WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE
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December 13, 2023

Scott Wyssling, PE

Digitally signed by Scott Wyssling, PE
DN: C=US, S=Utah, L=Alpine, O=Wyssling Consulting, OU=Engineering, CN="Scott Wyssling, PE", E=swyssling@wysslingconsulting.com
Reason: I am the author of this document
Location: your signing location here
Date: 2023.12.13 15:27:53-07'00'
Foxit PDF Editor Version: 11.1.0

Greenlancer Energy Inc.
500 Woodward Avenue, Suite 2125
Detroit, MI 48226

Re: Engineering Services
Project Residence
195 SW Waverly Lane, Lake City FL
42.120 kW System

To Whom It May Concern:

We have received information regarding solar panel installation on the roof of the above referenced structure. Our evaluation of the structure is to verify the existing capacity of the roof system and its ability to support the additional loads imposed by the proposed solar system.

A. Site Assessment Information

1. Site visit documentation identifying attic information including size and spacing of framing for the existing roof structure.
2. Design drawings of the proposed system including a site plan, roof plan and connection details for the solar panels. This information will be utilized for approval and construction of the proposed system.

B. Description of Structure:

Roof Framing: 2x6 purlins at 24” on center supported by steel trusses at 10’-0” on center.
Roof Material: Metal Roofing
Roof Slope: 09 degrees
Attic Access: Accessible
Foundation: Permanent

C. Loading Criteria Used

- **Dead Load**
  - Existing Roofing and framing = 7 psf
  - New Solar Panels and Racking = 3 psf
  - TOTAL = 10 PSF
- **ive Load** = 20 psf (reducible) – 0 psf at locations of solar panels
- **Ground Snow Load** = 0 psf
- **Wind Load** based on ASCE 7-16
  - Ultimate Wind Speed = 120 mph (based on Risk Category II)
  - Exposure Category C

Analysis performed of the existing roof structure utilizing the above loading criteria is in accordance with the 2020 FBC 7th Edition, including provisions allowing existing structures to not require strengthening if the new loads do not exceed existing design loads by 105% for gravity elements and 110% for seismic elements. This analysis indicates that the existing framing will support the additional panel loading without damage, if installed correctly.

D. Solar Panel Anchorage

1. The solar panels shall be mounted in accordance with the most recent S-5! Installation manual. If during solar panel installation, the roof framing members appear unstable or deflect non-uniformly, our office should be notified before proceeding with the installation.
2. System will be attached to the metal roofing material utilizing the patented S-5! Connection. Installation of the connections shall be in accordance with the manufacturer's recommendations.
3. Considering the wind speed, roof slopes, size and spacing of framing members, and condition of the roof, the panel supports shall be placed no greater than 48" on center.

Based on the above evaluation, this office certifies that with the racking and mounting specified, the existing roof system will adequately support the additional loading imposed by the solar system. This evaluation is in conformance with the 2020 FBC 7th Edition, current industry standards, and is based on information supplied to us at the time of this report.

Should you have any questions regarding the above or if you require further information do not hesitate to contact me.

Very truly yours,

Scott E. Wyssling, PE
Florida License No. 81558
Florida COA # RY34912

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Gravity Loads

Project Residence
195 SW Waverly Lane
Lake City , FL

Existing

Roof Dead Load

2.0 psf	Metal
1.6 psf	1/2" Plywood Sheathing
1.3 psf	2x6 @ 24 in. o.c.
1.0 psf	Ceiling, Mechanical, Electrical
1.1 psf	Miscellaneous
7.0 psf	**TOTAL**

Second Floor Dead Load

0 psf	Floor Finishes
0 psf	1 1/8" Subfloor Sheathing
0 psf	Joists @ 16' o.c.
0 psf	Partitions
0 psf	Ceiling, Mechanical, Electrical
0 psf	Miscellaneous
0 psf	TOTAL

Roof Live Load

20 psf

Floor Live Load

0 psf

Roof Snow Load

Ground SnowLoad= 0 psf (to be divided by cosine of roof angle for horizontal projection ASCE 7 Sec. 7.4)

$p_f = 0.7\ C_e\ C_t\ I\ p_g =$ 0 psf $C_e = 1$, $C_t = 1.1$ Flat Roof Snow Load (ASCE 7-16 Eq. 7.3-1)

$C_s =$ **1.00** ASCE 7-16 Figure 7.4-1

Additional

Roof Dead Load - New Solar Panels

3 psf

Roof Live Load at Solar Panels

0 psf

Roof Snow Load at Solar Panels

0 psf Sloped Roof Snow Load (ASCE 7-16 Eq. 7.4-1)

Total

Total Existing Roof Load = $(DL_{ROOF} + Max(LL_{ROOF} \text{ or } S))\ Area_{ROOF}$

234692 lbs

Total New Roof Load = $(DL_{ROOF} + DL_{ADD} + Max(LL_{ROOF} \text{ or } S))\ Area_{ROOF}$

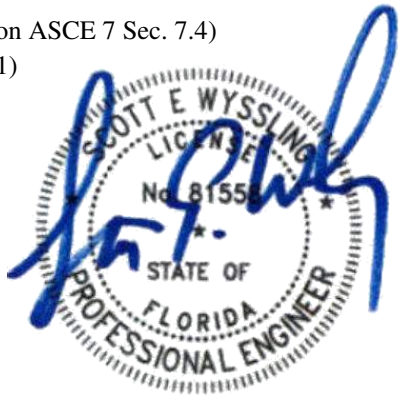
195664 lbs

Change in Demand = (Total New Roof Load - Existing Roof Load) / Existing Roof Load

-16.63%

Total New Gravity Loads are less than Existing Loads. OK

2018 IEBC Section 807.4 states:
"Existing structural elements supporting any additional gravity loads as a result of the alterations, including the effects of snow drift , shall comply with the International Building Code. EXCEPTION: 1. Structural elements whose stress is not increased by more than 5%."



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Wind Uplift

Rooftop Solar Panels Parallel to Roof Surface

ASCE 7-16, Section 29.4.4

V =	120	Basic Wind Speed
Exposure	C	ASCE 7-16, Section 26.7
K_z =	0.85	Velocity Pressure Coefficient, ASCE 7-16, Figure 26.10-1
K_{zt} =	1	Topographic Factor, ASCE 7-16, Section 26.8.2
K_d =	0.85	Directionality Factor, ASCE 7-16, Section 26.6
K_e =	0.994	Ground Elevation Factor, ASCE 7-16, Section 26.9
q_h =	26.5 psf	$q_h = 0.00256K_zK_{zt}K_dK_eV^2$ (ASCE 7-16 Eq. 26.10-1)
Roof Angle =	9	deg
Roof Type	Gable	
s_{anchor} =	48 in	Horizontal spacing of roof anchors
A_{trib} =	11.51 sf	Panel Area tributary to each roof anchor

Project Residence
195 SW Waverly Lane
Lake City , FL

I, SCOTT WYSSLING, PE#81558, AN ENGINEER PURSUANT TO CHAPTER 471, CERTIFY THAT THE PV ELECTRICAL SYSTEM AND ELECTRICAL COMPONENTS ARE DESIGNED AND APPROVED USING THE STANDARDS CONTAINED IN THE MOST RECENT VERSION OF THE FLORIDA BUILDING CODE, FBC 107.

