

# ROOF MOUNT PHOTOVOLTAIC SYSTEM

## CODES:

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

## CONSTRUCTION NOTES:

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

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

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

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

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

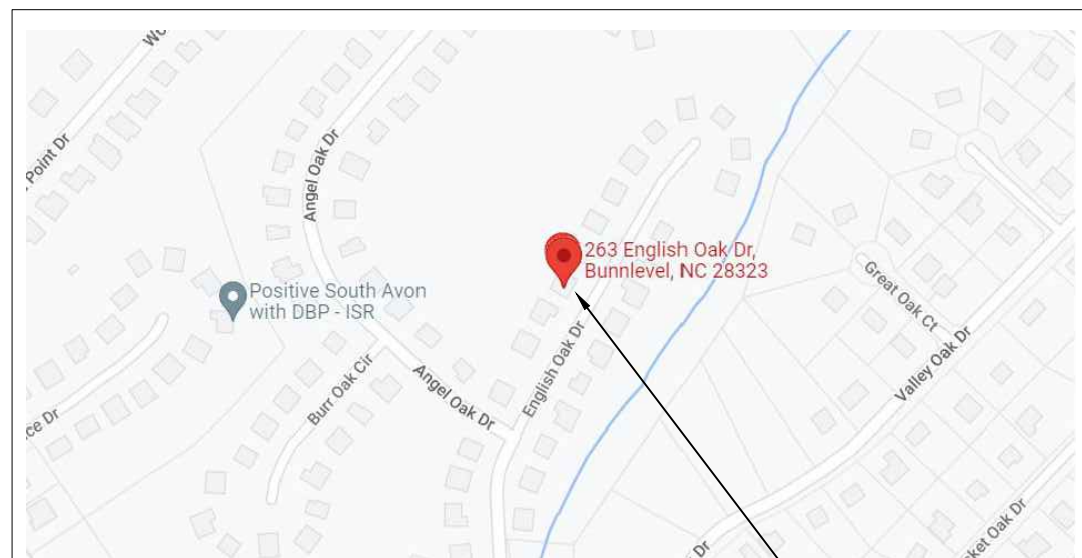
SOLAR PHOTOVOLTAIC SYSTEM EQUIPMENT WILL BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS OF ART. 690 OF THE 2017 AC

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

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

## VICINITY MAP:



SITE LOCATION

## TABLE OF CONTENTS:

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

**CLIENT:**  
 GRAHAM LEWIS  
 263 ENGLISH OAK DRIVE, BUNNLEVEL, NC 28323  
 AHJ: HARNETT COUNTY (NC)  
 UTILITY: SOUTH RIVER EMC  
 PHONE: (816) 383-2825  
 EMAIL: SLEWIS4514@GMAIL.COM  
 FINANCE: OTHER

**SYSTEM:**  
 SYSTEM SIZE (DC): 22 X 400 = 8.800 kW  
 SYSTEM SIZE (AC): 6.380 kW @ 240V  
 MODULES: 22 X FREEDOM FOREVER: FF-MP-BBB-400  
 MICROINVERTERS: 22 X ENPHASE IQ8PLUS-72-2-US

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



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










**GREG ALBRIGHT**

**CONTRACTOR LICENSE:**  
 ELECTRICAL CONTRACTOR U.34043

## SITE LOCATION

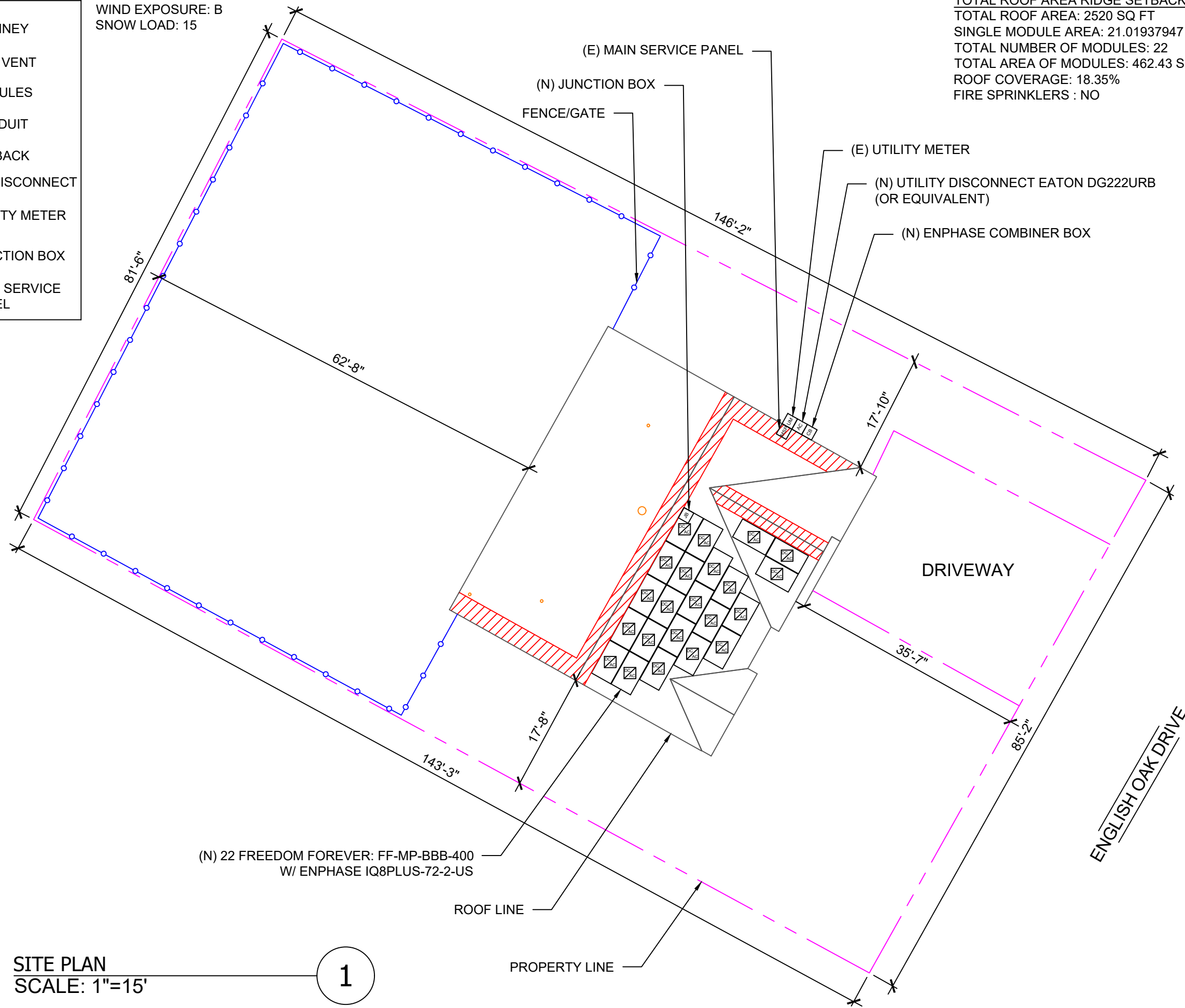
|                   |                    |                      |                |
|-------------------|--------------------|----------------------|----------------|
| JOB NO:<br>297496 | DATE:<br>1/24/2023 | DESIGNED BY:<br>J.F. | SHEET:<br>PV-1 |
|-------------------|--------------------|----------------------|----------------|

**LEGEND:**

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

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

TOTAL ROOF AREA RIDGE SETBACK CALCS:  
 TOTAL ROOF AREA: 2520 SQ FT  
 SINGLE MODULE AREA: 21.01937947 SQ FT  
 TOTAL NUMBER OF MODULES: 22  
 TOTAL AREA OF MODULES: 462.43 SQ FT  
 ROOF COVERAGE: 18.35%  
 FIRE SPRINKLERS : NO



ROOF AREA: 2520 SQ FT

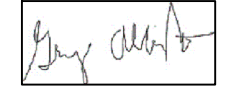
**CLIENT:**  
 GRAHAM LEWIS  
 263 ENGLISH OAK DRIVE, BUNNLEVEL, NC  
 28323  
 AHJ: HARNETT COUNTY (NC)  
 UTILITY: SOUTH RIVER EMC  
 PHONE: (816) 383-2825  
 EMAIL: SLEWIS4514@GMAIL.COM  
 FINANCE: OTHER

