

ROOF MOUNT PHOTOVOLTAIC SYSTEM

CODES:

THIS PROJECT COMPLIES WITH THE FOLLOWING:
 2018 NORTH CAROLINA BUILDING CODE
 2018 NORTH CAROLINA RESIDENTIAL CODE
 2018 NORTH CAROLINA PLUMBING CODE
 2018 NORTH CAROLINA MECHANICAL CODE
 2018 NORTH CAROLINA FUEL GAS CODE
 2017 NATIONAL ELECTRICAL CODE
 AS ADOPTED BY HARNETT COUNTY (NC)

CONSTRUCTION NOTES:

CONDUIT AND CONDUCTOR SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.

ALL SOLAR ENERGY SYSTEM EQUIPMENT SHALL BE SCREENED TO THE MAXIMUM EXTENT POSSIBLE AND SHALL BE PAINTED A COLOR SIMILAR TO THE SURFACE UPON WHICH THEY ARE MOUNTED.

MODULES SHALL BE TESTED , LISTED AND IDENTIFIED WITH FIRE CLASSIFICATION IN ACCORDANCE WITH UL 2703. SMOKE AND CARBON MONOXIDE ALARMS ARE REQUIRED PER SECTION R314 AND 315 TO BE VERIFIED AND INSPECTED BY INSPECTOR IN THE FIELD.

DIG ALERT (811) TO BE CONTACTED AND COMPLIANCE WITH EXCAVATION SAFETY PRIOR TO ANY EXCAVATION TAKING PLACE

PHOTOVOLTAIC SYSTEM GROUND WILL BE TIED INTO EXISTING GROUND AT MAIN SERVICE FROM DC DISCONNECT/INVERTER AS PER 2017 NEC SEC 250.166(A).

SOLAR PHOTOVOLTAIC SYSTEM EQUIPMENT WILL BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS OF ART. 690 OF THE 2017 NEC

THE MAIN SERVICE PANEL WILL BE EQUIPPED WITH A GROUND ROD OR UFER

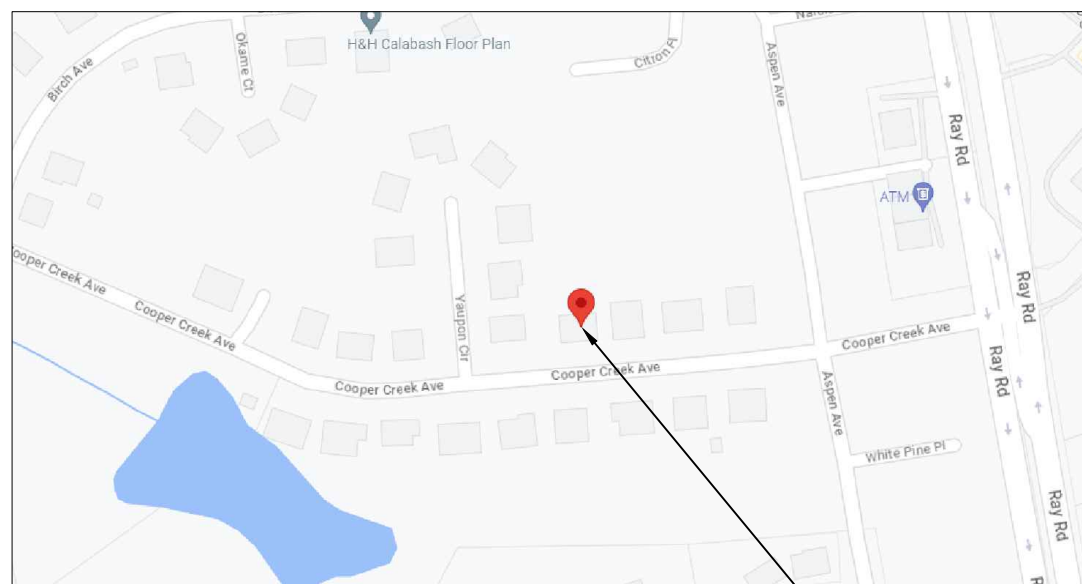
UTILITY COMPANY WILL BE NOTIFIED PRIOR TO ACTIVATION OF THE SOLAR PV SYSTEM

INSTALL CREW TO VERIFY ROOF STRUCTURE PRIOR TO COMMENCING WORK. EMT CONDUIT ATTACHED TO THE ROOF USING CONDUIT MOUNT.

THIS SYSTEM DESIGNED WITH:

WIND SPEED: 130
 WIND EXPOSURE: B
 SNOW LOAD: 15

VICINITY MAP:



SITE LOCATION

TABLE OF CONTENTS:

PV-1	SITE LOCATION
PV-2	SITE PLAN
PV-2A	ROOF PLAN WITH MODULES LAYOUT
PV-2B	ROOF AND STRUCTURAL TABLES
PV-3	MOUNTING DETAILS
PV-4	THREE LINE DIAGRAM
PV-5	CONDUCTOR CALCULATIONS
PV-6	EQUIPMENT & SERVICE LIST
PV-7	LABELS
PV-7A	SITE PLACARD
PV-8	MICROINVERTER CHART
PV-9	SAFETY PLAN
PV-10	SAFETY PLAN
APPENDIX	MANUFACTURER SPECIFICATION SHEETS

CLIENT:
 TROY HARRIS
 132 COOPER CREEK AVENUE, SPRING LAKE
 NC 28390
 AHJ: HARNETT COUNTY (NC)
 UTILITY: SOUTH RIVER EMC
 METER: 14482581
 PHONE: (407) 704-9388
 EMAIL: TROYCHARRIS@HOTMAIL.COM
 FINANCE: OTHER

SYSTEM:
 SYSTEM SIZE (DC): 25 X 410 = 10,250 kW
 SYSTEM SIZE (AC): 7,250 kW @ 240V
 MODULES: 25 X REC SOLAR: REC410AA
 PURE-R
 MICROINVERTERS: 25 X ENPHASE
 IQ8PLUS-72-2-US

REVISIONS		
NO.	REVISED BY	DATE
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



FREEDOM FOREVER LLC
 415 INDUSTRIAL CT., GREER, SC 29651
 Tel: (800) 385-1075

GREG ALBRIGHT

CONTRACTOR LICENSE:
 ELECTRICAL CONTRACTOR U.34043

SITE LOCATION

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	5/27/2023	A.A.	PV-1

- LEGEND:**
-  CHIMNEY
 -  PIPE VENT
 -  ATTACHMENTS
 -  MODULES
 -  RAFTERS
 -  RAIL
 -  SETBACK
 -  AC DISCONNECT
 -  MSP
 -  JUNCTION BOX
 -  PRODUCTION METER
 -  MICRO INVERTER
 -  COMBINER BOX

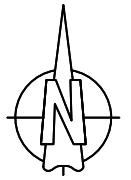
TOTAL ROOF AREA RIDGE SETBACK CALCS:
 TOTAL ROOF AREA: 2633.12 SQ FT
 SINGLE MODULE AREA: 20.81908296 SQ FT
 TOTAL NUMBER OF MODULES: 25
 TOTAL AREA OF MODULES: 520.48 SQ FT
 ROOF COVERAGE: 19.77%
 FIRE SPRINKLERS : NO

BOS WILL BE AS CLOSE AS POSSIBLE TO MSP WITHIN 10'

PV SYSTEM
 10.250 kW-DC
 7.250 kW-AC

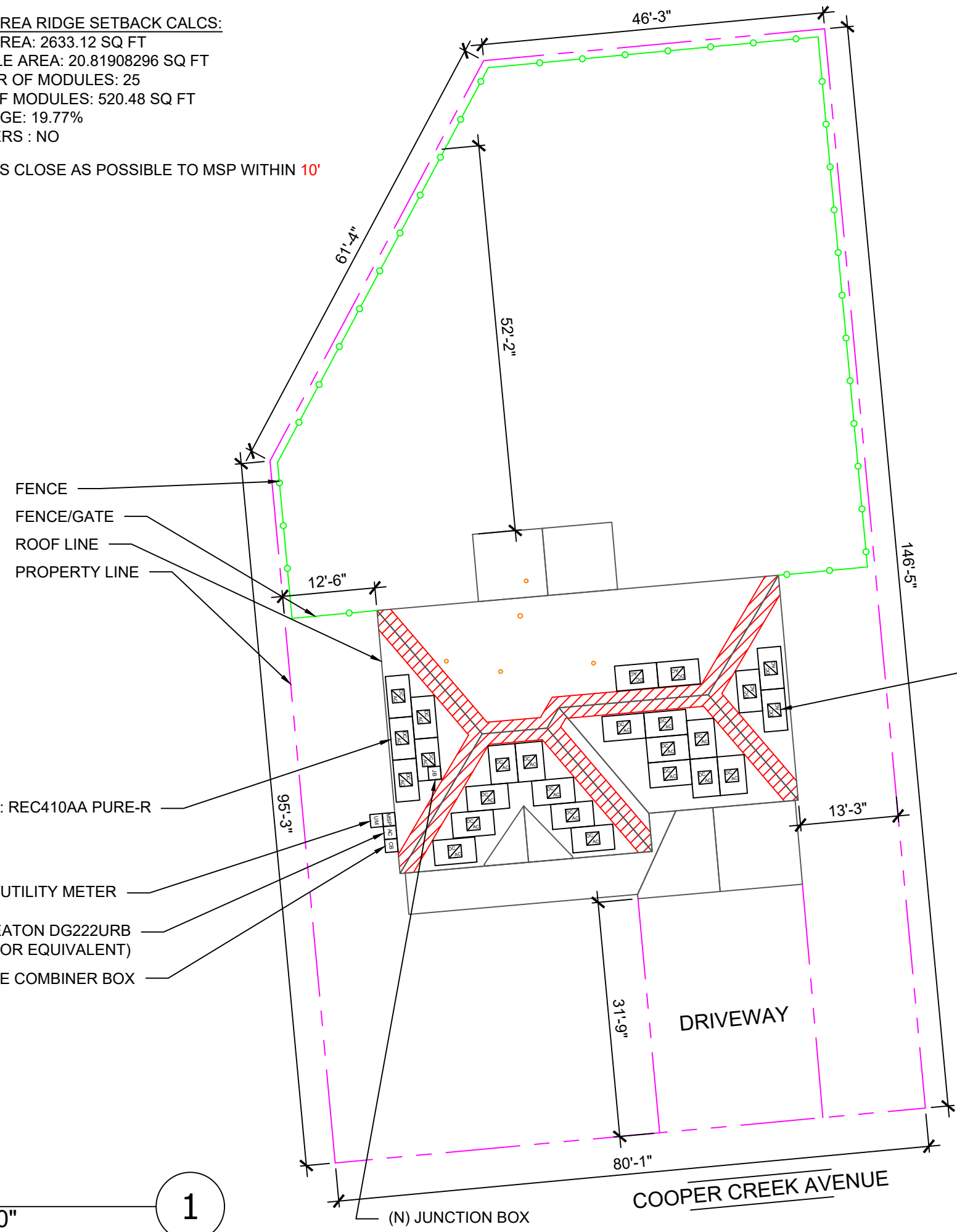
THIS SYSTEM DESIGNED WITH:
 WIND SPEED: 130
 WIND EXPOSURE: B
 SNOW LOAD: 15

- (N) 25 REC SOLAR: REC410AA PURE-R
- (E) MAIN SERVICE PANEL/UTILITY METER
- (N) UTILITY DISCONNECT EATON DG222URB (OR EQUIVALENT)
- ENPHASE COMBINER BOX