GC_p External Pressure Coefficient, ASCE 7-16, Figure 30.3-2

Roof Zone	**Zone 1**	**2e**	**2n**	**2r**	**3e**	**3r**
	-2.00	-2.00	-2.99	-2.99	-2.99	-3.57

$\mathbf{g}_a$ =	0.79	Pressure Equalization Factor, ASCE 7-16 Figure 29.4.-8
$\mathbf{g}_E$ =	1.00	Edge Array Factor, ASCE 29.4.4 edges < 0.5*building height, and panel spacing < 4ft.

$p_{net} = q_hGC_p\mathbf{g}_E\mathbf{g}_a$ = Design Wind Pressure, ASCE 7-16, Equation 29.4-7

Roof Zone	**1**	**2e**	**2n**	**2r**	**3e**	**3r**	
	-42 psf	-42 psf	-63 psf	-63 psf	-63 psf	-75 psf	Min Pressure = -16 psf
	Use 42 psf	**Use 42 psf**	**Use 63 psf**	**Use 63 psf**	**Use 63 psf**	**Use 75 psf**	ULTIMATE
x 0.6 =	**25 psf**	**25 psf**	**38 psf**	**38 psf**	**38 psf**	**45 psf**	ALLOWABLE

Connection to Existing Roof Framing

F.S. =	1	Additional Factor of Safety applied to withdrawl force, if desired
A_{trib} =	11.5	ft^2
DL_{panel} =	3 psf	

Roof Zone	**1**	**2e**	**2n**	**2r**	**3e**	**3r**
W_{uplift} =	42 psf	42 psf	63 psf	63 psf	63 psf	75 psf

P_{lag} = F.S. x A_{trib} x (0.6D - 0.6W) = **Withdrawl force for each roof anchor**

Roof Zone	**1**	**2e**	**2n**	**2r**	**3e**	**3r**
	-272.6 lbs	**-272.6 lbs**	**-415.8 lbs**	**-415.8 lbs**	**-415.8 lbs**	**-500.3 lbs**

Connection Capacity

*Panels in zone 2r spaced at 36" o/c. No panels in zones 2n, 3e, or 3r

Roof Zone	**1**	**2e**	**2n**	**2r**	**3e**	**3r**
DEMAND =	**273 lbs**	**273 lbs**	**416 lbs**	**416 lbs**	**416 lbs**	**500 lbs**
CAPACITY =	**366 lbs**	**366 lbs**	**366 lbs**	**366 lbs**	**366 lbs**	**366 lbs**
	up to64in ok	**up to64in ok**	**up to32in ok**	**up to32in ok**	**up to32in ok**	**up to32in ok**

SCOTT E WYSSLING LICENSE No. 81558 STATE OF FLORIDA PROFESSIONAL ENGINEER

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This analysis compairs the capacity of theS-5 Protea Bracket to the wind uplift demand only. For capacity of the complete mounting system, please see manufacturer's recommendations.

PROJECT RESIDENCE

PHOTOVOLTAIC SYSTEM
195 SW WAVERLY LN.
LAKE CITY, FL 32024

SYSTEM SIZE: 42.12 kW-DC | 31.32 kW-AC
MODULE: (108) TRINA SOLAR: TSM-DE09C.07 390 [390W]
INVERTER: (108) ENPHASE IQ8PLUS-72-2-US [240V] MICROINVERTER

GOVERNING CODES

ALL MATERIALS, EQUIPMENT, INSTALLATION AND WORK SHALL COMPLY WITH THE FOLLOWING APPLICABLE CODES:

- 2017 NATIONAL ELECTRIC CODE
- 2020 FLORIDA BUILDING CODE
- 2020 FLORIDA RESIDENTIAL CODE
- 2020 FLORIDA PLUMBING CODE
- 2020 FLORIDA FIRE CODE
- 2020 FLORIDA MECHANICAL CODE
- 780 CMR 51 MASSACHUSETTS RESIDENTIAL CODE 9TH EDITION
- IEEE STANDARD 929
- OSHA 29 CFR 1910.269
- WHERE APPLICABLE, RULES OF THE PUBLIC UTILITIES COMMISSION REGARDING SAFETY AND RELIABILITY
- THE AUTHORITY HAVING JURISDICTION
- MANUFACTURERS' LISTINGS AND INSTALLATION INSTRUCTIONS
- ANY OTHER LOCAL AMENDMENTS

VICINITY MAP

AERIAL MAP

GENERAL

1. UTILITY SHALL BE NOTIFIED BEFORE ACTIVATION OF PHOTOVOLTAIC SYSTEM.
2. 110.2 APPROVAL: ALL ELECTRICAL EQUIPMENT SHALL BE LABELED, LISTED, OR CERTIFIED BY A NATIONALLY RECOGNIZED TESTING LABORATORY ACCREDITED BY THE UNITED STATES OCCUPATIONAL SAFETY HEALTH ADMINISTRATION
3. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO INITIATING CONSTRUCTION.
4. CONTRACTOR SHALL REVIEW ALL MANUFACTURER INSTALLATION DOCUMENTS PRIOR TO INITIATING CONSTRUCTION.
5. ALL EQUIPMENT AND ASSOCIATED CONNECTIONS, ETC, AND ALL ASSOCIATED WIRING AND INTERCONNECTIONS SHALL BE INSTALLED ONLY BY QUALIFIED PERSONNEL.
6. THE CONTRACTOR OR OWNER MUST PROVIDE ROOF ACCESS (LADDER TO ROOF) FOR ALL THE REQUIRED INSPECTIONS. LADDERS MUST BE OSHA APPROVED, MINIMUM TYPE I WITH A 250LB. RATING, IN GOOD CONDITION AND DESIGNED FOR ITS INTENDED USE.
7. CONTRACTOR SHALL VERIFY THAT THE ROOF STRUCTURE WILL WITHSTAND THE ADDITIONAL LOADS.
8. LAG SCREWS SHALL PENETRATE A MINIMUM 2" INTO SOLID SAWN STRUCTURAL MEMBERS AND SHALL NOT EXCEED MANUFACTURER RECOMMENDATIONS FOR FASTENERS INTO ENGINEERED STRUCTURAL MEMBERS.
9. AN ACCESS POINT SHALL BE PROVIDED THAT DOES NOT PLACE THE GROUND LADDER OVER OPENINGS SUCH AS WINDOWS OR DOORS ARE LOCATED AT STRONG POINTS OF BUILDING CONSTRUCTION AND IN LOCATIONS WHERE THE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS TREE LIMBS, WIRES, OR SIGNS.
10. WHERE DC CONDUCTORS ARE RUN INSIDE BUILDING, THEY SHALL BE CONTAINED IN A METAL RACEWAY; THEY SHALL NOT BE INSTALLED WITHIN 10" OF THE ROOF DECKING OR SHEATHING EXCEPT WHERE COVERED BY THE PV MODULES AND EQUIPMENT.
11. ALL FIELD -INSTALLED JUNCTION, PULL AND OUTLET BOXES LOCATED BEHIND MODULES SHALL BE ACCESSIBLE DIRECTLY OR BY DISPLACEMENT OF A MODULE SECURED BY REMOVABLE FASTENERS.

