



Freedom Forever  
Planset Revision Letter

11/13/2023  
REV #2

Attn. City of Portsmouth (NH):

The changes outlined in Revision Details have been applied to the plans corresponding to the following customer:

ANNE MOODEY  
180 NEW CASTLE AVE , PORTSMOUTH, NH 03801

**Revision Details:**

1.Elevation updated.

All corresponding changes are notated on the plans by revision clouds.

Thank you for your time in reviewing these plans. Please reach out if you have any additional questions or concerns.

Construction Engineering  
Freedom Forever  
[engineering@freedomforever.com](mailto:engineering@freedomforever.com)

# ROOF MOUNT PHOTOVOLTAIC SYSTEM

## CODES:

THIS PROJECT COMPLIES WITH THE FOLLOWING:  
 2020 NH STATE BUILDING CODE  
 2020 NH STATE FIRE CODE  
 2018 INTERNATIONAL BUILDING CODE  
 2018 INTERNATIONAL RESIDENTIAL CODE  
 2018 INTERNATIONAL MECHANICAL CODE  
 2018 INTERNATIONAL PLUMBING CODE  
 2018 INTERNATIONAL FUEL GAS CODE  
 2018 INTERNATIONAL ENERGY CONSERVATION CODE  
 2018 INTERNATIONAL EXISTING BUILDING CODE  
 2018 INTERNATIONAL SWIMMING POOL AND SPA CODE  
 "2018 NFPA 1, FIRE CODE AS AMENDED BY SAF-FMO 300"  
 2018 NFPA 101 LIFE SAFETY CODE AS AMENDED BY SAF-FMO 300  
 2023 NATIONAL ELECTRICAL CODE  
 AS ADOPTED BY CITY OF PORTSMOUTH (NH)

## 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 2023 NEC SEC 250.166(A).

SOLAR PHOTOVOLTAIC SYSTEM EQUIPMENT WILL BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS OF ART. 690 OF THE 2023 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

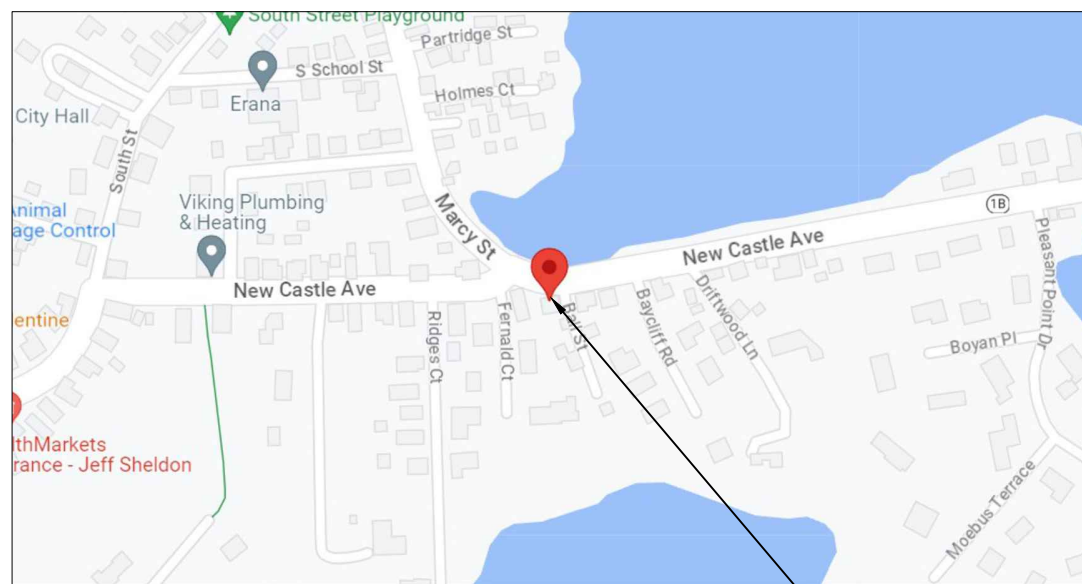
SOLAREGE OPTIMIZERS ARE LISTED TO IEC 62109-1 (CLASS II SAFETY) AND UL 1741 STANDARDS

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

### THIS SYSTEM DESIGNED WITH:

WIND SPEED: 121  
 WIND EXPOSURE: B  
 SNOW LOAD: 50

## VICINITY MAP:



SITE LOCATION

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APPENDIX	MANUFACTURER SPECIFICATION SHEETS

CLIENT:  
 ANNE MOODEY  
 180 NEW CASTLE AVE, PORTSMOUTH, NH  
 03801  
 AHJ: CITY OF PORTSMOUTH (NH)  
 UTILITY: EVERSOURCE ENERGY (EASTERN  
 MA)  
 METER: 72329222  
 APN: PRSM-000101-000023  
 PHONE: (603) 361-7031  
 EMAIL: AMOODEY1@GMAIL.COM

SYSTEM:  
 SYSTEM SIZE (DC): 15 X 385 = 5.775 kW  
 SYSTEM SIZE (AC): 5.000 kW @ 240V  
 MODULES: 15 X JINKO SOLAR:  
 JKM385M-72HBL  
 OPTIMIZERS: 15 X SOLAREGE P505  
 INVERTER: SOLAREGE SE5000H-USRGM  
 [S11]











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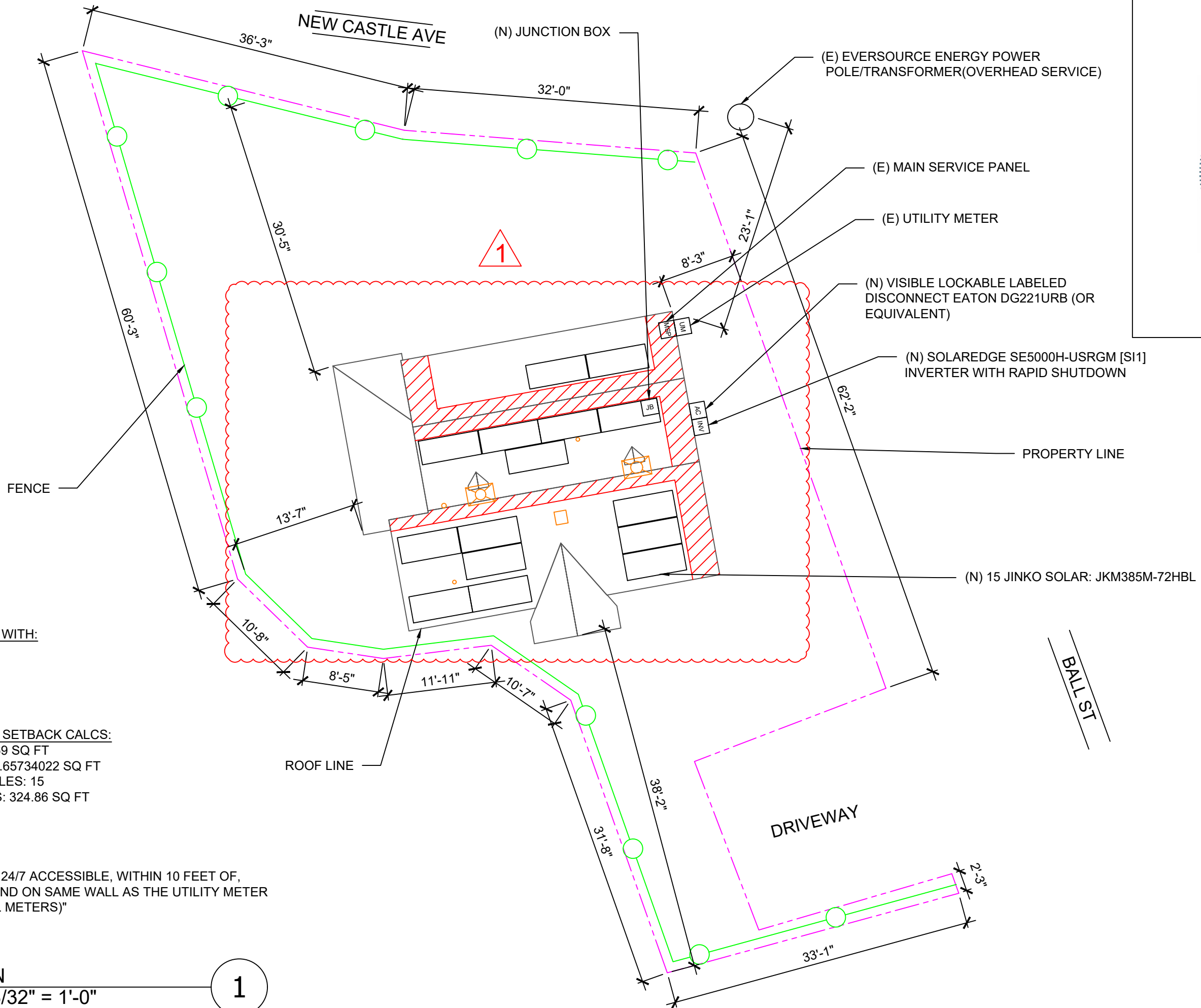
  