SITE PLAN
 SCALE: 1/16" = 1'-0"

1



ROOF AREA: 2633.12 SQ FT

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 TROY HARRIS
 132 COOPER CREEK AVENUE, SPRING LAKE
 NC 28390
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 UTILITY: SOUTH RIVER EMC
 METER: 14482581
 PHONE: (407) 704-9388
 EMAIL: TROYCHARRIS@HOTMAIL.COM
 FINANCE: OTHER

SYSTEM:
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 SYSTEM SIZE (AC): 7.250 kW @ 240V
 MODULES: 25 X REC SOLAR: REC410AA PURE-R
 MICROINVERTERS: 25 X ENPHASE IQ8PLUS-72-2-US

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





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Greg Albright

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SITE PLAN			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	5/27/2023	A.A.	PV-2

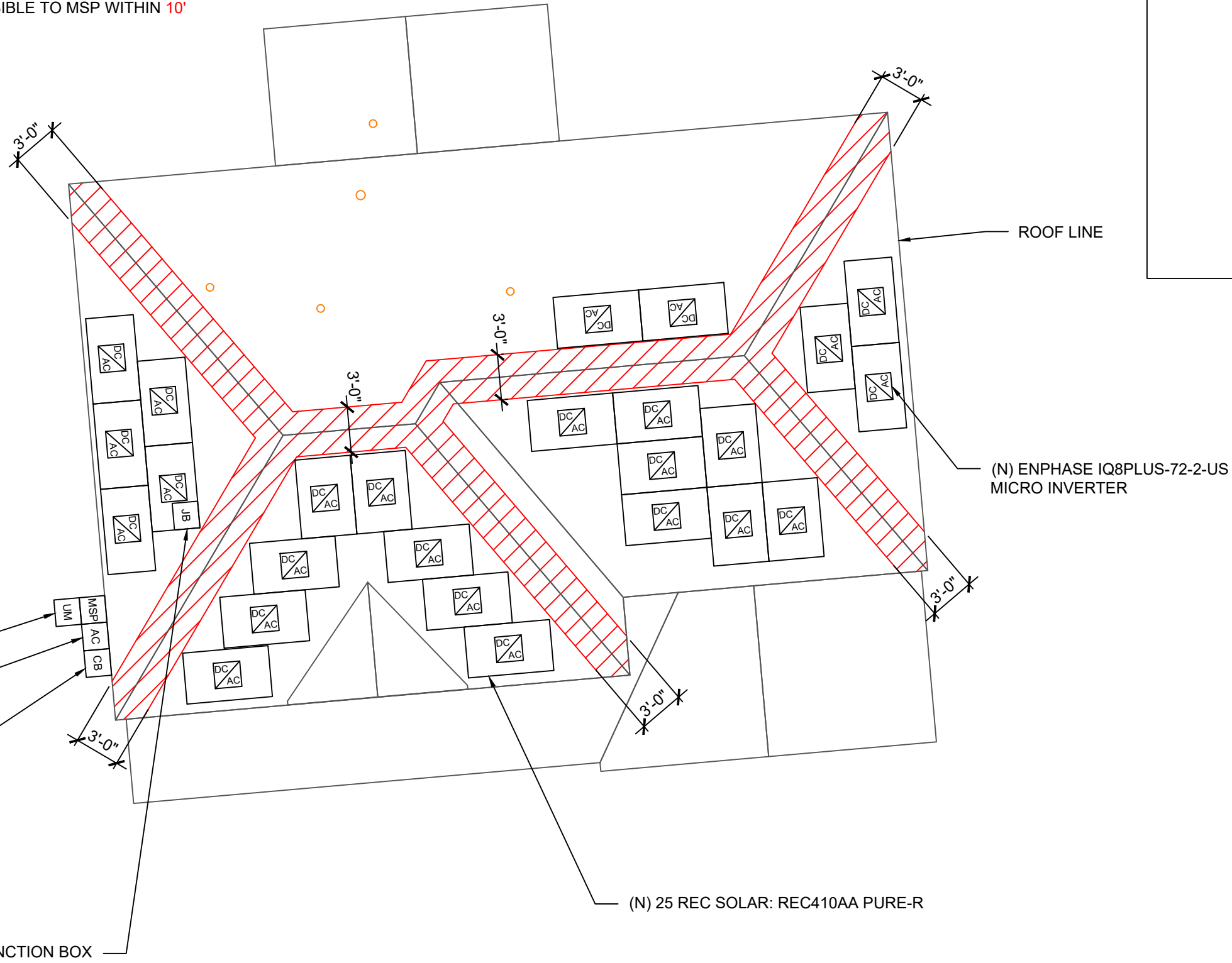
LEGEND:

-  CHIMNEY
-  PIPE VENT
-  ATTACHMENTS
-  MODULES
-  RAFTERS
-  RAIL
-  SETBACK
-  AC DISCONNECT
-  MSP
-  JUNCTION BOX
-  PRODUCTION METER
-  MICRO INVERTER
-  COMBINER BOX

MODIFIED SETBACKS PROPOSED AT RIDGE:
 TOTAL ARRAY AREA = 520.48 SF
 TOTAL ROOF AREA = 2633.12 SF
 TOTAL ARRAY AREA AS A % TO ROOF AREA = 19.77%
 19.77% < 33%

TOTAL ROOF AREA: 2633.12 SQ FT
 TOTAL ARRAY AREA: 520.48 SQ FT
 ARRAY COVERAGE: 19.77%
 SYSTEM DISTRIBUTED WEIGHT: 2.28 LBS
 UNIRAC: FLASHKIT PRO POINT-LOAD: 18.24 LBS

BOS WILL BE AS CLOSE AS POSSIBLE TO MSP WITHIN 10'



PV SYSTEM
 10.250 kW-DC
 7.250 kW-AC

THIS SYSTEM DESIGNED WITH:
 WIND SPEED: 130
 WIND EXPOSURE: B
 SNOW LOAD: 15

- (E) MAIN SERVICE PANEL
- (N) AC DISCONNECT EATON DG222URB (OR EQUIVALENT)
- (N) ENPHASE COMBINER BOX

(N) JUNCTION BOX

ROOF AREA: 2633.12 SQ FT

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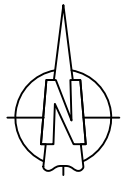


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ROOF PLAN
 SCALE: 1/8" = 1'-0"

1

- NOTES:**
1. EMT CONDUIT ATTACHED TO THE ROOF USING CONDUIT MOUNTS
 2. ATTACHED CLAMPS AT 25% FROM THE EDGE AND 50% FROM THE CENTER OF THE MODULES
 3. JUNCTION BOX IS MOUNTED TO THE RAIL.

ROOF PLAN WITH MODULES LAYOUT

JOB NO: 337821	DATE: 5/27/2023	DESIGNED BY: A.A.	SHEET: PV-2A
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ROOF DETAILS:

TOTAL ROOF AREA: 2633.12 SQ FT
 TOTAL ARRAY AREA: 520.48 SQFT
 ARRAY COVERAGE: 19.77%
 SYSTEM DISTRIBUTED WEIGHT: 2.28 LBS
 UNIRAC: FLASHKIT PRO POINT-LOAD: 18.24 LBS

ROOF AREA STATEMENT

ROOF	MODULE QUANTITY	ROOF PITCH	ARRAY PITCH	AZIMUTH	ROOF AREA	ARRAY AREA
ROOF 1	7	30	30	175	335 SQ FT	145.73 SQ FT
ROOF 2	8	22	22	175	364 SQ FT	166.55 SQ FT
ROOF 3	3	30	30	85	192 SQ FT	62.46 SQ FT
ROOF 4	5	22	22	265	262 SQ FT	104.1 SQ FT
ROOF 5	2	22	22	355	750 SQ FT	41.64 SQ FT
----	----	----	----	----	SQ FT	SQ FT
----	----	----	----	----	SQ FT	SQ FT
----	----	----	----	----	SQ FT	SQ FT
----	----	----	----	----	SQ FT	SQ FT
----	----	----	----	----	SQ FT	SQ FT

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 PURE-R
 MICROINVERTERS: 25 X ENPHASE
 IQ8PLUS-72-2-US

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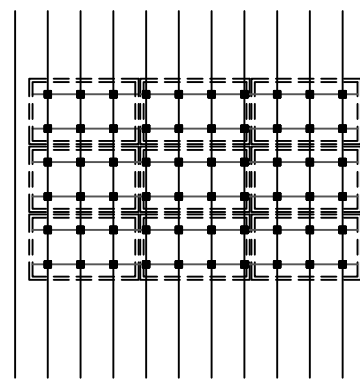
ROOF DETAILS

JOB NO: 337821	DATE: 5/27/2023	DESIGNED BY: A.A.	SHEET: PV-2B
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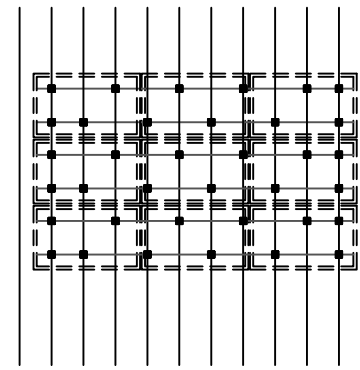
TABLE 1 - ARRAY INSTALLATION