**SYSTEM:**  
 SYSTEM SIZE (DC): 22 X 400 = 8.800 kW  
 SYSTEM SIZE (AC): 6.380 kW @ 240V  
 MODULES: 22 X FREEDOM FOREVER:  
 FF-MP-BBB-400  
 MICROINVERTERS: 22 X ENPHASE  
 IQ8PLUS-72-2-US

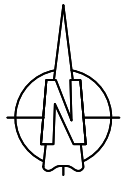
| REVISIONS |            |      |
|-----------|------------|------|
| NO.       | REVISED BY | DATE |
| -         | -          | -    |
| -         | -          | -    |
| -         | -          | -    |

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

GREG ALBRIGHT



CONTRACTOR LICENSE:  
 ELECTRICAL CONTRACTOR U.34043












SITE PLAN  
 SCALE: 1"=15'

1

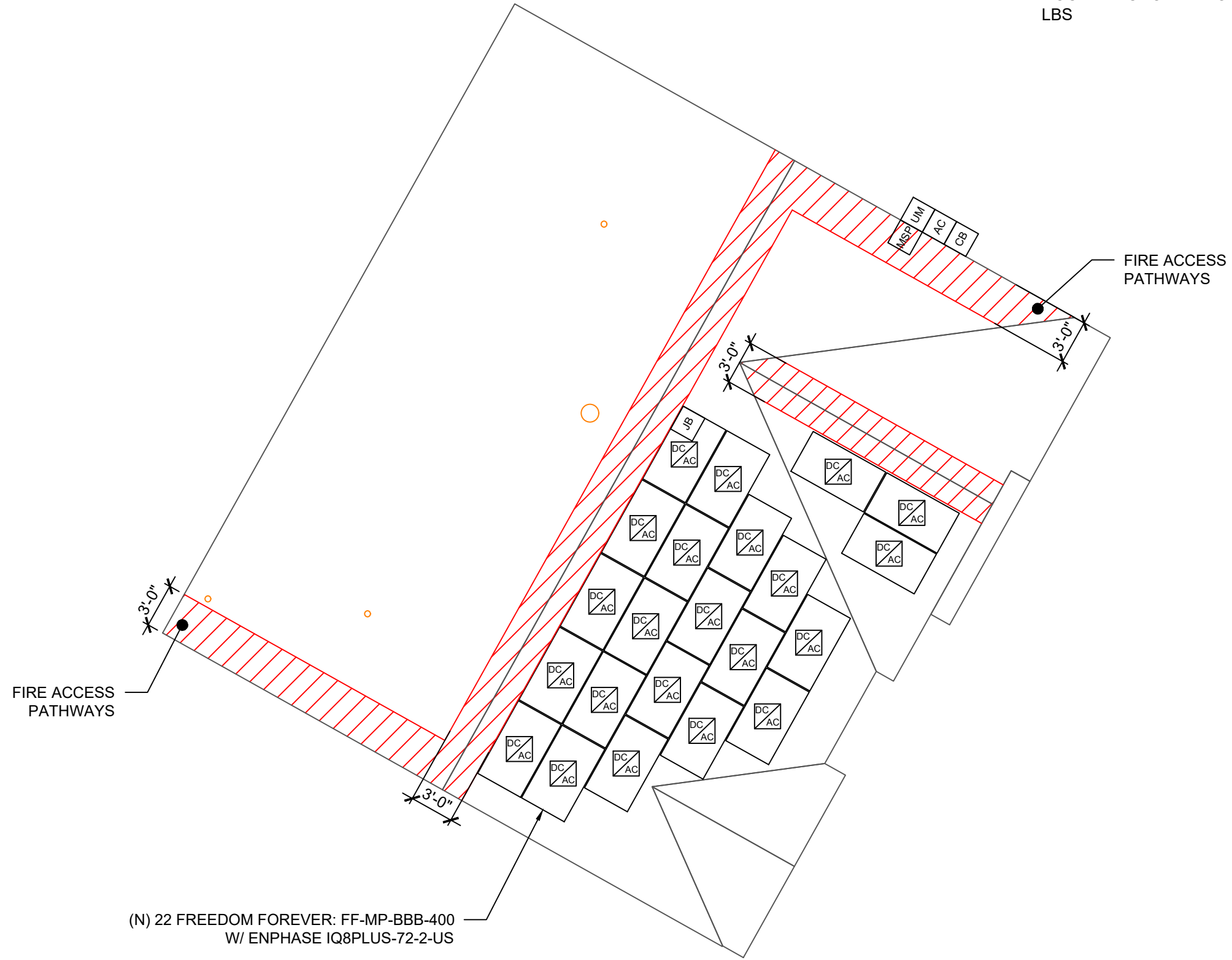
| SITE PLAN |           |              |        |
|-----------|-----------|--------------|--------|
| JOB NO:   | DATE:     | DESIGNED BY: | SHEET: |
| 297496    | 1/24/2023 | J.F.         | PV-2   |

**LEGEND:**

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

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

TOTAL ROOF AREA: 2520 SQ FT  
 TOTAL ARRAY AREA: 462.43 SQ FT  
 ARRAY COVERAGE: 18.35%  
 SYSTEM DISTRIBUTED WEIGHT: 2.32 LBS  
 ROCKIT MICRORAIL POINT-LOAD: 27.48 LBS



(N) 22 FREEDOM FOREVER: FF-MP-BBB-400  
 W/ ENPHASE IQ8PLUS-72-2-US

ROOF AREA: 2520 SQ FT

**CLIENT:**  
 GRAHAM LEWIS  
 263 ENGLISH OAK DRIVE, BUNNLEVEL, NC 28323  
**AHJ:** HARNETT COUNTY (NC)  
**UTILITY:** SOUTH RIVER EMC  
**PHONE:** (816) 383-2825  
**EMAIL:** SLEWIS4514@GMAIL.COM  
**FINANCE:** OTHER

**SYSTEM:**  
 SYSTEM SIZE (DC): 22 X 400 = 8.800 kW  
 SYSTEM SIZE (AC): 6.380 kW @ 240V  
 MODULES: 22 X FREEDOM FOREVER: FF-MP-BBB-400  
 MICROINVERTERS: 22 X ENPHASE IQ8PLUS-72-2-US

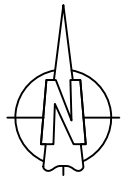
| REVISIONS |            |      |
|-----------|------------|------|
| NO.       | REVISED BY | DATE |
| -         | -          | -    |
| -         | -          | -    |
| -         | -          | -    |



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

**GREG ALBRIGHT**

**CONTRACTOR LICENSE:**  
 ELECTRICAL CONTRACTOR U.34043



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

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 PLAN WITH MODULES LAYOUT

|                   |                    |                      |                 |
|-------------------|--------------------|----------------------|-----------------|
| JOB NO:<br>297496 | DATE:<br>1/24/2023 | DESIGNED BY:<br>J.F. | SHEET:<br>PV-2A |
|-------------------|--------------------|----------------------|-----------------|

# ROOF DETAILS:

TOTAL ROOF AREA: 2520 SQ FT  
 TOTAL ARRAY AREA: 462.43 SQFT  
 ARRAY COVERAGE: 18.35%  
 SYSTEM DISTRIBUTED WEIGHT: 2.32 LBS  
 ROCKIT MICRORAIL POINT-LOAD: 27.48 LBS

| ROOF AREA STATEMENT |                 |            |             |         |           |              |
|---------------------|-----------------|------------|-------------|---------|-----------|--------------|
| ROOF                | MODULE QUANTITY | ROOF PITCH | ARRAY PITCH | AZIMUTH | ROOF AREA | ARRAY AREA   |
| ROOF 1              | 19              | 25         | 25          | 119     | 834 SQ FT | 399.37 SQ FT |
| ROOF 2              | 3               | 25         | 25          | 209     | 174 SQ FT | 63.06 SQ FT  |
| ----                | ----            | ----       | ----        | ----    | SQ FT     | SQ FT        |
| ----                | ----            | ----       | ----        | ----    | SQ FT     | SQ FT        |
| ----                | ----            | ----       | ----        | ----    | SQ FT     | SQ FT        |
| ----                | ----            | ----       | ----        | ----    | SQ FT     | SQ FT        |
| ----                | ----            | ----       | ----        | ----    | SQ FT     | SQ FT        |
| ----                | ----            | ----       | ----        | ----    | SQ FT     | SQ FT        |
| ----                | ----            | ----       | ----        | ----    | SQ FT     | SQ FT        |
| ----                | ----            | ----       | ----        | ----    | SQ FT     | SQ FT        |

