


ENGINEER:  
  
**MODEL ENERGY**  
 300 FAYETTEVILLE ST.  
 #1430  
 RALEIGH, NC 27602  
 919-274-9905  
 MODELENERGY.COM  
 P-1194

JOB TITLE:  
**NEW SOLAR PV SYSTEM**  
 11.73 kW DC INPUT  
 11.4 kW AC EXPORT  
**STUART VOGT**  
 470 RIVER RD.  
 FUQUAY-VARINA, NC 27526

**CONSTRUCTION NOTES**

- ALL WORK AND EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST NATIONAL, STATE, AND LOCAL CODES AND ORDINANCES
- FOLLOW MANUFACTURER'S INSTALLATION INSTRUCTIONS, BEST PRACTICES, AND SPECIFICATIONS
- WIRES SHALL BE RATED AND LABELED "SUNLIGHT RESISTANT" WHERE EXPOSED TO AMBIENT CONDITIONS
- THE PHOTOVOLTAIC SYSTEM SHALL NOT EXCEED 600 VOLTS OR 800 AMPS
- EACH ELECTRICAL APPLIANCE SHALL BE PROVIDED WITH A NAMEPLATE GIVING THE IDENTIFYING NAME AND THE RATING IN VOLTS AND AMPERES, OR VOLTS AND WATTS. IF THE APPLIANCE IS TO BE USED ON A SPECIFIC FREQUENCY OR FREQUENCIES, IT SHALL BE SO MARKED. WHERE MOTOR OVERLOAD PROTECTION EXTERNAL TO THE APPLIANCES IS REQUIRED, THE APPLIANCE SHALL BE SO MARKED
- WHERE APPLICABLE, GROUNDING ELECTRODE CONDUCTOR TO BE CONTINUOUS. GROUNDING CRIMPS TO BE IRREVERSIBLE
- GROUNDING DC PHOTOVOLTAIC ARRAYS SHALL BE PROVIDED WITH DC GROUND-FAULT PROTECTION THAT MEETS THE REQUIREMENTS OF NEC SECTION 690.5. UNGROUNDED DC PHOTOVOLTAIC ARRAYS SHALL COMPLY WITH NEC SECTION 690.35
- IN ONE- AND TWO-FAMILY DWELLINGS, LIVE PARTS IN PHOTOVOLTAIC SOURCE CIRCUITS AND PHOTOVOLTAIC OUTPUT CIRCUITS OVER 150 VOLTS TO GROUND, SHALL ONLY BE ACCESSIBLE TO QUALIFIED PERSONS WHILE ENERGIZED.
- PHOTOVOLTAIC SYSTEMS SHALL BE PERMANENTLY MARKED AT VARIOUS EQUIPMENT LOCATIONS TO IDENTIFY THAT A PHOTOVOLTAIC SYSTEM IS INSTALLED AND THAT VARIOUS DANGERS ARE PRESENT.
- EACH PHOTOVOLTAIC SYSTEM DISCONNECTING MEANS SHALL BE PERMANENTLY MARKED TO IDENTIFY IT AS A PHOTOVOLTAIC SYSTEM DISCONNECT
- WHERE ALL TERMINALS OF A DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION, A WARNING SIGN SHALL BE MOUNTED ON OR ADJACENT TO THE DISCONNECT
- A PERMANENT LABEL FOR THE DIRECT-CURRENT PHOTOVOLTAIC POWER SOURCE SHALL BE PROVIDED BY THE INSTALLED AT THE DC DISCONNECT MEANS
- A PERMANENT PLAQUE OR DIRECTORY, DENOTING ALL ELECTRIC POWER SOURCES SERVING THE PREMISES, SHALL BE INSTALLED AT EACH SERVICE EQUIPMENT LOCATION AND AT LOCATIONS OF ALL POWER PRODUCTION SOURCES.
- A PERMANENT PLAQUE OR DIRECTORY SHALL BE PROVIDED DENOTING THE LOCATIONS OF THE SERVICE DISCONNECT MEANS AND THE PHOTOVOLTAIC SYSTEM DISCONNECT MEANS IF THEY ARE NOT LOCATED AT THE SAME LOCATION.
- ALL MODULE GROUND CONNECTIONS SHALL BE MADE IN ACCORDANCE WITH NEC SECTION 690.4 (C)