	ROOF PITCH	ROOFING TYPE	ATTACHMENT TYPE	FRAMING TYPE ¹	MAX UNBRACED LENGTH(FT.) ¹	RAFTER/TRUSS SISTERING	PENETRATION PATTERN ²	MAX ATTACHMENT SPACING (IN.) ²	MAX RAIL OVERHANG(I N.) ³
ROOF 1	30	COMP SHINGLE	UNIRAC FLASHKIT PRO	2X4 TRUSS @ 16" OC	6.00'	NOT REQ'D	STAGGERED	48" OC	16"
ROOF 2	22	COMP SHINGLE	UNIRAC FLASHKIT PRO	2X4 TRUSS @ 16" OC	6.00'	NOT REQ'D	STAGGERED	48" OC	16"
ROOF 3	30	COMP SHINGLE	UNIRAC FLASHKIT PRO	2X4 TRUSS @ 16" OC	6.00'	NOT REQ'D	STAGGERED	48" OC	16"
ROOF 4	22	COMP SHINGLE	UNIRAC FLASHKIT PRO	2X4 TRUSS @ 16" OC	6.00'	NOT REQ'D	STAGGERED	48" OC	16"
ROOF 5	22	COMP SHINGLE	UNIRAC FLASHKIT PRO	2X4 TRUSS @ 16" OC	6.00'	NOT REQ'D	STAGGERED	48" OC	16"

1. CONTRACTOR TO VERIFY FRAMING TYPE AND MAX UNBRACED LENGTH PRIOR TO INSTALLATION. IF THE ABOVE INFORMATION DOES NOT MATCH FIELD CONDITIONS, NOTIFY ENGINEER OF RECORD IMMEDIATELY.
2. WHERE COLLAR TIES OR RAFTER SUPPORTS EXIST, CONTRACTOR SHALL USE RAFTERS WITH COLLAR TIES AS ATTACHMENT POINTS.
3. WHERE APPLICABLE FOR RAILED ATTACHMENT INSTALLATIONS.



STACKED DETAIL
For Illustration purposes only

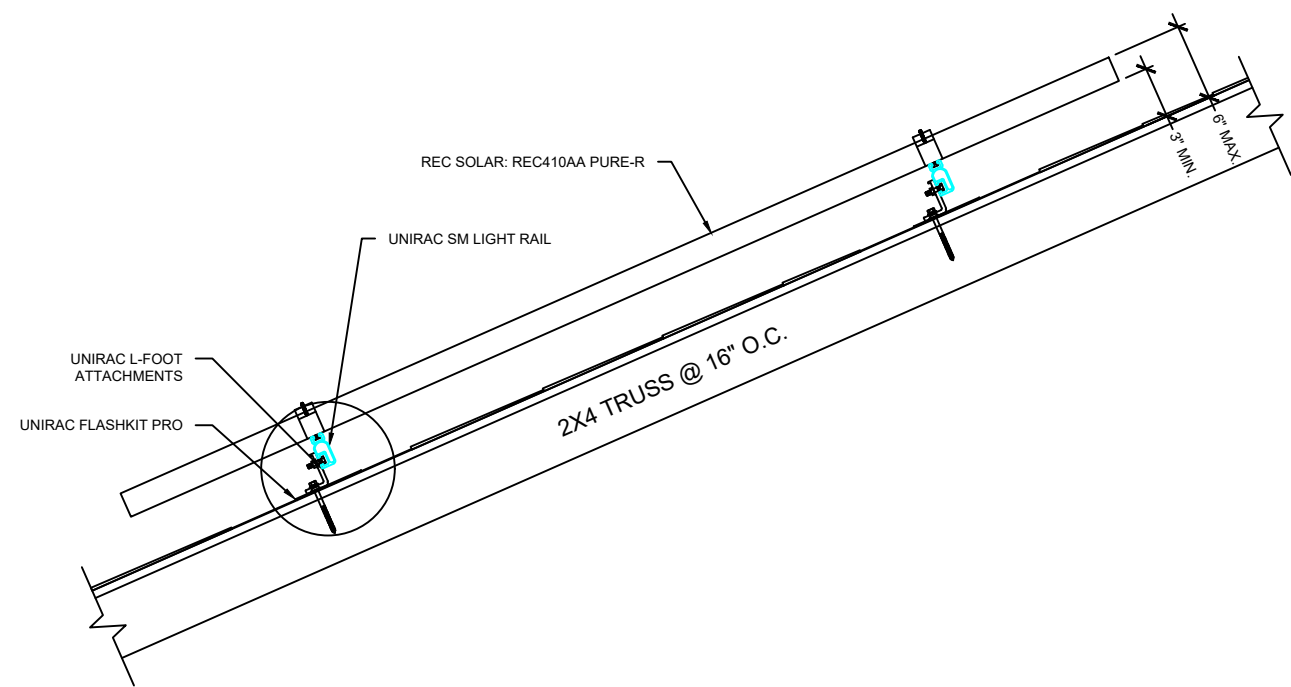


STAGGERED DETAIL
For Illustration purposes only

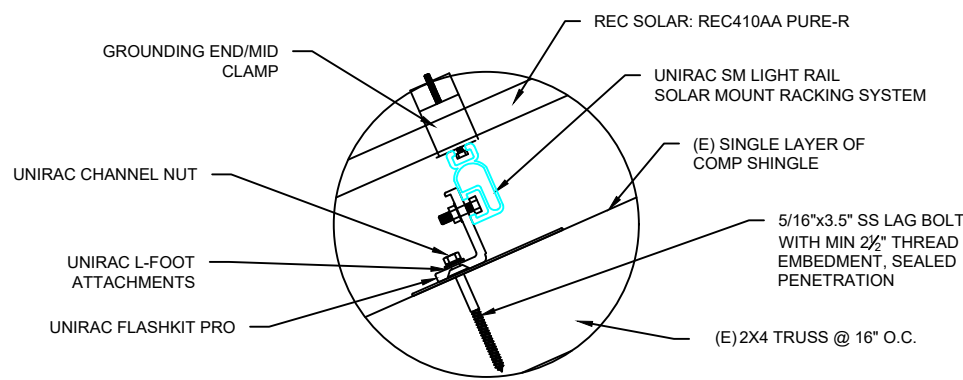
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NC 28390
AHJ: HARNETT COUNTY (NC)
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FINANCE: OTHER

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MODULES: 25 X REC SOLAR: REC410AA
PURE-R
MICROINVERTERS: 25 X ENPHASE
IQ8PLUS-72-2-US

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SOLAR PV ARRAY SECTION VIEW
Scale: NTS



ATTACHMENT DETAIL
Scale: NTS

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415 INDUSTRIAL CT., GREER, SC 29651
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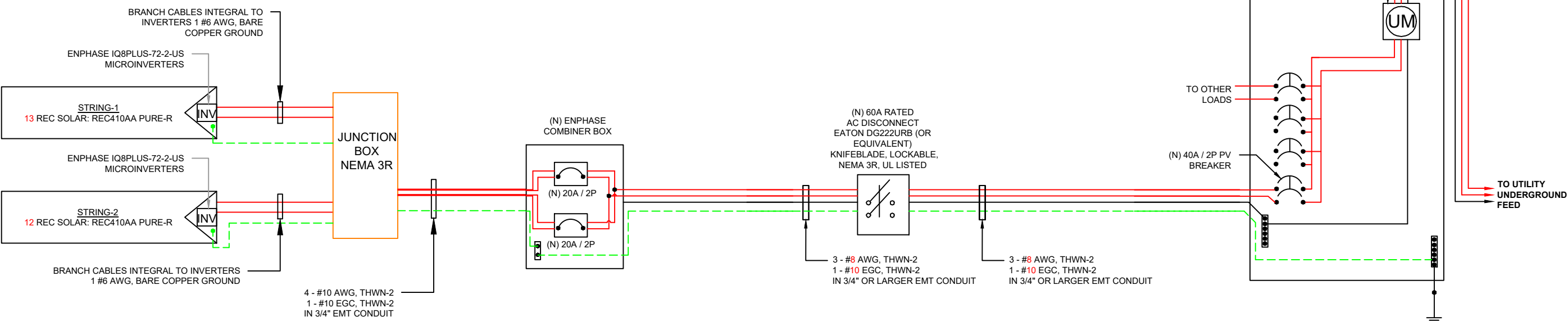
GREG ALBRIGHT

Greg Albright

CONTRACTOR LICENSE:
ELECTRICAL CONTRACTOR U.34043

MOUNTING DETAILS			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	5/27/2023	A.A.	PV-3

BACKFEED BREAKER SIZING					
MAX. CONTINUOUS OUTPUT 30.25A @ 240V					
30.25	X	1.25	=	38AMPS	40A BREAKER - OK



CLIENT:
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PURE-R
MICROINVERTERS: 25 X ENPHASE
IQ8PLUS-72-2-US

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GREG ALBRIGHT

CONTRACTOR LICENSE:
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NOTE:
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ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT
TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS

THREE LINE DIAGRAM			
JOB NO: 337821	DATE: 5/27/2023	DESIGNED BY: A.A.	SHEET: PV-4

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT
690.13(B)

DO NOT DISCONNECT UNDER LOAD
NEC 690.15 (B) & NEC 690.33(D)(2)

WARNING
SINGLE 120-VOLT SUPPLY
DO NOT CONNECT
MULTIWIRE BRANCH CIRCUITS
NEC 710.15(C) & 692.9 (C)

WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM
NEC 705.12(D) & NEC 690.59

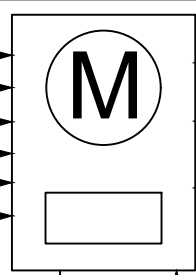
WARNING
TURN OFF PHOTOVOLTAIC
AC DISCONNECT PRIOR TO
WORKING INSIDE PANEL
NEC 110.27(C) & OSHA 1910.145(F)(7)

WARNING
ELECTRICAL SHOCK HAZARD
TERMINALS ON THE LINE AND
LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION
706.15(C)(4) & 690.13(B)