**freedom**  
 FOREVER  
 FREEDOM FOREVER LLC  
 43445 BUSINESS PARK DR #110, TEMECULA,  
 CA 92590  
 Tel: (800) 385-1075  
**GREG ALBRIGHT**  
  
 CONTRACTOR LICENSE:  
 ELECTRICAL CONTRACTOR 0512C

SITE LOCATION			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
369950	11/13/2023	S.G.	PV-1

**LEGEND:**

-  CHIMNEY
-  PIPE VENT
-  MODULES
-  CONDUIT
-  SETBACK
-  AC DISCONNECT
-  UTILITY METER
-  JUNCTION BOX
-  INVERTER
-  MAIN SERVICE PANEL

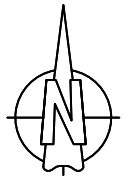
**PV SYSTEM**  
 5.775 kW-DC  
 5.000 kW-AC



**THIS SYSTEM DESIGNED WITH:**  
 WIND SPEED: 121  
 WIND EXPOSURE: B  
 SNOW LOAD: 50

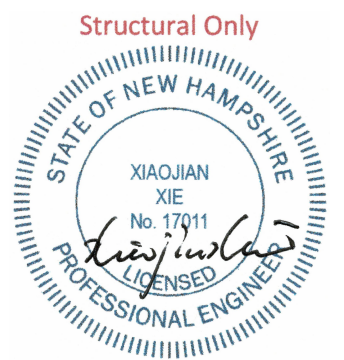
**TOTAL ROOF AREA RIDGE SETBACK CALCS:**  
 TOTAL ROOF AREA: 1311.69 SQ FT  
 SINGLE MODULE AREA: 21.65734022 SQ FT  
 TOTAL NUMBER OF MODULES: 15  
 TOTAL AREA OF MODULES: 324.86 SQ FT  
 ROOF COVERAGE: 24.77%  
 FIRE SPRINKLERS : NO

"AC DISCONNECT SHALL BE 24/7 ACCESSIBLE, WITHIN 10 FEET OF, WITHIN VISIBLE SIGHT OF, AND ON SAME WALL AS THE UTILITY METER (EXCEPTION FOR PEDESTAL METERS)"



**SITE PLAN**  
 SCALE: 3/32" = 1'-0"

1



ROOF AREA: 1311.69 SQ FT

**CLIENT:**  
 ANNE MOODEY  
 180 NEW CASTLE AVE, PORTSMOUTH, NH 03801  
**AHJ:** CITY OF PORTSMOUTH (NH)  
**UTILITY:** EVERSOURCE ENERGY (EASTERN MA)  
 METER: 72329222  
 APN: PRSM-000101-000023  
 PHONE: (603) 361-7031  
 EMAIL: AMOODEY1@GMAIL.COM











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 SYSTEM SIZE (AC): 5.000 kW @ 240V  
 MODULES: 15 X JINKO SOLAR: JKM385M-72HBL  
 OPTIMIZERS: 15 X SOLAREEDGE P505  
 INVERTER: SOLAREEDGE SE5000H-USRGM [S11]

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SITE PLAN			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
369950	11/13/2023	S.G.	PV-2

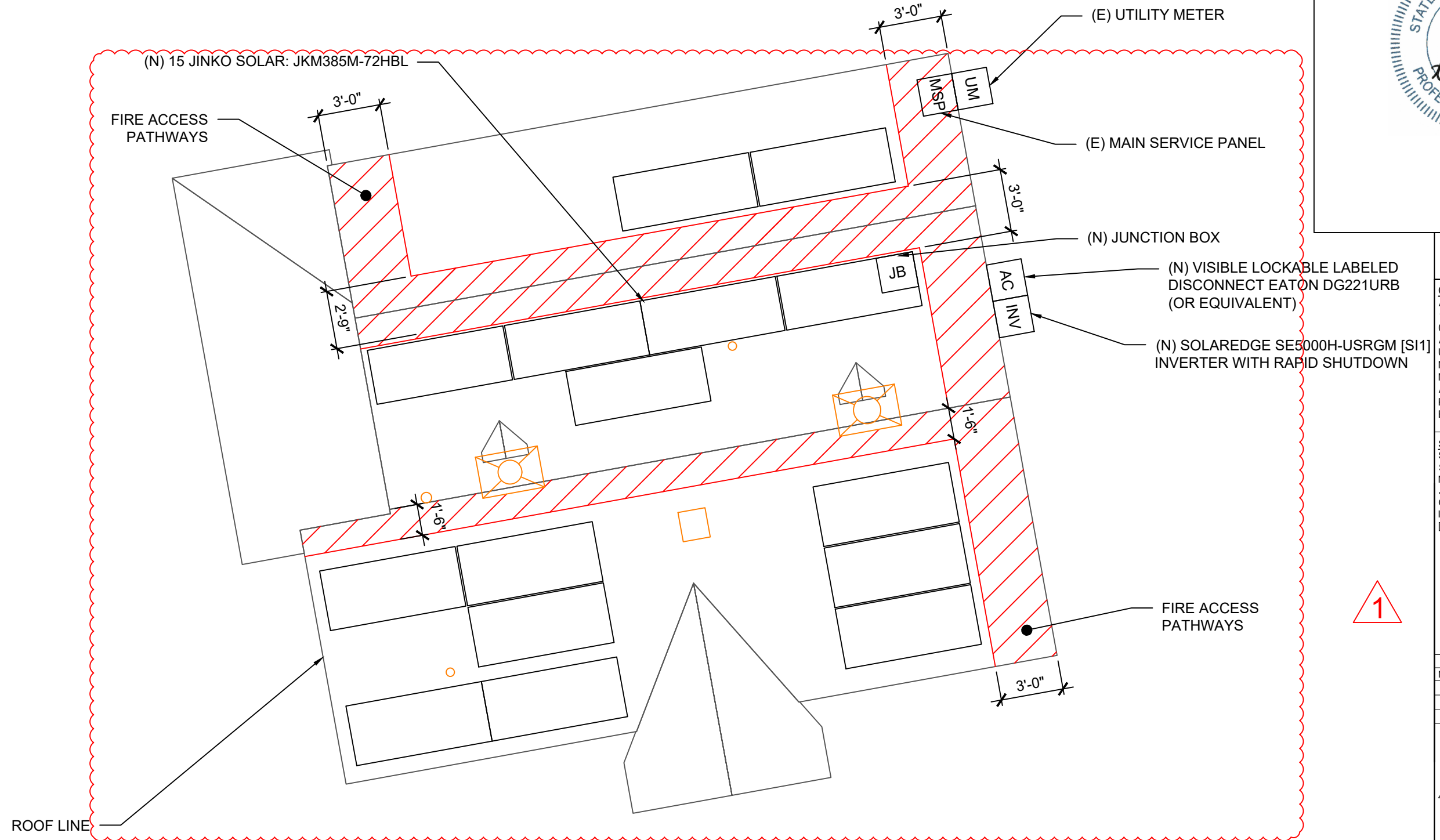
**LEGEND:**

-  CHIMNEY
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-  MODULES
-  CONDUIT
-  SETBACK
-  AC DISCONNECT
-  UTILITY METER
-  JUNCTION BOX
-  INVERTER
-  MAIN SERVICE PANEL

**PV SYSTEM**  
**5.775 kW-DC**  
**5.000 kW-AC**

**THIS SYSTEM DESIGNED WITH:**  
 WIND SPEED: 121  
 WIND EXPOSURE: B  
 SNOW LOAD: 50

TOTAL ROOF AREA: 1311.69 SQ FT  
 TOTAL ARRAY AREA: 324.86 SQ FT  
 ARRAY COVERAGE: 24.77%  
 SYSTEM DISTRIBUTED WEIGHT: 2.29 LBS  
 UNIRAC: FLASHKIT PRO POINT-LOAD: 18.15 LBS



ROOF AREA: 1311.69 SQ FT

**CLIENT:**  
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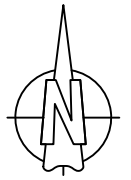


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ROOF PLAN WITH MODULES LAYOUT

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**ROOF PLAN**  
**SCALE: 3/16" = 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 DETAILS:

TOTAL ROOF AREA: 1311.69 SQ FT  
 TOTAL ARRAY AREA: 324.86 SQFT  
 ARRAY COVERAGE: 24.77%  
 SYSTEM DISTRIBUTED WEIGHT: 2.29 LBS  
 UNIRAC: FLASHKIT PRO POINT-LOAD: 18.15 LBS



ROOF AREA STATEMENT						
ROOF	MODULE QUANTITY	ROOF PITCH	ARRAY PITCH	AZIMUTH	ROOF AREA	ARRAY AREA
ROOF 1	8	28	28	170	462.46 SQ FT	173.26 SQ FT
ROOF 2	5	37	37	170	345.37 SQ FT	108.29 SQ FT
ROOF 3	2	37	37	350	280.45 SQ FT	43.31 SQ FT
----	----	----	----	----	SQ FT	SQ FT
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----	----	----	----	----	SQ FT	SQ FT