ELECTRICAL

1. WIRING MATERIALS SHALL COMPLY WITH MAXIMUM CONTINUOUS CURRENT OUTPUT AT 25°C AND MAXIMUM VOLTAGE AT 600V; WIRE SHALL BE WET RATED AT 90°C.
2. EXPOSED PHOTOVOLTAIC SYSTEM CONDUCTORS ON THE ROOF WILL BE USE 2 OR PV-TYPE WIRE.
3. PHOTOVOLTAIC SYSTEM CONDUCTORS SHALL BE IDENTIFIED AND GROUPED. THE MEANS OF IDENTIFICATION SHALL BE PERMITTED BY SEPARATE COLOR-CODING, MARKING TAPE, TAGGING OR OTHER APPROVED MEANS.
4. ALL EXTERIOR CONDUIT, FITTINGS, AND BOXES SHALL BE RAIN-TIGHT AND APPROVED FOR USE IN WET LOCATIONS.
5. ALL METALLIC RACEWAYS AND EQUIPMENT SHALL BE BONDED AND ELECTRICALLY CONTINUOUS.
6. WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, CONTRACTOR SHALL SIZE THEM ACCORDING TO APPLICABLE CODES.
7. REMOVAL OF A UTILITY-INTERACTIVE INVERTER OR OTHER EQUIPMENT SHALL NOT DISCONNECT THE BUILDING CONNECTION BETWEEN THE GROUNDING ELECTRODE CONDUCTOR AND THE PV SOURCE AND/OR OUTPUT CIRCUIT GROUNDED CONDUCTOR.
8. FOR GROUNDED SYSTEMS, THE PHOTOVOLTAIC SOURCE AND OUTPUT CIRCUITS SHALL BE PROVIDED WITH A GROUND-FAULT PROTECTION DEVICE OR SYSTEM THAT DETECTS A GROUND FAULT, INDICATES THAT FAULT HAS OCCURED AND AUTOMATICALLY DISCONNECTS ALL CONDUCTORS OR CAUSES THE INVERTER TO AUTOMATICALLY CEASE SUPPLYING POWER TO OUTPUT CIRCUITS.
9. FOR UNGROUNDED SYSTEMS, THE INVERTER IS EQUIPPED WITH GROUND FAULT PROTECTION AND A GFI FUSE PORT FOR GROUND FAULT INDICATION.
10. PV MODULE FRAMES SHALL BE BONDED TO RACKING RAIL OR BARE COPPER GEC/GEC PER THE MODULE MANUFACTURER'S LISTED INSTRUCTION SHEET.
11. PV MODULE RACKING RAIL SHALL BE BONDED TO BARE COPPER GEC VIA WEEB LUG, ILSCO GBL-4DBT LAY-IN LUG, OR EQUIVALENT LISTED LUG.
12. THE PHOTOVOLTAIC INVERTER WILL BE LISTED AS UL 1741 COMPLIANT.
13. RACKING AND BONDING SYSTEM TO BE UL2703 RATED.
14. ANY REQUIRED GROUNDING ELECTRODE CONDUCTOR WILL BE CONTINUOUS, EXCEPT FOR SPLICES OR JOINTS AS BUS BARS WITHIN LISTED EQUIPMENT.
15. WHEN BACKFED BREAKER IS THE METHOD OF UTILITY INTERCONNECTION, THE BREAKERS SHALL NOT READ "LINE AND LOAD".
16. WHEN APPLYING THE 120% RULE, THE SOLAR BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUS BAR FROM THE MAIN BREAKER.
17. THE WORKING CLEARANCE AROUND THE EXISTING ELECTRICAL EQUIPMENT AS WELL AS THE NEW ELECTRICAL EQUIPMENT WILL BE MAINTAINED.

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SHEET INDEX:

PROJECT, HOME
195 SW WAVERLY LN.
LAKE CITY, FL 32024

AHJ: COLUMBIA COUNTY

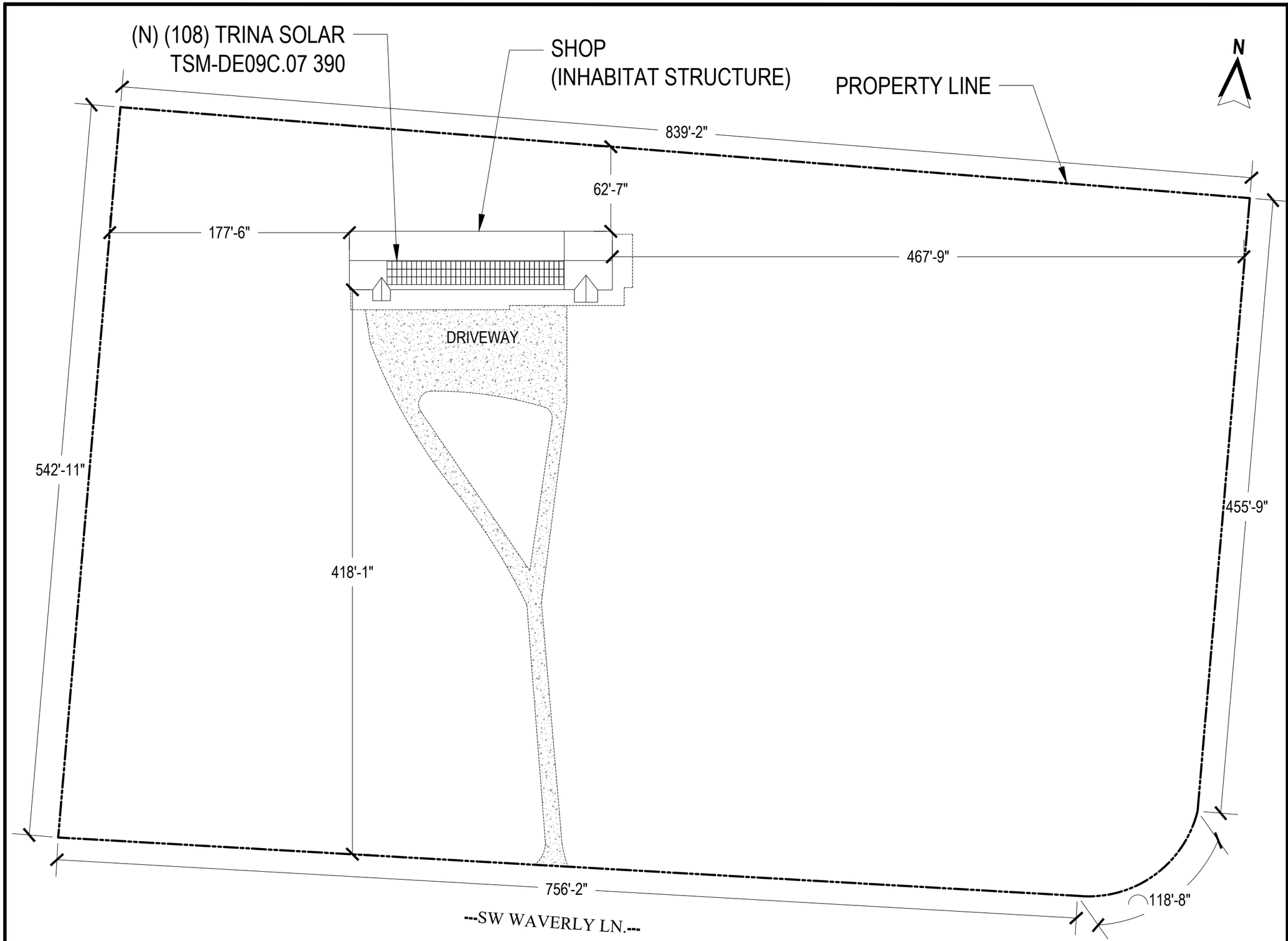
MADISON SERVICE COMPANY, LLC

COVER PAGE

DATE: 12/8/2023
DRAWN BY: OE

REV #1:
REV #2:
REV #3:

PV-1



LEGEND:

PROPERTY LINE: ——— – – ———

DRIVEWAY: – – – – – – – – – – – –

APN: 363S1500302105

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SCALE: 1"=70'-0"

PROJECT, HOME
195 SW WAVERLY LN.
LAKE CITY, FL 32024

AHJ: COLUMBIA COUNTY

MADISON SERVICE COMPANY, LLC

PROPERTY PLAN

DATE: 12/8/2023
DRAWN BY: OE

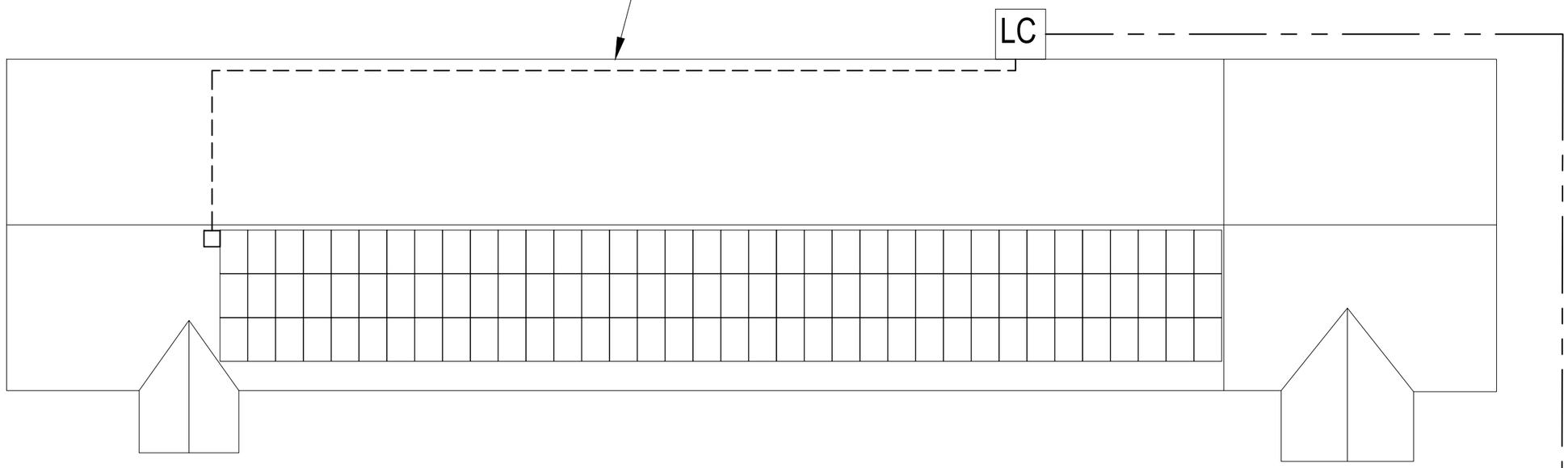
PV-2

ROOF DETAIL

ROOF TYPE: STANDING SEAM METAL

ROOF SECTION 1: 108 MODULES
AZIMUTH: 175°
PITCH: 9°

1



1

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SYSTEM LEGEND

PHOTOVOLTAIC SYSTEM:
DC SYSTEM SIZE: 42.12 kW
AC SYSTEM SIZE: 31.32 kW

UM — MAIN SERVICE METER AND SERVICE POINT

MP — MAIN SERVICE PANEL

LC — 200A RATED PV LOAD CENTER

(108) TRINA SOLAR: TSM-DE09C.07 390 [390W] WITH (108) ENPHASE IQ8PLUS-72-2-US [240V] MICROINVERTERS

JUNCTION BOX AND CONDUIT

CONDUIT RUN

CONDUIT TO BE RUN IN ATTIC IF POSSIBLE, OTHERWISE CONDUIT BLOCKS MIN. 1"/MAX 6" ABOVE ROOF SURFACE, CLOSE TO RIDGE LINES, AND UNDER EAVES; TO BE PAINTED TO MATCH EXTERIOR/EXISTING BACKGROUND COLOR OF ITS LOCATION; TO BE LABELED AT MAX 10' INTERVALS. CONDUIT RUNS ARE APPROXIMATE AND ARE TO BE DETERMINED IN THE BY THE INSTALLERS

AC — UTILITY AC DISCONNECT

CONDUIT RUN

CONDUIT MATERIAL WILL BE PVC AND WILL RUN THROUGH TRENCH AT A DEPTH OF 18" UNDERGROUND.
CONDUIT RUNS ARE APPROXIMATE AND ARE TO BE DETERMINED BY THE INSTALLERS