WARNING
THIS EQUIPMENT FED BY
MULTIPLE SOURCES:
TOTAL RATING OF ALL OVERCURRENT
DEVICES EXCLUDING MAIN POWER
SUPPLY SHALL NOT EXCEED
AMPACITY OF BUSBAR
NEC 705.12(B)(3)(3)

WARNING
THE DISCONNECTION OF THE
GROUNDED CONDUCTOR(S)
MAY RESULT IN OVERVOLTAGE
ON THE EQUIPMENT
NEC 690.31(E)

**RAPID SHUTDOWN SWITCH FOR
SOLAR PV SYSTEM**
690.56(C)(3)



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

IFC 605.11.3.1(1) & 690.56(C)

CAUTION
PHOTOVOLTAIC SYSTEM CIRCUIT IS BACKFED
NEC 705.12(D) & NEC 690.59

WARNING
POWER SOURCE OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE.
NEC 705.12(C) & NEC 690.59

WARNING
ARC FLASH AND SHOCK HAZARD
APPROPRIATE PPE REQUIRED

24 INCH FLASH HAZARD BOUNDARY
3 CALORIM? FLASH HAZARD AT 18 INCHES
480 VAC SHOCK HAZARD WHEN COVER IS REMOVED
42 INCH LIMITED APPROACH
12 INCH RESTRICTED APPROACH - 500 V CLASS 00 GLOVES
1 INCH PROHIBITED APPROACH - 500 V CLASS 00 GLOVES
LOCATION: 132 COOPER CREEK AVENUE, SPRING LAKE, NC 28390

NEC 706.15(C) AND NEC 110.16

PHOTOVOLTAIC AC DISCONNECT
NEC 690.13(B)

PHOTOVOLTAIC AC DISCONNECT
RATED AC OUTPUT CURRENT: **30.25A**
NOMINAL OPERATING AC VOLTAGE: **240V**
NEC 690.54

WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM
NEC 705.12(D) & NEC 690.59

SOLAR PV DC CIRCUIT
EVERY 10' ON CONDUIT AND ENCLOSURES
NEC 690.31

PHOTOVOLTAIC POWER SOURCE
EVERY 10' ON CONDUIT AND ENCLOSURES
NEC 690.31(D)(2)

MAXIMUM VOLTAGE **60** V
MAXIMUM CIRCUIT CURRENT **N/A** A
MAX DC-DC CONVERTER OUTPUT CURRENT **15** A

NOTES:

- NEC ARTICLES 690 AND 705 AND IRC SECTION R324 MARKINGS SHOWN HEREON.
- ALL MARKING SHALL CONSIST OF THE FOLLOWING:
 - UV RESISTANT SIGN MATERIAL WITH ENGRAVED OR MACHINE PRINTED LETTERS OR ELECTRO-PLATING.
 - RED BACKGROUND COLOR WHITE TEXT AND LINE WORK.
 - ARIAL FONT.
- ALL SIGNS SHALL BE SIZED APPROPRIATELY AND PLACED IN THE LOCATIONS SPECIFIED. SIGNAGE CANNOT BE HAND-WRITTEN.
- SIGNS SHALL BE ATTACHED TO THE SERVICE EQUIPMENT WITH POP-RIVETS OR SCREWS

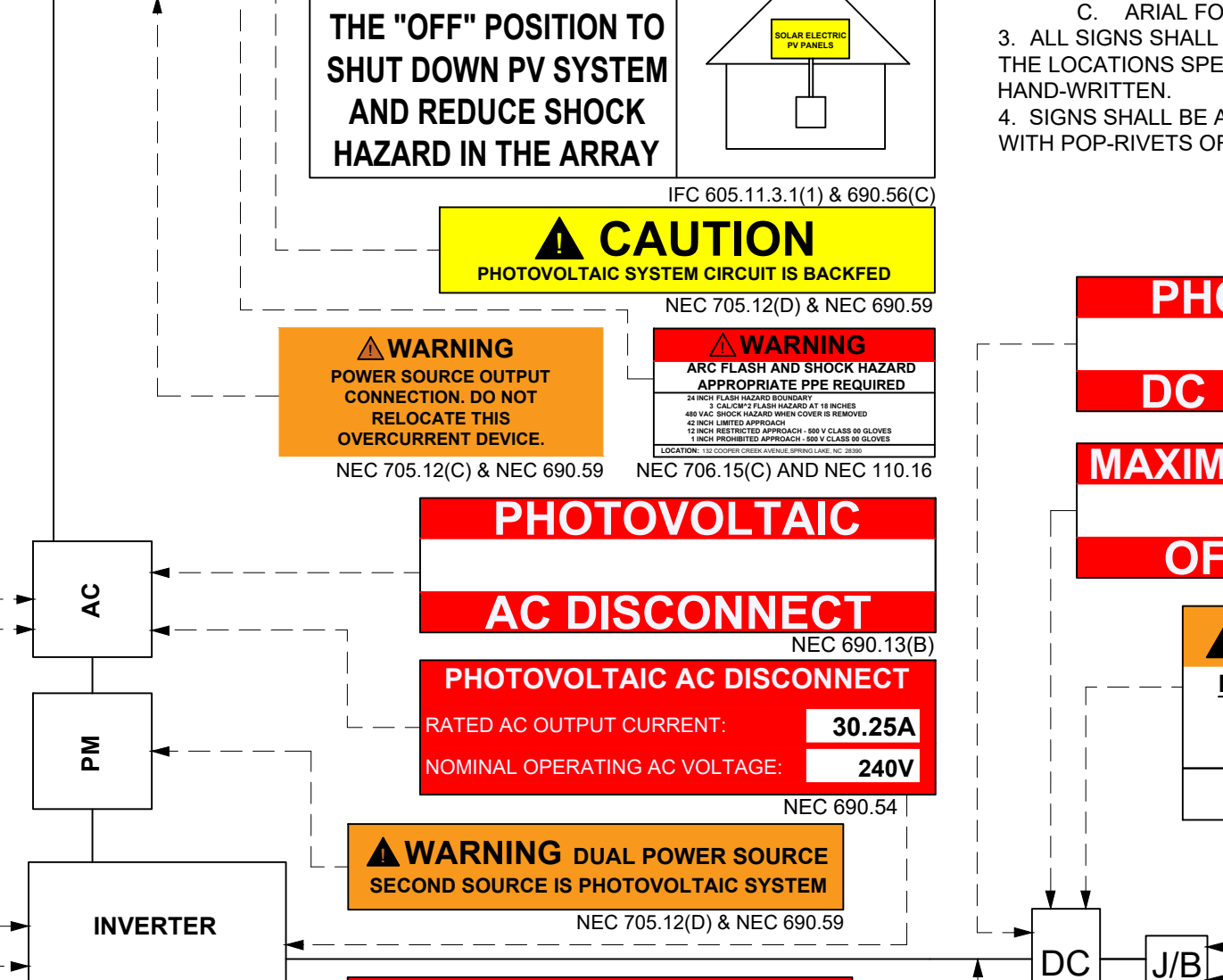
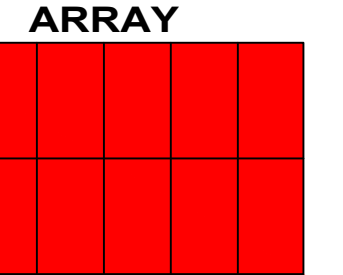
PHOTOVOLTAIC DC DISCONNECT
NEC 690.13(B)

MAXIMUM DC VOLTAGE OF PV SYSTEM
NEC 690.53

WARNING
ELECTRICAL SHOCK HAZARD
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION
DC VOLTAGE IS ALWAYS PRESENT WHEN SOLAR MODULES ARE EXPOSED TO SUNLIGHT
706.15(C)(4) & 690.13(B)

WARNING
ELECTRICAL SHOCK HAZARD
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION
706.15(C)(4) & 690.13(B)

WARNING
TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL
NEC 110.27(C) & OSHA 1910.145(F)(7)



CLIENT:
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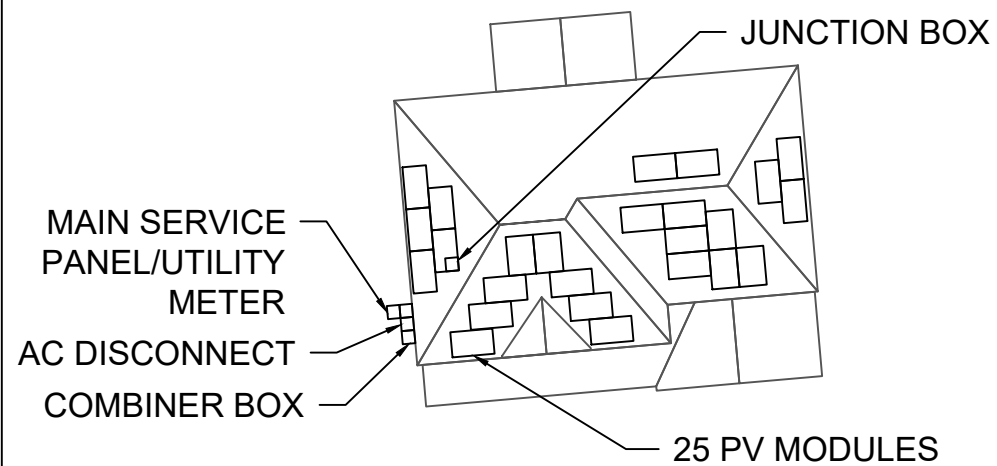
GREG ALBRIGHT

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ELECTRICAL CONTRACTOR U.34043

LABELS			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	5/27/2023	A.A.	PV-7

CAUTION:

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



COOPER CREEK AVENUE

WARNING

TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL



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ELECTRICAL CONTRACTOR U.34043