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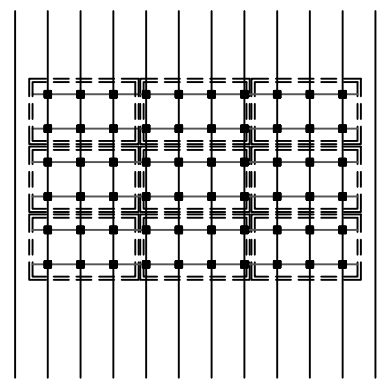
  
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**GREG ALBRIGHT**  
  
**CONTRACTOR LICENSE:**  
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ROOF DETAILS			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
369950	11/13/2023	S.G.	PV-2B

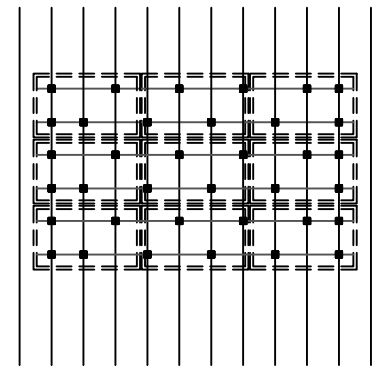
**TABLE 1 - ARRAY INSTALLATION**

	ROOF PITCH	ROOFING TYPE	ATTACHMENT TYPE	FRAMING TYPE	MAX UNBRACED LENGTH(FT.)	STRUCTURAL ANALYSIS RESULT	PENETRATION PATTERN	MAX ATTACHMENT SPACING (IN.)	MAX RAIL OVERHANG(IN.)
ROOF 1	28	Comp Shingle	Unirac Flashkit Pro	2x8 RAFTER @ 32" O.C.	7.1	PASS	STAGGERED	32	10.66667
ROOF 2	37	Comp Shingle	Unirac Flashkit Pro	2x8 RAFTER @ 32" O.C.	7.1	PASS	STAGGERED	32	10.66667
ROOF 3	37	Comp Shingle	Unirac Flashkit Pro	2x8 RAFTER @ 32" O.C.	7.1	PASS	STAGGERED	32	10.66667

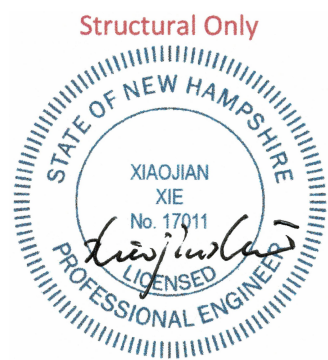
1. CONTRACTOR TO VERIFY FRAMING TYPE AND MAX UNBRACED LENGTH PRIOR TO INSTALLATION. IF THE ABOVE INFORMATION DOES NOT MATCH FIELD CONDITIONS, NOTIFY ENGINEER OF RECORD IMMEDIATELY.
2. WHERE COLLAR TIES OR RAFTER SUPPORTS EXIST, CONTRACTOR SHALL USE RAFTERS WITH COLLAR TIES AS ATTACHMENT POINTS.
3. MAX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



**STACKED DETAIL**  
For Illustration purposes only



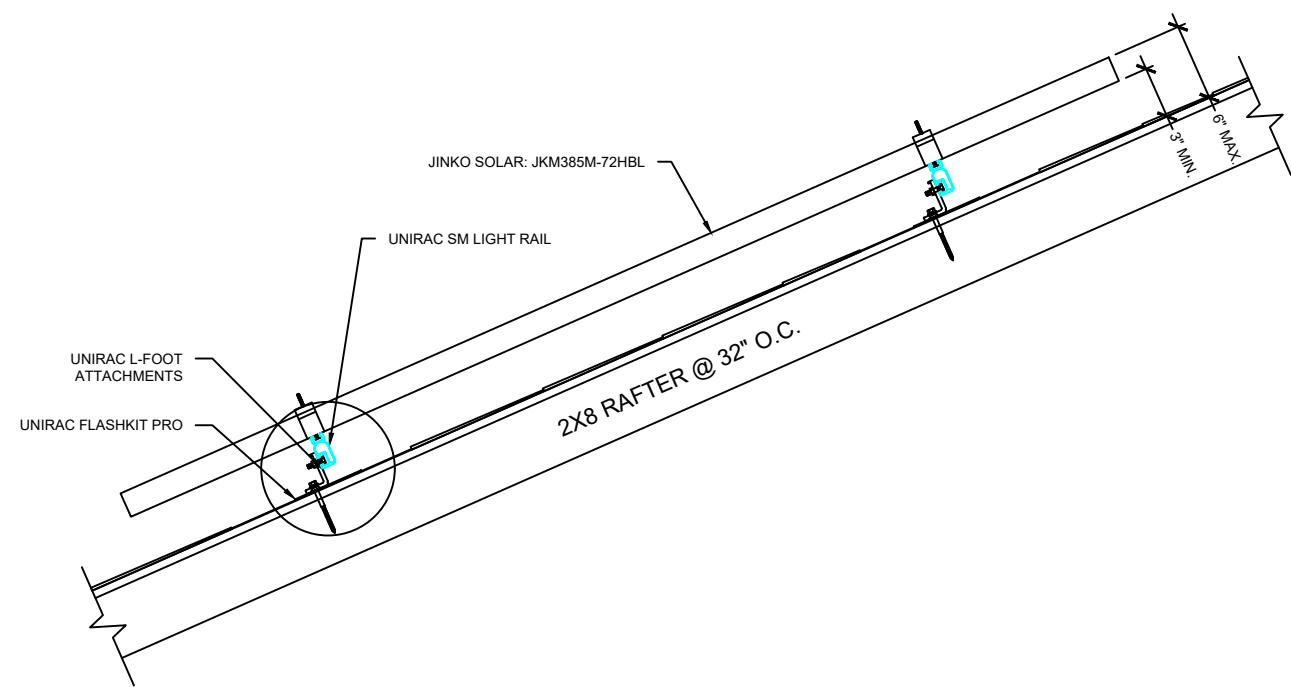
**STAGGERED DETAIL**  
For Illustration purposes only



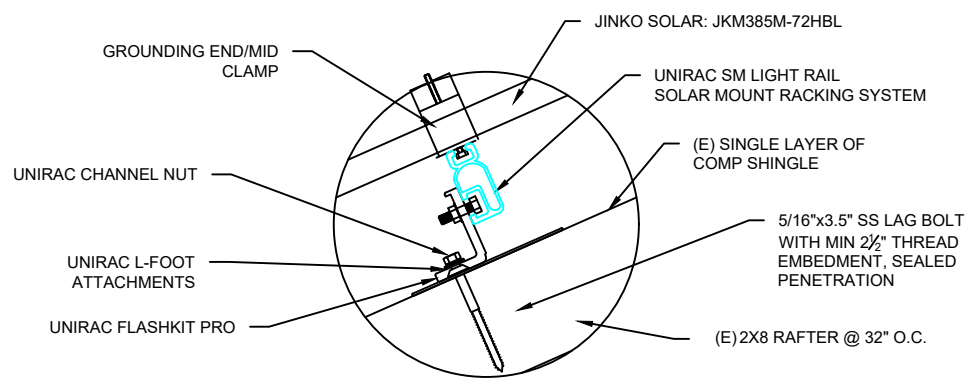
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**SYSTEM:**  
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 MODULES: 15 X JINKO SOLAR: JKM385M-72HBL  
 OPTIMIZERS: 15 X SOLAREEDGE P505  
 INVERTER: SOLAREEDGE SE5000H-USRGM [S11]

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**SOLAR PV ARRAY SECTION VIEW**  
Scale: NTS



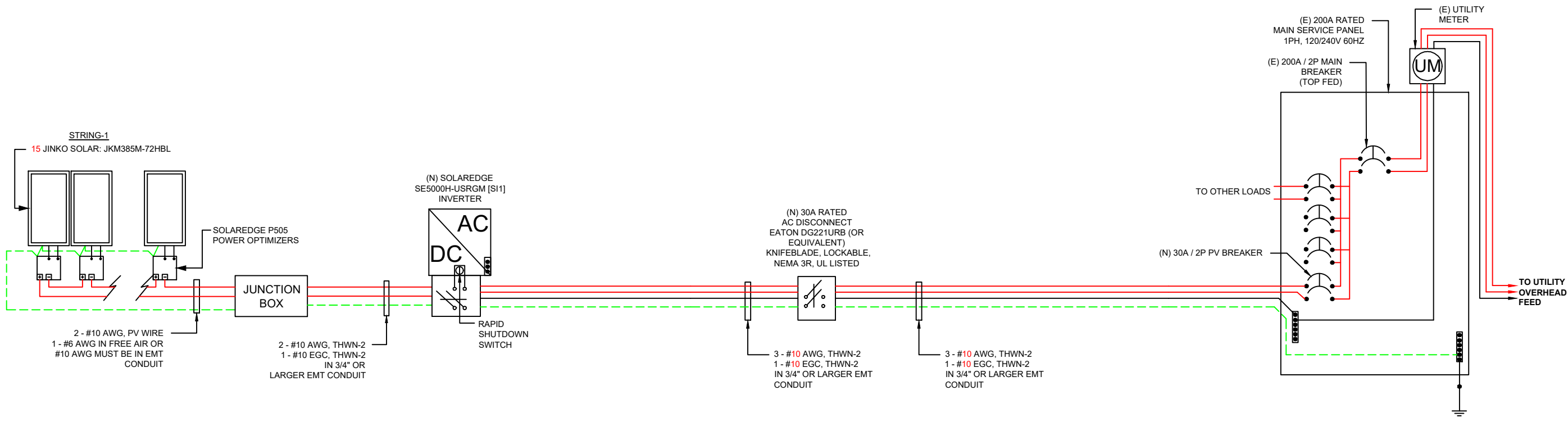
**ATTACHMENT DETAIL**  
Scale: NTS

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 CONTRACTOR LICENSE:  
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MOUNTING DETAILS			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
369950	11/13/2023	S.G.	PV-3