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

PROJECT, HOME
195 SW WAVERLY LN.
LAKE CITY, FL 32024

AHJ: COLUMBIA COUNTY

MADISON SERVICE COMPANY, LLC

SITE PLAN

DATE: 12/8/2023
DRAWN BY: OE

PV-3

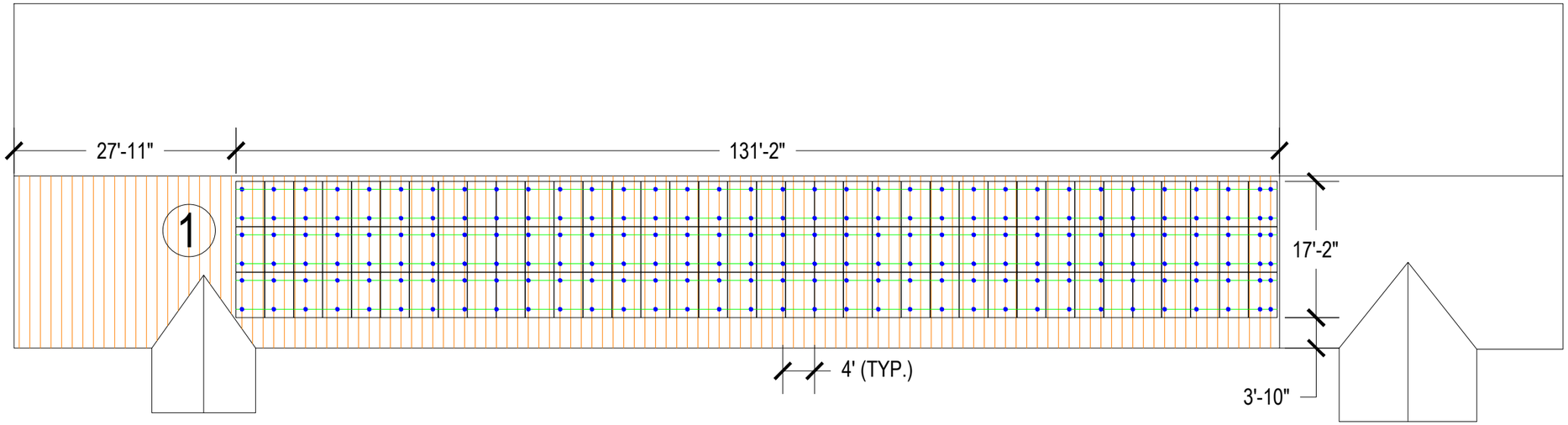
ROOF DETAIL

ROOF TYPE: STANDING SEAM METAL

ROOF SECTION 1: 108 MODULES
AZIMUTH: 175°
PITCH: 9°

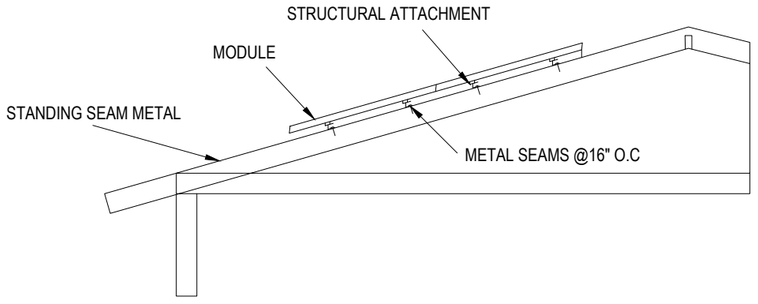
1

N



SYSTEM LEGEND

- ROOF ATTACHMENT POINT
- ROOF FRAMING (METAL SEAMS)
- RACKING



NTS

ELEVATION DETAIL

MODULE MECHANICAL SPECIFICATIONS	
DESIGN WIND SPEED	120 MPH
DESIGN SNOW LOAD	0 PSF
# OF STORIES	1
ROOF PITCH	9°
TOTAL ARRAY AREA (SQ. FT)	2293.92
TOTAL ROOF AREA (SQ. FT)	8692.3
ARRAY SQ. FT / TOTAL ROOF SQ. FT	26.24%

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

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LAKE CITY, FL 32024

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MADISON SERVICE COMPANY, LLC