SITE PLACARD

JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	5/27/2023	A.A.	PV-7A

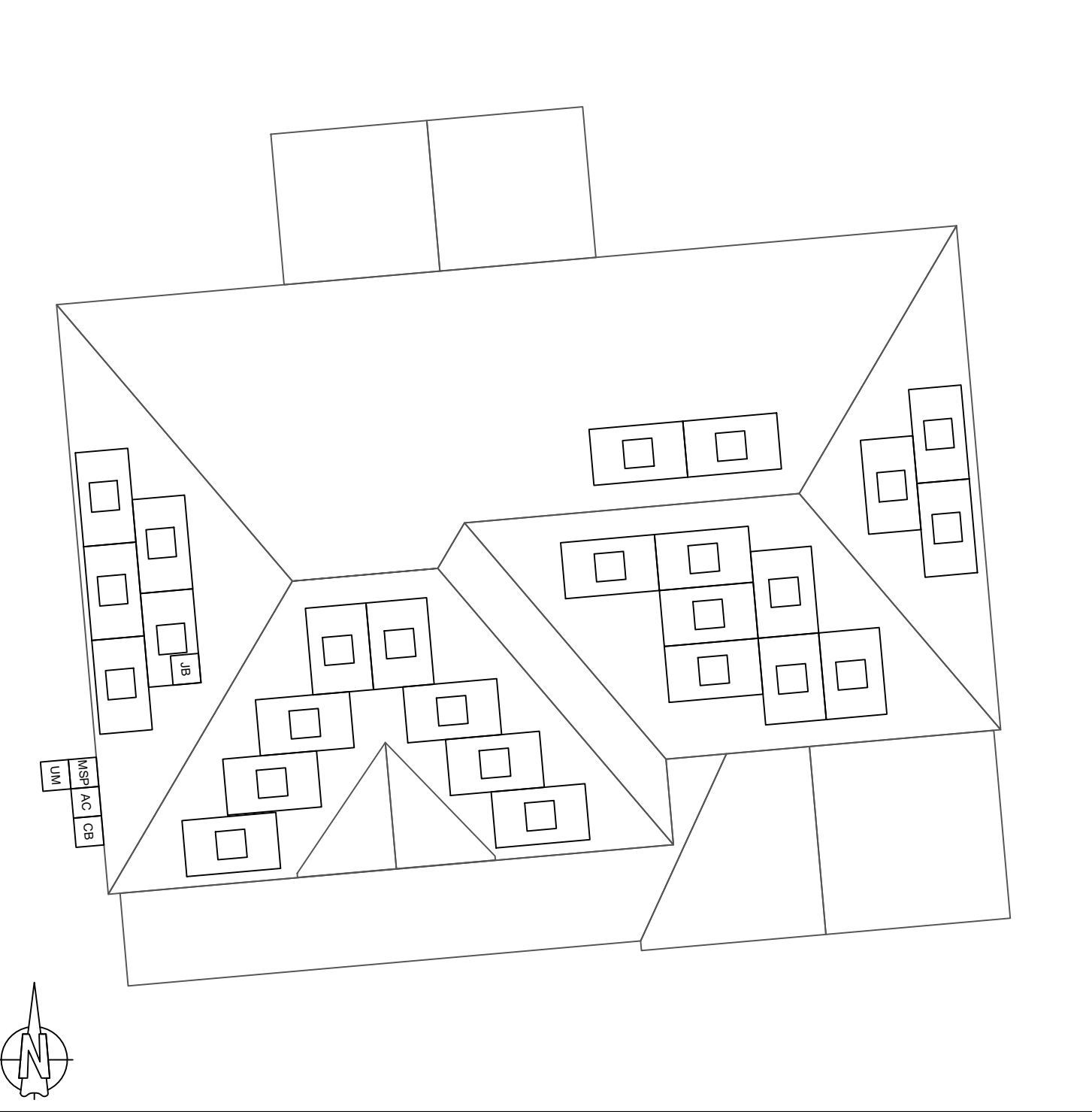
NOTES:

1. NEC ARTICLES 690 AND 705 AND IRC SECTION R324 MARKINGS SHOWN HEREON.
2. ALL MARKING SHALL CONSIST OF THE FOLLOWING:
 - A. UV RESISTANT SIGN MATERIAL WITH ENGRAVED OR MACHINE PRINTED LETTERS OR ELECTRO-PLATING.
 - B. RED BACKGROUND COLOR WHITE TEXT AND LINE WORK.
 - C. AERIAL FONT.
3. ALL SIGNS SHALL BE SIZED APPROPRIATELY AND PLACED IN THE LOCATIONS SPECIFIED. SIGNAGE CANNOT BE HAND-WRITTEN.
4. SIGNS SHALL BE ATTACHED TO THE SERVICE EQUIPMENT WITH POP-RIVETS OR SCREWS.

ENPHASE MICROINVERTER CHART

1-10 11-20 21-30 31-40 41-50 51-60

1
2
3
4
5
6
7
8
9
10



CLIENT:
 TROY HARRIS
 132 COOPER CREEK AVENUE, SPRING LAKE
 NC 28390
 AHJ: HARNETT COUNTY (NC)
 UTILITY: SOUTH RIVER EMC
 METER: 14482581
 PHONE: (407) 704-9388
 EMAIL: TROYHARRIS@HOTMAIL.COM
 FINANCE: OTHER

SYSTEM:
 SYSTEM SIZE (DC): 25 X 410 = 10,250 kW
 SYSTEM SIZE (AC): 7,250 kW @ 240V
 MODULES: 25 X REC SOLAR: REC410AA
 PURE-R
 MICROINVERTERS: 25 X ENPHASE
 IQ8PLUS-72-2-US

REVISIONS		
NO.	REVISED BY	DATE
-	-	-
-	-	-
-	-	-



FREEDOM FOREVER LLC
 415 INDUSTRIAL CT., GREER, SC 29651
 Tel: (800) 385-1075

GREG ALBRIGHT

CONTRACTOR LICENSE:
 ELECTRICAL CONTRACTOR U.34043

MICROINVERTER CHART

JOB NO: 337821	DATE: 5/27/2023	DESIGNED BY: A.A.	SHEET: PV-8
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SAFETY PLAN

MARK UP KEY

INSTRUCTIONS:

- USE SYMBOLS IN KEY TO MARK UP THIS SHEET.
- SAFETY PLAN MUST BE MARKED BEFORE JOB STARTS AS PART OF THE PRE-PLAN
- DOCUMENT ALL ADDITIONAL HAZARDS ON THIS PAGE & MAKE NOTES ON THE JHA SHEET

INCIDENT REPORTING:

INJURIES - CALL INJURY HOTLINE

(855) 400-7233

**If injury is life threatening, call 911 first THEN the Injury Hotline*

NON-INJURIES - USE MOBILE INCIDENT REPORTING

(Auto, Property Damage, Near Miss)



NEAREST OCCUPATIONAL/INDUSTRIAL CLINIC:

NAME: _____

ADDRESS: _____

NEAREST HOSPITAL:

NAME: _____

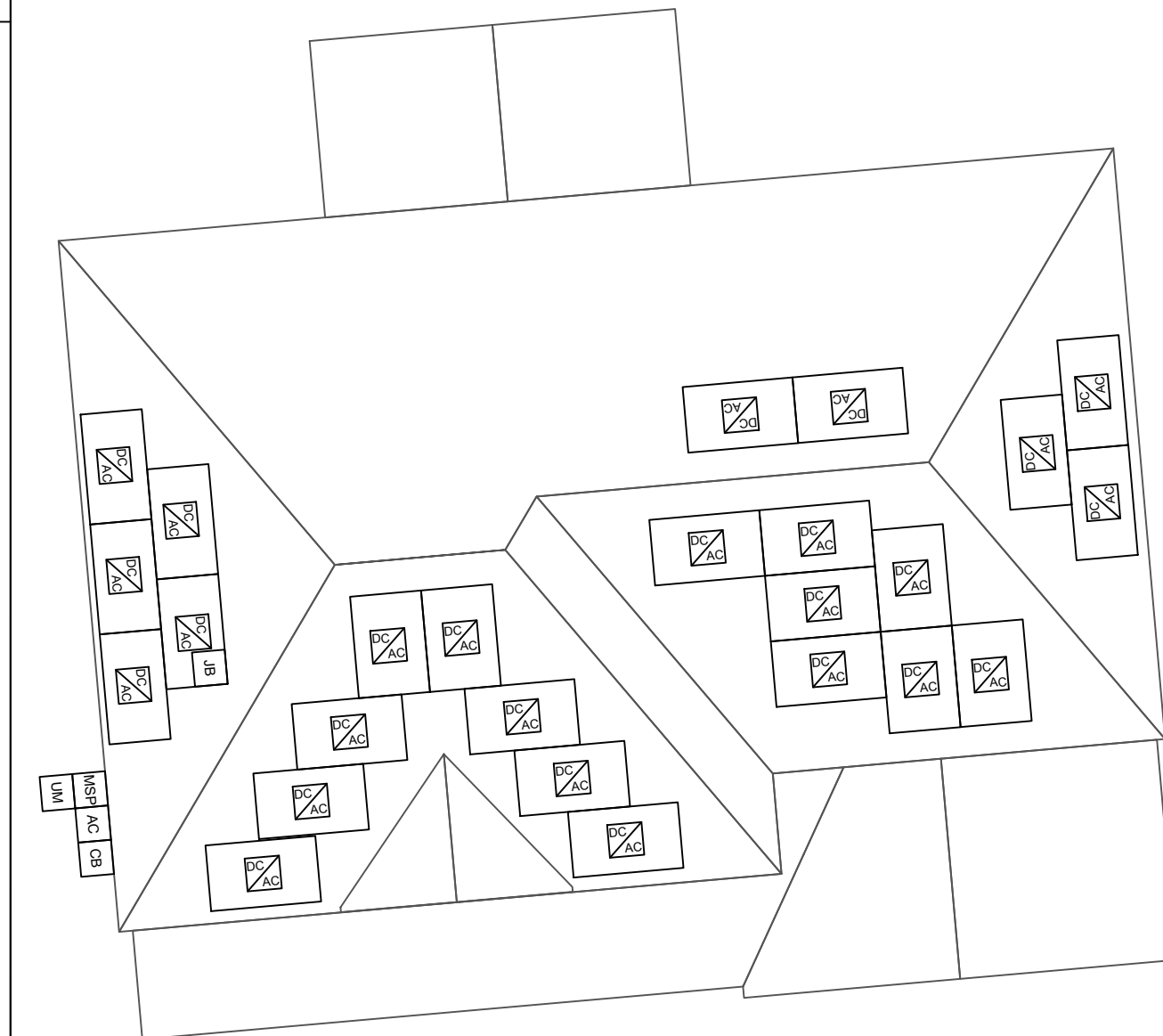
ADDRESS: _____

SAFETY COACH CONTACT INFORMATION:

NAME: _____

PHONE NUMBER: _____

ALL EMPLOYEES ON SITE SHALL BE MADE AWARE OF THE SAFETY PLAN AND SIGN INDICATING THAT THEY ARE AWARE OF THE HAZARDS ON-SITE AND THE PLAN FOR WORKING SAFELY.