BACKFEED BREAKER SIZING					
MAX. CONTINUOUS OUTPUT 21.00A @ 240V					
21.00	X	1.25	=	26.25AMPS	30A BREAKER - OK
SEE 705.12 OF 2023 NEC					
200	X	1.20	=	240	
240	-	200	=	40A ALLOWABLE BACKFEED	

**PV SYSTEM**  
**5.775 kW-DC**  
**5.000 kW-AC**



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THREE LINE DIAGRAM			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
369950	11/13/2023	S.G.	PV-4

WIRE SCHEDULE												
RACEWAY #	EQUIPMENT				CONDUCTOR QTY.	AWG WIRE SIZE	STARTING ALLOWABLE AMPACITY @ 90°C 310.15(B)(16)	STARTING CURRENT APPLIED TO CONDUCTORS IN RACEWAY	TEMPERATURE CORRECTION FACTOR 310.15(B)(2)(a)	ADJUSTMENT FACTOR FOR MORE THAN 3 CONDUCTORS 310.15(B)(3)(a)	ADJUSTED CONDUCTOR AMPACITY @ 90°C	MAXIMUM CURRENT APPLIED TO CONDUCTORS IN RACEWAY
1	DC	MODULE	TO	OPTIMIZER	2	10	40	12.40	0.91	1	36.40	15.50
2	DC	OPTIMIZER	TO	JUNCTION BOX	2	10	40	15.00	0.91	1	36.40	18.75
3	DC	JUNCTION BOX	TO	INVERTER	2	10	40	15.00	0.91	1	36.40	18.75
4	AC	INVERTER	TO	AC DISCONNECT	3	10	40	21.00	0.91	1	36.40	26.25
5	AC	AC DISCONNECT	TO	POI	3	10	40	21.00	0.91	1	36.40	26.25
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CONDUCTOR AMPACITY CALCULATIONS IN ACCORDANCE WITH NEC 690.8.

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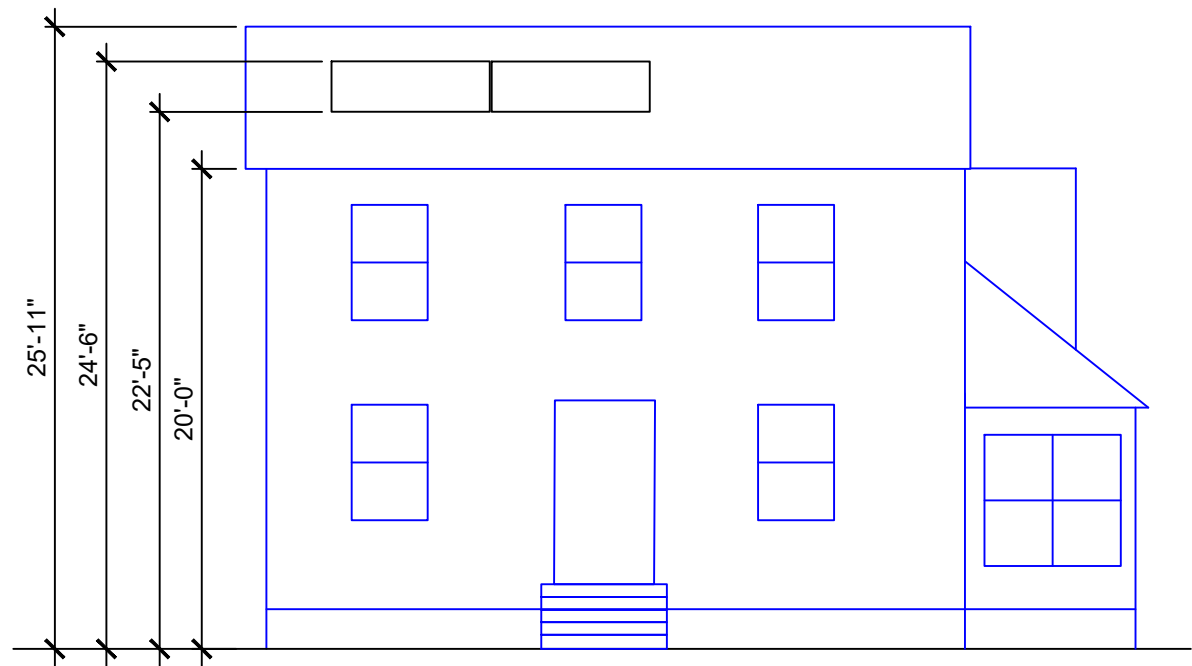
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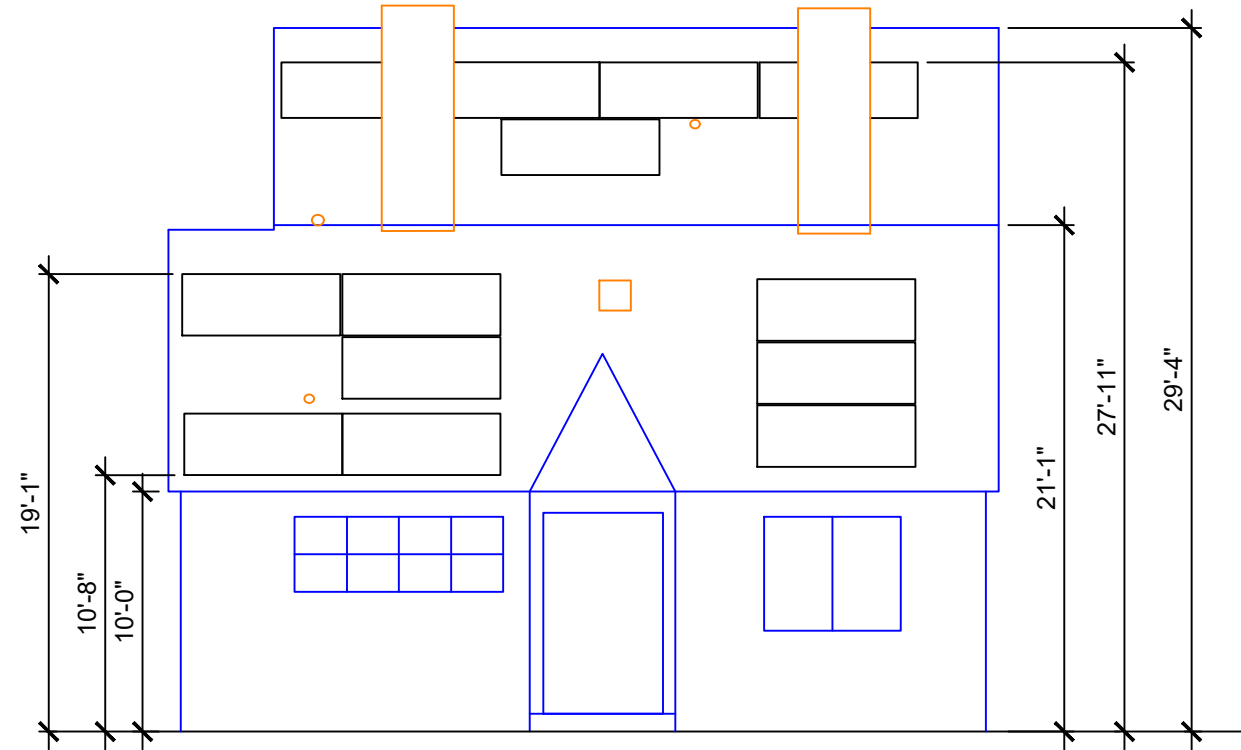


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CONDUCTOR CALCULATIONS			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
369950	11/13/2023	S.G.	PV-5



FRONT OF HOUSE ELEVATION



BACK OF HOUSE ELEVATION

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-	-	-

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 FOREVER  
 FREEDOM FOREVER LLC  
 43445 BUSINESS PARK DR #110, TEMECULA,  
 CA 92590  
 Tel: (800) 385-1075  
**GREG ALBRIGHT**  
  
 CONTRACTOR LICENSE:  
 ELECTRICAL CONTRACTOR 0512C

BUILDING ELEVATION			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
369950	11/13/2023	S.G.	PV-5C





**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

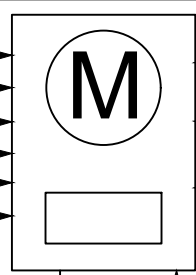
**WARNING**  
TURN OFF PHOTOVOLTAIC  
AC DISCONNECT PRIOR TO  
WORKING INSIDE PANEL  
NEC 110.27(C) & OSHA 1910.145(F)(7)

**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 OVERTVOLTAGE  
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)