**CLIENT:**  
 GRAHAM LEWIS  
 263 ENGLISH OAK DRIVE, BUNNLEVEL, NC 28323  
 AHJ: HARNETT COUNTY (NC)  
 UTILITY: SOUTH RIVER EMC  
 PHONE: (816) 383-2825  
 EMAIL: SLEWIS4514@GMAIL.COM  
 FINANCE: OTHER

**SYSTEM:**  
 SYSTEM SIZE (DC): 22 X 400 = 8.800 kW  
 SYSTEM SIZE (AC): 6.380 kW @ 240V  
 MODULES: 22 X FREEDOM FOREVER: FF-MP-BBB-400  
 MICROINVERTERS: 22 X ENPHASE IQ8PLUS-72-2-US

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



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

**GREG ALBRIGHT**

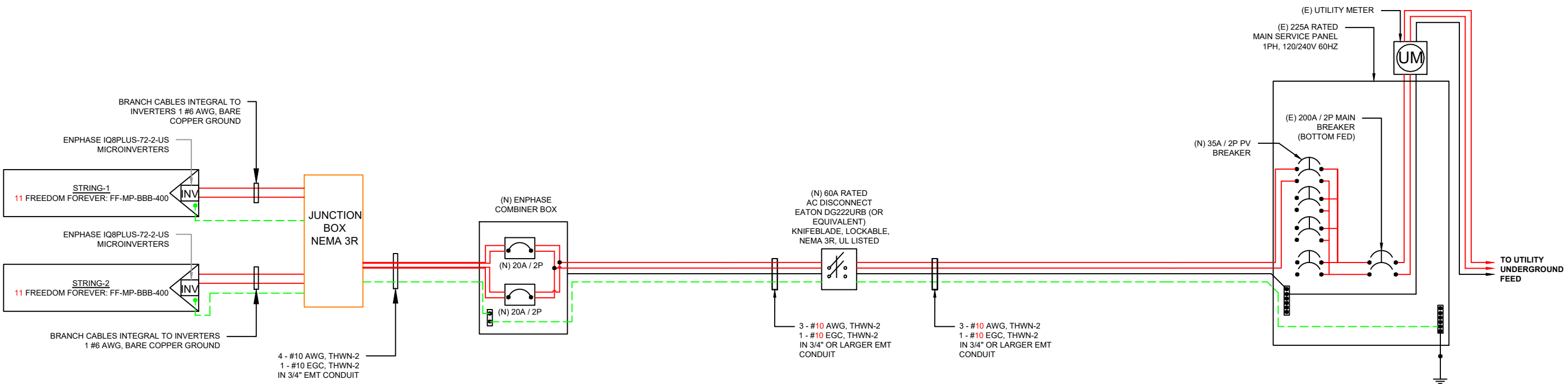
**CONTRACTOR LICENSE:**  
 ELECTRICAL CONTRACTOR U.34043

| ROOF DETAILS |           |              |        |
|--------------|-----------|--------------|--------|
| JOB NO:      | DATE:     | DESIGNED BY: | SHEET: |
| 297496       | 1/24/2023 | J.F.         | PV-2B  |



**BACKFEED BREAKER SIZING**  
 MAX. CONTINUOUS OUTPUT 26.62A @ 240V  
 26.62 X 1.25 = 33.28AMPS 35A BREAKER - OK  
 SEE 705.12 OF 2017 AC  
 225 X 1.20 = 270  
 270 - 200 = 70A ALLOWABLE BACKFEED

**PV SYSTEM**  
 8.800 kW-DC  
 6.380 kW-AC



**CLIENT:**  
 GRAHAM LEWIS  
 263 ENGLISH OAK DRIVE, BUNNLEVEL, NC  
 28323  
 AHJ: HARNETT COUNTY (NC)  
 UTILITY: SOUTH RIVER EMC  
 PHONE: (816) 383-2825  
 EMAIL: SLEWIS4514@GMAIL.COM  
 FINANCE: OTHER

**SYSTEM:**  
 SYSTEM SIZE (DC): 22 X 400 = 8.800 kW  
 SYSTEM SIZE (AC): 6.380 kW @ 240V  
 MODULES: 22 X FREEDOM FOREVER:  
 FF-MP-BBB-400  
 MICROINVERTERS: 22 X ENPHASE  
 IQ8PLUS-72-2-US

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



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

**GREG ALBRIGHT**

**CONTRACTOR LICENSE:**  
 ELECTRICAL CONTRACTOR U.34043

**NOTE:**  
 CONDUIT AND CONDUCTORS SPECIFICATIONS ARE BASED  
 ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT  
 TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS

THREE LINE DIAGRAM

|                   |                    |                      |                |
|-------------------|--------------------|----------------------|----------------|
| JOB NO:<br>297496 | DATE:<br>1/24/2023 | DESIGNED BY:<br>J.F. | SHEET:<br>PV-4 |
|-------------------|--------------------|----------------------|----------------|

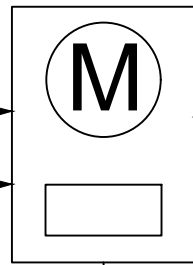






**WARNING:**  
POWER SOURCE OUTPUT  
CONNECTION  
DO NOT RELOCATE THIS  
OVERCURRENT DEVICE.

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



**"WARNING"**  
DUAL POWER SOURCES  
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM  
RATED AC OUTPUT CURRENT - 26.62 AMPS  
AC NORMAL OPERATING VOLTAGE - 240 VOLTS

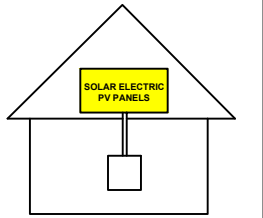
690.54

**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.
  - 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

**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)

PV METER

PM

AC

**PV SYSTEM AC DISCONNECT**  
RATED AC OUTPUT CURRENT - 26.62 AMPS  
AC NORMAL OPERATING VOLTAGE - 240 VOLTS

690.15, 690.54

**RAPID SHUTDOWN SWITCH FOR  
SOLAR PV SYSTEM**

690.56(C)(3)

INVERTER

MAXIMUM VOLTAGE  V  
MAXIMUM CIRCUIT CURRENT  A  
MAX DC-DC CONVERTER  
OUTPUT CURRENT  A

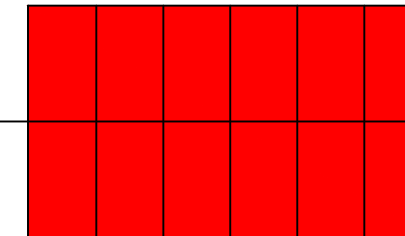
**"WARNING"**  
ELECTRICAL SHOCK HAZARD.  
TERMINALS ON BOTH LINE AND LOAD SIDES  
MAY BE ENERGIZED IN THE OPEN POSITION.

690.13 (B)

**PV SYSTEM DC DISCONNECT**  
MAXIMUM VOLTAGE: 480V  
MAXIMUM CIRCUIT CURRENT: N/A  
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:  
GRAHAM LEWIS  
263 ENGLISH OAK DRIVE, BUNNLEVEL, NC  
28323  
AHJ: HARNETT COUNTY (NC)  
UTILITY: SOUTH RIVER EMC  
PHONE: (816) 383-2825  
EMAIL: SLEWIS4514@GMAIL.COM  
FINANCE: OTHER

SYSTEM:  
SYSTEM SIZE (DC): 22 X 400 = 8.800 kW  
SYSTEM SIZE (AC): 6.380 kW @ 240V  
MODULES: 22 X FREEDOM FOREVER:  
FF-MP-BBB-400  
MICROINVERTERS: 22 X ENPHASE  
IQ8PLUS-72-2-US