- (P)** PERMANENT ANCHOR
- (T)** TEMPORARY ANCHOR
- IL** INSTALLER LADDER
- B** JUNCTION / COMBINER BOX
- S** STUB-OUT
- ⊗** SKYLIGHT
- ☁** NO LADDER ACCESS (STEEP GRADE OR GROUND LEVEL OBSTRUCTIONS)
- RESTRICTED ACCESS
- CONDUIT
- (GAS)** GAS SHUT OFF
- (H₂O)** WATER SHUT OFF
- (7)** SERVICE DROP
- (Z)** POWER LINES

CLIENT:
 TROY HARRIS
 132 COOPER CREEK AVENUE, SPRING LAKE NC 28390
 AHJ: HARNETT COUNTY (NC)
 UTILITY: SOUTH RIVER EMC
 METER: 14482581
 PHONE: (407) 704-9388
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SYSTEM:
 SYSTEM SIZE (DC): 25 X 410 = 10,250 kW
 SYSTEM SIZE (AC): 7,250 kW @ 240V
 MODULES: 25 X REC SOLAR: REC410AA PURE-R
 MICROINVERTERS: 25 X ENPHASE IQ8PLUS-72-2-US

BREAK AND WATER LOG

THIS LOG IS TO BE FILLED OUT ANY TIME THE TEMP EXCEEDS 90 DEGREES. THE CREW LEAD AND ROOF LEAD ARE RESPONSIBLE FOR ENSURING THIS IS COMPLETED AND UPLOADED AT THE END OF EVERYDAY WHEN TEMPS EXCEED 90 DEGREES

REVISIONS		
NO.	REVISED BY	DATE
-	-	-
-	-	-
-	-	-

NAME	SIGNATURE

DATE: _____ TIME: _____

NAME	0800HRS	0900HRS	1000HRS	1100HRS	1200HRS	1300HRS	1400HRS	1500HRS	1600HRS

freedom FOREVER

FREEDOM FOREVER LLC
 415 INDUSTRIAL CT., GREER, SC 29651
 Tel: (800) 385-1075

GREG ALBRIGHT

Greg Albright

CONTRACTOR LICENSE:
 ELECTRICAL CONTRACTOR U.34043

SAFETY PLAN			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
337821	5/27/2023	A.A.	PV-9

FOR INSTALLATION REFERENCE ONLY

SCAN QR CODE TO ACCESS REFERENCE LINK

FREEDOM REFERENCES



INSTALL HOTLINE

PV INSTALLATION REFERENCES



ENPHASE IQ8



SOLAREEDGE HD WAVE



TESLA INVERTER

BATTERY INSTALLATION REFERENCES



TESLA POWERWALL 2



SHIFT/SELF CONSUMPTION



SOLAREEDGE ENERGY BANK



SOLAREEDGE LG RESU (BACKUP)



TESLA POWERWALL+ (BACKUP)

REC ALPHA PURE-R SERIES

PRODUCT SPECIFICATIONS

COMPACT PANEL SIZE

9 A PANEL CURRENT
COMPATIBLE WITH MLPE

430 WP
223 W/M²




LEAD FREE
ROHS COMPLIANT

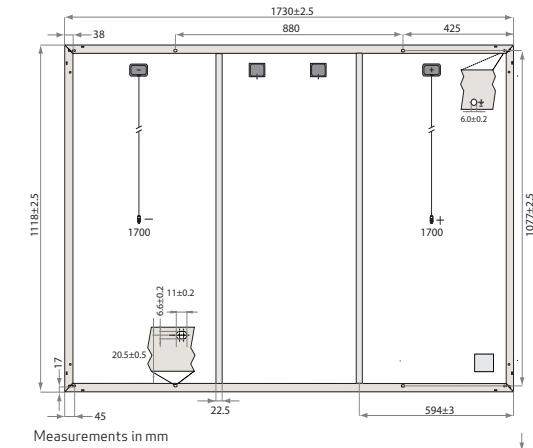
EXPERIENCE

PERFORMANCE

REC ALPHA PURE-R SERIES

PRODUCT SPECIFICATIONS

GENERAL DATA	
Cell type:	80 half-cut REC heterojunction cells with lead-free, gapless technology
Glass:	3.2 mm solar glass with anti-reflective surface treatment in accordance with EN 12150
Backsheet:	Highly resistant polymer (black)
Frame:	Anodized aluminum (black)
Junction box:	4-part, 4 bypass diodes, lead-free IP68 rated, in accordance with IEC 62790
Connectors:	Stäubli MC4 PV-KBT4/KST4 (4 mm ²) in accordance with IEC 62852, IP68 only when connected
Cable:	4 mm ² solar cable, 1.7 + 1.7 m in accordance with EN 50618
Dimensions:	1730 x 1118 x 30 mm (1.93 m ²)
Weight:	21.5 kg
Origin:	Made in Singapore



ELECTRICAL DATA		Product Code*: RECxxxAA Pure-R			
Power Output - P _{MAX} (Wp)	400	410	420	430	
Watt Class Sorting - (W)	0/+10	0/+10	0/+10	0/+10	
Nominal Power Voltage - V _{MPP} (V)	48.8	49.4	50.0	50.5	
Nominal Power Current - I _{MPP} (A)	8.20	8.30	8.40	8.52	
Open Circuit Voltage - V _{OC} (V)	58.9	59.2	59.4	59.7	
Short Circuit Current - I _{SC} (A)	8.80	8.84	8.88	8.91	
Power Density (W/m ²)	207	212	218	223	
Panel Efficiency (%)	20.7	21.2	21.8	22.3	
Power Output - P _{MAX} (Wp)	305	312	320	327	
Nominal Power Voltage - V _{MPP} (V)	46.0	46.6	47.1	47.6	
Nominal Power Current - I _{MPP} (A)	6.64	6.70	6.80	6.88	
Open Circuit Voltage - V _{OC} (V)	55.5	55.8	56.0	56.3	
Short Circuit Current - I _{SC} (A)	7.11	7.16	7.20	7.24	

Values at standard test conditions (STC: air mass AM 1.5, irradiance 1000 W/m², temperature 25°C), based on a production spread with a tolerance of P_{MAX}, V_{OC} & I_{SC} ±3% within one watt class. Nominal module operating temperature (NMOT: air mass AM 1.5, irradiance 800 W/m², temperature 20°C, windspeed 1 m/s). * Where xxx indicates the nominal power class (P_{MAX}) at STC above.

MAXIMUM RATINGS		WARRANTY		
Operational temperature:	-40 ... +85°C		Standard	REC ProTrust
System voltage:	1000 V	Installed by an REC Certified Solar Professional	No	Yes
Test load (front):	+7000 Pa (713 kg/m ²)*	System Size	All	<25 kW 25-500 kW
Test load (rear):	-4000 Pa (407 kg/m ²)*	Product Warranty (yrs)	20	25
Series fuse rating:	25 A	Power Warranty (yrs)	25	25
Reverse current:	25 A	Labor Warranty (yrs)	0	25
		Power in Year 1	98%	98%
		Annual Degradation	0.25%	0.25%
		Power in Year 25	92%	92%

*See installation manual for mounting instructions. Design load = Test load / 1.5 (safety factor)

The REC ProTrust Warranty is only available on panels purchased through an REC Certified Solar Professional installer. Warranty conditions apply. See www.recgroup.com for more details.

Available from:

Founded in 1996, REC Group is an international pioneering solar energy company dedicated to empowering consumers with clean, affordable solar power. As Solar's Most Trusted, REC is committed to high quality, innovation, and a low carbon footprint in the solar materials and solar panels it manufactures. Headquartered in Norway with operational headquarters in Singapore, REC also has regional hubs in North America, Europe, and Asia-Pacific.

CERTIFICATIONS	
IEC 61215:2016, IEC 61730:2016, UL 61730	
IEC 62804	PID
IEC 61701	Salt Mist
IEC 62716	Ammonia Resistance
ISO 11925-2	Ignitability (EN 13501-1 Class E)
IEC 62782	Dynamic Mechanical Load
IEC 61215-2:2016	Hailstone (35mm)
IEC 62321	Lead-free acc. to RoHS EU 863/2015
IEC 61730-2:2016	Fire Class C (as per UL 790)
ISO 14001, ISO 9001, IEC 45001, IEC 62941	

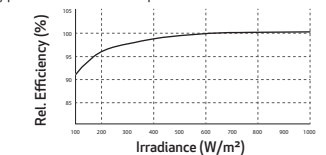


TEMPERATURE RATINGS*	
Nominal Module Operating Temperature:	44°C (±2°C)
Temperature coefficient of P _{MAX} :	-0.24 %/°C
Temperature coefficient of V _{OC} :	-0.24 %/°C
Temperature coefficient of I _{SC} :	0.04 %/°C

*The temperature coefficients stated are linear values

DELIVERY INFORMATION	
Panels per pallet:	33
Panels per 40 ft GP/high cube container:	858 (26 pallets)
Panels per 13.6 m truck:	924 (28 pallets)

LOW LIGHT BEHAVIOUR
Typical low irradiance performance of module at STC:



Ref: PM-DS-12-06-Rev-3.103.23 Specifications subject to change without notice.

REC Solar PTE. LTD.
20 Tuas South Ave. 14
Singapore 637312
post@recgroup.com
www.recgroup.com





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 superfast 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 IQ Battery, 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 Shutdown Equipment and conform with various regulations, when installed according to manufacturer's instructions.

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) and IEEE 1547:2018 (UL 1741-SB 3rd Ed.)

Note:

IQ8 Microinverters cannot be mixed together with previous generations of Enphase microinverters (IQ7 Series, IQ6 Series, etc) in the same system.

*Only when installed with IQ System Controller 2, meets UL 1741.
**IQ8 and IQ8Plus support split-phase, 240V installations only.

