

# ROOF MOUNT PHOTOVOLTAIC SYSTEM

## CODES:

THIS PROJECT COMPLIES WITH THE FOLLOWING:  
2020 7TH EDITION FLORIDA BUILDING CODE: BUILDING  
2020 7TH EDITION FLORIDA BUILDING CODE: RESIDENTIAL  
2020 7TH EDITION FLORIDA BUILDING CODE: MECHANICAL  
2020 7TH EDITION FLORIDA BUILDING CODE: PLUMBING  
2020 7TH EDITION FLORIDA BUILDING CODE: FUEL GAS  
2020 7TH EDITION FLORIDA BUILDING CODE: ENERGY CONSERVATION  
2020 7TH EDITION FLORIDA BUILDING CODE: EXISTING BUILDING  
2020 7TH EDITION FLORIDA BUILDING CODE: ACCESSIBILITY  
2020 7TH EDITION FLORIDA FIRE PREVENTION CODE  
2017 NATIONAL ELECTRIC CODE  
AS ADOPTED BY COLUMBIA COUNTY (FL)

## 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 AC SEC 250.166(A).

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

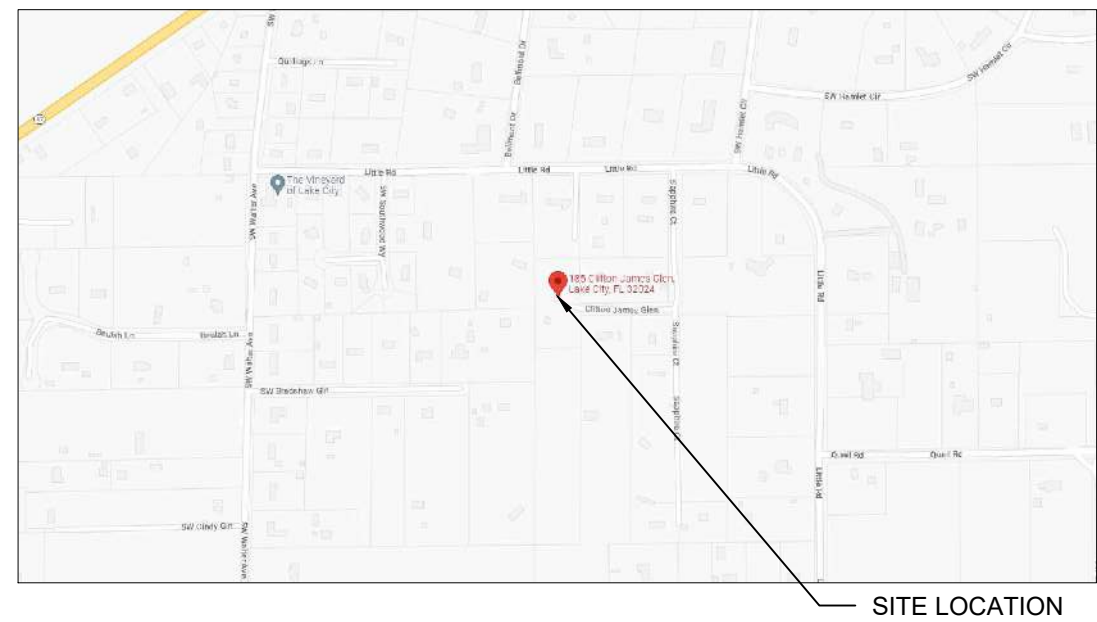
THE MAIN SERVICE PANEL WILL BE EQUIPPED WITH A GROUND ROD OR UFER

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

SOLAREEDGE OPTIMIZERS ARE LISTED TO IEC 62109-1 (CLASS II SAFETY) AND UL 1741 STANDARDS

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

## VICINITY MAP:



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Joungho Choi, PE on the date/or time stamp shown  
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Joungho Choi Digitally signed by Joungho Choi  
Date: 2023.02.17 04:58:09 -05'00'



CLIENT:  
DOUNG-TA LITTLE  
185 CLIFTON JAMES GLEN, LAKE CITY, FL  
32024  
AHJ: COLUMBIA COUNTY (FL)  
UTILITY: "CLAY ELECTRIC COOPERATIVE,  
INC."  
METER: 154741527  
PHONE: (386) 365-6053  
EMAIL: PRL185@LIVE.COM  
FINANCE: OTHER


SYSTEM:  
SYSTEM SIZE (DC): 32 X 400 = 12.800 kW  
SYSTEM SIZE (AC): 10.000 kW @ 240V  
MODULES: 32 X FREEDOM FOREVER:  
FF-MP-BBB-400  
OPTIMIZERS: 32 X SOLAREEDGE S440  
INVERTER: SOLAREEDGE SE10000H-USRGM  
[S11]


REVISIONS		
NO.	REVISED BY	DATE
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-	-	-


  
FREEDOM FOREVER LLC  
2619 CONSULATE DR SUITE 800, ORLANDO,  
FL 32819  
Tel: (800) 385-1075  
GREG ALBRIGHT  
  
CONTRACTOR LICENSE:  
CERTIFIED ELECTRICAL CONTRACTOR  
EC13008056


SITE LOCATION			
JOB NO: 303737	DATE: 2/16/2023	DESIGNED BY: W.K.	SHEET: PV-1


LEGEND:

 CHIMNEY

 PIPE VENT

 MODULES

 CONDUIT

 SETBACK

AC

AC DISCONNECT

JB

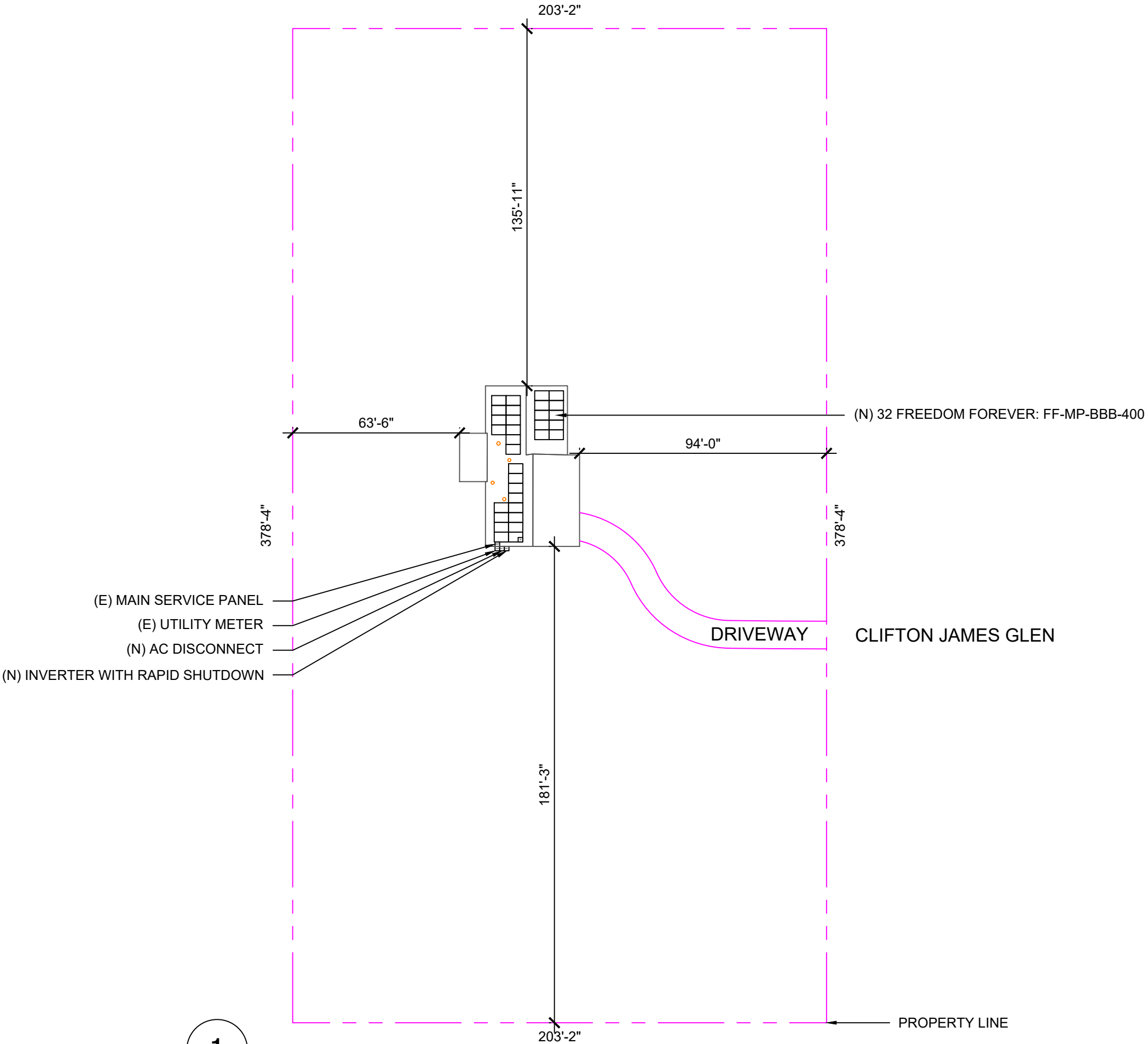
JUNCTION BOX

INV

INVERTER

MSP

MAIN SERVICE PANEL



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ROOF AREA: 2320 SQ FT

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AHJ: COLUMBIA COUNTY (FL)  
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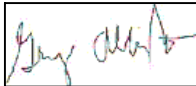
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SITE PLAN


JOB NO:	DATE:	DESIGNED BY:	SHEET:
303737	2/16/2023	W.K.	PV-2


LEGEND:

 CHIMNEY

 PIPE VENT

 MODULES

 CONDUIT

 SETBACK

AC

AC DISCONNECT

JB

JUNCTION BOX

INV

INVERTER

MSP

MAIN SERVICE PANEL

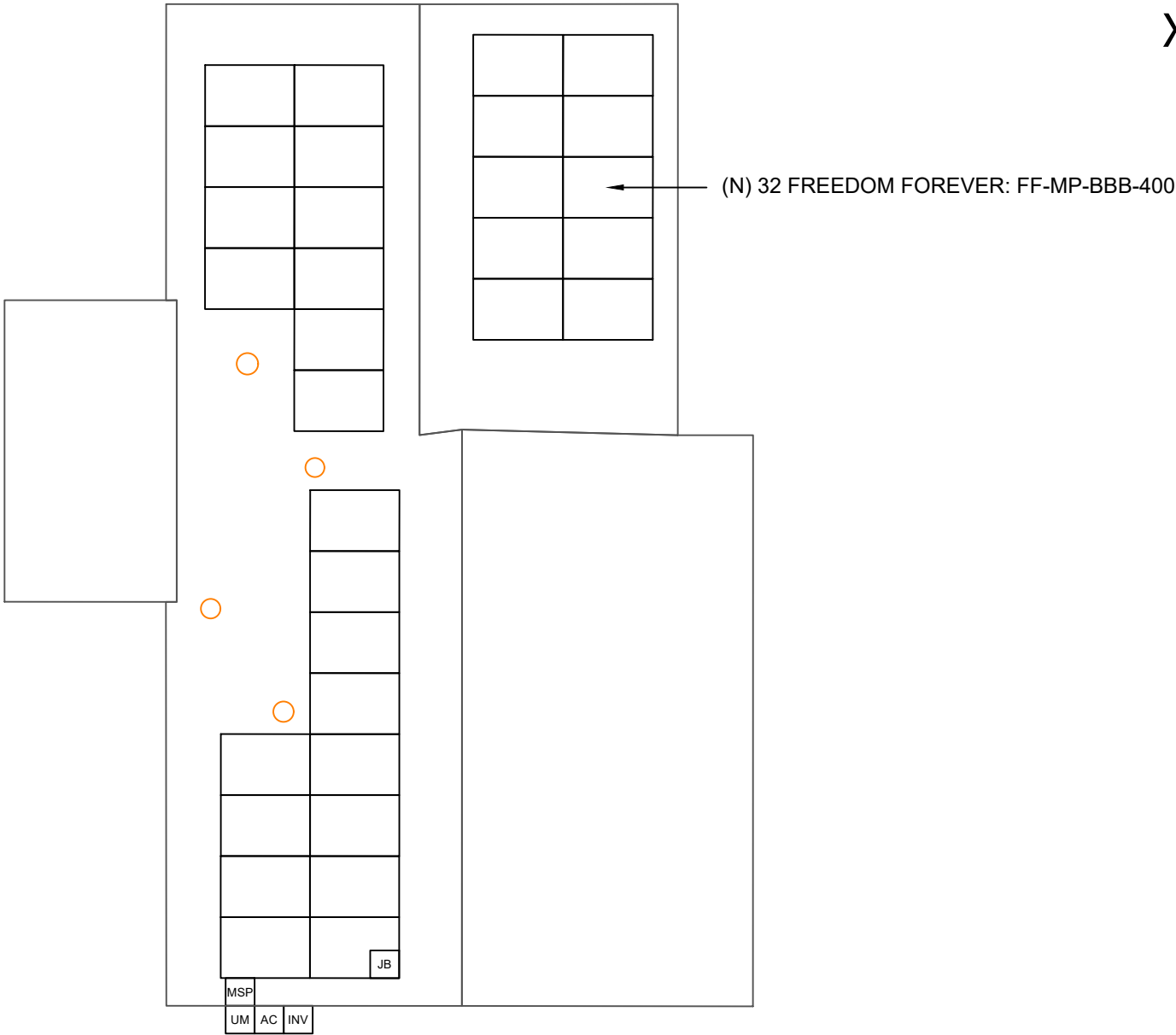
TOTAL ROOF AREA: 2320 SQ FT  
TOTAL ARRAY AREA: 672.62 SQ FT  
ARRAY COVERAGE: 28.99%  
SYSTEM DISTRIBUTED WEIGHT: 2.32 LBS  
S-5!: PROTEA POINT-LOAD: 12.09 LBS

Digitally signed  
Xiaojian Xie  
Date: 2023.02.  
23:28:59 -05'00

Structural Components Only



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ROOF PLAN WITH MODULES LAYOUT

JOB NO: 303737	DATE: 2/16/2023	DESIGNED BY: W.K.	SHEET: PV-2A
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ROOF PLAN  
SCALE: 1"=10'

1

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

ROOF DETAILS:

TOTAL ROOF AREA: 2320 SQ FT  
TOTAL ARRAY AREA: 672.62 SQFT  
ARRAY COVERAGE: 28.99%  
SYSTEM DISTRIBUTED WEIGHT: 2.32 LBS  
S-5I: PROTEA POINT-LOAD: 12.09 LBS

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ROOF AREA STATEMENT						
ROOF	MODULE QUANTITY	ROOF PITCH	ARRAY PITCH	AZIMUTH	ROOF AREA	ARRAY AREA
ROOF 1	10	15	15	90	424 SQ FT	210.19 SQ FT
ROOF 2	22	15	15	270	1061 SQ FT	462.43 SQ FT
----	----	----	----	----	SQ FT	SQ FT
----	----	----	----	----	SQ FT	SQ FT
----	----	----	----	----	SQ FT	SQ FT
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----	----	----	----	----	SQ FT	SQ FT
----	----	----	----	----	SQ FT	SQ FT

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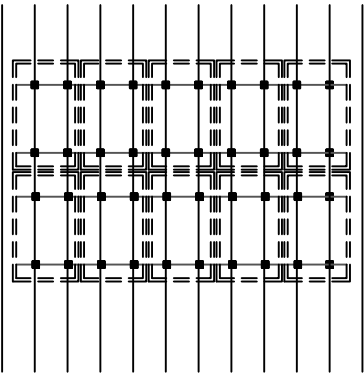
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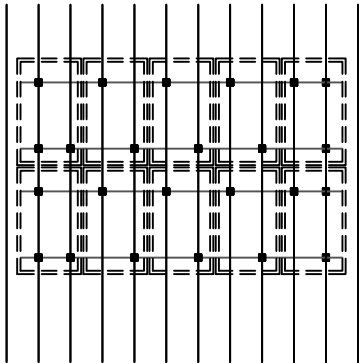
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ROOF DETAILS			
JOB NO: 303737	DATE: 2/16/2023	DESIGNED BY: W.K.	SHEET: PV-2B

TABLE 1 - ARRAY INSTALLATION									
	ROOF PITCH	ROOFING TYPE	ATTACHMENT TYPE	FRAMING TYPE1	MAX UNBRACED LENGTH(FT.)1	RAFTER/TRUSS SISTERING	PENETRATION PATTERN2	MAX ATTACHMENT SPACING (IN.)2	MAX RAIL OVERHANG(IN.) 3
ROOF 1	15	METAL	S-5 PROTEABRACKET	2X4 RAFTER @ 24" OC	5.00'	NOT REQ'D	STAGGERED	48" OC	16"
ROOF 2	15	METAL	S-5 PROTEABRACKET	2X4 RAFTER @ 24" OC	5.00'	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  
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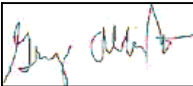
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OPTIMIZERS: 32 X SOLAREEDGE S440  
INVERTER: SOLAREEDGE SE10000H-USRGM [SI1]

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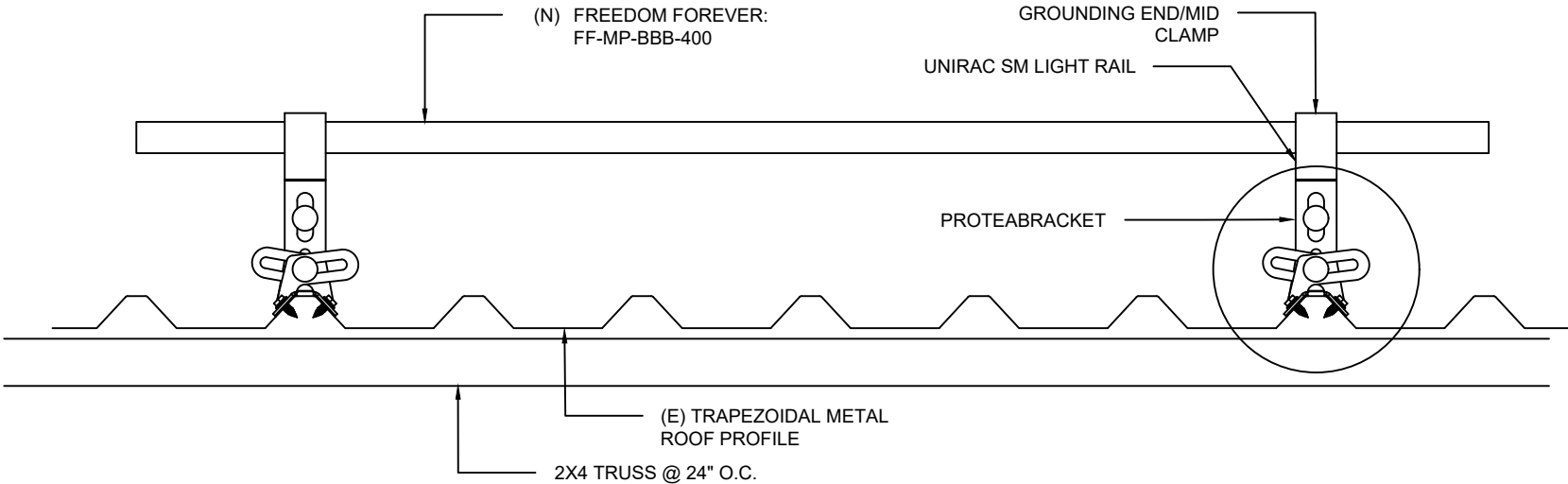
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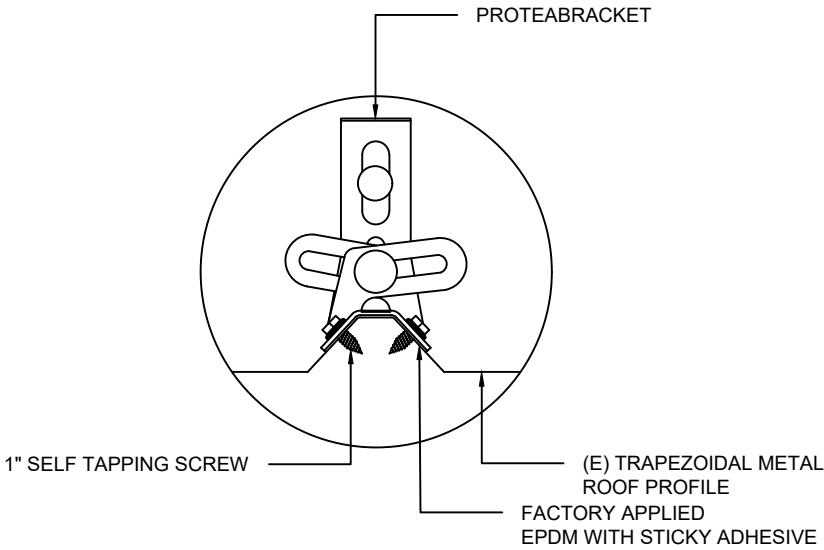
CONTRACTOR LICENSE:  
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EC13008056

MOUNTING DETAILS

JOB NO: 303737	DATE: 2/16/2023	DESIGNED BY: W.K.	SHEET: PV-3
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SOLAR PV ARRAY SECTION VIEW  
Scale: NTS