**ABBREVIATIONS**

A	AMPERE
AC	ALTERNATING CURRENT
DC	DIRECT CURRENT
ECC	EQUIPMENT GROUNDING CONDUCTOR
EMT	ELECTRICAL METAL TUBING
GALV	GALVANIZED
GEC	GROUNDING ELECTRODE CONDUCTOR
GND	GROUND
I	CURRENT
IMP	CURRENT AT MAXIMUM POWER
Isc	SHORT-CIRCUIT CURRENT
kVA	KILOVOLT AMPERE
kW	KILOWATT
MAX	MAXIMUM
MIN	MINIMUM
MCB	MAIN CIRCUIT BREAKER
MLO	MAIN LUG ONLY
NOM	NOMINAL
NTS	NOT TO SCALE
NPM	NOMINAL POWER
PV	PHOTOVOLTAIC
PVC	POLYVINYL CHLORIDE
SN	SOLAR NOON
STC	STANDARD TEST CONDITIONS
TYP	TYPICAL
V	VOLT
VMP	VOLTAGE AT MAXIMUM POWER
Voc	OPEN-CIRCUIT VOLTAGE
W	WATT

**CODE REFERENCES**

2017 NATIONAL ELECTRIC CODE  
 2012 NORTH CAROLINA BUILDING CODE  
 2012 NORTH CAROLINA RESIDENTIAL CODE  
 2012 NORTH CAROLINA FIRE CODE

**SHEET INDEX**


PV1.1 - PROJECT INFORMATION  
 PV2.1 - SITE INFORMATION  
 PV3.1 - STRUCTURAL INFORMATION  
 PV4.1 - ELECTRICAL INFORMATION  
 PV5.1 - EQUIPMENT LABELS

**SITE CONDITIONS**

ASCE 7-10 WIND SPEED - 116 MPH  
 EXPOSURE CATEGORY - B  
 RISK CATEGORY - II

**LEGEND**



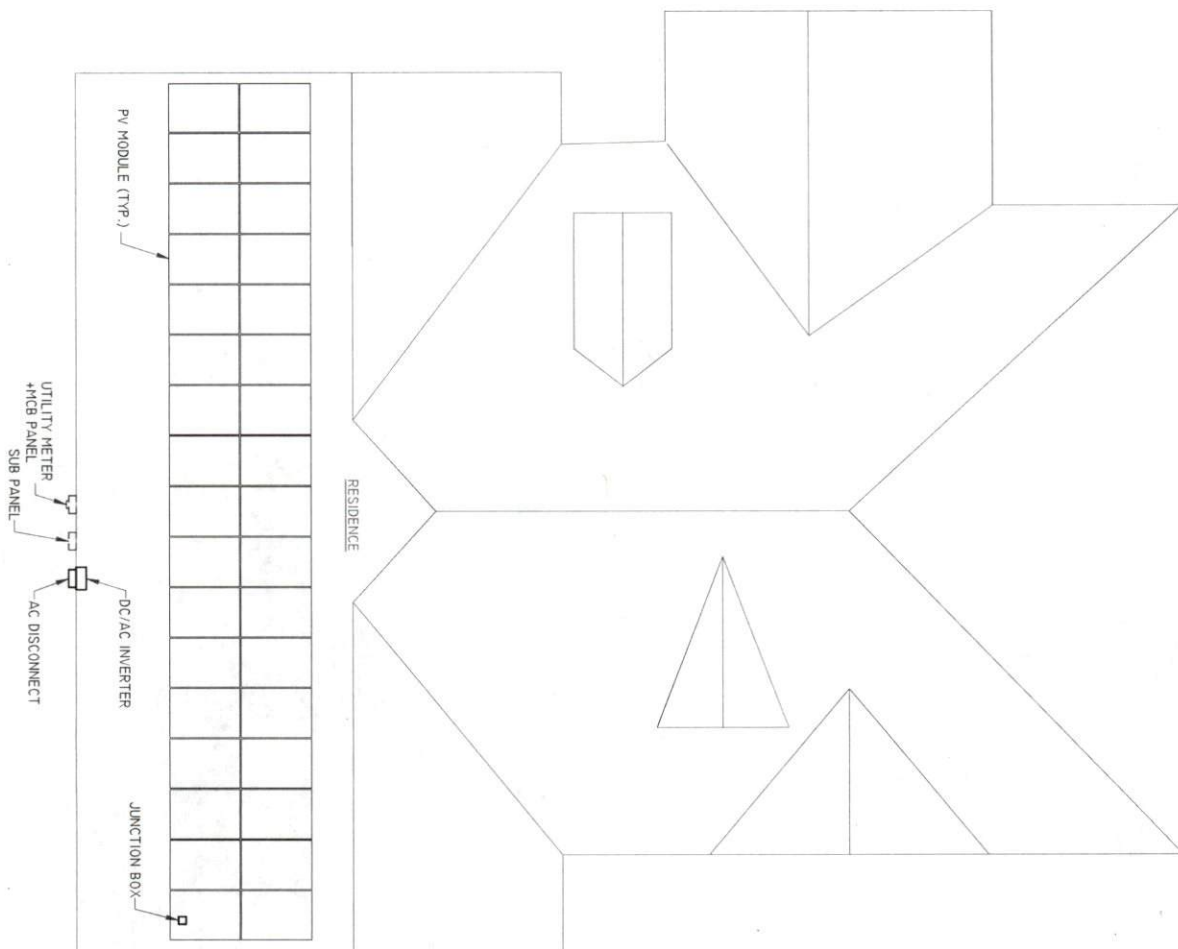
CLIENT:  
  