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



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

GREG ALBRIGHT

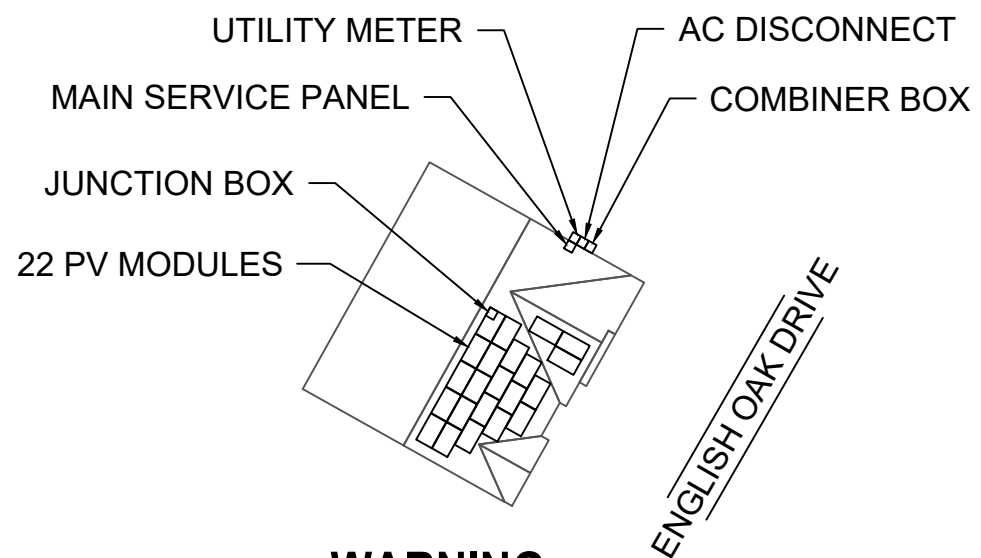
CONTRACTOR LICENSE:  
ELECTRICAL CONTRACTOR U.34043

LABELS

| JOB NO: | DATE:     | DESIGNED BY: | SHEET: |
|---------|-----------|--------------|--------|
| 297496  | 1/24/2023 | J.F.         | PV-7   |

# 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



CLIENT:  
 GRAHAM LEWIS  
 263 ENGLISH OAK DRIVE, BUNNLEVEL, NC 28323  
 AHJ: HARNETT COUNTY (NC)  
 UTILITY: SOUTH RIVER EMC  
 PHONE: (816) 383-2825  
 EMAIL: SLEWIS4514@GMAIL.COM  
 FINANCE: OTHER

SYSTEM:  
 SYSTEM SIZE (DC): 22 X 400 = 8.800 kW  
 SYSTEM SIZE (AC): 6.380 kW @ 240V  
 MODULES: 22 X FREEDOM FOREVER: FF-MP-BBB-400  
 MICROINVERTERS: 22 X ENPHASE IQ8PLUS-72-2-US

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



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

GREG ALBRIGHT

CONTRACTOR LICENSE:  
 ELECTRICAL CONTRACTOR U.34043

SITE PLACARD

| JOB NO: | DATE:     | DESIGNED BY: | SHEET: |
|---------|-----------|--------------|--------|
| 297496  | 1/24/2023 | J.F.         | PV-7A  |

## NOTES:

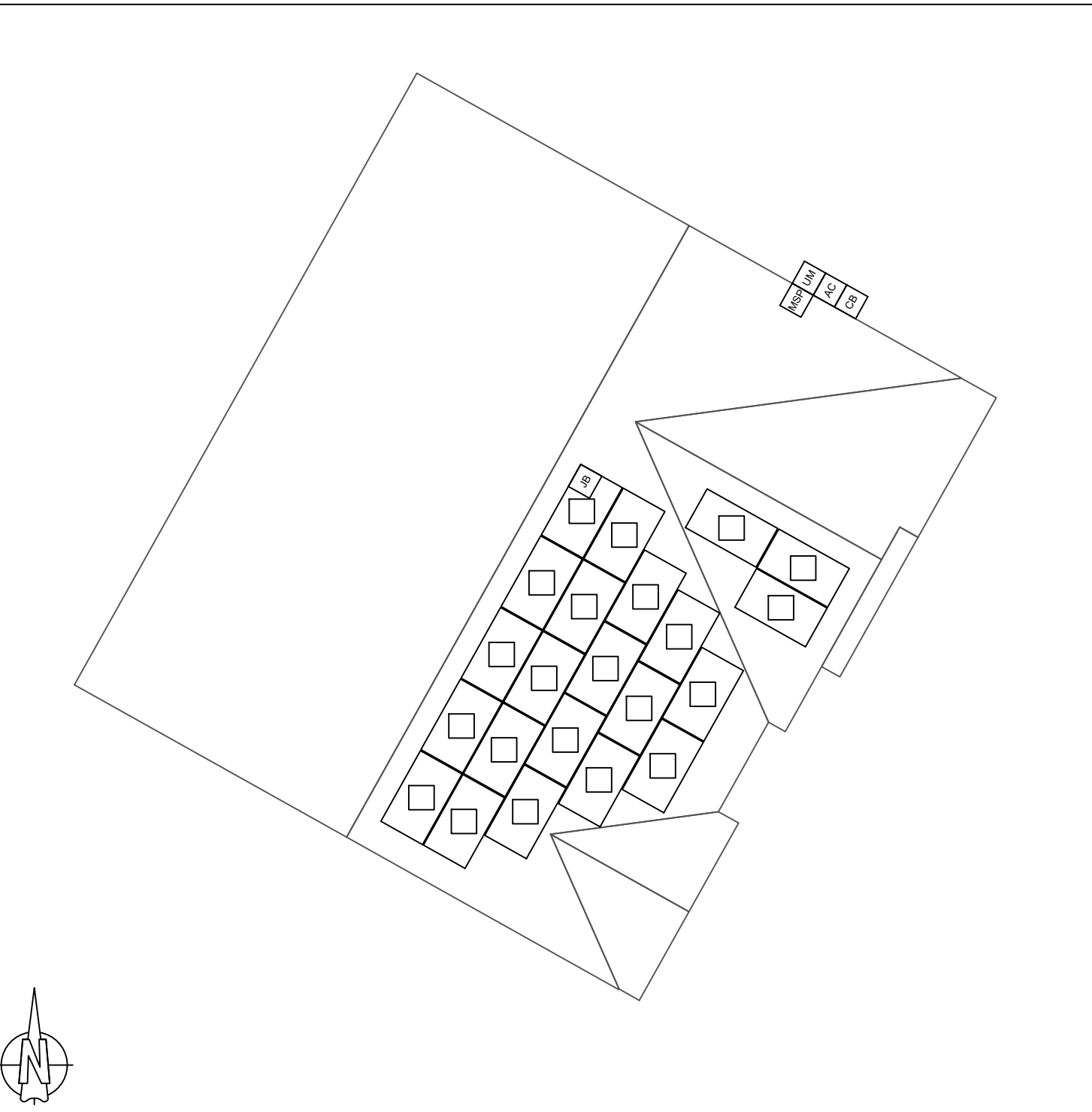
- AC ARTICLES 690 AND 705 AND IRC SECTION R324 MARKINGS SHOWN HEREON.
- ALL MARKING SHALL CONSIST OF THE FOLLOWING:
  - UV RESISTANT SIGN MATERIAL WITH ENGRAVED OR MACHINE PRINTED LETTERS OR ELECTRO-PLATING.
  - RED BACKGROUND COLOR WHITE TEXT AND LINE WORK.
  - AERIAL FONT.
- ALL SIGNS SHALL BE SIZED 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.

# ENPHASE MICROINVERTER CHART

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

1  
2  
3  
4  
5  
6  
7  
8  
9  
10

|  |  |  |  |  |  |
|--|--|--|--|--|--|
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |



**CLIENT:**  
 GRAHAM LEWIS  
 263 ENGLISH OAK DRIVE, BUNNLEVEL, NC 28323  
**AHJ:** HARNETT COUNTY (NC)  
**UTILITY:** SOUTH RIVER EMC  
**PHONE:** (816) 383-2825  
**EMAIL:** SLEWIS4514@GMAIL.COM  
**FINANCE:** OTHER

**SYSTEM:**  
 SYSTEM SIZE (DC): 22 X 400 = 8.800 kW  
 SYSTEM SIZE (AC): 6.380 kW @ 240V  
 MODULES: 22 X FREEDOM FOREVER: FF-MP-BBB-400  
 MICROINVERTERS: 22 X ENPHASE IQ8PLUS-72-2-US

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



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

**GREG ALBRIGHT**

**CONTRACTOR LICENSE:**  
 ELECTRICAL CONTRACTOR U.34043

**MICROINVERTER CHART**

|                          |                           |                             |                       |
|--------------------------|---------------------------|-----------------------------|-----------------------|
| <b>JOB NO:</b><br>297496 | <b>DATE:</b><br>1/24/2023 | <b>DESIGNED BY:</b><br>J.F. | <b>SHEET:</b><br>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: \_\_\_\_\_

