x 1.1"D (In Inch)

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	ENPHASE IQ7-60-2-US
NOMINAL OUTPUT VOLTAGE	240V
NOMINAL OUTPUT CURRENT	1.0A

PERCENT OF VALUES	NUMBER OF CURRENT CARRYING CONDUCTORS IN CONDUIT
0.80	4-6
0.70	7-9
0.50	10-20

OCPD Calculations

Breakers sized according to continuous duty output current. PV circuit nominal current based off # of modules per Circuit X (1.25[art. 210.19(A)(1)(a)]X (1.0 Max AC current per micro-inverter)
Circuit #1 = 14 modules, Output Current w/ continuous duty = 17.5 <= 20A Breaker
Breaker System output current w/ continuous duty = 17.5 <= 20A (System OCPD)

Conductor Calculations

Wire gauge calculated from art. code 310.15(B)(16) with ambient temperature calculations from art. 310.15(2)(a).
For "On Roof" conductors we use the 90°C column ampacity, 0.5"-3.5" off-the-roof temperature adjustment from 310.15(B)(3)(c), and raceway fill adjustments from 310.15(B)(16).
For "Off Roof" conductors we use the 75°C column ampacity, or the 90°C column ampacity with the relevant ambient temperature and raceway fill adjustments, whichever is less.
The rating of the conductor after adjustments MUST be greater than, or equal to, the continuous duty uprated output current.
Calculation Example - Wire Rating (90°C) x Ambient Temperature Adjustment x Conduit Fill Adjustment >= Continuous Duty Output Current
(On Roof): 10 gauge wire rated for 40A, 40A x 0.96 x 1.0 (2 Conductors) = 38.4A > 17.5A
(Off Roof): 10 gauge wire rated for 35A, 35A > 20A

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.

pure Energy
Smart. Green. It's Time.
PE SOLAR
ATTN KIM JONES
400 DOMINION DRIVE STE 105
MORRISVILLE, NC 25760

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	07/21/2022	00

Signature with Seal

PROJECT NAME
SAM KWON RESIDENCE
43 DOONBEG DR,
FUQUAY-VARINA, NC 27526 USA

SHEET NAME
WIRING CALCULATIONS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-6

⚠ WARNING

ELECTRIC SHOCK HAZARD

IF A GROUND FAULT IS INDICATED NORMALLY GROUNDED CONDUCTORS MAY BE UNGROUNDED AND ENERGIZED

LABEL LOCATION:
DC DISCONNECT, INVERTER
(PER CODE: NEC 690.35(F))
[To be used when inverter is ungrounded]

WARNING: PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION:
CONDUIT, COMBINER BOX
(PER CODE: NEC690.31(G)(E)(4) 10 FT
MAX SPACING OF LABELS

⚠ WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION:
POINT OF INTERCONNECTION
(PER CODE: NEC 690.59)

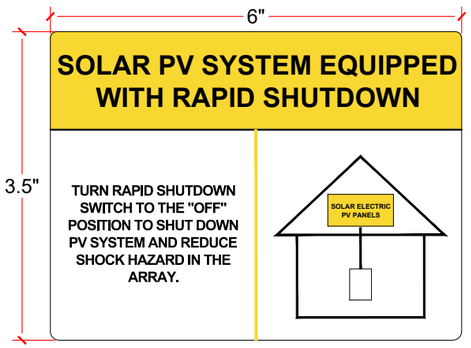
ADHESIVE FASTENED SIGNS:
- THE LABEL SHALL BE SUITABLE FOR THE ENVIRONMENT WHERE IT IS INSTALLED.
- WHERE REQUIRED ELSEWHERE IN THIS CODE, ALL FIELD APPLIED LABELS, WARNINGS, AND MARKINGS SHOULD COMPLY WITH ANSI Z535.4 [NEC 110.21(B) FIELD MARKING].
- ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT [IFC 605.11.1.3]

PHOTOVOLTAIC SYSTEM AC DISCONNECT
RATED AC OPERATING CURRENT 14.0 AMPS
AC NOMINAL OPERATING VOLTAGE 240 VOLTS

LABEL LOCATION:
AC DISCONNECT, POINT OF INTERCONNECTION
(PER CODE: NEC690.54)

WARNING
INVERTER OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
POINT OF INTERCONNECTION
(PER CODE: NEC 705.12(B)(2)(c))
[Not required if panelboard is rated not less than sum of ampere ratings of all overcurrent devices supplying it]



LABEL LOCATION:
MAIN SERVICE PANEL
(PER CODE: NEC 690.56(C)(1)(a))

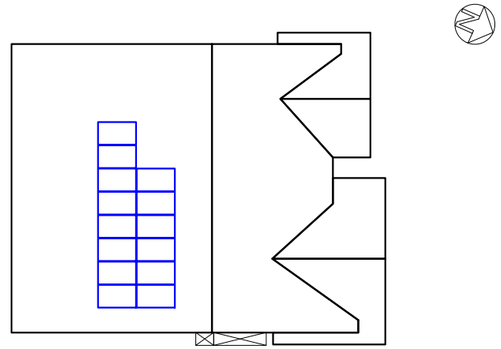
PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN

LABEL PER NEC 690.56(C)- PROVIDE AT NEW SUB PANEL OR SERVICE PANEL FOR RAPID SHUTDOWN COMPLIANT SYSTEM

CAUTION:

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM THE FOLLOWING SOURCES WITH DISCONNECTS LOCATED AS SHOWN

AT: ☒ METER AND MAIN SERVICE PANEL
AC DISCONNECT
ENPHASE COMBINER BOX



MARKING CONTENT AND FORMAT

NOTE : LABELS MAY COME IN DIFFERENT COLORS

ELECTRICAL NOTES :

1). UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
2). WORKING CLEARANCES AROUND THE EXISTING AND NEW ELECTRICAL EQUIPMENT WILL BE MAINTAINED IN ACCORDANCE WITH NEC ARTICLE 110.26.
3). ALL EQUIPMENT INSTALLED SHALL BE LISTED BY A NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) PER NEC ARTICLE 110.3.
4). RACKING CONFORMS TO AND IS LISTED UNDER UL 2703.
5). ALL LABELS OR MARKINGS SHALL BE VISIBLE AFTER INSTALLATION. THE LABELS SHALL BE REFLECTIVE, AND ALL LETTERS SHALL BE CAPITALIZED AND SHALL BE A MINIMUM HEIGHT OF 9.5 MM (3/8 IN) IN WHITE ON A RED BACKGROUND.
6). CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6 (C) (1) AND ARTICLE 310.8 (D).
7). CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.8 (C).

pure Energy
Smart. Green. It's Time.
PE SOLAR
ATTN KIM JONES
400 DOMINION DRIVE STE 105
MORRISVILLE, NC 25760

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	07/21/2022	00

Signature with Seal

PROJECT NAME
SAM KWON RESIDENCE
43 DOONBEG DR,
FUQUAY-VARINA, NC 27526 USA

SHEET NAME
PLACARD

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-7