**SOUTHERN ENERGY MANAGEMENT**  
 ENERGY EFFICIENCY & SOLAR POWER

ISSUED FOR: PERMIT  
 DATE: 8/1/18

PROJECT INFORMATION  
**PV1.1**

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1 SITE PLAN



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

PV2.1

SITE INFORMATION	
ISSUED FOR:	DATE:
PERMIT:	8/1/18

**Southern Energy Management**  
ENERGY EFFICIENCY & SOLAR POWER

CLIENT:

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11.73 kW DC INPUT  
11.4 kW AC EXPORT

**STUART VOGT**  
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ENGINEER:






ROOF MOUNT & FASTENERS	
ROOF MOUNT:	
MAKE	ECOLIBRIUM
TYPE	ECOX
MATERIAL	ALUMINUM
FASTENER:	
MAKE	GENERIC
MODEL	LAG BOLT
MATERIAL	304 SS
SIZE	5/16" X 4"
GENERAL:	
WEIGHT	0.1 LBS.
FASTENERS PER MOUNT	1
MAXIMUM PULL-OUT FORCE	768 LBS / MOUNT
SAFETY FACTOR	2
DESIGN PULL-OUT FORCE	384 LBS / MOUNT

ARRAY SUMMARY	
# MODULES	34
# ROOF MOUNTS	129
RAIL LENGTH	N/A
ARRAY AREA	750 SQFT.
ARRAY WEIGHT	2066 LBS.
AZIMUTH @ SN	249°
TILT ANGLE	45°