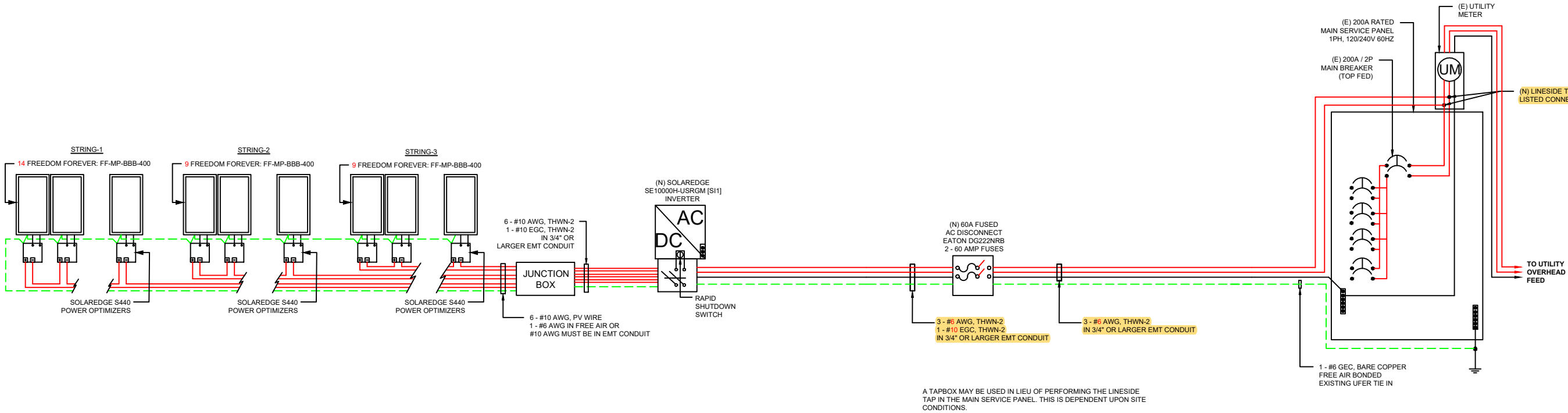
ATTACHMENT DETAIL  
Scale: NTS



BACKFEED FUSE SIZING					
MAX. CONTINUOUS OUTPUT 42.00A @ 240V					
42.00	X	1.25	=	53AMPS	60A FUSES - OK



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OPTIMIZERS: 32 X SOLAREdge S440  
INVERTER: SOLAREdge SE10000H-USRGM [Si1]

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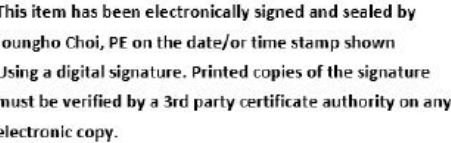
GREG ALBRIGHT

*Greg Albright*

CONTRACTOR LICENSE:  
CERTIFIED ELECTRICAL CONTRACTOR  
EC13008056

THREE LINE DIAGRAM

JOB NO: 303737	DATE: 2/16/2023	DESIGNED BY: W.K.	SHEET: PV-4
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## CONDUCTOR AMPACITY CALCULATIONS IN ACCORDANCE WITH AC 690.8.

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FINANCE: OTHER

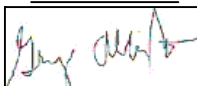
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OPTIMIZERS: 32 X SOLAREEDGE S440  
INVERTER: SOLAREEDGE SE10000H-USRGM  
[S11]

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**freedom**  
FOREVER

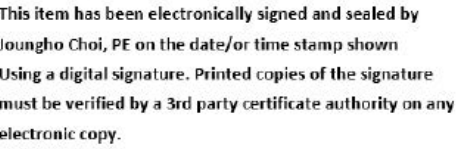
**FREEDOM FOREVER LLC**  
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FL 32819  
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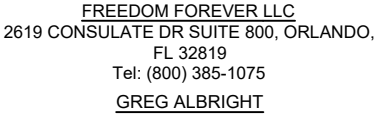
**CONDUCTOR CALCULATIONS**

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<b>DESIGNED BY:</b> W.K.	<b>SHEET:</b> PV-5			

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 [SI1]

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**CONTRACTOR LICENSE:**  
**CERTIFIED ELECTRICAL CONTRACTOR**  
**EC13008056**

## EQUIPMENT & SERVICE LIST

JOB NO:	DATE:	DESIGNED BY:	SHEET:
303737	2/16/2023	W.K.	PV-6

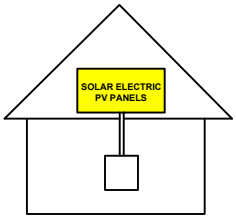


**WARNING:**  
POWER SOURCE OUTPUT  
CONNECTION  
DO NOT RELOCATE THIS  
OVERCURRENT DEVICE.

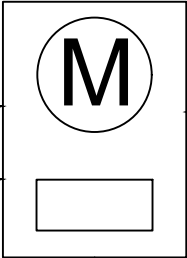
705.12(B)(2)(3)(b)

**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



690.56(C)(1)(A)

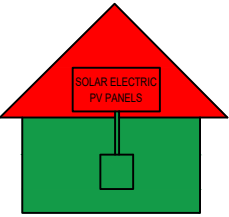


**"WARNING"**  
DUAL POWER SOURCES  
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM  
RATED AC OUTPUT CURRENT - 42.00 AMPS  
AC NORMAL OPERATING VOLTAGE - 240 VOLTS

690.54

**EMERGENCY RESPONDER  
THIS SOLAR PV SYSTEM EQUIPPED  
WITH RAPID SHUTDOWN**

TURN RAPID SHUTDOWN  
SWITCH TO THE "OFF"  
POSITION.  
ONLY CONDUCTORS INSIDE  
BUILDING OR OFF THE  
ROOF WILL SHUT DOWN



NFPA 11.12.2.1.1.1.2

**PV SYSTEM AC DISCONNECT  
RATED AC OUTPUT CURRENT - 42.00 AMPS  
AC NORMAL OPERATING VOLTAGE - 240 VOLTS**

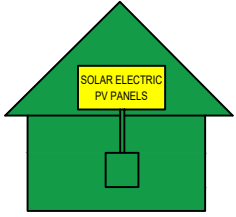
690.15, 690.54

**RAPID SHUTDOWN SWITCH FOR  
SOLAR PV SYSTEM**

690.56(C)(3)

**EMERGENCY RESPONDER  
THIS SOLAR PV SYSTEM EQUIPPED  
WITH RAPID SHUTDOWN**

TURN RAPID SHUTDOWN  
SWITCH TO THE "OFF"  
POSITION TO SHUT DOWN  
ENTIRE PV SYSTEM



NFPA 11.12.2.1.1.1.1

AC

INVERTER

If you have any questions about your system, please call  
our Customer Support Team at  
**888.557.6431**  
or visit [freedomforever.com/customer-service](https://freedomforever.com/customer-service)

This solar PV system was installed by

 **freedom**  
FOREVER

\*Freedom Forever is a Freedom contractor in all states it operates in. For more information visit [freedomforever.com/terms](https://freedomforever.com/terms)

**NOTES:**

1. AC 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. ARIAL 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



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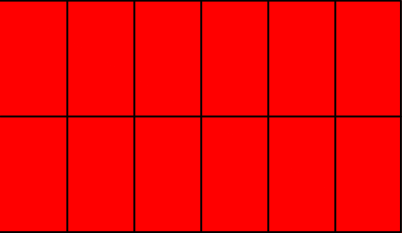
**"WARNING"**  
ELECTRICAL SHOCK HAZARD.  
TERMINALS ON BOTH LINE AND LOAD SIDES  
MAY BE ENERGIZED IN THE OPEN POSITION.

690.13 (B)

**PV SYSTEM DC DISCONNECT  
MAXIMUM VOLTAGE: 480V  
MAXIMUM CIRCUIT CURRENT: 27A  
MAX RATED OUTPUT CURRENT OF  
THE CONTROLLER OR DC-TO-DC  
CONVERTER: 15A**

690.53

**ARRAY**



AC 690.31(G)(3) & (4)

**"WARNING"**  
PHOTOVOLTAIC POWER SOURCE

EVERY 10' ON CONDUIT AND ENCLOSURES

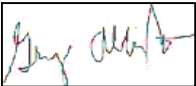
CLIENT:  
DOUNG-TA LITTLE  
185 CLIFTON JAMES GLEN, LAKE CITY, FL  
32024  
AHJ: COLUMBIA COUNTY (FL)  
UTILITY: "CLAY ELECTRIC COOPERATIVE,  
INC."  
METER: 154741527  
PHONE: (386) 365-6053  
EMAIL: PRL185@LIVE.COM  
FINANCE: OTHER

SYSTEM:  
SYSTEM SIZE (DC): 32 X 400 = 12.800 kW  
SYSTEM SIZE (AC): 10.000 kW @ 240V  
MODULES: 32 X FREEDOM FOREVER:  
FF-MP-BBB-400  
OPTIMIZERS: 32 X SOLAREEDGE S440  
INVERTER: SOLAREEDGE SE10000H-USRGM  
[S11]

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



FREEDOM FOREVER LLC  
2619 CONSULATE DR SUITE 800, ORLANDO,  
FL 32819  
Tel: (800) 385-1075  
GREG ALBRIGHT



CONTRACTOR LICENSE:  
CERTIFIED ELECTRICAL CONTRACTOR  
EC13008056

LABELS			
JOB NO: 303737	DATE: 2/16/2023	DESIGNED BY: W.K.	SHEET: PV-7

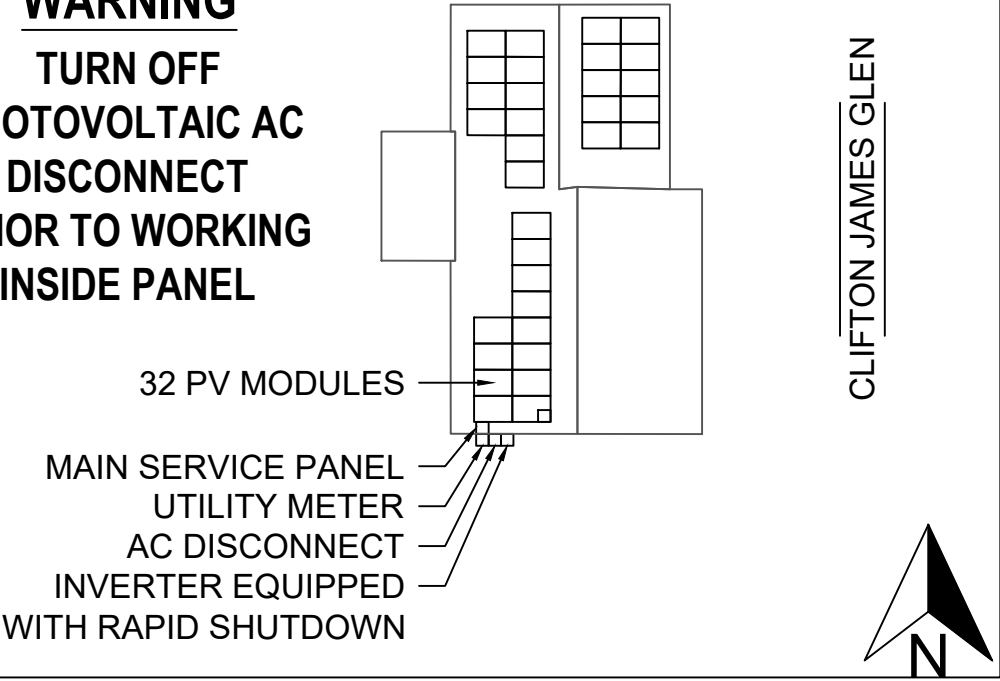


This item has been electronically signed and sealed by  
Jounggho Choi, PE on the date/or time stamp shown  
Using a digital signature. Printed copies of the signature  
must be verified by a 3rd party certificate authority on any  
electronic copy.