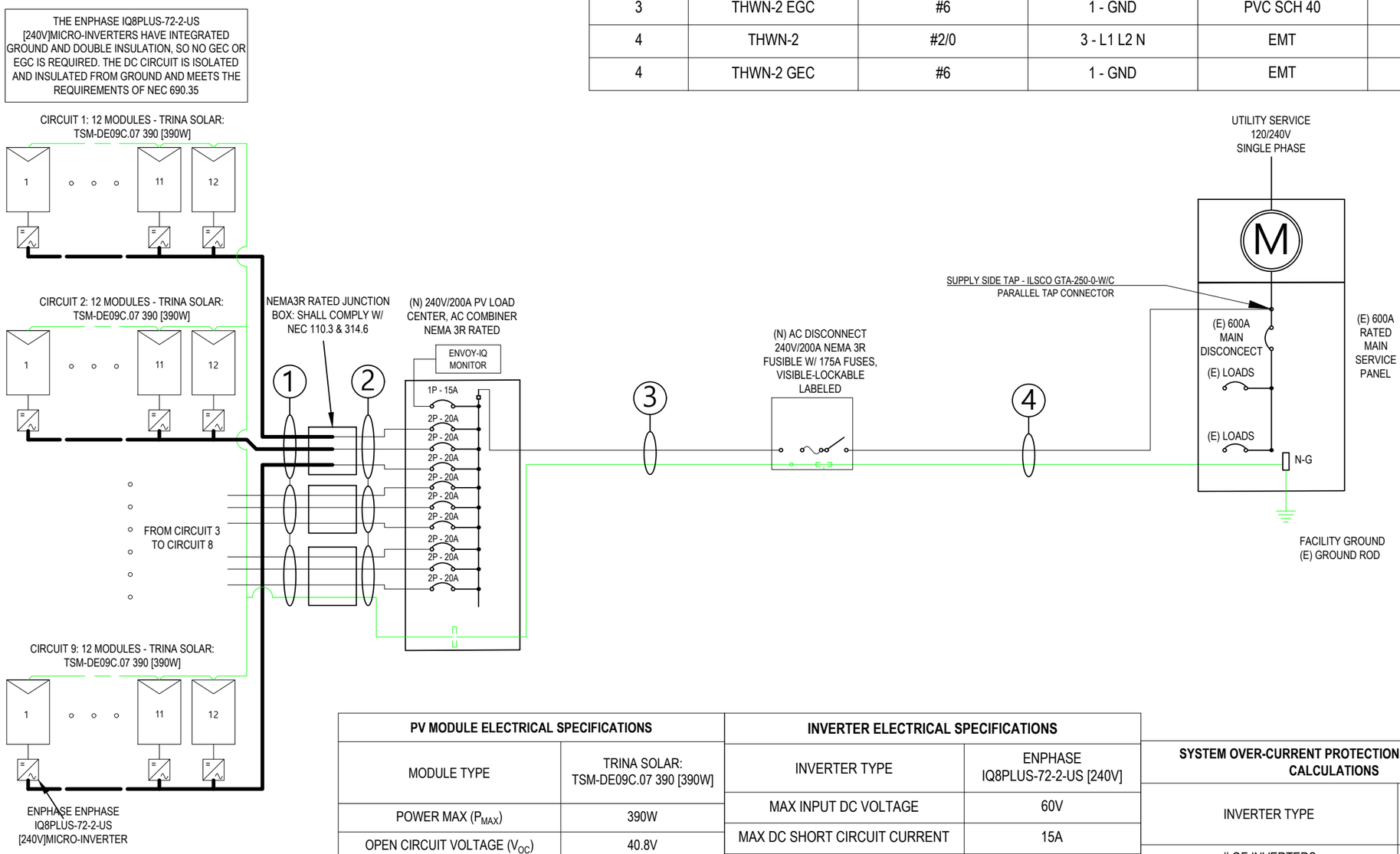
ROOF PLAN

DATE: 12/8/2023
DRAWN BY: OE

PV-3.1

CONDUCTOR AND CONDUIT SCHEDULE					
TAG	WIRE TYPE	WIRE SIZE	# OF CONDUCTORS	CONDUIT TYPE	MIN. CONDUIT SIZE
1	ENPHASE Q-CABLE	#12	6 - L1 L2	FREE AIR	N/A
1	BARE COPPER	#6	1 - BARE	FREE AIR	N/A
2	THWN-2	#10	6 - L1 L2	EMT	3/4"
2	THWN-2 EGC	#8	1 - GND	EMT	3/4"
3	THWN-2	#2/0	3 - L1 L2 N	PVC SCH 40	2"
3	THWN-2 EGC	#6	1 - GND	PVC SCH 40	2"
4	THWN-2	#2/0	3 - L1 L2 N	EMT	2"
4	THWN-2 GEC	#6	1 - GND	EMT	2"

THE ENPHASE IQ8PLUS-72-2-US [240V]MICRO-INVERTERS HAVE INTEGRATED GROUND AND DOUBLE INSULATION, SO NO GEC OR EGC IS REQUIRED. THE DC CIRCUIT IS ISOLATED AND INSULATED FROM GROUND AND MEETS THE REQUIREMENTS OF NEC 690.35



PV MODULE ELECTRICAL SPECIFICATIONS	
MODULE TYPE	TRINA SOLAR: TSM-DE09C.07 390 [390W]
POWER MAX (P_{MAX})	390W
OPEN CIRCUIT VOLTAGE (V_{OC})	40.8V
SHORT CIRCUIT CURRENT (I_{SC})	12.14A
MAX POWER-POINT VOLTAGE (V_{MP})	33.8V
MAX POWER-POINT CURRENT (I_{MP})	11.54A
SERIES FUSE RATING	25A

INVERTER ELECTRICAL SPECIFICATIONS	
INVERTER TYPE	ENPHASE IQ8PLUS-72-2-US [240V]
MAX INPUT DC VOLTAGE	60V
MAX DC SHORT CIRCUIT CURRENT	15A
MAXIMUM OUTPUT POWER	290W
MAXIMUM CONT. OUTPUT CURRENT	1.21A
CEC EFFICIENCY	97%
MAX UNITS PER 20A CIRCUIT	13

SYSTEM OVER-CURRENT PROTECTION DEVICE (OCPD) CALCULATIONS	
INVERTER TYPE	ENPHASE IQ8PLUS-72-2-US [240V]
# OF INVERTERS	108
MAX CONTINUOUS OUTPUT CURRENT	1.21
(# OF INVERTERS) X (MAX CONT. OUTPUT CURRENT) X 125% <= OCPD RATING	
(108 x 1.21A x 1.25)= 163.35A <= 175A, OK	

PHOTOVOLTAIC SYSTEM:
DC SYSTEM SIZE: 42.12 kW
AC SYSTEM SIZE: 31.32 kW
INVERTER: (108) ENPHASE IQ8PLUS-72-2-US [240V] MICRO-INVERTERS
MODULE: (108) TRINA SOLAR: TSM-DE09C.07 390 [390W]

NOTES:
1. MODULES ARE BONDED TO RAIL USING UL 2703 RATED BONDING SYSTEM - INTEGRATED BONDING MID-CLAMPS + DIRECT-BURIAL LAY-IN-LUGS; SEE ATTACHED FOR SPECIFICATIONS IF APPLICABLE
2. PV DC SYSTEM IS UNGROUNDED
3. PV ARRAY WILL HAVE A GROUNDING ELECTRODE SYSTEM IN COMPLIANCE WITH CEC 250.58 AND 690.47(A)
4. PV SOURCE, OUTPUT, AND INVERTER INPUT CIRCUIT WIRING METHODS SHALL COMPLY WITH CEC 690.1(G)
5. BACKFED PV BREAKER WILL BE INSTALLED AT OPPOSITE END OF THE BUS BAR FROM THE MAIN BREAKER. A PERMANENT WARNING LABEL TO BE INSTALLED PER SYSTEM SIGNAGE, PAGE
6. BARE COPPER IS TRANSITIONED TO THWN-2 VIA IRREVERSIBLE CRIMP; WHEN PRESENT, THE GEC TO BE CONTINUOUS
7. INVERTER(S) TO BE COMPLIANT WITH UL 1741 SUPPLEMENT A
8. CONDUIT AND CONDUCTOR SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS
9. CONDUIT AND CONDUCTOR SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UPSIZING AS REQUIRED BY FIELD CONDITIONS.