PV MODULES	
MAKE	REC
MODEL	REC345TP2S72
WIDTH	39"
LENGTH	79"
THICKNESS	1.8"
WEIGHT	49 LBS

**STATEMENT OF STRUCTURAL COMPLIANCE**

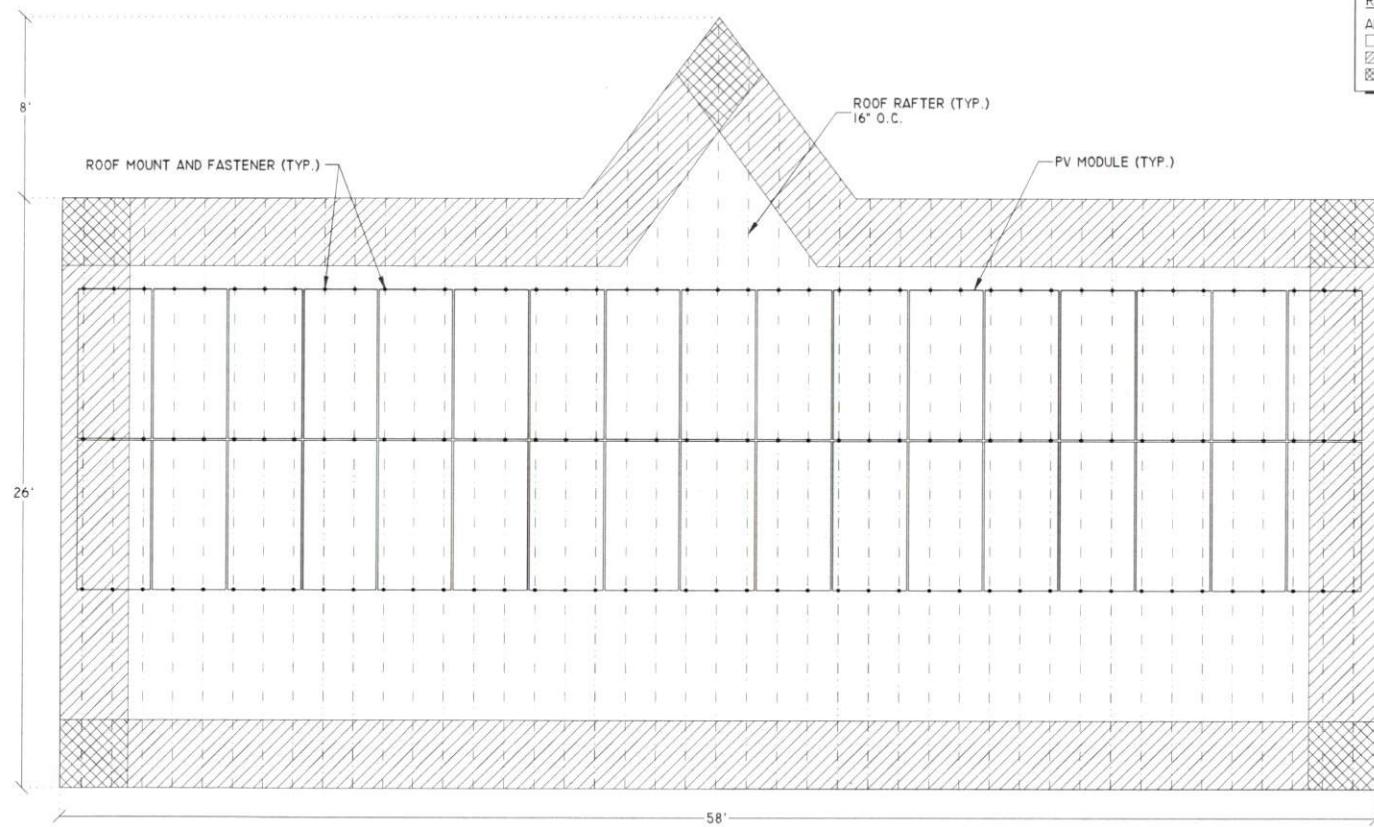
THE EXISTING ROOF STRUCTURE HAS BEEN DESIGNED TO SUPPORT THE ADDITIONAL LOADS OF THE PURPOSED PV SYSTEM. IN ADDITION, THE RACKING AND FASTENING SYSTEM SHALL BE CAPABLE OF SECURING THE SYSTEM TO THE STRUCTURE UNDER DESIGN CONDITIONS WHEN INSTALLED PROPERLY AND IN ACCORDANCE WITH THE RACKING AND FASTENING ARRANGEMENT DETAILED WITHIN THESE DRAWINGS.

SIGNED: 

NAME: ANDREW W. KING, PE

TITLE: PROFESSIONAL ENGINEER


ROOF ZONES:	
ALL ZONES	MAX. RAIL OVERHANG = 12"
<input type="checkbox"/> ZONE 1	MAX. FASTENER SPAN ZONE 1 = 16"
<input checked="" type="checkbox"/> ZONE 2	MAX. FASTENER SPAN ZONE 2 = 16"
<input checked="" type="checkbox"/> ZONE 3	MAX. FASTENER SPAN ZONE 3 = 16"



ROOF SUMMARY	
STRUCTURE	
TYPE	RAFTERS
MATERIAL	SOUTHERN PINE #2
SIZE	2" X 8"
SPACING	16" o.c.
EFF. SPAN	10'-0"
PITCH	12 / 12
DENSITY	30 LBS./CU.FT.
DECKING:	
TYPE	OSB
MATERIAL	WOOD COMPOSITE
THICKNESS	7/16"
WEIGHT	1.6 LBS./SQFT.
ROOFING:	
TYPE	ARCH SHINGLE
MATERIAL	ASPHALT
WEIGHT	2.3 LBS./SQFT.