# CAUTION:

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

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




## NOTES:

- AC 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.
  - AERIAL 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.


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[S11]

REVISIONS		
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EC13008056

SITE PLACARD			
JOB NO: 303737	DATE: 2/16/2023	DESIGNED BY: W.K.	SHEET: PV-7A

SOLAREEDGE OPTIMIZER CHART

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

1

2

3

4

5

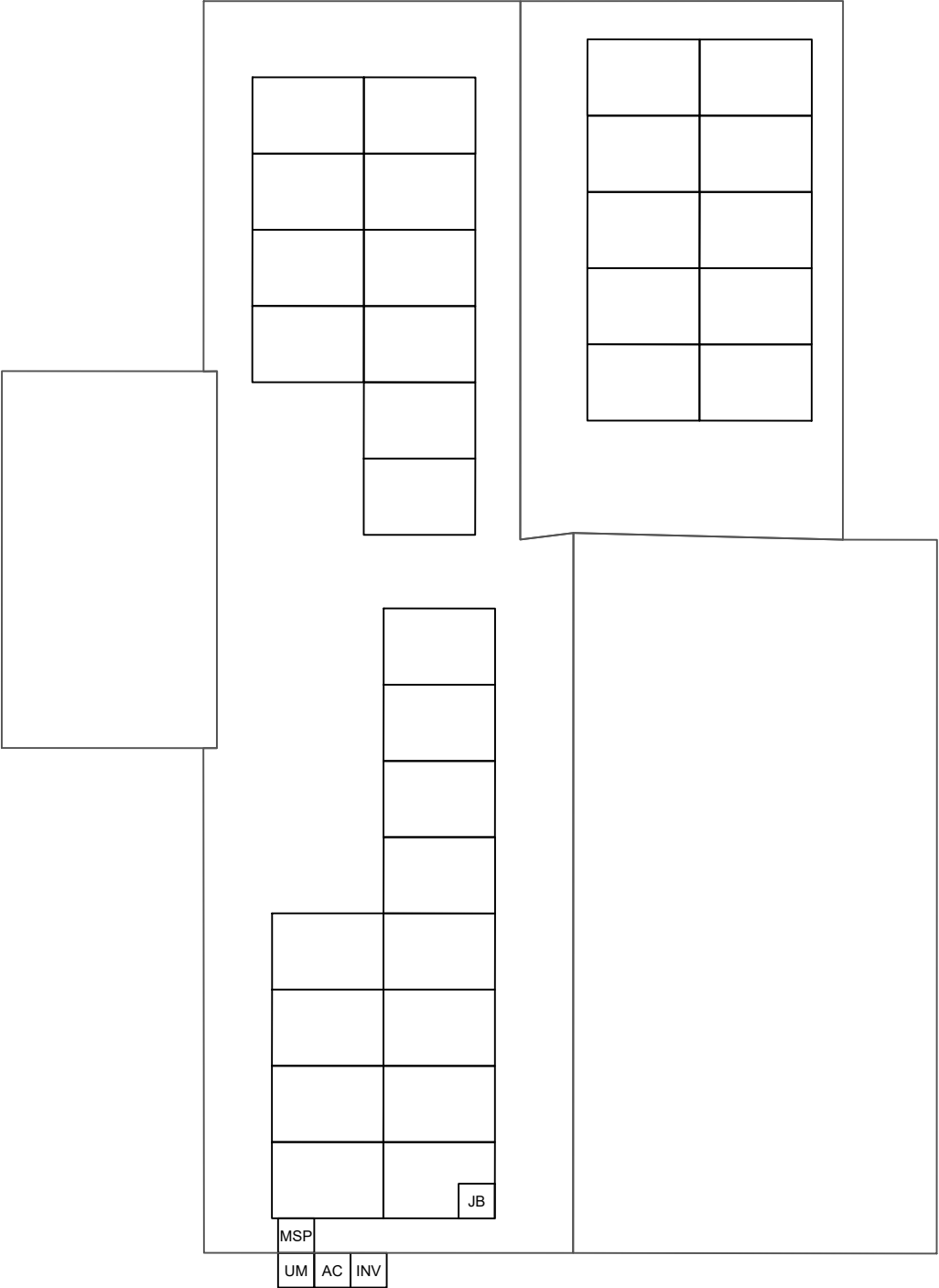
6

7

8

9

10



CLIENT:  
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32024  
AHJ: COLUMBIA COUNTY (FL)  
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METER: 154741527  
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SYSTEM:  
SYSTEM SIZE (DC): 32 X 400 = 12.800 kW  
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MODULES: 32 X FREEDOM FOREVER:  
FF-MP-BBB-400  
OPTIMIZERS: 32 X SOLAREEDGE S440  
INVERTER: SOLAREEDGE SE10000H-USRGM  
[SI1]

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



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GREG ALBRIGHT



CONTRACTOR LICENSE:  
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EC13008056

OPTIMIZER CHART			
JOB NO: 303737	DATE: 2/16/2023	DESIGNED BY: W.K.	SHEET: PV-8

## SAFETY PLAN

INSTRUCTIONS:

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

IN CASE OF EMERGENCY

INJURY HOTLINE  
(855) 400-7233

NEAREST HOSPITAL OR OCCUPATIONAL/INDUSTRIAL CLINIC

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.

NAME \_\_\_\_\_ SIGNATURE \_\_\_\_\_


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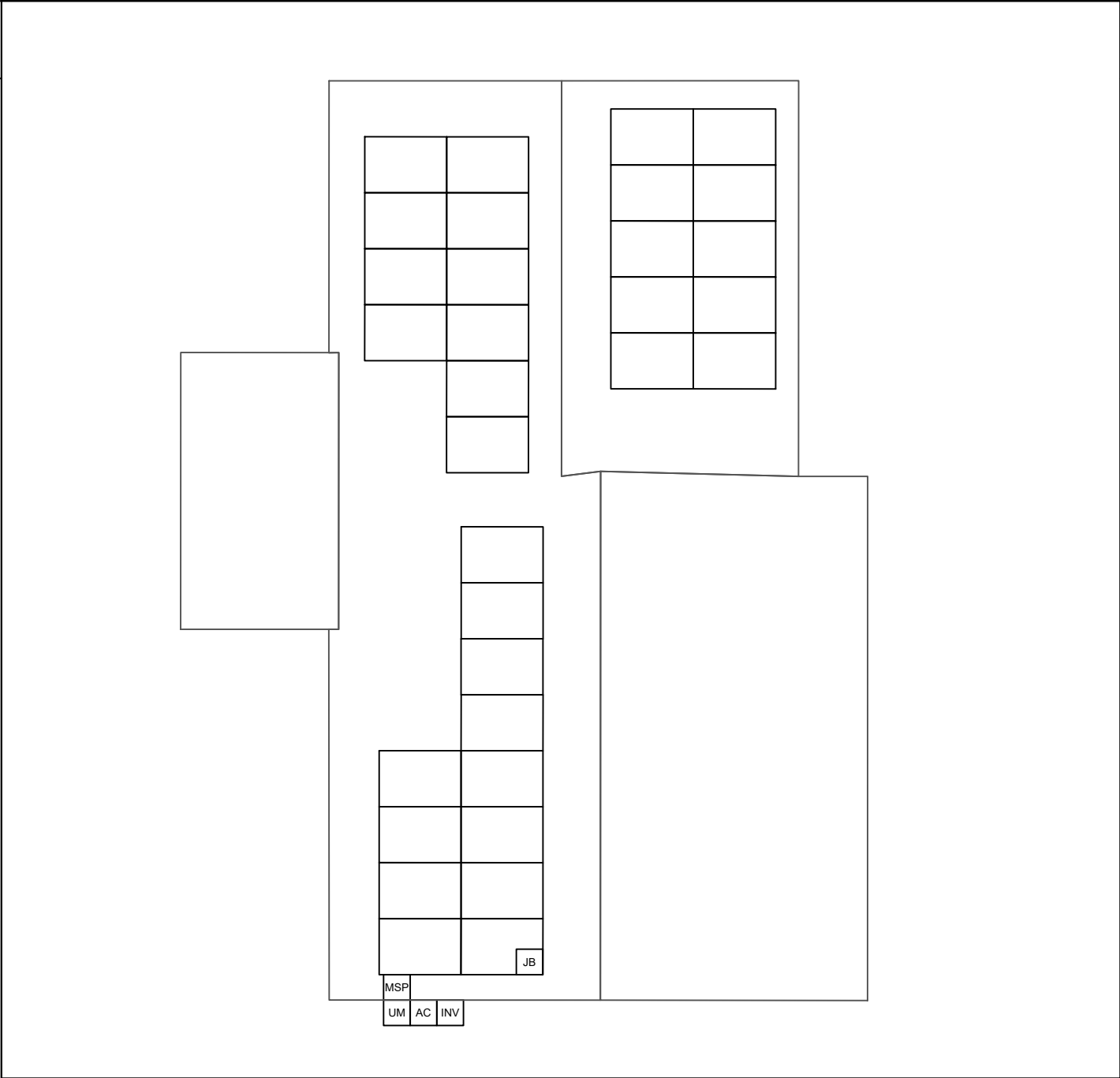
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DATE: \_\_\_\_\_ TIME: \_\_\_\_\_



## MARK UP KEY

(P) PERMANENT ANCHOR


Ⓓ TEMPORARY ANCHOR


## IL INSTALLER LADDER

**B** JUNCTION / COMBINER BOX

 STUB-OUT

 SKYLIGHT

 SKYLIGHT

 NO LADDER ACCESS (STEEP

GRADE OR GROUND LEVEL OBSTRUCTIONS)

☐ RESTRICTED ACCESS

DOONG-TA LITTLE  
185 CLIFTON JAMES GLEN, LAKE CITY, FL  
32024  
AHJ: COLUMBIA COUNTY (FL)  
UTILITY: "CLAY ELECTRIC COOPERATIVE,  
INC."