SCOTT E WYSSLING LICENSE No. 81551 STATE OF FLORIDA PROFESSIONAL ENGINEER

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
Florida License # RY34912

Signed 12/13/2023

PROJECT, HOME
195 SW WAVERLY LN.
LAKE CITY, FL 32024

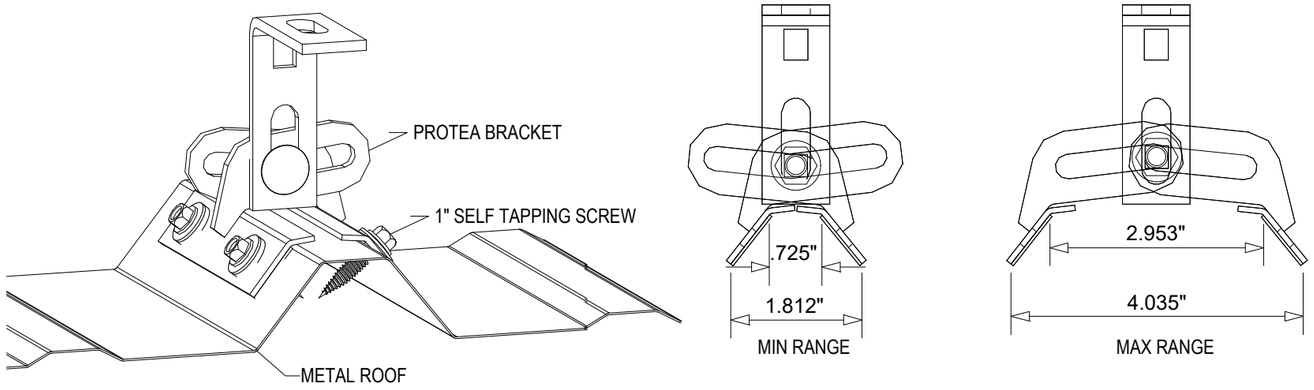
AHJ: COLUMBIA COUNTY

MADISON SERVICE COMPANY, LLC

1-LINE DIAGRAM & CALCULATIONS

DATE: 12/8/2023
DRAWN BY: OE

PV-4



1 ATTACHMENT DETAILS
(N.T.S.)

ATTACHMENT TYPE: S-5! PROTEA BRACKET WITH IRONRIDGE XR100 RAIL

MOUNTING TYPE: STANDING SEAM METAL, ROOF TILT: 9°

MODULE WEIGHT: 46.3 LBS
MODULE DIMENSIONS: 5.76' X 3.6'
MODULE WEIGHT/ SQ. FOOT: 2.23 LBS

TOTAL NO. OF MODULES: 108
TOTAL MODULE WEIGHT: 5000.4 LBS

BILL OF MATERIAL		
EQUIPMENT	**MAKE**	**QUANTITY**
MODULE	Trina Solar: TSM-DE09C.07 390 [390W]	108
INVERTER	ENPHASE IQ8PLUS-72-2-US [240V]	108
END CLAMPS	MODULE END CLAMP STANDARD	12
MID CLAMPS	MODULE MIDDLE CLAMP SET STANDARD (INTEGRATED GROUNDING)	210
MOUNTING POINTS	S-5 PROTEA BRACKET	204
MOUNTING RAILS	IRONRIDGE XR100 RAIL	60
LOAD CENTER	200A RATED LOAD CENTER WITH (9) 2P/20A BREAKER	1
MONITORING	ENPHASE MONITORING IQ-ENVOY WITH 1P/15A BREAKER	1
AC DISCONNECT	200A RATED FUSED UTILITY AC DISCONNECT WITH 175A FUSES	1

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MADISON SERVICE COMPANY, LLC

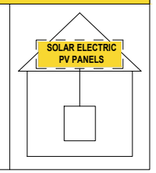
MOUNTING DETAILS AND BOM

DATE: 12/8/2023
DRAWN BY: OE

PV-5

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUTDOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN ARRAY



LABEL 1
AT RAPID SHUTDOWN SYSTEM
[NEC 690.56(C)(1)(A)].

! WARNING !
ELECTRIC 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

LABEL 2
AT EACH DISCONNECTING MEANS FOR PHOTOVOLTAIC EQUIPMENT
[NEC 690.15]

! WARNING !
ELECTRIC SHOCK HAZARD
TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.

LABEL 3
AT EACH DISCONNECTING MEANS FOR PHOTOVOLTAIC EQUIPMENT
[NEC 690.13 AND 690.15]

MAXIMUM VOLTAGE: -- V DC
MAXIMUM CIRCUIT CURRENT: ---A DC
MAX RATED OUTPUT CURRENT OF THE CHARGE CONTROLLER OR DC-TO-DC CONVERTER (IF INSTALLED): ---A DC

LABEL 4
AT EACH DC DISCONNECTING MEANS
[NEC 690.53]

PHOTOVOLTAIC AC DISCONNECT
OPERATING CURRENT: 130.68 A AC
OPERATING VOLTAGE: 240 V AC

LABEL 5
AT POINT OF INTERCONNECTION, MARKED AT DISCONNECTING MEANS
[NEC 690.54]

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LABEL 6
AT RAPID SHUTDOWN DISCONNECT SWITCH
[NEC 690.56(C)(3)].

! WARNING !
DUAL POWER SOURCES.
SECOND SOURCE IS PV SYSTEM

LABEL 7

! CAUTION !
PHOTOVOLTAIC SYSTEM CIRCUIT IS BACKFED

LABEL 8

AT POINT OF INTERCONNECTION; LABEL, SUCH AS LABEL 7 OR LABEL 8 MUST IDENTIFY PHOTOVOLTAIC SYSTEM
[NEC 705.12(B)(4)]

BI-DIRECTIONAL METER

LABEL 9
AT UTILITY METER
[NEC 690.56(B)]

PHOTOVOLTAIC DC DISCONNECT

LABEL 10
AT EACH DC DISCONNECTING MEANS
[NEC 690.13(B)]

PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN

LABEL 11
AT RAPID SHUTDOWN SWITCH
[NEC 690.56(C)].
LETTERS AT LEAST 3/8 INCH; WHITE ON RED BACKGROUND; REFLECTIVE
[IFC 605.11.1.1]

WARNING: PHOTOVOLTAIC POWER SOURCE

LABEL 12
AT EXPOSED RACEWAYS, CABLE TRAYS, AND OTHER WIRING METHODS; SPACED AT MAXIMUM 10 FT SECTION OR WHERE SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS.
[NEC 690.31(G)]
LETTERS AT LEAST 3/8 INCH; WHITE ON RED BACKGROUND; REFLECTIVE
[IFC 605.11.1.1]

UTILITY AC DISCONNECT

LABEL 13
AT EACH AC DISCONNECTING MEANS
[NEC 690.13(B)]

! WARNING !
POWER SOURCE OUTPUT CONNECTION - DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL 14
AT POINT OF INTERCONNECTION OVERCURRENT DEVICE
[NEC 705.12(B)(2)(3)(B)]

#03-359 LOCAL CODES

WARNING
THIS SERVICE METER IS ALSO SERVED BY A PHOTOVOLTAIC SYSTEM

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ALL SIGNAGE MUST BE PERMANENTLY ATTACHED AND BE WEATHER RESISTANT/SUNLIGHT RESISTANT AND CANNOT BE HAND-WRITTEN PER CEC 110.21(B)

PERMANENT PLAQUE OR DIRECTORY PROVIDING THE LOCATION OF THE SERVICE DISCONCECTING MEANS AND THE PHOTOVOLTAIC SYSTEM DISCONCECTING MEANS IF NOT IN THE SAME LOCATION
[CEC 690.56(B)]