ROOF LOADING	
DEAD LOAD:	
ROOFING	3.9 LBS./SQFT.
PV ARRAY	2.8 LBS./SQFT.
TOTAL	6.7 LBS./SQFT.
WIND LOAD:	
UPLIFT ZONE 1	-49.5 LBS./SQFT.
UPLIFT ZONE 2	-59.4 LBS./SQFT.
UPLIFT ZONE 3	-59.4 LBS./SQFT.
DOWNWARD	45.4 LBS./SQFT.
FASTENER LOAD:	
UPLIFT ZONE 1	-292 LBS.
UPLIFT ZONE 2	-297 LBS.
UPLIFT ZONE 3	-0 LBS.
DOWNWARD	264 LBS.

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STRUCTURAL INFORMATION

**PV3.1**

1 | MODULE, RACKING, AND FASTENER LAYOUT - ROOF PLANAR VIEW

SCALE : 3/16" = 1'-0"

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PV MODULES	
MAKE	REC
MODEL	REC345TP2S72
TECHNOLOGY	MULTI-CRYST
NOM. POWER (P <sub>nom</sub> )	345 WATTS
NOM. VOLT. (V <sub>mp</sub> )	38.7 VOLTS
O.C. VOLT. (V <sub>oc</sub> )	46.5 VOLTS
MAX. SYS. VOLT.	1000 V (UL)
TEMP. COEF. (V <sub>tc</sub> )	-0.30 %/°C
NOM. CURR. (I <sub>mp</sub> )	8.92 AMPS
S.C. CURR. (I <sub>sc</sub> )	9.36 AMPS
MAX. SERIES FUSE	20 AMPS

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

DC/AC INVERTER	
MAKE	SOLAREDDGE
MODEL	SEII400A-US
TECHNOLOGY	TRANSFORMER-LESS
DC INPUT:	
MAX. POWER	15350 WATTS
VOLT. RANGE	350-500 VOLTS
NOM. VOLT.	350 VOLTS
MAX. CURRENT	34.5 AMPS
STRING INPUTS	3 STRINGS
AC OUTPUT:	
NOM. POWER	11400 WATTS
NOM. VOLT.	240 VOLTS
MAX. POWER	12000 WATTS
MAX. CURR.	47.5 AMPS
GFP (Y/N)	YES
GFCI (Y/N)	YES
AFCI (Y/N)	YES
DC DISC. (Y/N)	YES
RAPID SHUTDOWN	YES
FUSE RATING	15 AMPS
PROTECT. RATING	NEMA 3R

MODULE OPTIMIZER	
MAKE	SOLAR EDGE
MODEL	P400
DC INPUT:	
NOM. POWER	400 WATTS
VOLT. RANGE	8-80
MAX. CURR.	10.0 AMPS
DC OUTPUT:	
NOM. POWER	400 WATTS
MAX. VOLT.	60 VOLTS
MAX. CURR.	15.0 AMPS
MIN. STRING	10 OPTIMIZERS
MAX. STRING	25 OPTIMIZERS
MAX. POWER	5250 WATTS

CONDUCTOR SCHEDULE													
TAG	CURRENT CARRYING CONDUCTORS				GROUNDING CONDUCTORS			CONDUIT/RACEWAY				NOTES	
	QTY.	SIZE	MATERIAL	INSULATION	QTY.	SIZE	MATERIAL	INSULATION	QTY.	SIZE	MATERIAL		LOCATION
C1	6	10 AWG	COPPER	PV WIRE	1	6 AWG	COPPER	BARE	-	-	-	FREE AIR	1
C2	6	10 AWG	COPPER	THWN-2	1	10 AWG	COPPER	THWN-2	1	1/2"	ROMEX/EMT	INT/EXT	2.4
C3	3	6 AWG	COPPER	THWN	1	10 AWG	COPPER	THWN	1	3/4"	ROMEX/EMT	INT/EXT	2.4
XC	-	-	-	-	-	-	-	-	-	-	-	-	3