 <b>CONDUIT</b>	METER: 154741527 PHONE: (386) 365-6053 EMAIL: PRL185@LIVE.COM FINANCE: OTHER
 <b>GAS SHUT OFF</b>	

**WATER SHUT OFF**

**SYSTEM:**  
**SYSTEM SIZE (DC):** 32 X 400 = 12.800 kW  
**SYSTEM SIZE (AC):** 10.000 kW @ 240V  
**MODULES:** 32 X FREEDOM FOREVER:  
**FF MD 888 400.**

<p>⑦ SERVICE DROP</p>	<p>OPTIMIZERS: 32 X SOLAREEDGE S440 INVERTER: SOLAREEDGE SE10000H-USRGM [S11]</p>
-----------------------	---------------------------------------------------------------------------------------

② POWER LINES


**CLIENT:**  
DOUNG-TA LITTLE  
185 CLIFTON JAMES GLEN, LAKE CITY, FL  
32024  
AHJ: COLUMBIA COUNTY (FL)  
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FF-MP-BBB-400  
OPTIMIZERS: 32 X SOLAREDGE S440  
INVERTER: SOLAREDGE SE10000H-USRGM  
[S11]

# 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

[illegible]

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



GREG ALBRIGHT

CONTRACTOR LICENSE:  
CERTIFIED ELECTRICAL CONTRACTOR  
EC13008056

SAFETY PLAN			
JOB NO: 303737	DATE: 2/16/2023	DESIGNED BY: W.K.	SHEET: PV-9

JOB NO:	DATE:	DESIGNED BY:	SHEET:
303737	2/16/2023	W.K.	PV-9

JOB HAZARD ANALYSIS

Crew leader to fill out all sections below, hold a pre-job safety meeting with all personnel, and upload this completed document and the Safety Plan to Site Capture

Ladder Access

- Ladders must be inspected before each use.
  - Extension ladders must be set up on a firm and level surface at a 4-to-1 rise to run angle (or 75 degrees) and the top must be secured to the structure. Extension style ladders placed on uneven, loose or slippery surfaces must additionally have the base firmly anchored or lashed so the base will not slip out.
  - Extension ladders must be used with walk-through devices or the ladder must extend 36" above the stepping off point.
  - A-frame ladders must only be climbed with the ladder spreader bars locked in the open position; A-frame ladders shall not be climbed while in the closed position (ex, closed and used while leaned against a structure).
- Additional notes:

Mobile Equipment

- Only Qualified operators will operate equipment; operators must maintain a certification on their person for the equipment being operated.
- Type(s) of mobile equipment (Type/Make/Model):
- Qualified operator(s):

Material Handling and Storage

- Materials will be staged/stored in a way that does not present a hazard to client, personnel or public. Materials stored on the roof will be physically protect from failing or sliding off.

Fall Protection

- A site-specific plan for fall prevention and protection is required prior to starting work and must remain onsite at all times until work is complete; a fall rescue plan must be outlined and discussed among the crew prior to work start.
- First-person-Up (FPU) must install their anchor and connect before any other task, including installing other anchors. The Last-Person-Down (LPD) must be the only person on a roof uninstalling fall protection.

- FPCP (name and title):

- FPU and LPD (name and title):

Electrical Safety

- The Electrical Qualified Person (EQP) is required onsite to perform electrical work.
  - All electrical work will be performed with equipment in an electrically safe condition (de-energized) unless approval has been granted prior to work.
  - Service drops and overhead electrical hazards will be indentified and protected from contact, as neccessary.
- EQP (name and tile):

Public Protection

- The safety of the Client and Public must be maintained at all times.
- The Client and the Public shall be prevented from entering the work zone through the use of barriers and/or signage, as required.
- Company, Client and Public property shall be protected from falling objects.
- Pets (including dogs) shall be secured by their owners prior to work start.
- The Client should not leave pets, family members, or others in charge or care of Employees, Contractors, or Temporary Workers.

- Crew leader responsible for communication with the client:
- Client and public is excluded from work area by barricades (N/A, Yes, No):

Training and Pre-Job Safety Briefing

- All employees onsite shall be made aware of the specific hazards of this project and review this HJA during a pre-job briefing, and their signature indicates awareness of site conditions and the plan to eliminate any hazards identified prior to and during the project.

- Crew leader (name/title):

- Crew member (name/title):

- Crew member (name/title):

- Crew member (name/title):

- Crew member (name/title):

- Crew member (name/title):

Airborne Contaminants:

- Asbestos-containing (Transite) piping (ACP) - Do not disturb (move, drill, cut fracture, etc.)
- Asbestos-containing thermal insulation (ACI) and Asbestos-containing duct wrapping (ACW) - do not disturb, no attic or crawlspace access is allowed if work to be performed could cause exposure to personnel, client or public.

- If yes, list specific tasks and protection in place:

Weather and Environment

- The site supervisor shall forecast the weather conditions at the job site, prior to crew arrival, in order to mitigate any hazards associated with inclement weather (heat, cold, wind, rain, etc.)
- The site supervisor will utilized a portable wind meter (anemometer) to verify actual onsite wind conditions, by checking at the ground and on any elevated work surface (ex, rooftop) prior to work start, at midday and prior to solar panel staging on a roof.
- Elevated work involving the moving or maneuvering of solar panels shall cease at 25mph (sustained wind) until wind subsides.

- Forecasted weather maximum temp (degrees f):

Heat Related Illness Prevention

- Employees shall have access to potable drinking water that is fresh, pure, and suitably cool. The water shall be located as close as practicable to the areas where employees are working. Water shall be supplied in sufficient quantity at the beginning of the work shift to provide at least one quart per employee per hour for drinking for the entire shift. Employees may begin the shift with smaller quantities of water if they identify the location and have effective means for replenishment during the shift to allow employees to drink on quart or more per hour. The frequent drinking of water shall be encouraged.
- Shade shall be present when temperature exceeds 80 degrees Fahrenheit. When the outdoor temperature in the work exceeds 80 degrees Fahrenheit, employees shall have and maintain one or more areas with shade at all times.
- New employees must be acclimatized. New employees will be monitored by their Crew Leader (site supervisor) for the first two (2) weeks of employment or longer when necessary.
- Employees will be allowed and encouraged to implement scheduled breaks during each shift. Employees must take cool-down breaks in the shade any time they feel the need to do so to protect them from overheating. Supervisors are REQUIRED to allow employees any break period they need during high heat conditions.
- Cool Vests are encouraged for all employees at all times during periods of high heat.
- Identify the location of the closet Occupational/Industrial Clinic or Hospital in case a crew member becomes ill.

What is the specific plan to provide and replenish sufficient water for all employees on site?

- If offsite replenish is necessary, where will you go to replenish water (location/address):

- Who will replenish the drinking water (name):

Restroom facilities

- Employees shall have access to restroom facilities with hand-washing stations. Use of onsite restroom is at the client's discretion (location is annotated below). If client does not give permission, location of suitable restroom facilities with hand-washing stations offsite will be provided. The onsite supervisor will identify location and make arrangements to ensure all employees have access at any point.

- Restroom facilities will be (circle one): Onsite - Offsite
  - If Offsite, add location name and address:

Incident Reporting Procedure

- Contact your Site Supervisor
- Name:

Phone:

- Contact your Manager
- Name:

Phone:

- Contact your Site Supervisor
- Name:

Phone:

With: Your full name, phone number, office location, brief description of what happen and when.


NOTE ADDITIONAL HAZARDS NOT ADDRESSED ABOVE  
(add as many as necessary by using additional sheets)

Define the Hazard:	Method/steps to prevent incident:
Define the Hazard:	Method/steps to prevent incident:
Define the Hazard:	Method/steps to prevent incident:
Define the Hazard:	Method/steps to prevent incident:

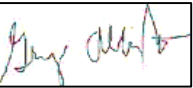
CLIENT:  
DOUNG-TA LITTLE  
185 CLIFTON JAMES GLEN, LAKE CITY, FL 32024  
AHJ: COLUMBIA COUNTY (FL)  
UTILITY: "CLAY ELECTRIC COOPERATIVE, INC."  
METER: 154741527  
PHONE: (386) 365-6053  
EMAIL: PRL185@LIVE.COM  
FINANCE: OTHER

SYSTEM:  
SYSTEM SIZE (DC): 32 X 400 = 12.800 kW  
SYSTEM SIZE (AC): 10.000 kW @ 240V  
MODULES: 32 X FREEDOM FOREVER: FF-MP-BBB-400  
OPTIMIZERS: 32 X SOLAREEDGE S440  
INVERTER: SOLAREEDGE SE10000H-USRGM [S11]

	REVISIONS	
NO.	REVISED BY	DATE
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-	-	-



FREEDOM FOREVER LLC  
2619 CONSULATE DR SUITE 800, ORLANDO, FL 32819  
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GREG ALBRIGHT

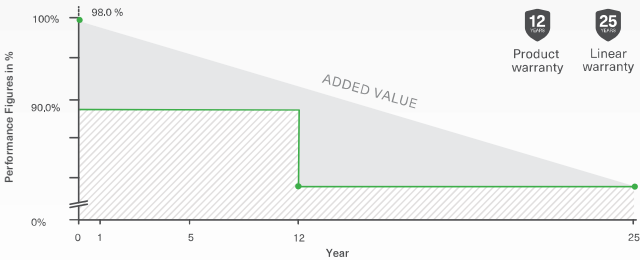
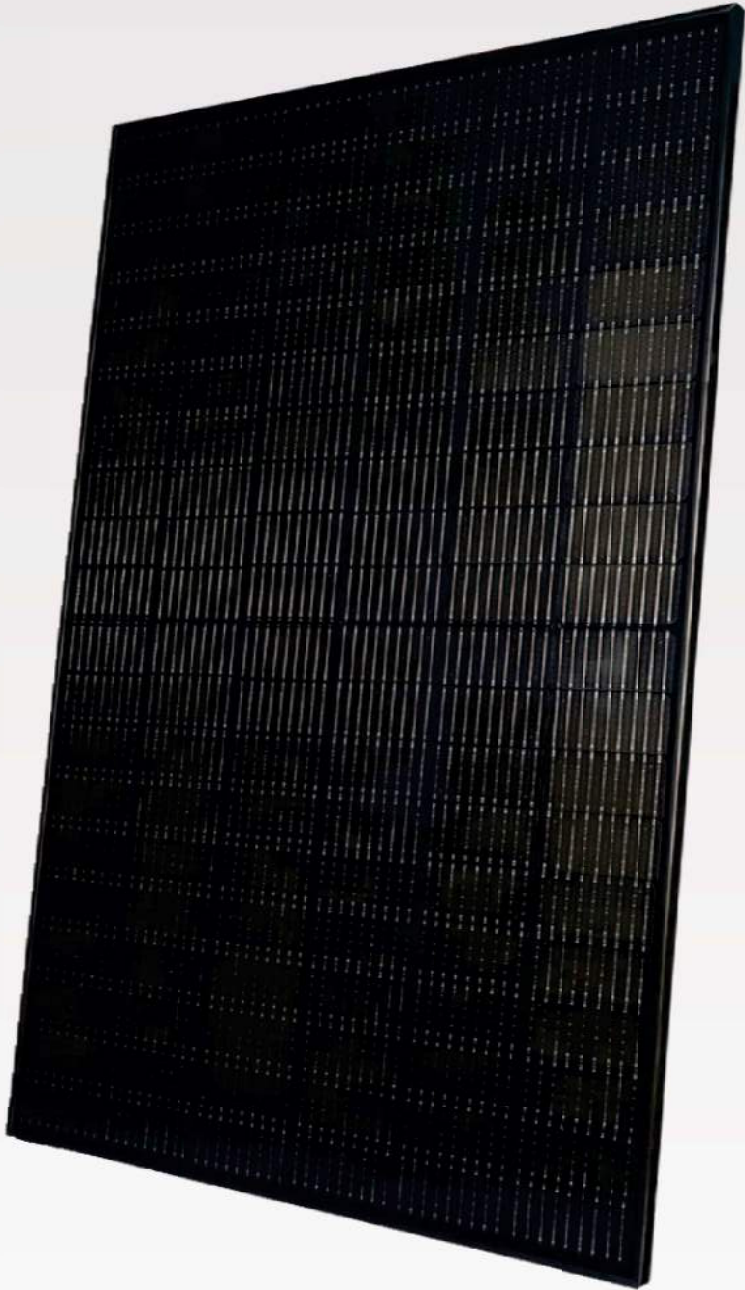