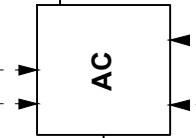
**CAUTION**  
PHOTOVOLTAIC SYSTEM CIRCUIT IS BACKFED  
NEC 705.12(D) & NEC 690.59

**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 CALCMF2 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: 180 NEW CASTLE AVE, PORTSMOUTH, NH 03801

**PHOTOVOLTAIC AC DISCONNECT**  
NEC 690.13(B)

**PHOTOVOLTAIC AC DISCONNECT**  
RATED AC OUTPUT CURRENT: **21.00A**  
NOMINAL OPERATING AC VOLTAGE: **240V**  
NEC 690.54



**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 **480** V  
MAXIMUM CIRCUIT CURRENT **13.5** 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)

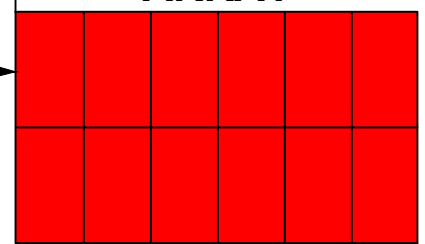
**MAXIMUM DC VOLTAGE OF PV SYSTEM**  
NEC 690.53

**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)



NEC 690.31(G)(3) & (4)

CLIENT:  
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180 NEW CASTLE AVE, PORTSMOUTH, NH 03801  
AHJ: CITY OF PORTSMOUTH (NH)  
UTILITY: EVERSOURCE ENERGY (EASTERN MA)  
METER: 72329222  
APN: PRSM-000101-000023  
PHONE: (603) 361-7031  
EMAIL: AMOODEY1@GMAIL.COM

SYSTEM:  
SYSTEM SIZE (DC): 15 X 385 = 5.775 kW  
SYSTEM SIZE (AC): 5.000 kW @ 240V  
MODULES: 15 X JINKO SOLAR: JKM385M-72HBL  
OPTIMIZERS: 15 X SOLAREEDGE P505  
INVERTER: SOLAREEDGE SE5000H-USRGM [S11]

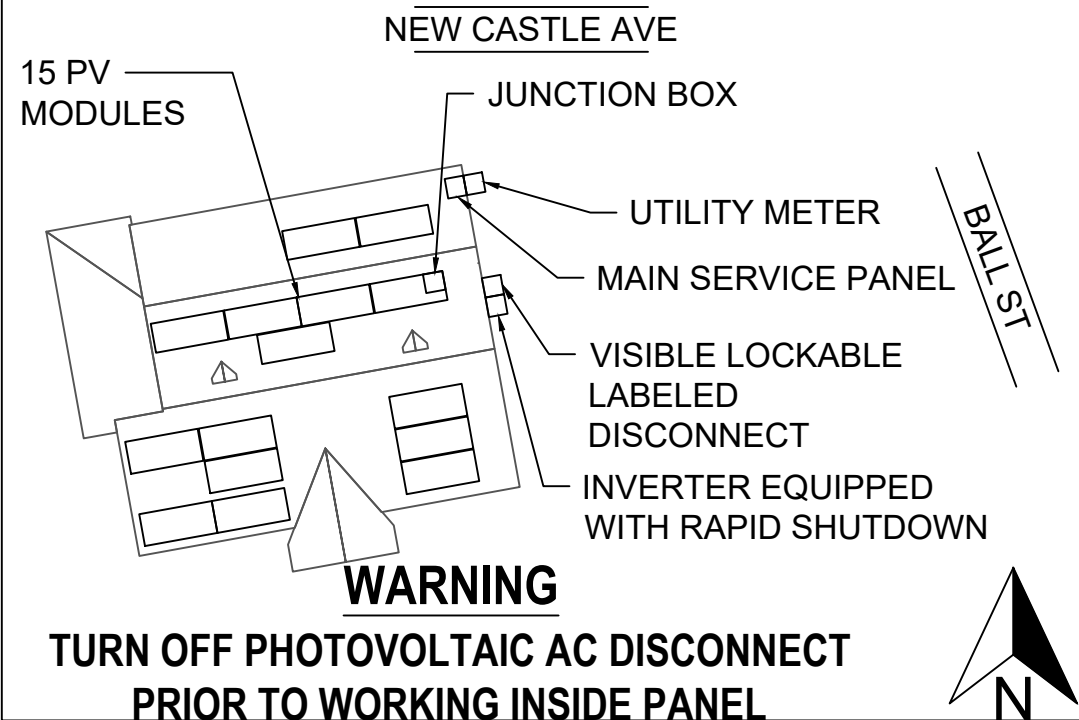
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2	S.G.	11/13/2023
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**GREG ALBRIGHT**  
*Greg Albright*  
CONTRACTOR LICENSE:  
ELECTRICAL CONTRACTOR 0512C

LABELS			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
369950	11/13/2023	S.G.	PV-7

# CAUTION:

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



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*Greg Albright*

CONTRACTOR LICENSE:  
ELECTRICAL CONTRACTOR 0512C

SITE PLACARD

JOB NO:	DATE:	DESIGNED BY:	SHEET:
369950	11/13/2023	S.G.	PV-7A

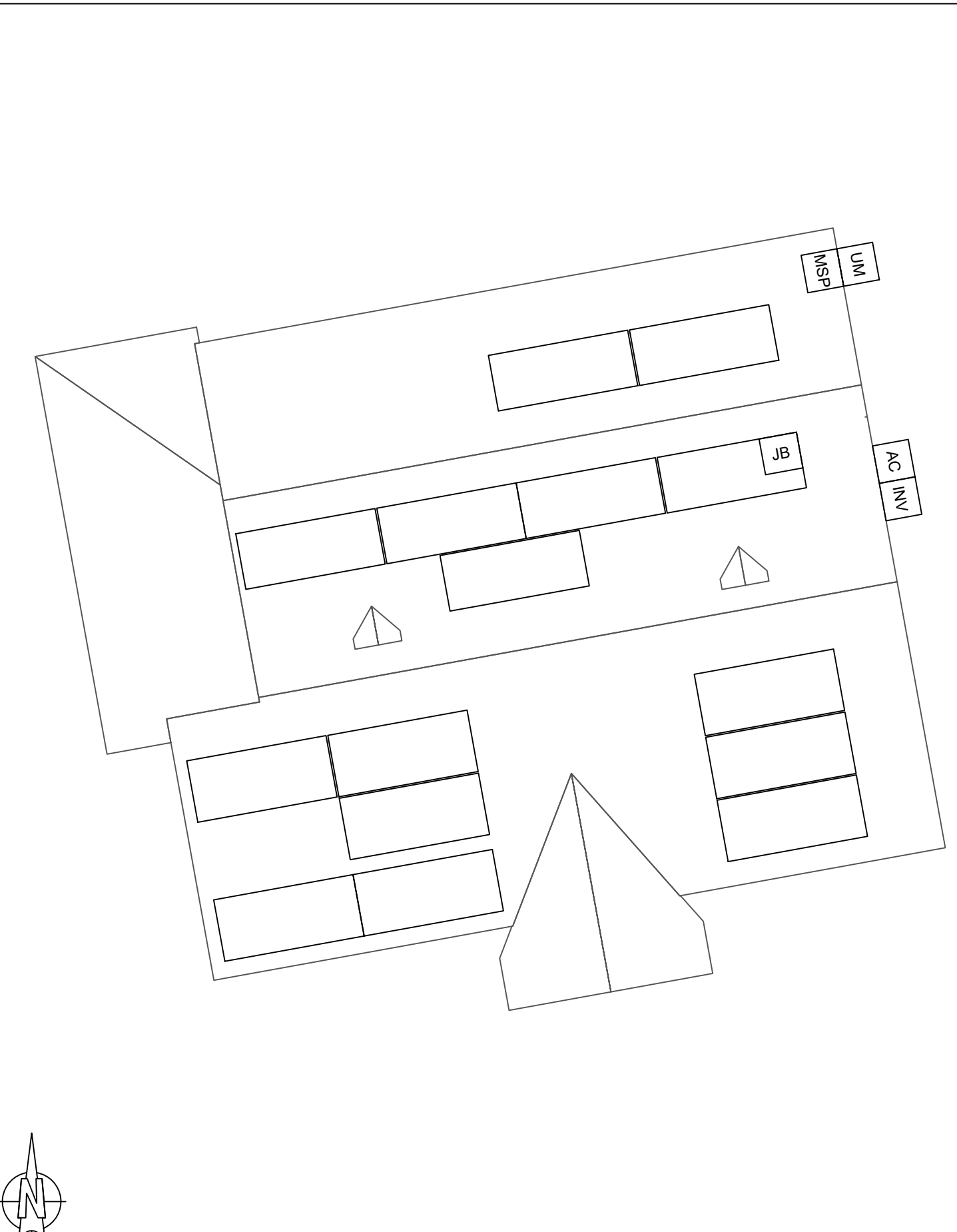
**NOTES:**

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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.