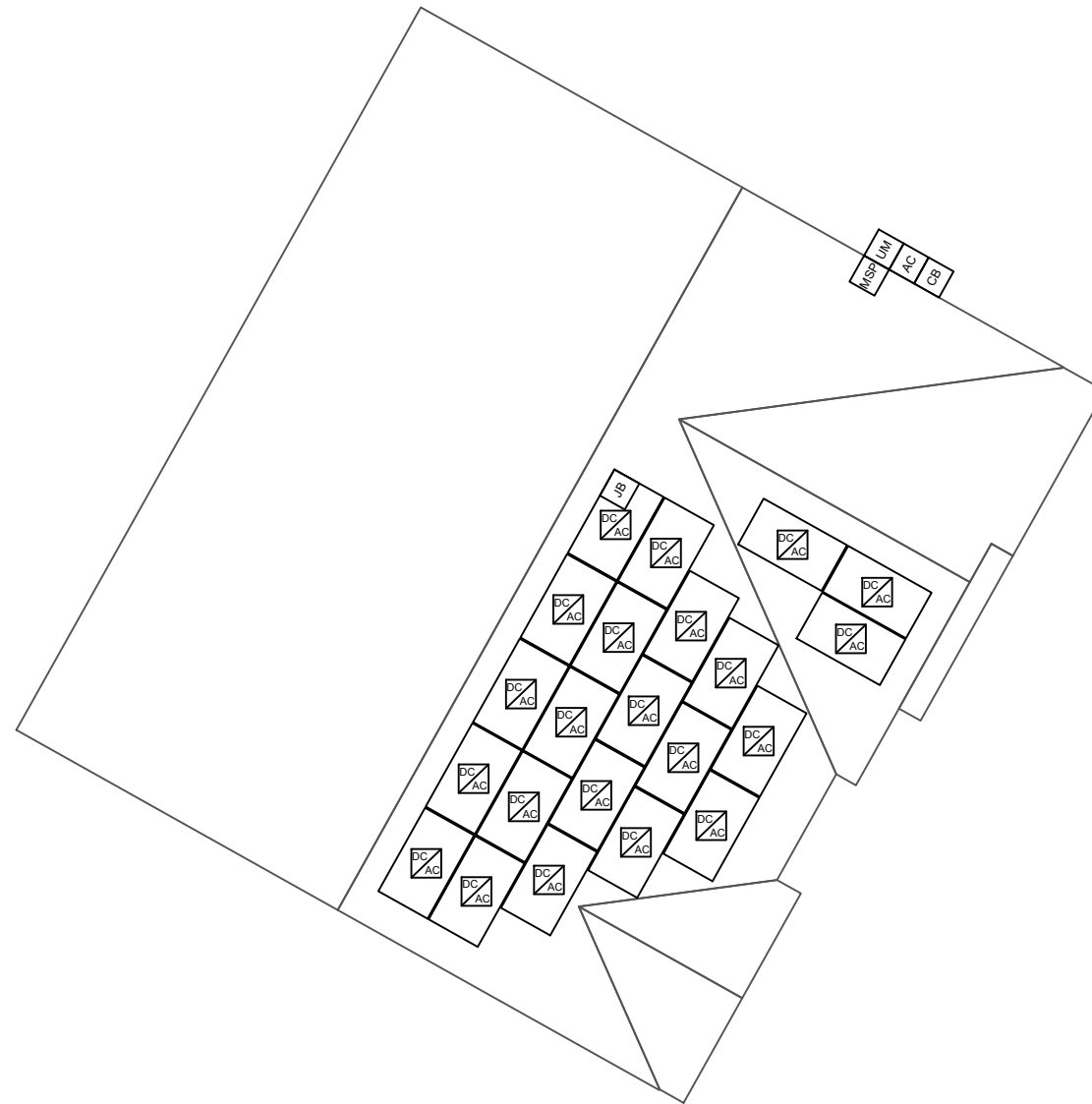
ADDRESS: \_\_\_\_\_

### 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.



- (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:**  
 GRAHAM LEWIS  
 263 ENGLISH OAK DRIVE, BUNNLEVEL, NC 28323  
 AHJ: HARNETT COUNTY (NC)  
 UTILITY: SOUTH RIVER EMC  
 PHONE: (816) 383-2825  
 EMAIL: SLEWIS4514@GMAIL.COM  
 FINANCE: OTHER

**SYSTEM:**  
 SYSTEM SIZE (DC): 22 X 400 = 8.800 kW  
 SYSTEM SIZE (AC): 6.380 kW @ 240V  
 MODULES: 22 X FREEDOM FOREVER: FF-MP-BBB-400  
 MICROINVERTERS: 22 X ENPHASE IQ8PLUS-72-2-US

# BREAK AND WATER LOG

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

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

| NAME | SIGNATURE |
|------|-----------|
|      |           |
|      |           |
|      |           |
|      |           |
|      |           |
|      |           |
|      |           |
|      |           |
|      |           |
|      |           |

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

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

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

**GREG ALBRIGHT**

CONTRACTOR LICENSE:  
 ELECTRICAL CONTRACTOR U.34043

| SAFETY PLAN |           |              |        |
|-------------|-----------|--------------|--------|
| JOB NO:     | DATE:     | DESIGNED BY: | SHEET: |
| 297496      | 1/24/2023 | J.F.         | 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 necessary.

EQP (name and title):

## 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:**  
 GRAHAM LEWIS  
 263 ENGLISH OAK DRIVE, BUNNLEVEL, NC 28323  
 AHJ: HARNETT COUNTY (NC)  
 UTILITY: SOUTH RIVER EMC  
 PHONE: (816) 383-2825  
 EMAIL: SLEWIS4514@GMAIL.COM  
 FINANCE: OTHER

**SYSTEM:**  
 SYSTEM SIZE (DC): 22 X 400 = 8.800 kW  
 SYSTEM SIZE (AC): 6.380 kW @ 240V  
 MODULES: 22 X FREEDOM FOREVER:  
 FF-MP-BBB-400  
 MICROINVERTERS: 22 X ENPHASE  
 IQ8PLUS-72-2-US

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



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

**GREG ALBRIGHT**



**CONTRACTOR LICENSE:**  
 ELECTRICAL CONTRACTOR U.34043

| SAFETY PLAN |           |              |        |
|-------------|-----------|--------------|--------|
| JOB NO:     | DATE:     | DESIGNED BY: | SHEET: |
| 297496      | 1/24/2023 | J.F.         | PV-10  |