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings ¹	W	235 – 350	235 – 440
Module compatibility		60-cell / 120 half-cell	54-cell / 108 half-cell, 60-cell / 120 half-cell, 66-cell / 132 half-cell and 72-cell / 144 half-cell
MPPT voltage range	V	27 – 37	27 – 45
Operating range	V	16 – 48	16 – 58
Min. / Max. start voltage	V	22 / 48	22 / 58
Max. input DC voltage	V	50	60
Max. continuous input DC current	A	10	12
Max. input DC short-circuit current	A		25
Max. module I _{sc}	A		20
Overtoltage class DC port			II
DC port backfeed current	mA		0
PV array configuration		1 x 1 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 ²	V	240 / 211 – 264	
Max. continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	47 – 68	
AC short circuit fault current over 3 cycles	Arms	2	
Max. units per 20 A (L-L) branch circuit ³		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	%	97.7	
CEC weighted efficiency	%	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 (H x W x D)		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, IEEE 1547:2018 (UL 1741-SB 3 rd Ed.), 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 Shutdown 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) Pairing PV modules with wattage above the limit may result in additional clipping losses. See the compatibility calculator at <https://link.enphase.com/module-compatibility>.
(2) Nominal voltage range can be extended beyond nominal if required by the utility. (3) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

Product specifications

Eaton DG222URB

Catalog Number: DG222URB

Eaton General duty non-fusible safety switch, single-throw, 60 A, NEMA 3R, Rainproof, Painted galvanized steel, Two-pole, Two-wire, 240 V

General specifications

Product Name	Catalog Number
Eaton general duty non-fusible safety switch	DG222URB
	UPC
	782113144238

Product Length/Depth	Product Height
7.38 in	14.38 in

Product Width	Product Weight
8.69 in	9 lb

Warranty	Certifications
Eaton Selling Policy 25-000, one (1) year from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first.	UL Listed

	Catalog Notes
	WARNING! Switch is not approved for service entrance unless a neutral kit is installed.



Product specifications

Product Category
General duty safety switch

Enclosure material
Painted galvanized steel

Type
Non-fusible, single-throw

Fuse configuration
Non-fusible

Number of wires
2

Enclosure
NEMA 3R

Voltage rating
240V

Amperage Rating
60A

Number Of Poles
Two-pole

Resources

Catalogs
[Eaton's Volume 2—Commercial Distribution](#)

Multimedia
[Double Up on Safety](#)
[Switching Devices Flex Center](#)

Specifications and datasheets
[Eaton Specification Sheet - DG222URB](#)

Warranty guides
[Selling Policy 25-000 - Distribution and Control Products and Services](#)



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Eaton House
30 Pembroke Road
Dublin 4, Ireland
Eaton.com
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[Eaton.com/socialmedia](https://www.eaton.com/socialmedia)

FLASHKIT PRO



FLASHKIT PRO is the complete attachment solution for composition shingle roofs. Featuring Unirac's patented **SHED & SEAL** technology, a weather proof system which provides the ultimate protection against roof leaks. Kitted in 10 packs for maximum convenience, flashings and hardware are available in Mill or Dark finishes. With **FLASHKIT** pro, you have everything you need for a quick, professional installation.



TRUSTED WATER SEAL FLASHINGS
FEATURING **SHED & SEAL** TECHNOLOGY



YOUR COMPLETE SOLUTION
Flashings, lags, continuous slot L-Feet and hardware



CONVENIENT 10 PACKS
Packaged for speed and ease of handling

FLASHKIT PRO

INSTALLATION GUIDE



FLASHKIT PRO IS THE COMPLETE FLASHING AND ATTACHMENT SOLUTION FOR COMPOSITION ROOFS.



STEP 1
INSTALL **FLASHKIT PRO** FLASHING



STEP 2
INSTALL L-FOOT



STEP 3
ATTACH L-FOOT TO RAIL

PRE-INSTALL

- Locate roof rafters and snap chalk lines to mark the installation point for each roof attachment.
- Drill a 7/32" pilot hole at each roof attachment. Fill each pilot hole with sealant.

STEP 1 INSTALL FLASHKIT PRO FLASHING

- Add a U-shaped bead of roof sealant to the underside of the flashing with the open side of the U pointing down the roof slope. Slide the aluminum flashing underneath the row of shingles directly up slope from the pilot hole as shown. Align the indicator marks on the lower end of the flashing with the chalk lines on the roof to center the raised hole in the flashing over the pilot hole in the roof. When installed correctly, the flashing will extend under the two courses of shingles above the pilot hole.

STEP 2 INSTALL L-FOOT

- Fasten L-foot and Flashing into place by passing the included lag bolt and pre-installed stainless steel-backed EPDM washer through the L-foot EPDM grommet, and the raised hole in the flashing, into the pilot hole in the roof rafter.

- Drive the lag bolt down until the L-foot is held firmly in place. It is normal for the EPDM on the underside of the stainless steel backed EPDM washer to compress and expand beyond the outside edge of the steel washer when the proper torque is applied.

TIP:

- Use caution to avoid over-torquing the lag bolt if using an impact driver.
- Repeat Steps 1 and 2 at each roof attachment point.

STEP 3 ATTACH L-FOOT TO RAIL

- Insert the included 3/8"-16 T-bolts into the lower slot on the Rail (sold separately), spacing the bolts to match the spacing between the roof attachments.
- Position the Rail against the L-Foot and insert the threaded end of the T-Bolt through the continuous slot in the L-Foot. Apply anti-seize to bolt threads to prevent galling of the T-bolt and included 3/8" serrated flange nut. Place the 3/8" flange nut on the T-bolt and finger tighten. Repeat STEP 3 until all L-Feet are secured to the Rail with a T-bolt. Adjust the level and height of the Rail and torque each bolt to 30ft-lbs.

THE COMPLETE ROOF ATTACHMENT SOLUTION

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

FASTER INSTALLATION. 25-YEAR WARRANTY.

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

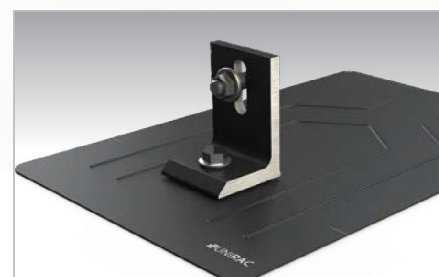
SOLARMOUNT



SOLARMOUNT is the professionals' choice for residential PV mounting applications. Every aspect of the system is designed for an easier, faster installation experience. **SOLARMOUNT** is a complete solution with revolutionary universal clamps, **FLASHKIT PRO**, full system UL 2703 certification and 25-year warranty. Not only is **SOLARMOUNT** easy to install, but best-in-class aesthetics make it the most attractive on any block!



New & Improved:
THE PROFESSIONALS' CHOICE
With Superior Aesthetics



NOW FEATURING FLASHKIT PRO
The Complete Roof Attachment Solution
FEATURING SHED & SEAL TECHNOLOGY



NOW WITH UNIVERSAL MIDCLAMPS
Accommodates 30mm-51mm module frames
One tool, one-person installs are here!



REVOLUTIONARY NEW ENDCLAMPS
Concealed design and included End Caps

THE PROFESSIONALS' CHOICE FOR RESIDENTIAL RACKING

BEST INSTALLATION EXPERIENCE • CURB APPEAL • COMPLETE SOLUTION • UNIRAC SUPPORT

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

SOLARMOUNT



BETTER DESIGNS

TRUST THE INDUSTRY'S BEST DESIGN TOOL

Start the design process for every project in our U-Builder on-line design tool. It's a great way to save time and money.

BETTER SYSTEMS

ONE SYSTEM - MANY APPLICATIONS

Quickly set modules flush to the roof on steep pitched roofs. Orient a large variety of modules in Portrait or Landscape. Tilt the system up on flat or low slow roofs. Components available in mill, clear, and dark finishes to optimize your design financials and aesthetics.

BETTER RESULTS

MAXIMIZE PROFITABILITY ON EVERY JOB

Trust Unirac to help you minimize both system and labor costs from the time the job is quoted to the time your teams get off the roof. Faster installs. Less Waste. More Profits.

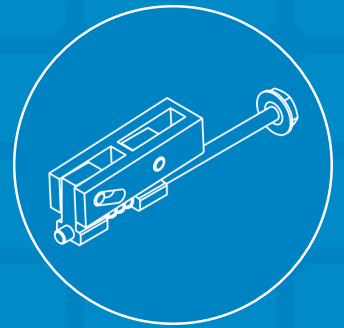
BETTER SUPPORT

WORK WITH THE INDUSTRIES MOST EXPERIENCED TEAM

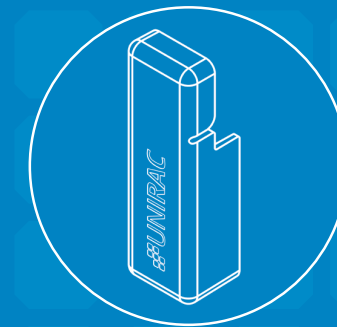
Professional support for professional installers and designers. You have access to our technical support and training groups. Whatever your support needs, we've got you covered. Visit Unirac.com/solarmount for more information.

LISTED UL2703 BONDING & GROUNDING MECHANICAL LOADING SYSTEM FIRE CLASSIFICATION

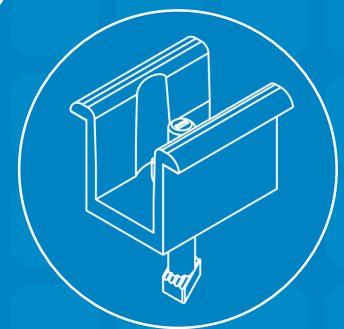
CONCEALED UNIVERSAL ENDCLAMPS



END CAPS INCLUDED WITH EVERY ENDCLAMP



UNIVERSAL SELF-STANDING MIDCLAMPS



U-BUILDER ONLINE DESIGN TOOL SAVES TIME & MONEY
Visit design.unirac.com

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 9001:2008, 14001:2004 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 providing products of exceptional quality. SOLARMOUNT is covered by a 25 year limited product warranty and a 5 year limited finish warranty.

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

PUB2018AUG31 - PRINTED UPDATE FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702



Certificate of Compliance

Certificate: 70131735 **Master Contract:** 266909
Project: 80082031 **Date Issued:** 2021-06-02
Issued To: **Unirac**
1411 Broadway NE
Albuquerque, New Mexico, 87102
United States

Attention: Klaus Nicolaedis

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.