CONTRACTOR LICENSE:  
CERTIFIED ELECTRICAL CONTRACTOR  
EC13008056

SAFETY PLAN			
JOB NO: 303737	DATE: 2/16/2023	DESIGNED BY: W.K.	SHEET: PV-10



# 400W MODULE



## MODULE SPECIFICATIONS

### ELECTRICAL CHARACTERISTICS

Characteristics	FF-MP-BBB-400
Maximum Power (Pmax)	400W
Maximum Power Voltage (Vmp)	31.01V
Maximum Power Current (Imp)[A]	12.90A
Open Circuit Voltage (Voc)[V]	37.04V
Short Circuit Current (Isc)[A]	13.79A
Module Efficiency	20.48%
Power Tolerance	0/+5W
STC	Irradiance of 1000W/m², AM1.5, Cell Temperature 25°C

### MECHANICAL CHARACTERISTICS

Cell Type	Mono perc, 182 mm-half cells, 108 (6x9+6x9)
Weight	22.1 kgs (48.7 lbs)
Dimension	1722 x 1134 x 35 mm (67.80 x 44.65 x 1.38 in)
Front Glass	3.2 mm (.13 in)
Junction Box	IP68 (3 Bypass Diodes)
Output Cables	1200 mm (47.24 in)
Connector	Staubli MC4
Frame & Installation	Anodized aluminum profile

### OPERATIONS CHARACTERISTICS

Operational Temperature	-40°C~+85°
Max System Voltage	1500V
Max Series Fuse Rating	25A
Safety Class	Class II
Fire Rating	Type 1

### MECHANICAL LOADING

Snow Load	5,400Pa (113lb/ft2)
Rear Side Design Load	2,400Pa (50lb/ft2)

### PACKAGING INFORMATION

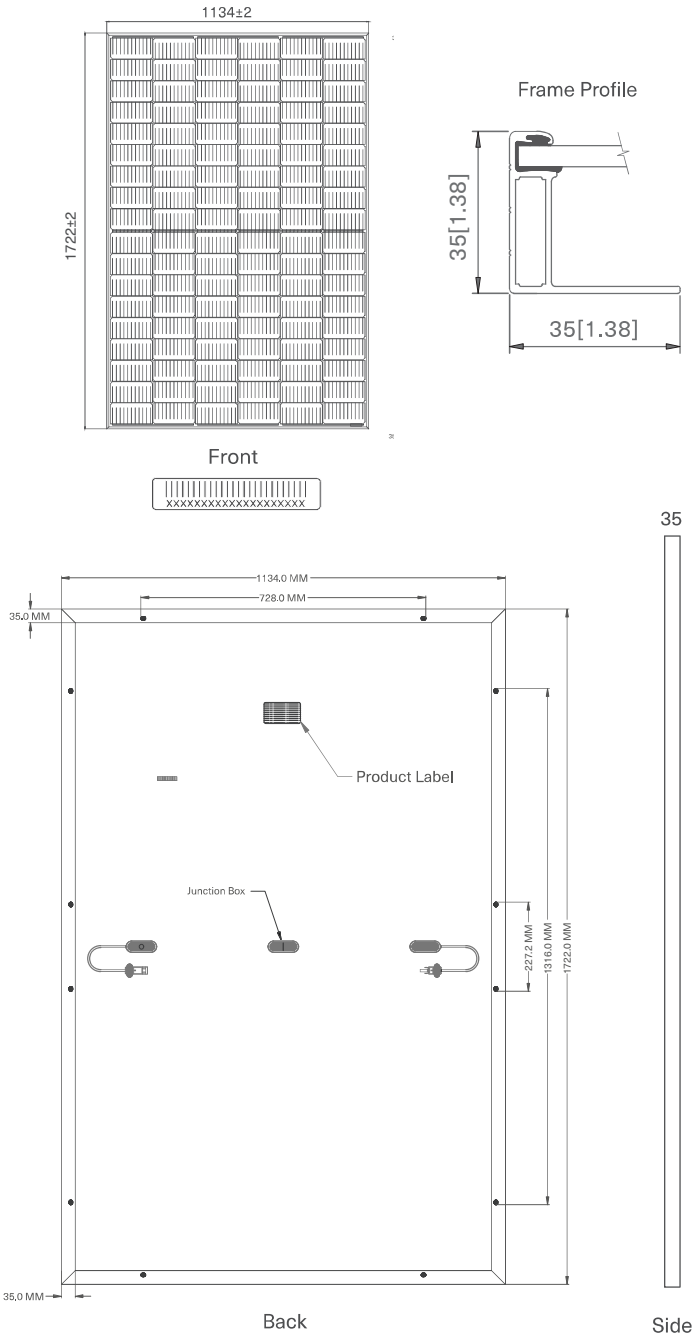
Container	20' GP	40' HC
Pallets per Container	6	26
Panels per Container	186	806
Panels per Pallet	31	31
Packaging Bon Weight	679 kg (1497 lbs)	
Panels per Pallet	1785 x 1130 x 1180 mm ( 70.28 x 44.49 x 46.46 in)	

### TEMPERATURE RATINGS

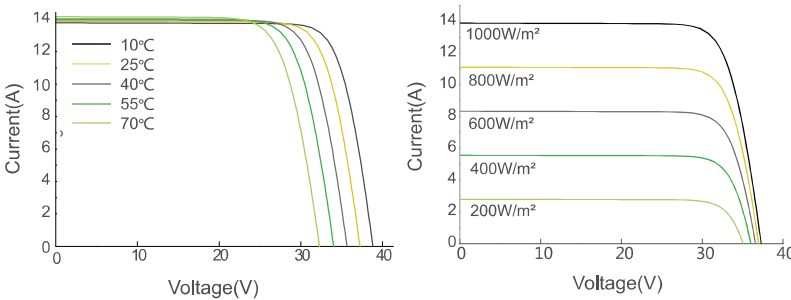
Temperature Coefficient of P <sub>max</sub>	-0.350%/°C
Temperature Coefficient of V <sub>oc</sub>	-0.275%/°C
Temperature Coefficient of I <sub>sc</sub>	+0.045%/°C
Nominal Operating cell Temperature (NOCT)	42°C±2°C



UL 61730 | UL 61215 | ISO 9001 | ISO 14001



### CURRENT-VOLTAGE CURVE



# Power Optimizer

## For North America

S440, S500



POWER OPTIMIZER

### PV power optimization at the module level

- Specifically designed to work with SolarEdge residential inverters
- Detects abnormal PV connector behavior, preventing potential safety issues\*
- Module-level voltage shutdown for installer and firefighter safety
- Superior efficiency (99.5%)
- Mitigates all types of module mismatch loss, from manufacturing tolerance to partial shading
- Faster installations with simplified cable management and easy assembly using a single bolt
- Flexible system design for maximum space utilization
- Compatible with bifacial PV modules
- Meets NEC requirements for arc fault protection (AFCI) and Photovoltaic Rapid Shutdown System (PVRSS)

\* Expected availability in 2022

[solaredge.com](https://www.solaredge.com)



## Power Optimizer

### For North America

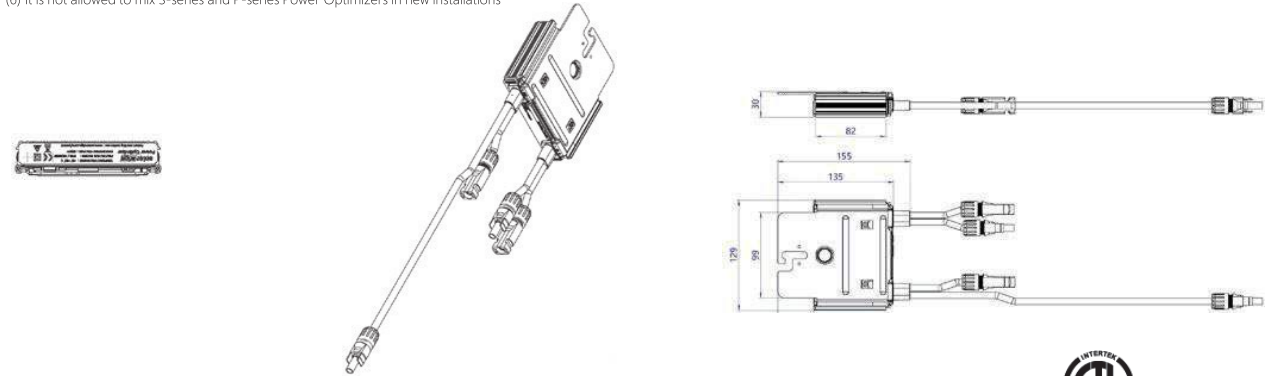
S440, S500

	S440	S500	Unit
INPUT			
Rated Input DC Power <sup>(1)</sup>	440	500	W
Absolute Maximum Input Voltage (Voc)	60		Vdc
MPPT Operating Range	8 - 60		Vdc
Maximum Short Circuit Current (Isc) of Connected PV Module	14.5	15	Adc
Maximum Efficiency	99.5		%
Weighted Efficiency	98.6		%
Overvoltage Category	II		
OUTPUT DURING OPERATION			
Maximum Output Current	15		Adc
Maximum Output Voltage	60		Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM INVERTER OR INVERTER OFF)			
Safety Output Voltage per Power Optimizer	1+/-0.1		Vdc
STANDARD COMPLIANCE			
Photovoltaic Rapid Shutdown System	NEC 2014, 2017 & 2020		
EMC	FCC Part 15 Class B, IEC61000-6-2, IEC61000-6-3		
Safety	IEC62109-1 (class II safety), UL1741		
Material	UL94 V-0, UV Resistant		
RoHS	Yes		
Fire Safety	VDE-AR-E 2100-712:2013-05		
INSTALLATION SPECIFICATIONS			
Maximum Allowed System Voltage	1000		Vdc
Dimensions (W x L x H)	129 x 153 x 30 / 5.07 x 6.02 x 1.18		mm / in
Weight (including cables)	655 / 1.5		gr / lb
Input Connector	MC4 <sup>(2)</sup>		
Input Wire Length	0.1 / 0.32		m / ft
Output Connector	MC4		
Output Wire Length	(+) 2.3, (-) 0.10 / (+) 7.54, (-) 0.32		m / ft
Operating Temperature Range <sup>(3)</sup>	-40 to +85		°C
Protection Rating	IP68 / Type6B		
Relative Humidity	0 - 100		%