# MACH 2 400W MODULE

## FF-MP-BBB-400

High module conversion efficiency up to 20.48%

Excellent weak light performance

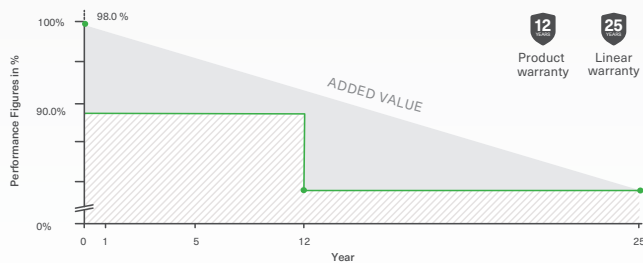
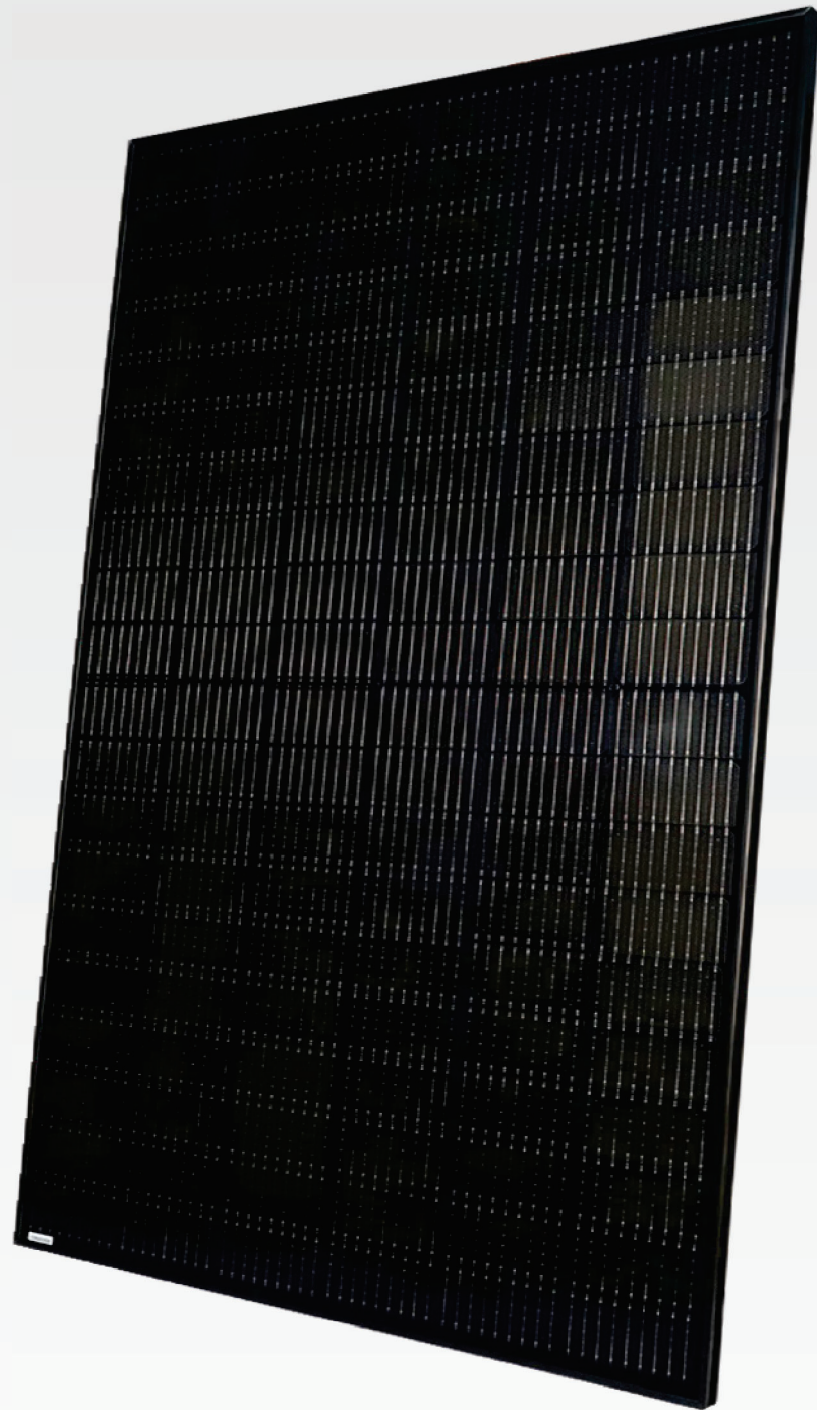
Withstanding harsh environment

Lower operating temperature

Extreme weather loading

12-year material & workmanship

25-year linear power output

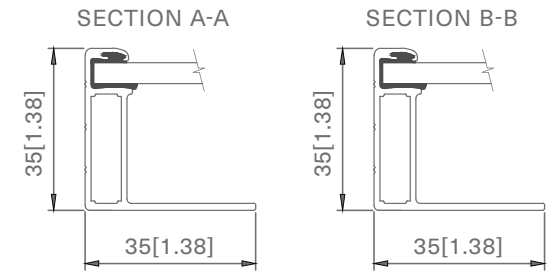


## MODULE SPECIFICATIONS

### ELECTRICAL CHARACTERISTICS

| Characteristics                             | FF-MP-BBB-400   |
|---|---|
| Maximum Power (P <sub>max</sub> )           | 400W  |
| Maximum Power Voltage (V <sub>mp</sub> )    | 31.01V  |
| Maximum Power Current (I <sub>mp</sub> )[A] | 12.90A  |
| Open Circuit Voltage (V <sub>oc</sub> )[V]  | 37.07V  |
| Short Circuit Current (I <sub>sc</sub> )[A] | 13.79A  |
| Module Efficiency                           | 20.48%  |
| Power Tolerance                             | 0/+5W   |
| STC   | Irradiance of 1000W/m <sup>2</sup> , AM1.5, cell Temperature 25°C |

### FRAME PROFILE



### 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)                         |
| Front Glass          | 3.2 mm (.13 in), High Transmission, Low Iron & Semi-Tempered Glass |
| Junction Box         | IP68 (3 Bypass Diodes)   |
| Output Cables        | 1200 mm (47 in)  |
| Connector            | Staubli EVO2   |
| 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

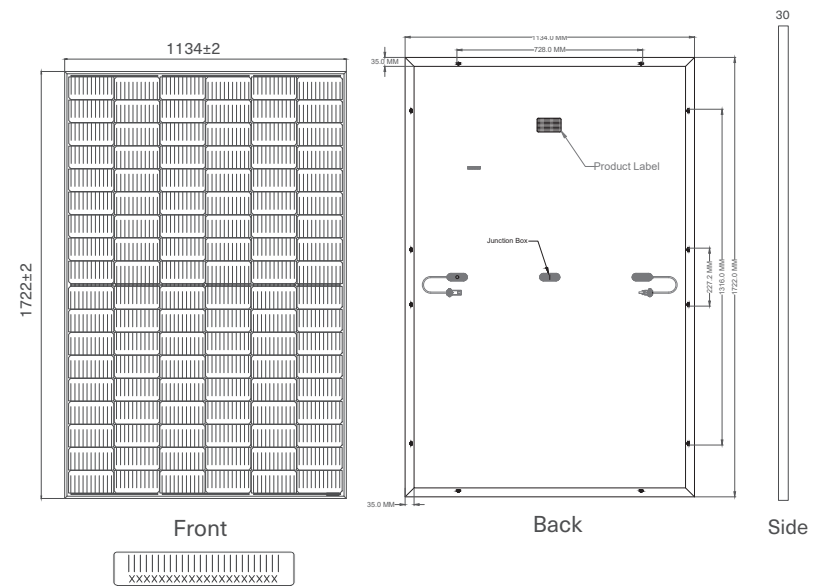
|                       |                     |
|-----------------------|---------------------|
| Snow Load             | 5,400Pa (113lb/ft2) |
| Rear Side Design Load | 2,400Pa (50lb/ft2)  |

### PACKAGING INFORMATION

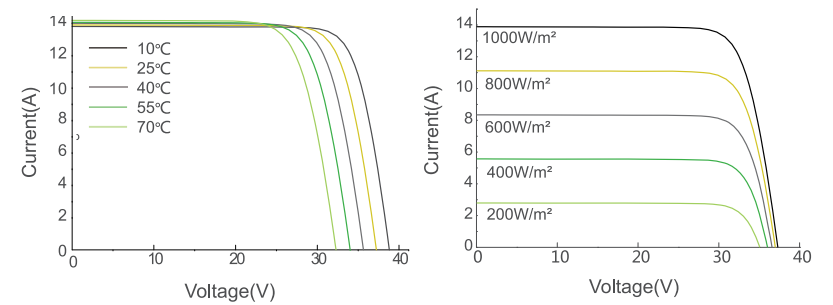
|                       |        |        |
|-----------------------|--------|--------|
| Container             | 20' GP | 40' HC |
| Pallets per Container | 6      | 26     |
| Panels per Container  | 186    | 806    |

### 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   |



### CURRENT-VOLTAGE CURVE

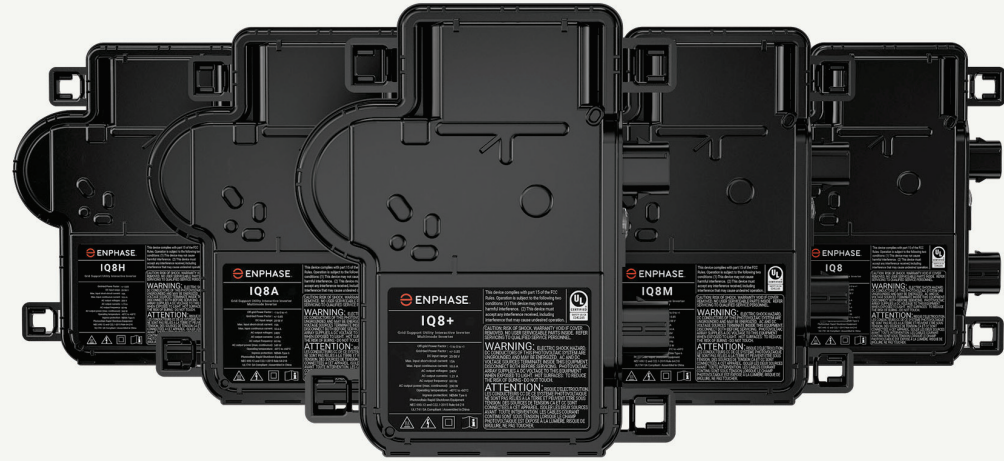


### CERTIFICATIONS AND STANDARDS PENDING



UL 61730 | UL 61215 | ISO 9001 | ISO 14001





## IQ8 Series Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.



IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.



IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

### Easy to install

- Lightweight and compact with plug-n-play connectors
- Power Line Communication (PLC) between components
- Faster installation with simple two-wire cabling

### High productivity and reliability

- Produce power even when the grid is down\*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

### Microgrid-forming

- Complies with the latest advanced grid support\*\*
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) requirements

\* Only when installed with IQ System Controller 2, meets UL 1741. IQ8H-208V operates only in grid-tied mode.  
 \*\* IQ8 Series Microinverters supports split phase, 240V. IQ8H-208 supports split phase, 208V only.

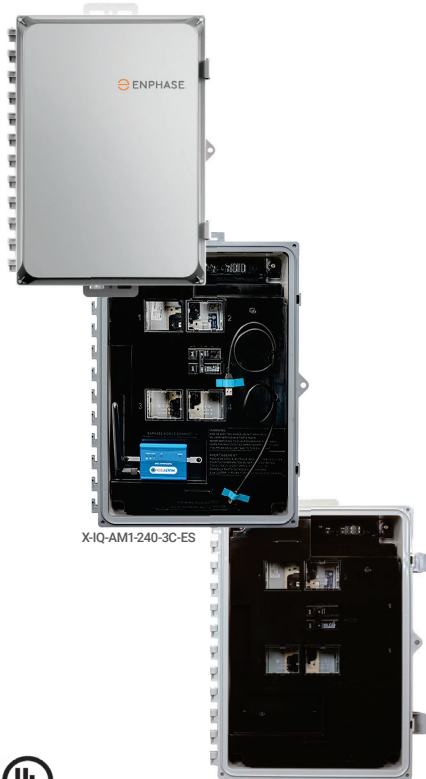
## IQ8 Series Microinverters

| INPUT DATA (DC)                                      |                  | IQ8-60-2-US   | IQ8PLUS-72-2-US | IQ8M-72-2-US    | IQ8A-72-2-US | IQ8H-240-72-2-US | IQ8H-208-72-2-US <sup>1</sup> |
|--|------------------|---|-----------------|-----------------|--------------|------------------|-------------------------------|
| Commonly used module pairings <sup>2</sup>           | W                | 235 – 350   | 235 – 440       | 260 – 460       | 295 – 500    | 320 – 540+       | 295 – 500+                    |
| Module compatibility                                 |                  | 60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell  |                 |                 |              |                  |                               |
| MPPT voltage range                                   | V                | 27 – 37   | 29 – 45         | 33 – 45         | 36 – 45      | 38 – 45          | 38 – 45                       |
| Operating range                                      | V                | 25 – 48   |                 | 25 – 58         |              |                  |                               |
| Min/max start voltage                                | V                | 30 / 48   |                 | 30 / 58         |              |                  |                               |
| Max input DC voltage                                 | V                | 50  |                 | 60              |              |                  |                               |
| Max DC current <sup>3</sup> [module Isc]             | A                |   |                 | 15              |              |                  |                               |
| Overvoltage class DC port                            |                  |   |                 | II              |              |                  |                               |
| DC port backfeed current                             | mA               |   |                 | 0               |              |                  |                               |
| PV array configuration                               |                  | 1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit   |                 |                 |              |                  |                               |
| OUTPUT DATA (AC)                                     |                  | IQ8-60-2-US   | IQ8PLUS-72-2-US | IQ8M-72-2-US    | IQ8A-72-2-US | IQ8H-240-72-2-US | IQ8H-208-72-2-US <sup>1</sup> |
| Peak output power                                    | VA               | 245   | 300             | 330             | 366          | 384              | 366                           |
| Max continuous output power                          | VA               | 240   | 290             | 325             | 349          | 380              | 360                           |
| Nominal (L-L) voltage/range <sup>4</sup>             | V                |   |                 | 240 / 211 – 264 |              |                  | 208 / 183 – 250               |
| Max continuous output current                        | A                | 1.0   | 1.21            | 1.35            | 1.45         | 1.58             | 1.73                          |
| Nominal frequency                                    | Hz               | 60  |                 |                 |              |                  |                               |
| Extended frequency range                             | Hz               | 50 – 68   |                 |                 |              |                  |                               |
| AC short circuit fault current over 3 cycles         | A <sub>rms</sub> |   |                 | 2               |              |                  | 4.4                           |
| Max units per 20 A (L-L) branch circuit <sup>5</sup> |                  | 16  | 13              | 11              | 11           | 10               | 9                             |
| Total harmonic distortion                            |                  | <5%   |                 |                 |              |                  |                               |
| Overvoltage class AC port                            |                  | III   |                 |                 |              |                  |                               |
| AC port backfeed current                             | mA               | 30  |                 |                 |              |                  |                               |
| Power factor setting                                 |                  | 1.0   |                 |                 |              |                  |                               |
| Grid-tied power factor (adjustable)                  |                  | 0.85 leading – 0.85 lagging   |                 |                 |              |                  |                               |
| Peak efficiency                                      | %                | 97.5  | 97.6            | 97.6            | 97.6         | 97.6             | 97.4                          |
| CEC weighted efficiency                              | %                | 97  | 97              | 97              | 97.5         | 97               | 97                            |
| Night-time power consumption                         | mW               | 60  |                 |                 |              |                  |                               |
| MECHANICAL DATA                                      |                  |   |                 |                 |              |                  |                               |
| Ambient temperature range                            |                  | -40°C to +60°C (-40°F to +140°F)  |                 |                 |              |                  |                               |
| Relative humidity range                              |                  | 4% to 100% (condensing)   |                 |                 |              |                  |                               |
| DC Connector type                                    |                  | MC4   |                 |                 |              |                  |                               |
| Dimensions (HxWxD)                                   |                  | 212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")  |                 |                 |              |                  |                               |
| Weight   |                  | 1.08 kg (2.38 lbs)  |                 |                 |              |                  |                               |
| Cooling  |                  | Natural convection – no fans  |                 |                 |              |                  |                               |
| Approved for wet locations                           |                  | Yes   |                 |                 |              |                  |                               |
| Pollution degree                                     |                  | PD3   |                 |                 |              |                  |                               |
| Enclosure  |                  | Class II double-insulated, corrosion resistant polymeric enclosure  |                 |                 |              |                  |                               |
| Environ. category / UV exposure rating               |                  | NEMA Type 6 / outdoor   |                 |                 |              |                  |                               |
| COMPLIANCE   |                  |   |                 |                 |              |                  |                               |
| Certifications                                       |                  | CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01  |                 |                 |              |                  |                               |
|  |                  | This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions. |                 |                 |              |                  |                               |

(1) The IQ8H-208 variant will be operating in grid-tied mode only at 208V AC. (2) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility> (3) Maximum continuous input DC current is 10.6A (4) Nominal voltage range can be extended beyond nominal if required by the utility. (5) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

# Enphase IQ Combiner 3-ES/3C-ES

X-IQ-AM1-240-3-ES  
X-IQ-AM1-240-3C-ES



X-IQ-AM1-240-3C-ES

X-IQ-AM1-240-3-ES

The **Enphase IQ Combiner 3-ES/3C-ES** with Enphase IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 3C-ES) consolidates interconnection equipment into a single enclosure and streamlines PV and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

### Smart

- Includes IQ Gateway for communication and control
- Includes LTE-M1 cell modem (included only with IQ Combiner 3C-ES)
- Includes solar shield to match Ensemble esthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

### Simple

- Reduced size from IQ Combiner+ (X-IQ-AM1-240-2)
- Centered mounting brackets support single stud mounting
- Supports back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A total PV or storage branch circuits

### Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the Combiner SKU's
- UL listed

## Enphase IQ Combiner 3-ES / 3C-ES

### MODEL NUMBER

|  |  |
|--|--|
| IQ Combiner 3-ES (X-IQ-AM1-240-3-ES)   | IQ Combiner 3-ES with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.  |
| IQ Combiner 3C-ES (X-IQ-AM1-240-3C-ES) | IQ Combiner 3C-ES with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect LTE-M1 (CELLMODEM-M1), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat. |