Issued by: *Michael Hoffnagle*
Michael Hoffnagle



PRODUCTS

CLASS - C531302 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems
CLASS - C531382 - POWER SUPPLIES - PHOTOVOLTAICS-PV Racking and clamping systems - Certified to US Standards

Models:	SM	-	SOLARMOUNT Flush-to-Roof is an extruded aluminum rail PV racking system that is installed parallel to the roof in landscape or portrait orientations.
	ULA	-	Unirac Large Array is a ground mount system using the SolarMount (SM) platform for the bonding and grounding of PV modules.

Solarmount



Certificate: 70131735
Project: 80082031

Master Contract: 266909
Date Issued: 2021-06-02

The system listed is designed to provide bonding/grounding, and mechanical stability for photovoltaic modules. The system is secured to the roof with the L-Foot components through the roofing material to building structure. Modules are secured to the racking system with stainless steel or aluminum mid clamps and Aluminum end clamps. The modules are bonded to the racking system with the stainless-steel bonding mid clamps with piercing points. The system is grounded with 10 AWG copper wire to bonding/grounding lugs. Fire ratings of Class A with Type 1, 2, 3, 10, 19, 22 or 25 for steep slope. Tested at 5" interstitial gap which allows installation at any stand-off height.

The grounding of the system is intended to comply with the latest edition of the National Electrical Code, to include NEC 250 & 690. Local codes compliance is required, in addition to national codes. All grounding/bonding connections are to be torqued in accordance with the Installation Manual and the settings used during the certification testing for the current edition of the project report.

The system may employ optimizers/micro-inverters and used for grounding when installed per installation instructions.

UL 2703 Mechanical Load ratings:

Downward Design Load (lb/ft ²)	113.5
Upward Design Load (lb/ft ²)	50.7
Down-Slope Load (lb/ft ²)	16.13

Test Loads:

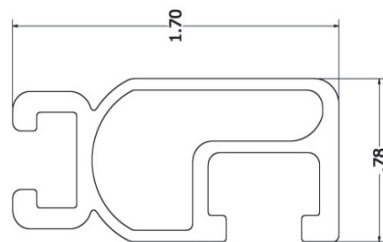
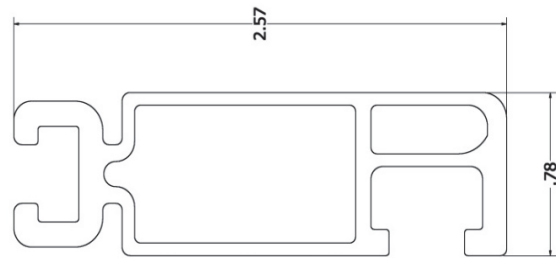
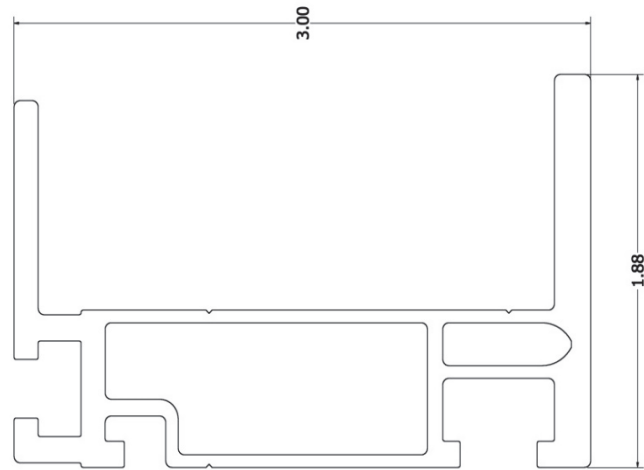
Downward Load (lb/ft ²)	170.20
Upward Load (lb/ft ²)	76.07
Down-Slope Load (lb/ft ²)	24.2

Unirac Large Array

ULA is a ground mount system using the SolarMount (SM) platform for the bonding and grounding of PV modules. ULA aluminum components merge with SM rails and installer-supplied steel pipe. The SM rail system is secured to the horizontal Pipe using the Rail Bracket components. The Rear and Front cap secures the horizontal Pipe to the vertical Pipe. The Front cap is also used to secure the Cross brace. A Slider is attached to the vertical Pipe to secure the Cross brace. The SM rails, caps, slider, rail brackets, and cross braces materials are 6105-T5 aluminum extrusion. Fasteners materials are 304 stainless steel. Horizontal and vertical pipe materials meet the minimum requirements of ASTM A53 for galvanized steel pipe in 2" and 3" diameter.

The mechanical load ratings from the SM test data will be applied to the ULA model.

Fire Testing is not applicable due to being a ground mount system.



Properties	SOLARMOUNT Light	SOLARMOUNT Rail Profile 2	SOLARMOUNT HD	Units
BEAM HEIGHT	1.70	2.57	3.00	in
APPROX WEIGHT	0.491	0.728	1.271	plf
CROSS SECTION AREA	0.409	0.625	1.059	in ²
SECTION MODULUS (X-AXIS)	0.15	0.363	0.898	in ³
SECTION MODULUS (Y-AXIS)	0.067	0.113	0.221	in ³
MOMENT OF INERTIA (X-AXIS)	0.13	0.467	1.45	in ⁴
MOMENT OF INERTIA (Y-AXIS)	0.026	0.045	0.267	in ⁴
RADIUS OF GYRATION (X-AXIS)	0.564	0.865	1.17	in
RADIUS OF GYRATION (Y-AXIS)	0.254	0.269	0.502	in

PAGE H3

Certificate



Certificate no. **US 82160015 01**

License Holder:
Unirac Inc.
1411 Broadway NE
Albuquerque NM 87102
USA

Manufacturing Plant:
Unirac Inc.
1411 Broadway NE
Albuquerque NM 87102
USA

Test report no.: USA- 31440029 005
Tested to: UL 2703:2015

Client Reference: Tom Young

Certified Product: Module Rack Mounting System

License Fee - Units

Model Designation: SolarMount (SM)

7

Max System Voltage of PV Module: 1000 VDC
Max Size of PV Module: 20.8 sq.ft. surface area
Max Overcurrent Protection Rating of PV Module:
30 A when using the qualified grounding lugs;
20 A when using the Enphase micro inverter EGC.

Fire Rating: Class A when installed with
Type 1, Type 2, Type3, or Type 10 fire rated modules.

(continued)

Appendix: 1,1-5

7

Licensed Test mark:



Date of Issue
(day/mo/yr)
27/07/2016



March 28, 2022

Unirac
1411 Broadway Blvd. NE
Albuquerque, NM 87102

Attn.: Unirac - Engineering Department

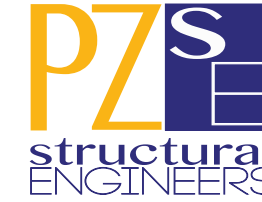
Re: Engineering Certification for the Unirac U-Builder 2.0 SOLARMOUNT Flush Rail

PZSE, Inc. - Structural Engineers has reviewed the Unirac SOLARMOUNT rails, proprietary mounting system constructed from modular parts which is intended for rooftop installation of solar photovoltaic (PV) panels; and has reviewed the U-builder Online tool. This U-Builder software includes analysis for the SOLARMOUNT LIGHT rail, SOLARMOUNT STANDARD rail, and SOLARMOUNT HEAVY DUTY rail with Standard and Pro Series hardware. All information, data and analysis contained within are based on, and comply with the following codes and typical specifications:

1. Minimum Design Loads for Buildings and other Structures, ASCE/SEI 7-05 and ASCE/SEI 7-10
2. 2006-2015 International Building Code, by International Code Council, Inc.
3. 2006-2015 International Residential Code, by International Code Council, Inc.
4. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES.
5. 2015 Aluminum Design Manual, by The Aluminum Association, 2015

Following are typical specifications to meet the above code requirements:

- Design Criteria:** Ground Snow Load = 0 - 100 (psf)
Basic Wind Speed = 85 - 190 (mph)
Roof Mean Height = 0 - 60 (ft)
Roof Pitch = 0 - 45 (degrees)
Exposure Category = B, C & D
- Attachment Spacing:** Per U-builder Engineering report.
- Cantilever:** Maximum cantilever length is $L/3$, where "L" is the span noted in the U-Builder online tool.
- Clearance:** 2" to 10" clear from top of roof to top of PV panel.
- Tolerance(s):** 1.0" tolerance for any specified dimension in this report is allowed for installation.
- Installation Orientation:** See SOLARMOUNT Rail Flush Installation Guide.
Landscape - PV Panel long dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the long side.
Portrait - PV Panel short dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the short side.



Components and Cladding Roof Zones:

The Components and Cladding Roof Zones shall be determined based on ASCE 7-05 and ASCE 7-10 Component and Cladding design.

- Notes:
- 1) U-builder Online tool analysis is only for Unirac SM SOLARMOUNT Rail Flush systems only and do not include roof capacity check.
 - 2) Risk Category II per ASCE 7-10.
 - 3) Topographic factor, k_{zt} is 1.0.
 - 4) Average parapet height is 0.0 ft.
 - 5) Wind speeds are LRFD values.
 - 6) Attachment spacing(s) apply to a seismic design category E or less.

Design Responsibility:

The U-Builder design software is intended to be used under the responsible charge of a registered design professional where required by the authority having jurisdiction. In all cases, this U-builder software should be used under the direction of a design professional with sufficient structural engineering knowledge and experience to be able to:

- Evaluate whether the U-Builder Software is applicable to the project, and
- Understand and determine the appropriate values for all input parameters of the U-Builder software.

This letter certifies that the Unirac SM SOLARMOUNT Rails Flush, when installed according to the U-Builder engineering report and the manufacture specifications, is in compliance with the above codes and loading criteria.

This certification excludes evaluation of the following components:

- 1) The structure to support the loads imposed on the building by the array; including, but not limited to: strength and deflection of structural framing members, fastening and/or strength of roofing materials, and/or the effects of snow accumulation on the structure.
- 2) The attachment of the SM SOLARMOUNT Rails to the existing structure.
- 3) The capacity of the solar module frame to resist the loads.

This requires additional knowledge of the building and is outside the scope of the certification of this racking system.

If you have any questions on the above, do not hesitate to call.

Prepared by:
PZSE, Inc. – Structural Engineers
Roseville, CA