NOTES:

1. MANUFACTURER PROVIDED, UL LISTED WIRING HARNESS FOR USE ON EXPOSED ROOFS
2. CONDUIT SIZE SHOWN IS CODE MINIMUM. LARGER SIZES ARE ALLOWED.
3. EXISTING CONDUCTORS, FIELD VERIFY
4. EQUIPMENT TERMINAL RATING SHALL BE A MINIMUM OF 75°C AT BOTH END OF CONDUCTOR

AC DISCONNECT	
MAKE	GENERIC
MODEL	N/A
ENCL. RATING	NEMA 3R
VOLT. RATING	240 VOLTS
AMP RATING	60 AMPS
UL LIST. (Y/N)	YES
FUSED (Y/N)	NO
FUSE RATING	N/A

NOTES:

- LOAD-BREAK RATED
- VISIBLE OPEN
- LOCKABLE IN OPEN POSITION
- INSTALL ADJACENT TO METER

SUB PANEL (EXISTING)	
MAKE	N/A
MODEL	N/A
ENCL. RATING	NEMA 3R
VOLT. RATING	600 VOLTS
BUS RATING	125 AMPS
UL LIST. (Y/N)	YES
MAIN BREAKER (Y/N)	NO
BREAKER RATING	N/A

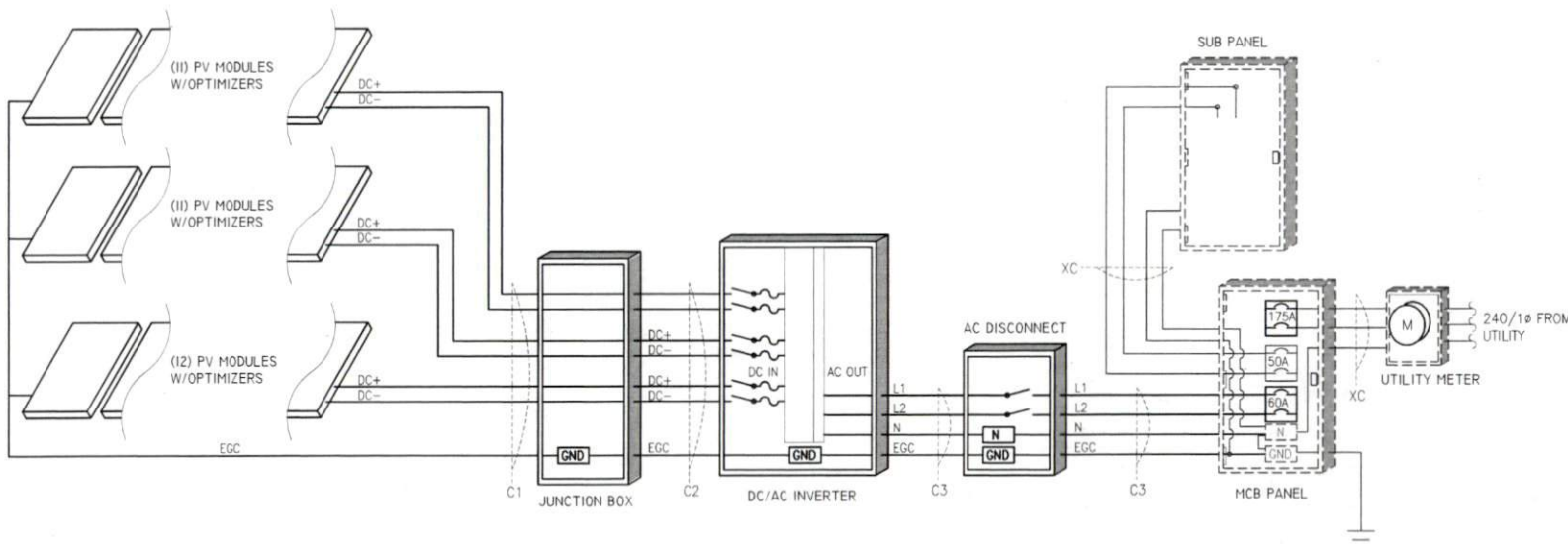
NOTES:

- INSTALL RELOCATED BREAKERS FROM MCB PANEL TO THIS SUB PANEL.