# 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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OPTIMIZER CHART			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
369950	11/13/2023	S.G.	PV-8

# 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:

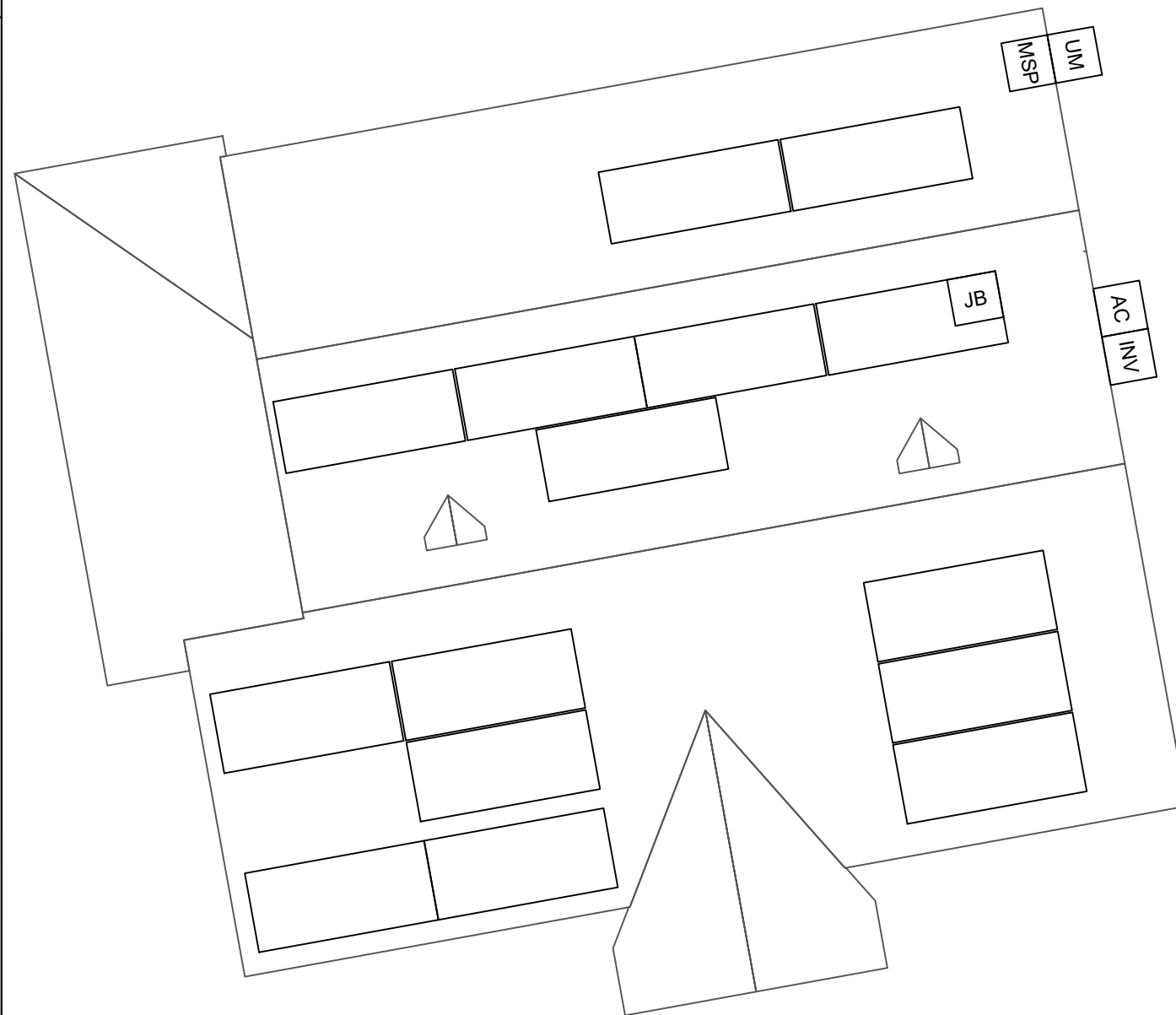
NAME: \_\_\_\_\_

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.

NAME	SIGNATURE
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

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



- 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
- H<sub>2</sub>O WATER SHUT OFF
- 7 SERVICE DROP
- Z POWER LINES

**CLIENT:**  
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-	-	-

# 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

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

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SAFETY PLAN			
JOB NO:	DATE:	DESIGNED BY:	SHEET:
369950	11/13/2023	S.G.	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 identified 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:**  
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## SAFETY PLAN

JOB NO: 369950	DATE: 11/13/2023	DESIGNED BY: S.G.	SHEET: PV-10
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FOR INSTALLATION REFERENCE ONLY

SCAN QR CODE TO ACCESS REFERENCE LINK

**FREEDOM REFERENCES**



INSTALL HOTLINE

**PV INSTALLATION REFERENCES**



ENPHASE



SOLAREEDGE



TESLA

**BATTERY INSTALLATION REFERENCES**



Enphase Storage Systems



SOLAREEDGE Storage Systems



TESLA Storage Systems



NON-BACKUP Battery Systems



Misc. Quick Guide



**THE MOST  
DEPENDABLE  
SOLAR BRAND**



## EAGLE 72HM G2 Black

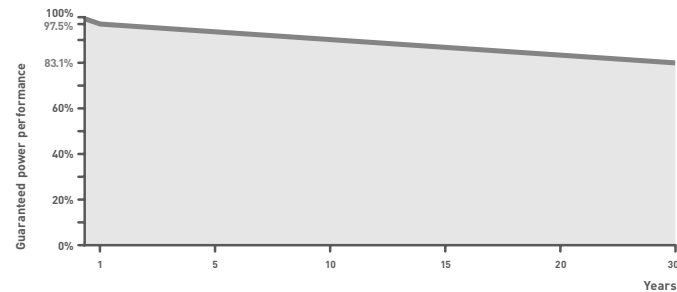
**380-400 WATT • HALF CELL MONO PERC MODULE**

Positive power tolerance of 0~+3%

- NYSE-listed since 2010, Bloomberg Tier 1 manufacturer
- Best-selling module globally for last 4 years
- Top performance in the strictest 3rd party labs
- 99.9% on-time delivery to the installer
- Automated manufacturing utilizing artificial intelligence
- Vertically integrated, tight controls on quality
- Premium solar panel factories in USA and Malaysia

### LINEAR PERFORMANCE WARRANTY

25-Year Performance Warranty



Nomenclature: JKM400M-72HBL

Code	Cell	Code	Backsheet	Code	Cell
mult	Full	mult	White	mult	Normal
H	Half	B	Black	L	Diamond

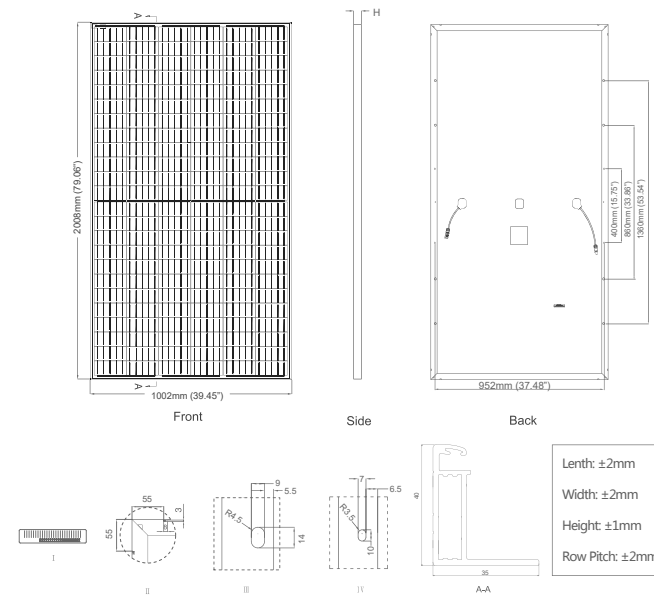


- ISO9001:2008 Quality Standards
- ISO14001:2004 Environmental Standards
- IEC61215, IEC61730 certified products
- OHSAS18001 Occupational Health & Safety Standards
- UL1703 certified products

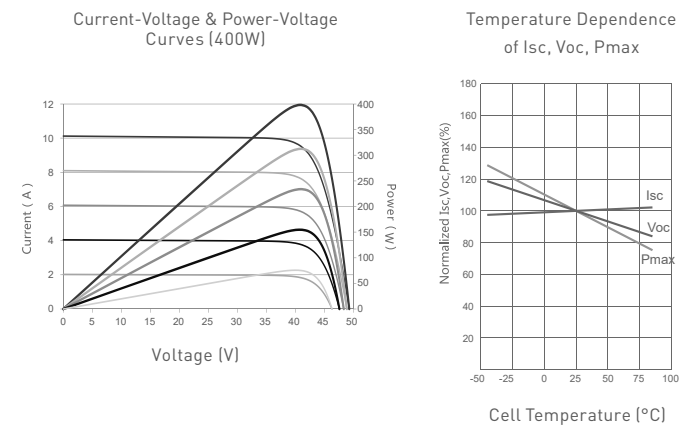
### KEY FEATURES

- Diamond Half Cell Technology**  
 World-record breaking efficient mono PERC half cut solar cells deliver high power in a small footprint.
- Designed for Long Life**  
 Uses the same DuPont protective film as the Space Station, Mars Lander, and jetliners. 25-year warranty.
- Shade Tolerant**  
 Twin array design allows continued performance even with shading by trees or debris.
- Power Boost in Cloudy Conditions**  
 A special film diffuses light, boosting performance even with shading by trees or debris.
- Protected Against All Environments**  
 Certified to withstand humidity, heat, rain, marine environments, wind, hailstorms, and packed snow.