### MICROINVERTERS, ACCESSORIES AND REPLACEMENT PARTS (not included, order separately)

|  |   |
|--|---|
| Supported Microinverters   | IQ6, IQ7, IQ8. Do not mix IQ6/7 Micro-inverters with IQ8  |
| Ensemble Communications Kit (COMMS-CELLMODEM-M1)                     | Includes COMMS-KIT-01 and CELLMODEM-M1 with 5-year data plan for Ensemble sites   |
| Circuit Breakers<br>BRK-10A-2-240<br>BRK-15A-2-240<br>BRK-20A-2P-240 | Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers.<br>Circuit breaker, 2 pole, 10A, Eaton BR210<br>Circuit breaker, 2 pole, 15A, Eaton BR215<br>Circuit breaker, 2 pole, 20A, Eaton BR220 |
| EPLC-01  | Power line carrier (communication bridge pair), quantity - one pair   |
| XA-SOLARSHIELD-ES  | Replacement solar shield for Combiner 3-ES / 3C-ES  |
| XA-PLUG-120-3  | Accessory receptacle for Power Line Carrier in IQ Combiner 3-ES / 3C-ES (required for EPLC-01)  |
| XA-ENV-PCBA-3  | Replacement IQ Gateway printed circuit board (PCB) for Combiner 3-ES / 3C-ES  |

### ELECTRICAL SPECIFICATIONS

|  |  |
|--|--|
| Rating   | Continuous duty  |
| System voltage   | 120/240 VAC, 60 Hz   |
| Eaton BR series busbar rating                          | 125 A  |
| Max. continuous current rating                         | 65 A   |
| Max. continuous current rating (input from PV/storage) | 64 A   |
| Max. fuse/circuit rating (output)                      | 90 A   |
| Branch circuits (solar and/or storage)                 | Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included) |
| Max. total branch circuit breaker rating (input)       | 80A of distributed generation / 95A with IQ Gateway breaker included                       |
| Gateway breaker  | 10A or 15A rating GE/Siemens/Eaton included  |
| Production metering CT                                 | 200 A solid core pre-installed and wired to IQ Gateway                                     |
| Consumption monitoring CT (CT-200-SPLIT)               | A pair of 200 A split core current transformers  |

### MECHANICAL DATA

|                                |   |
|--------------------------------|---|
| Dimensions (WxHxD)             | 37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.  |
| Weight                         | 7.5 kg (16.5 lbs)   |
| Ambient temperature range      | -40° C to +46° C (-40° to 115° F)   |
| Cooling                        | Natural convection, plus heat shield  |
| Enclosure environmental rating | Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction   |
| Wire sizes                     | <ul style="list-style-type: none"> <li>• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors</li> <li>• 60 A breaker branch input: 4 to 1/0 AWG copper conductors</li> <li>• Main lug combined output: 10 to 2/0 AWG copper conductors</li> <li>• Neutral and ground: 14 to 1/0 copper conductors</li> </ul> Always follow local code requirements for conductor sizing. |
| Altitude                       | Up to 3000 meters (9,842 feet)  |

### INTERNET CONNECTION OPTIONS

|                  |   |
|------------------|---|
| Integrated Wi-Fi | 802.11b/g/n   |
| Cellular         | CELLMODEM-M1-06 4G based LTE-M1 cellular modem (included only with IQ Combiner 3C-ES). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations. |
| Ethernet         | Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)   |

### COMPLIANCE

|                        |   |
|------------------------|---|
| Compliance, Combiner   | UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003<br>Production metering: ANSI C12.20 accuracy class 0.5 (PV production)<br>Consumption metering: accuracy class 2.5 |
| Compliance, IQ Gateway | UL 60601-1/CANCSA 22.2 No. 61010-1  |

To learn more about Enphase offerings, visit [enphase.com](http://enphase.com)

© 2022 Enphase Energy. All rights reserved. Enphase, the Enphase logo, IQ Combiner 3C-ES, and other trademarks or service names are trademarks of Enphase Energy, Inc. Data subject to change. 10-17-2022



To learn more about Enphase offerings, visit [enphase.com](http://enphase.com)





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

## Eaton general duty non-fusible safety switch

**DG222URB**

**UPC:**782113144238

### Dimensions:

- **Height:** 14.38 IN
- **Length:** 7.38 IN
- **Width:** 8.69 IN

**Weight:**9 LB

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

### 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:** Non-fusible, single-throw
- **Amperage Rating:** 60A
- **Enclosure:** NEMA 3R, Rainproof
- **Enclosure Material:** Painted galvanized steel
- **Fuse Configuration:** Non-fusible
- **Number Of Poles:** Two-pole
- **Number Of Wires:** Two-wire
- **Product Category:** General duty safety switch
- **Voltage Rating:** 240V

### Supporting documents:

- [Eatons Volume 2-Commercial Distribution](#)
- [Eaton Specification Sheet - DG222URB](#)

### Certifications:

- UL Listed

**Product compliance:** No Data





## ROCKIT

### COMPLETE RAIL-LESS RACKING SYSTEM

The RockIt system is the industry's premier rail-less PV racking system for composition shingle, tile, and metal roofs. Designed in conjunction with the needs of installers, RockIt quickly & easily installs with a single tool. Featuring an easy-to-position alignment slide and a top-down leveling system, RockIt is logistically intelligent with no need to ship or transport long rails. Components are available in a black finish that complements both commercial and residential applications. Conforms to UL 2703.

### FEATURES & BENEFITS

- Patented watertight technology
- Fully integrated bonding
- Top-down leveling system
- North-South adjustability
- Single tool install

### STREAMLINED INSTALLATION WITH MINIMAL ROOF PENETRATIONS



## ROCKIT

### COUPLING

The fast installing RockIt Coupling easily attaches to the module frame to bridge the gaps between modules.

### SKIRT

The sleek black Skirt installs first and acts as an alignment guide for the entire array. The Skirt End Cap does double duty as a skirt coupling device and an aesthetically-pleasing finishing touch.

### ROCKIT MOUNT

Featuring integrated bonding pins, the RockIt Mount connects to the Slide and can easily be positioned for fast installation. Features top-down leveling.

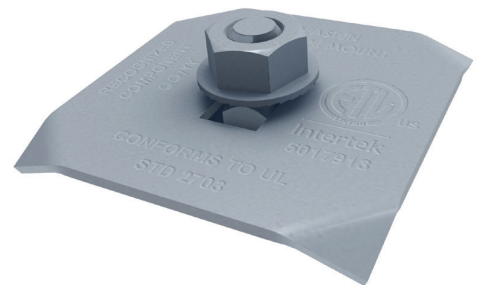


### ROCKIT SLIDE

Available in three variations, the RockIt Slide allows installation on composition shingle, tile, and metal roofs.

### FRAME MLPE MOUNT

Attaches and fully bonds MLPE's (Module Level Power Electronics) to the module frame with a single bolt clip.





May 16, 2022

EcoFasten Solar LLC  
4141 W Van Buren St, Ste 2  
Phoenix, AZ 85009  
TEL: (877) 859-3947

Attn.: Eco Fasten Solar LLC - Engineering Department

Re: Report # 2015-05884HG.07.01 – EcoFasten - RockIt System for Gable and Hip Roofs  
Subject: Engineering Certification for the State of North Carolina

PZSE, Inc. – Structural Engineers has provided engineering and span tables for the EcoFasten - RockIt System, as presented in PZSE Report # 2015-05884HG.07.01, "Engineering Certification for the EcoFasten - RockIt System for Gable and Hip Roofs". All information, data, and analysis therein are based on, and comply with, the following building codes and typical specifications:

- Building Codes:
1. ASCE/SEI 7-10, 7-16, Minimum Design Loads for Buildings and Other Structures, by American Society of Civil Engineers
  2. 2015 & 2018 International Building Code
  3. 2015 & 2018 International Residential Code
  4. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES
  5. Aluminum Design Manual 2015 & 2018, by The Aluminum Association, Inc.
  6. ANSI/AWC NDS-2015 & 2018, National Design Specification for Wood Construction, by the American Wood Council

Design Criteria:

Risk Category II  
Seismic Design Category = A - E  
Exposure Category = B, C & D  
Basic Wind Speed (ultimate) per ASCE 7-16 = 90 mph to 180 mph  
Ground Snow Load = 0 to 60 (psf)

This letter certifies that the loading criteria and design basis for the EcoFasten - RockIt System Span Tables are in compliance with the above codes.

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

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

DIGITALLY SIGNED