MCB PANEL (EXISTING)	
MAKE	EATON
MODEL	N/A
ENCL. RATING	NEMA 3R
VOLT. RATING	600 VOLTS
BUS RATING	200 AMPS
UL LIST. (Y/N)	YES
MAIN BREAKER (Y/N)	YES
BREAKER RATING	175 AMPS

NOTES:

- BACK-FEED SOLAR OUTPUT VIA 60A BREAKER AT THE OPPOSITE END OF THE BUS BAR FROM MAIN BREAKER
- RELOCATE EXISTING BREAKERS AS REQUIRED
- PROVIDE NEW 175A MAIN BREAKER



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ELECTRICAL INFORMATION

PV4.1

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**PHOTOVOLTAIC ARRAY AC DISCONNECT**

MAXIMUM OPERATING AC VOLTAGE: 240V  
MAXIMUM OPERATING CURRENT: 48 AMPS

PLACE ON COVER OF AC DISCONNECT SWITCH

**WARNING!**  
**ELECTRIC SHOCK HAZARD!**  
**DO NOT TOUCH TERMINALS!**

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

PLACE ON JUNCTION BOX

**WARNING!**

PHOTOVOLTAIC POWER SOURCE

PLACE ON DC CONDUIT

**WARNING!**  
**ELECTRIC SHOCK HAZARD!**  
**DO NOT TOUCH TERMINALS!**

DUAL POWER SOURCE. PHOTOVOLTAIC  
SYSTEM IS SECONDARY POWER SOURCE.  
TERMINALS ON BOTH THE LINE AND LOAD SIDES  
MAY BE ENERGIZED IN THE OPEN POSITION.

PLACE ON MCB PANEL

**WARNING!**  
**INVERTER OUTPUT CONNECTION:**  
**DO NOT RELOCATE THIS OVER-CURRENT DEVICE**

LABEL FOR PV INPUT BREAKER

**PHOTOVOLTAIC SYSTEM EQUIPPED  
WITH RAPID SHUTDOWN**

RAPID SHUTDOWN LABEL

**WARNING!**  
**ELECTRIC SHOCK HAZARD. THE DC  
CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM  
ARE UNGROUNDED AND MAY BE ENERGIZED.**

PLACE ON JUNCTION BOXES, COMBINER BOXES, DISCONNECTS AND  
EQUIPMENT THAT ARE CONNECTED TO UNGROUNDED CIRCUITS.

**WARNING!**  
**ELECTRIC SHOCK HAZARD!**  
**DO NOT TOUCH TERMINALS!**

TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED  
IN THE OPEN POSITION. THE DC CONDUCTORS OF THIS  
PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED.

**PHOTOVOLTAIC POWER SOURCE**

OPERATING AC VOLTAGE: 240V  
MAX OPERATING AC OUTPUT CURRENT: 48 AMPS

**PHOTOVOLTAIC ARRAY DC DISCONNECT**

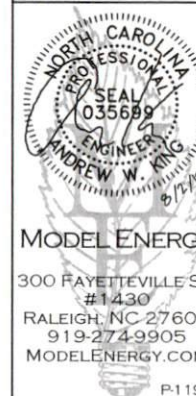
OPERATING DC VOLTAGE: 350 VOLTS  
OPERATING CURRENT: 33.5 AMPS  
MAX SYSTEM VOLTAGE: 500 VOLTS  
SHORT-CIRCUIT CURRENT: 45 AMPS

PLACE ON THE COVER OF INVERTER/DC DISCONNECT SWITCH

*EQUIPMENT LABEL NOTES*

1. LABELS SHALL HAVE A RED BACKGROUND COLOR WITH WHITE LETTERING. TEXT SHALL BE IN ALL CAPITAL LETTERS AND NOT BE BOLD FONT
2. LABEL MATERIAL SHALL BE SUITABLE FOR THE EQUIPMENT ENVIRONMENT
3. CONDUIT SHALL BE MARKED WITH REQUIRED LABEL EVERY 10 FEET

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EQUIPMENT LABELS

**PV5.1**

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