### ENGINEERING DRAWINGS



### ELECTRICAL PERFORMANCE & TEMPERATURE DEPENDENCE



### MECHANICAL CHARACTERISTICS

Cells	Mono PERC Diamond Cell (158.75x158.75mm)
No. of Cells	144 (6x24)
Dimensions	2008x1002x40mm (79.06x39.45x1.57in)
Weight	22.5kg (49.6lbs)
Front Glass	3.2mm, Anti-Reflection Coating High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminum Alloy
Junction Box	IP67 Rated
Output Cables	12AWG, 2286mm (90in) or Customized Length
Fire Type	Type 1
Pressure Rating	5400Pa (Snow) & 2400Pa (Wind)
Connector	MC4

### TEMPERATURE CHARACTERISTICS

Temperature Coefficients of Pmax	-0.35%/°C
Temperature Coefficients of Voc	-0.29%/°C
Temperature Coefficients of Isc	0.048%/°C
Nominal Operating Cell Temperature (NOCT)	45±2°C

### MAXIMUM RATINGS

Operating Temperature (°C)	-40°C~+85°C
Maximum System Voltage	1000VDC (UL/IEC)
Maximum Series Fuse Rating	20A

### PACKAGING CONFIGURATION

[Two pallets = One stack]  
27pcs/pallets, 54pcs/stack, 594pcs/40' HQ Container

### ELECTRICAL CHARACTERISTICS

Module Type	JKM380M-72HBL		JKM385M-72HBL		JKM390M-72HBL		JKM395M-72HBL		JKM400M-72HBL	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	380Wp	286Wp	385Wp	290Wp	390Wp	294Wp	395Wp	298Wp	400Wp	302Wp
Maximum Power Voltage (Vmp)	40.5V	38.6V	40.8V	38.8V	41.1V	39.1V	41.4V	39.3V	41.7V	39.6V
Maximum Power Current (Imp)	9.39A	7.42A	9.44A	7.48A	9.49A	7.54A	9.55A	7.60A	9.60A	7.66A
Open-circuit Voltage (Voc)	48.9V	47.5V	49.1V	47.7V	49.3V	48.0V	49.5V	48.2V	49.8V	48.5V
Short-circuit Current (Isc)	9.75A	7.88A	9.92A	7.95A	10.12A	8.02A	10.23A	8.09A	10.36A	8.16A
Module Efficiency STC [%]	18.89%		19.14%		19.38%		19.63%		19.88%	

\*STC: ☀ Irradiance 1000W/m<sup>2</sup>    🌡 Cell Temperature 25°C    ☁ AM = 1.5  
 NOCT: ☀ Irradiance 800W/m<sup>2</sup>    🌡 Ambient Temperature 20°C    ☁ AM = 1.5    🌬 Wind Speed 1m/s

\*Power measurement tolerance: +/- 3%

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.  
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 JKM380-400M-72HBL-A3.1-US

# 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](http://solaredge.com)



# / Power Optimizer

## For North America

S440, S500

	S440	S500	Unit
<b>INPUT</b>			
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		%
Oversvoltage Category	II		
<b>OUTPUT DURING OPERATION</b>			
Maximum Output Current	15		Adc
Maximum Output Voltage	60		Vdc
<b>OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM INVERTER OR INVERTER OFF)</b>			
Safety Output Voltage per Power Optimizer	1+/-0.1		Vdc
<b>STANDARD COMPLIANCE</b>			
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		
<b>INSTALLATION SPECIFICATIONS</b>			
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

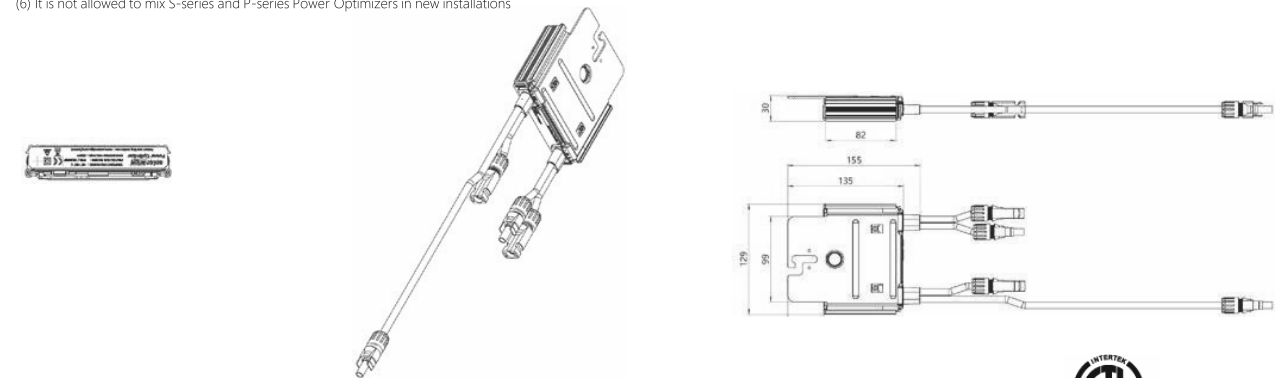
(3) For ambient temperature above +70°C / +158°F power de-rating is applied. Refer to Power Optimizers Temperature De-Rating Technical Note for more details

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



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							
<b>OUTPUT</b>								
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							
<b>INPUT</b>								
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							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

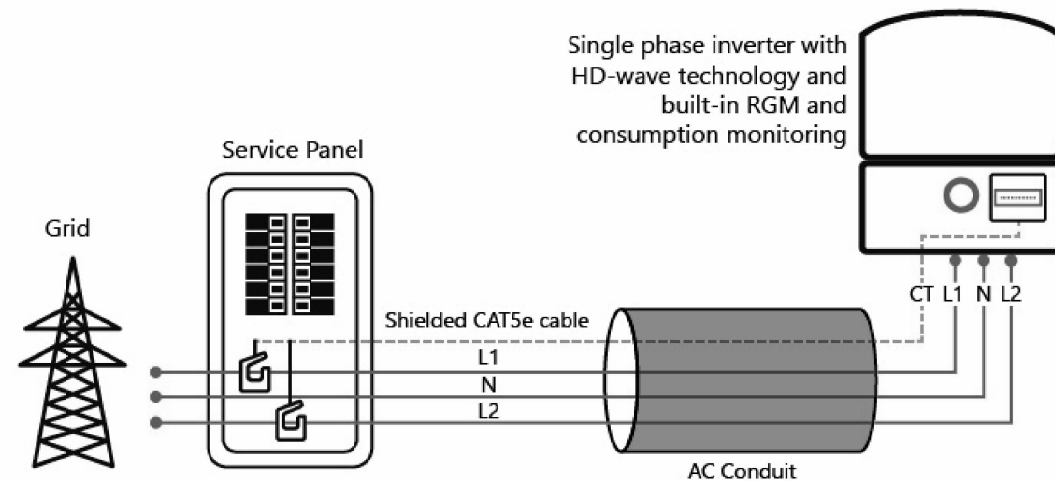
MODEL NUMBER	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US
<b>ADDITIONAL FEATURES</b>							
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)						
Revenue Grade Metering, ANSI C12.20	Optional <sup>(3)</sup>						
Consumption 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						
<b>STANDARD COMPLIANCE</b>							
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						
<b>INSTALLATION SPECIFICATIONS</b>							
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			
Weight with Safety Switch	22 / 10	25.1 / 11.4	26.2 / 11.9	38.8 / 17.6			
Noise	< 25			< 50			
Cooling	Natural Convection						
Operating Temperature Range	-40 to +140 / -40 to +60 <sup>(4)</sup>						
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



## Product specifications

# Eaton DG221URB

Catalog Number: DG221URB

Eaton General duty non-fusible safety switch, single-throw, 30 A, 240 V, NEMA 3R, Rainproof, Painted galvanized steel, Two-pole, Two-wire

## General specifications

Product Name	Catalog Number
Eaton general duty non-fusible safety switch	DG221URB
	UPC
	782113120232
Product Length/Depth	Product Height
6.88 in	10.81 in
Product Width	Product Weight
6.38 in	6 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
30A
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 - DG221URB



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# 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



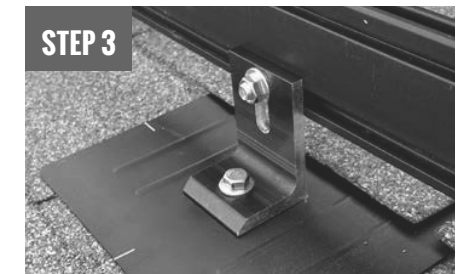
**FLASHKIT PRO** IS THE COMPLETE FLASHING AND ATTACHMENT SOLUTION FOR COMPOSITION ROOFS.