(1) Rated power of the module at STC will not exceed the power optimizer Rated Input DC Power. Modules with up to +5% power tolerance are allowed  
(2) For other connector types please contact SolarEdge  
(3) For ambient temperature above +70°C / +158°F power de-rating is applied. Refer to Power Optimizers Temperature De-Rating Technical Note for more details

PV System Design Using a SolarEdge Inverter		Single Phase HD-Wave	Three Phase for 208V grid	Three Phase for 277/480V grid	
Minimum String Length (Power Optimizers)	S440, S500	8	14	18	
Maximum String Length (Power Optimizers)		25		50 <sup>(4)</sup>	
Maximum Nominal Power per String		5700 (6000 with SE7600-US-SE11400-U)	6000	12750	W
Maximum Allowed Connected Power per String <sup>(5)</sup> (Permitted only when the difference in connected power between strings is 1,000W or less)		Refer to Footnote 5	One String 7200W Two strings or more 7800W	15,000W	
Parallel Strings of Different Lengths or Orientations		Y			

(4) A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement  
(5) If the inverters rated AC power < maximum nominal power per string, then the maximum power per string will be able to reach up to the inverters maximum input DC power. Refer to: <https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf>  
(6) It is not allowed to mix S-series and P-series Power Optimizers in new installations



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# Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US

12-25  
YEAR  
WARRANTY



INVERTERS

## Optimized installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking 99% weighted efficiency
- Quick and easy inverter commissioning directly from a smartphone using the SolarEdge SetApp
- Fixed voltage inverter for longer strings
- Integrated arc fault protection and rapid shutdown for NEC 2014, NEC 2017 and NEC 2020 per article 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Small, lightweight, and easy to install both outdoors or indoors
- Built-in module-level monitoring
- Optional: Faster installations with built-in consumption metering (1% accuracy) and production revenue grade metering (0.5% accuracy, ANSI C12.20)

# Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US

MODEL NUMBER	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
APPLICABLE TO INVERTERS WITH PART NUMBER	SEXXXXH-XXXXXBXX4							
OUTPUT								
Rated AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
Maximum AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac
AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229)	-	✓	-	✓	-	-	✓	Vac
AC Frequency (Nominal)	59.3 - 60 - 60.5 <sup>(1)</sup>							Hz
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5	A
Maximum Continuous Output Current @208V	-	16	-	24	-	-	48.5	A
Power Factor	1, Adjustable - 0.85 to 0.85							
GFDI Threshold	1							A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes							
INPUT								
Maximum DC Power @240V	4650	5900	7750	9300	11800	15500	17650	W
Maximum DC Power @208V	-	5100	-	7750	-	-	15500	W
Transformer-less, Ungrounded	Yes							
Maximum Input Voltage	480							Vdc
Nominal DC Input Voltage	380				400			Vdc
Maximum Input Current @240V <sup>(2)</sup>	8.5	10.5	13.5	16.5	20	27	30.5	Adc
Maximum Input Current @208V <sup>(2)</sup>	-	9	-	13.5	-	-	27	Adc
Max. Input Short Circuit Current	45							Adc
Reverse-Polarity Protection	Yes							
Ground-Fault Isolation Detection	600k $\Omega$ Sensitivity							
Maximum Inverter Efficiency	99	99.2						%
CEC Weighted Efficiency	99						99 @ 240V 98.5 @ 208V	%
Nighttime Power Consumption	< 2.5							W

(1) For other regional settings please contact SolarEdge support  
(2) A higher current source may be used; the inverter will limit its input current to the values stated

# / Single Phase Inverter with HD-Wave Technology for North America

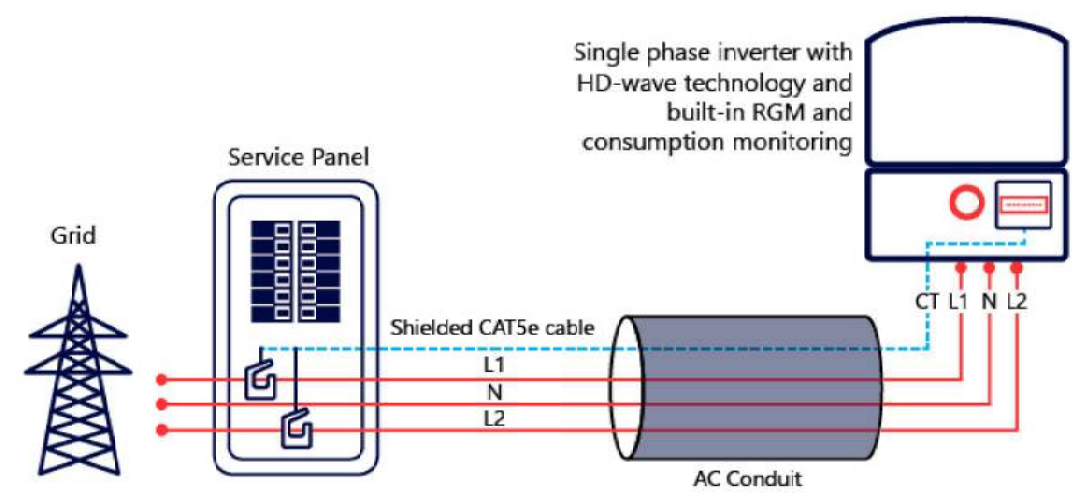
SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US/  
SE7600H-US / SE10000H-US / SE11400H-US

MODEL NUMBER	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
ADDITIONAL FEATURES								
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)							
Revenue Grade Metering, ANSI C12.20	Optional <sup>(3)</sup>							
Consumption metering								
Inverter Commissioning	With the SetApp mobile application using Built-in Wi-Fi Access Point for Local Connection							
Rapid Shutdown - NEC 2014, NEC 2017 and NEC 2020, 690.12	Automatic Rapid Shutdown upon AC Grid Disconnect							
STANDARD COMPLIANCE								
Safety	UL1741, UL1741 SA, UL1699B, CSA C22.2, Canadian AFCI according to T.I.L. M-07							
Grid Connection Standards	IEEE1547, Rule 21, Rule 14 (HI)							
Emissions	FCC Part 15 Class B							
INSTALLATION SPECIFICATIONS								
AC Output Conduit Size / AWG Range	1" Maximum / 14-6 AWG				1" Maximum /14-4 AWG			
DC Input Conduit Size / # of Strings / AWG Range	1" Maximum / 1-2 strings / 14-6 AWG				1" Maximum / 1-3 strings / 14-6 AWG			
Dimensions with Safety Switch (HxWxD)	17.7 x 14.6 x 6.8 / 450 x 370 x 174				21.3 x 14.6 x 7.3 / 540 x 370 x 185		in / mm	
Weight with Safety Switch	22 / 10		25.1 / 11.4		26.2 / 11.9		38.8 / 17.6	lb / kg
Noise	< 25				< 50		dBA	
Cooling	Natural Convection							
Operating Temperature Range	-40 to +140 / -40 to +60 <sup>(4)</sup>						°F / °C	
Protection Rating	NEMA 4X (Inverter with Safety Switch)							

(3) Inverter with Revenue Grade Meter P/N: SExxxxH-US000BNC4; Inverter with Revenue Grade Production and Consumption Meter P/N: SExxxxH-US000BNI4 . For consumption metering, current transformers should be ordered separately: SEACT0750-200NA-20 or SEACT0750-400NA-20. 20 units per box  
(4) Full power up to at least 50°C / 122°F; for power de-rating information refer to: <https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf>

## How to Enable Consumption Monitoring

By simply wiring current transformers through the inverter's existing AC conduits and connecting them to the service panel, homeowners will gain full insight into their household energy usage helping them to avoid high electricity bills



[pe.eaton.com](http://pe.eaton.com)

## Eaton general duty cartridge fuse safety switch

**DG222NRB**

**UPC:**782113144221

**Dimensions:**

- **Height:** 14.37 IN
- **Length:** 7.35 IN
- **Width:** 8.4 IN

**Weight:**10 LB

**Notes:**Maximum hp ratings apply only when dual element fuses are used. 3-Phase hp rating shown is a grounded B phase rating, UL listed.

**Warranties:**

- 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.

**Specifications:**

- **Type:** General duty, cartridge fused
- **Amperage Rating:** 60A
- **Enclosure:** NEMA 3R
- **Enclosure Material:** Painted galvanized steel
- **Fuse Class Provision:** Class H fuses
- **Fuse Configuration:** Fusible with neutral
- **Number Of Poles:** Two-pole
- **Number Of Wires:** Three-wire
- **Product Category:** General duty safety switch
- **Voltage Rating:** 240V

**Supporting documents:**

- [Eatons Volume 2-Commercial Distribution](#)
- [Eaton Specification Sheet - DG222NRB](#)

**Certifications:**

- UL Listed

**Product compliance:** No Data





The right way to attach solar PV to trapezoidal roof profiles!

# S-5!® The Right Way!™



NOW AVAILABLE  
IN ALUMINUM

ProteaBracket™

## ProteaBracket™

A versatile bracket for mounting solar PV to trapezoidal roof profiles

ProteaBracket™ is now made in aluminum. Still the most versatile trapezoidal metal roof attachment solution on the market, the S-5! ProteaBracket just got better!

The bracket features an adjustable attachment base and module attachment options to accommodate different roof profile dimensions and mounting options.

Our pre-applied EPDM gasket with peel and stick adhesive makes installation a snap, ensuring accurate and secure placement the first time.

With no messy sealants, faster installation, and a weather-proof fit, ProteaBracket offers you the most versatile solar attachment solution available.

ProteaBracket\* can be used for rail mounting or "direct-attach" with S-5! PVKIT™



## Features and Benefits

- 34% lighter - saves on shipping
- Stronger L-Foot™
- Load-tested for engineered application
- Corrosion-resistant materials
- Adjustable - Fits rib profiles up to 3"
- Peel-and-Stick prevents accidental shifting during installation
- Fully pre-assembled
- 25-year warranty\*

\*When ProteaBracket is used in conjunction with the S-5! PVKIT, an additional nut is required during installation.

\*See [www.S-5.com](http://www.S-5.com) for details.

888-825-3432 | [www.S-5.com](http://www.S-5.com) |

S-5!®  
The Right Way!™

ProteaBracket™ is the perfect solar attachment solution for most trapezoidal rib, exposed-fastened metal roof profiles!

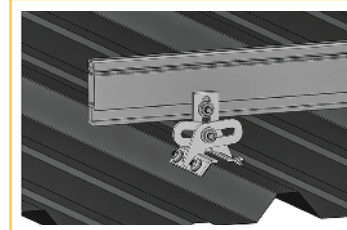
ProteaBracket™ is compatible with common metal roofing materials and comes with a pre-applied EPDM gasket on the base.