**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](http://UNIRAC.COM) OR CALL (505) 248-2702

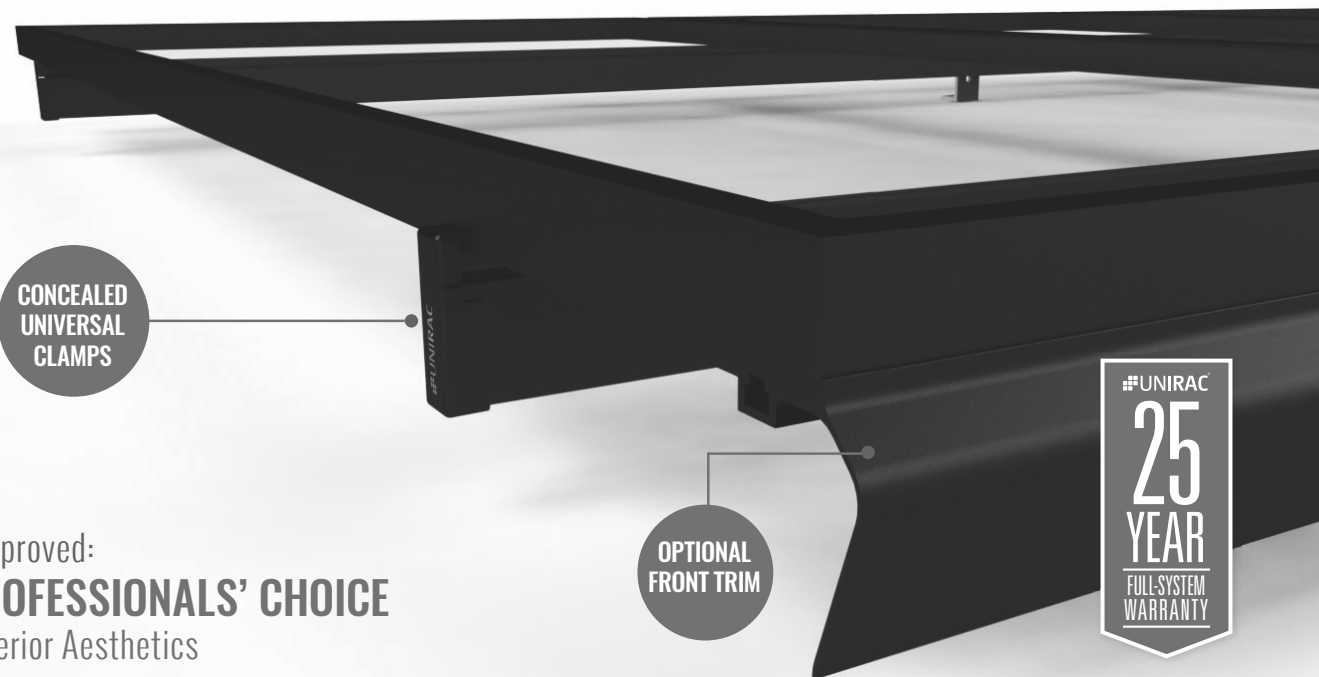
## FASTER INSTALLATION. 25-YEAR WARRANTY.

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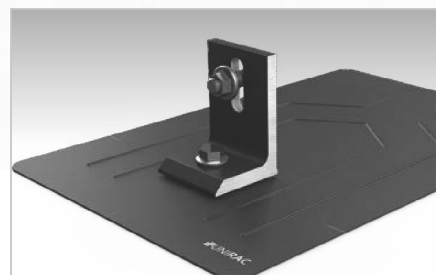
# SOLARMOUNT



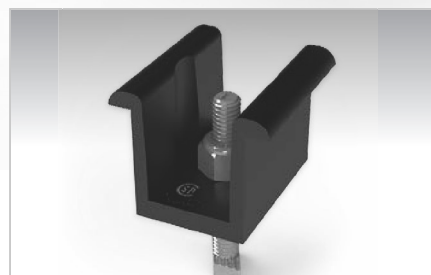
**SOLARMOUNT** is the professionals' choice for residential PV mounting applications. Every aspect of the system is designed for an easier, faster installation experience. **SOLARMOUNT** is a complete solution with revolutionary universal clamps, **FLASHKIT PRO**, full system UL 2703 certification and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



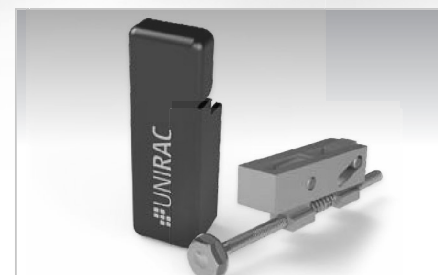
New & Improved:  
**THE PROFESSIONALS' CHOICE**  
With Superior Aesthetics



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



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



**REVOLUTIONARY NEW ENDCLAMPS**  
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# 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.

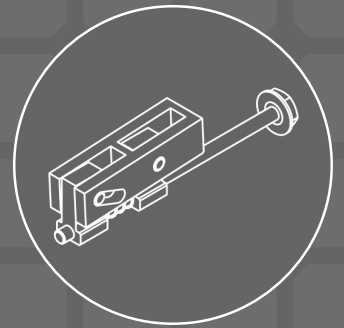
## BETTER SUPPORT

### WORK WITH THE INDUSTRIES MOST EXPERIENCED TEAM

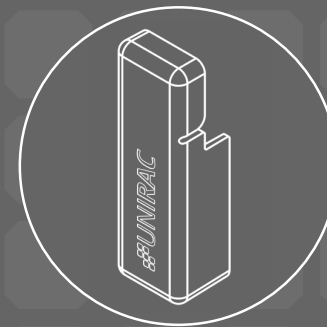
Professional support for professional installers and designers. You have access to our technical support and training groups. Whatever your support needs, we've got you covered. Visit [Unirac.com/solarmount](http://Unirac.com/solarmount) for more information.

**LISTED UL2703** BONDING & GROUNDING MECHANICAL LOADING SYSTEM FIRE CLASSIFICATION

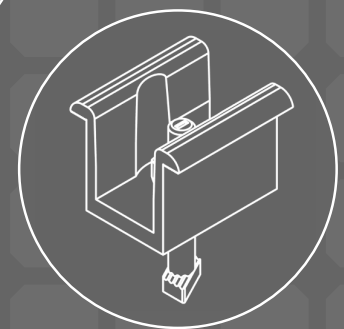
CONCEALED UNIVERSAL ENDCLAMPS



END CAPS INCLUDED WITH EVERY ENDCLAMP



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

UNMATCHED EXPERIENCE	CERTIFIED QUALITY	ENGINEERING EXCELLENCE	BANKABLE WARRANTY	DESIGN TOOLS	PERMIT DOCUMENTATION
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### 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

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# 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

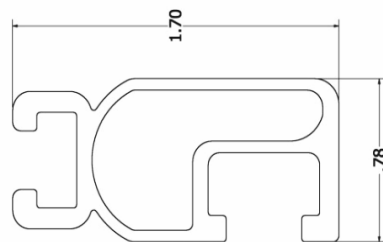
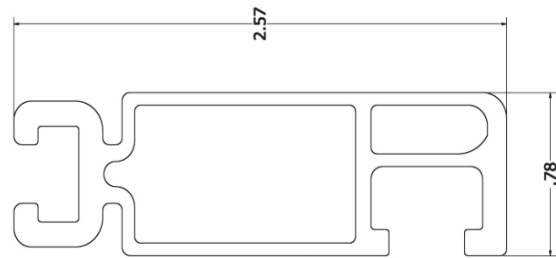
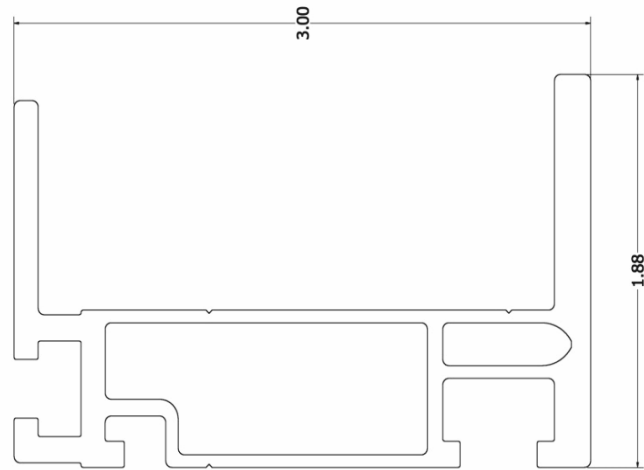
## Unirac Large Array

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

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# 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)

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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)

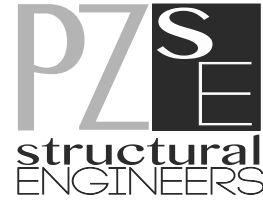
Appendix: 1,1-5

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Licensed Test mark:



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



March 31, 2020

Unirac  
1411 Broadway Blvd. NE  
Albuquerque, NM 87102

Attn.: Unirac - Engineering Department

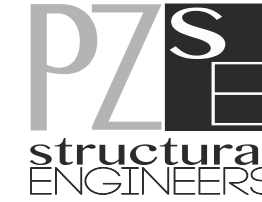
Re: Engineering Certification for the Unirac U-Builder 2.0 SOLARMOUNT Flush Rail

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

**DIGITALLY SEALED**