**Note:** All four pre-punched holes must be used to achieve tested strength. Fasteners are provided.

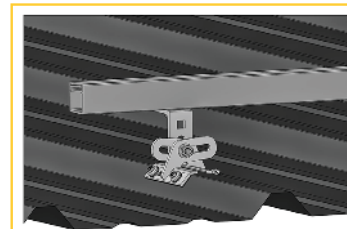
For design assistance, ask your distributor, or visit [www.S-5.com](http://www.S-5.com) for the independent lab test data that can be used for load-critical designs and applications. Also, please visit our website for more information including metallurgical compatibilities and specifications.

S-5!® holding strength is unmatched in the industry.

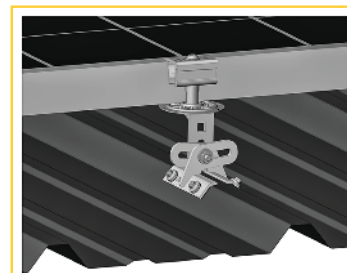
## Multiple Attachment Options:



Side  
Mount Rail



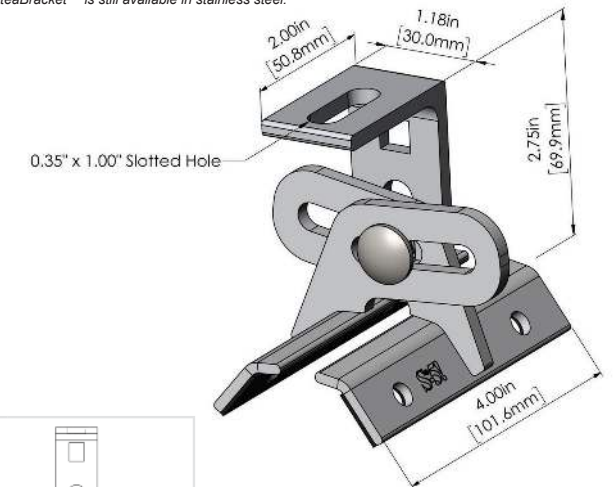
Bottom  
Mount Rail



w/ S-5!  
PVKIT™  
(rail-less)

## ProteaBracket™

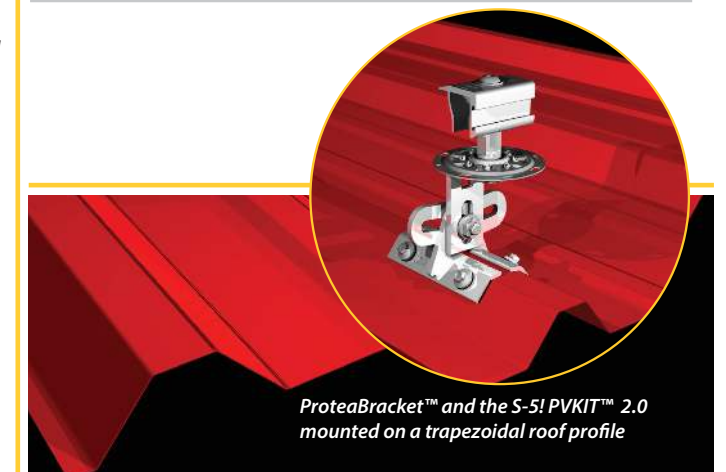
ProteaBracket™ is still available in stainless steel.



ProteaBracket fits profiles  
up to 3 inches

INSTALLATION:

**No surface preparation needed.** (1) Wipe away excess oil and debris. (2) Peel off adhesive release paper. (3) Align and mount bracket directly onto crown of panel. (4) Secure ProteaBracket through pre-punched holes, using piercing-point S-5! screws.



ProteaBracket™ and the S-5! PVKIT™ 2.0 mounted on a trapezoidal roof profile

S-5!® Warning! Please use this product responsibly!

Products are protected by multiple U.S. and foreign patents. For published data regarding holding strength, bolt torque, patents, and trademarks, visit the S-5! website at [www.S-5.com](http://www.S-5.com).

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Distributed by

# 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](http://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

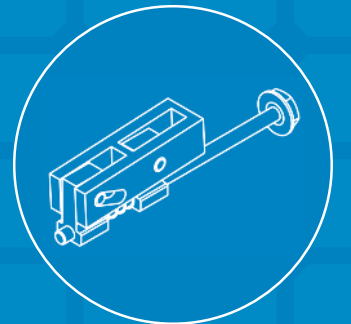
Professional support for professional installers and designers. You have access to our technical support and training groups. Whatever your support needs, we've got you covered. Visit [Unirac.com/solarmount](http://Unirac.com/solarmount) for more information.



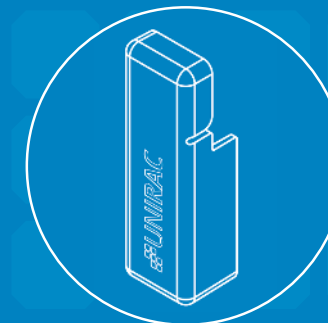
**UL2703**

BONDING & GROUNDING  
MECHANICAL LOADING  
SYSTEM FIRE CLASSIFICATION

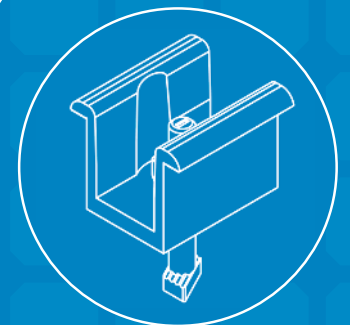
### CONCEALED UNIVERSAL ENDCLAMPS



### END CAPS INCLUDED WITH EVERY ENDCLAMP



### UNIVERSAL SELF STANDING MIDCLAMPS



### U-BUILDER ONLINE DESIGN TOOL SAVES TIME & MONEY

Visit [design.unirac.com](http://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](http://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 <sup>2</sup> )	113.5
Upward Design Load (lb/ft <sup>2</sup> )	50.7
Down-Slope Load (lb/ft <sup>2</sup> )	16.13

Test Loads:

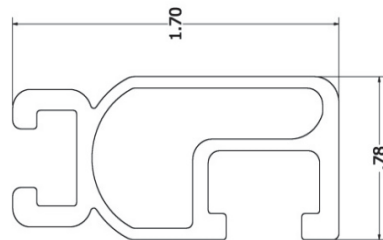
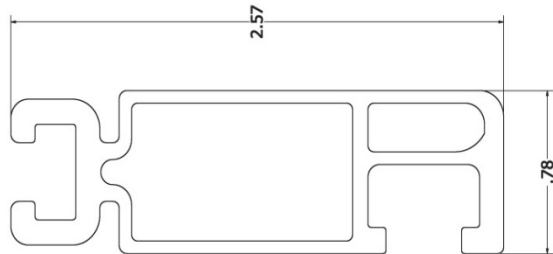
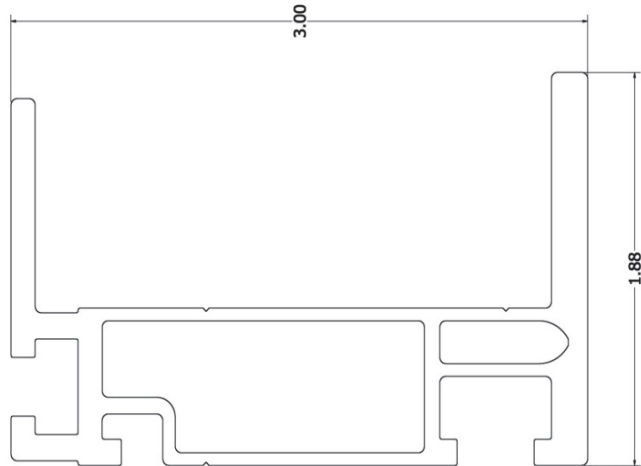
Downward Load (lb/ft <sup>2</sup> )	170.20
Upward Load (lb/ft <sup>2</sup> )	76.07
Down-Slope Load (lb/ft <sup>2</sup> )	24.2

## 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 <sup>2</sup>
SECTION MODULUS (X-AXIS)	0.15	0.363	0.898	in <sup>3</sup>
SECTION MODULUS (Y-AXIS)	0.067	0.113	0.221	in <sup>3</sup>
MOMENT OF INERTIA (X-AXIS)	0.13	0.467	1.45	in <sup>4</sup>
MOMENT OF INERTIA (Y-AXIS)	0.026	0.045	0.267	in <sup>4</sup>
RADIUS OF GYRATION (X-AXIS)	0.564	0.865	1.17	in
RADIUS OF GYRATION (Y-AXIS)	0.254	0.269	0.502	in

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      Client Reference: Tom Young  
Tested to:      UL 2703:2015

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

Licensed Test mark: 	Date of Issue (day/mo/yr) 27/07/2016
--------------------------------------------------------------------------------------------------------------	--------------------------------------------



January 20, 2021

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. 2020 Florida Building Code, by Florida Building Commission
2. Minimum Design Loads for Buildings and other Structures, ASCE/SEI 7-16
3. 2018 International Building Code, by International Code Council, Inc. w/ Provisions from SEAOC PV-2 2017.
4. 2018 International Residential Code, by International Code Council, Inc. w/ Provisions from SEAOC PV-2 2017.
5. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES.
6. 2015 Aluminum Design Manual, by The Aluminum Association, 2015

Following are typical specifications to meet the above code requirements:

<b>Design Criteria:</b>	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
<b>Attachment Spacing:</b>	Per U-builder Engineering report.
<b>Cantilever:</b>	Maximum cantilever length is L/3, where "L" is the span noted in the U-Builder online tool.
<b>Clearance:</b>	2" to 10" clear from top of roof to top of PV panel.
<b>Tolerance(s):</b>	1.0" tolerance for any specified dimension in this report is allowed for installation.
<b>Installation Orientation:</b>	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.

1478 Stone Point Drive, Suite 190, Roseville, CA 95661  
T 916.961.3960 F 916.961.3965 W [www.pzse.com](http://www.pzse.com)  
Experience | Integrity | Empowerment



#### Components and Cladding Roof Zones:

The Components and Cladding Roof Zones shall be determined based on ASCE 7-16 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 7-16.
  - 3) Topographic factor,  $k_{zt}$  is 1.0.
  - 4) Array Edge Factor  $Y_e = 1.5$
  - 5) Average parapet height is 0.0 ft.
  - 6) Wind speeds are LRFD values.
  - 7) 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.

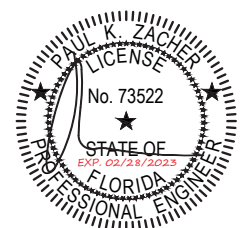
If you have any questions on the above, do not hesitate to call.

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

THIS ITEM HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY PAUL K. ZACHER, PE ON 01/20/2021 USING A SHA-1 AUTHENTICATION CODE.

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SHA-1 AUTHENTICATION CODE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

DIGITAL SIGNATURE



01/20/2021

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Experience | Integrity | Empowerment