WHERE THE PV SYSTEMS ARE REMOTELY LOCATED FROM EACH OTHER, A DIRECTORY IN ACCORDANCE WITH 705.10 SHALL BE PROVIDED AT EACH PV SYSTEM DISCONCECTING MEANS.
PV SYSTEM EQUIPMENT AND DISCONCECTING MEANS SHALL NOT BE INSTALLED IN BATHROOMS
[CEC 690.4(D),(E)]

LABELING NOTES
1.1 LABELING REQUIREMENTS BASED ON THE 2017 NATIONAL ELECTRICAL CODE, INTERNATIONAL FIRE CODE 605.11, OSHA STANDARD 1910.145, ANSI Z535
1.2 MATERIAL BASED ON THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
1.3 LABELS TO BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED.
1.4 LABELS TO BE A MINIMUM LETTER HEIGHT OF 3/8" AND PERMANENTLY AFFIXED.
1.5 ALERTING WORDS TO BE COLOR CODED. "DANGER" WILL HAVE RED BACKGROUND; "WARNING" WILL HAVE ORANGE BACKGROUND; "CAUTION" WILL HAVE YELLOW BACKGROUND. [ANSI Z535]

LABELS ARE NOT DRAWN TO SCALE

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LAKE CITY, FL 32024

AHJ: COLUMBIA COUNTY

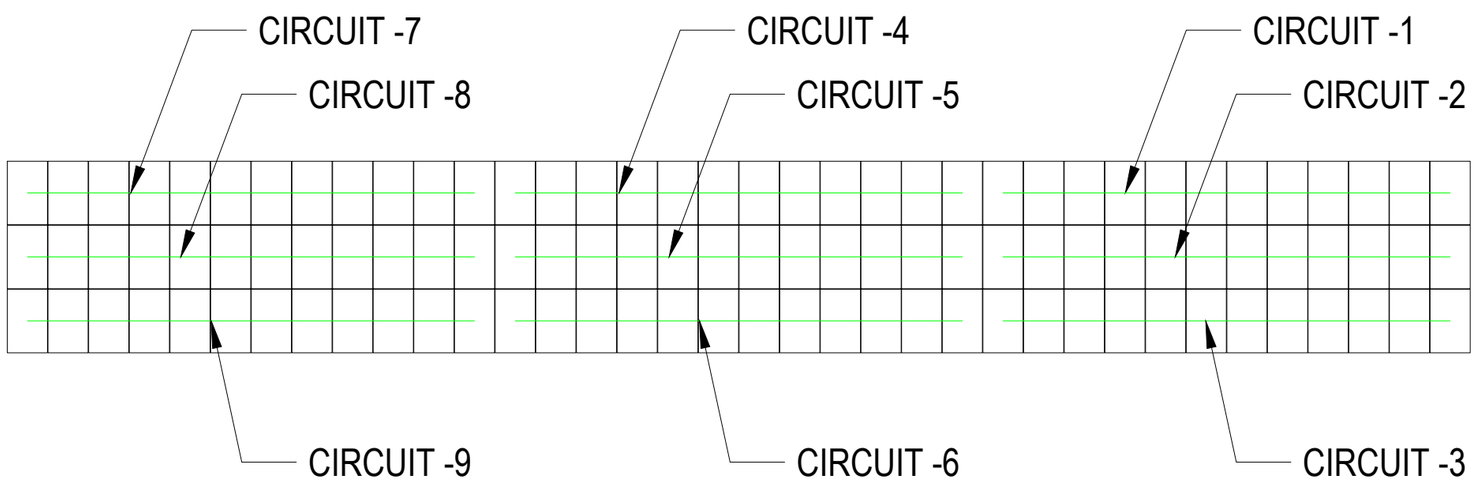
MADISON SERVICE COMPANY, LLC

ELECTRICAL LABELS

DATE: 12/8/2023
DRAWN BY: OE

PV-6

CIRCUIT DETAIL
ENPHASE CIRCUITS
CIRCUIT # 1: 12 MODULES
CIRCUIT # 2: 12 MODULES
CIRCUIT # 3: 12 MODULES
CIRCUIT # 4: 12 MODULES
CIRCUIT # 5: 12 MODULES
CIRCUIT # 6: 12 MODULES
CIRCUIT # 7: 12 MODULES
CIRCUIT # 8: 12 MODULES
CIRCUIT # 9: 12 MODULES



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LAKE CITY, FL 32024

AHJ: COLUMBIA COUNTY

MADISON SERVICE COMPANY, LLC

MICRO INVERTER & CIRCUIT MAP

DATE: 12/8/2023
DRAWN BY: OE

PV-7

Mono Multi Solutions

Vertex S

BACKSHEET MONOCRYSTALLINE MODULE

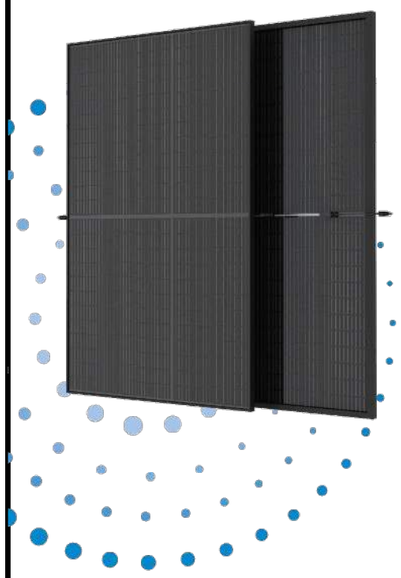
PRODUCT: TSM-DE09C.07

PRODUCT RANGE: 380-405W

405W
MAXIMUM POWER OUTPUT

0~+5W
POSITIVE POWER TOLERANCE

21.1%
MAXIMUM EFFICIENCY



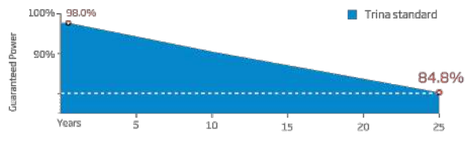
High value
- More productivity from same roof size.
- Outstanding visual appearance.
- Leading 210mm cell technology.

Small in size, big on power
- Small format module allow greater energy generation in limited space.
- Up to 405W, 21.1% module efficiency with high density interconnect technology.
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current.
- Reduce installation cost with higher power bin and efficiency.
- Boost performance in warm weather with lower temperature coefficient (-0.34%) and operating temperature.

Universal solution for residential and C&I rooftops
- Designed for compatibility with existing mainstream optimizers, inverters and mounting systems.
- Perfect size and low weight makes handling and transportation easier and more cost-effective.
- Diverse installation solutions for flexibility in system deployment

High Reliability
- 25 year product warranty.
- 25 year performance warranty with lowest degradation.
- Minimized micro-cracks with innovative non-destructive cutting technology.
- Ensured PID resistance through cell process and module material control.
- Mechanical performance up to +6000 Pa and-4000 Pa negative load

Trina Solar's Backsheet Performance Warranty



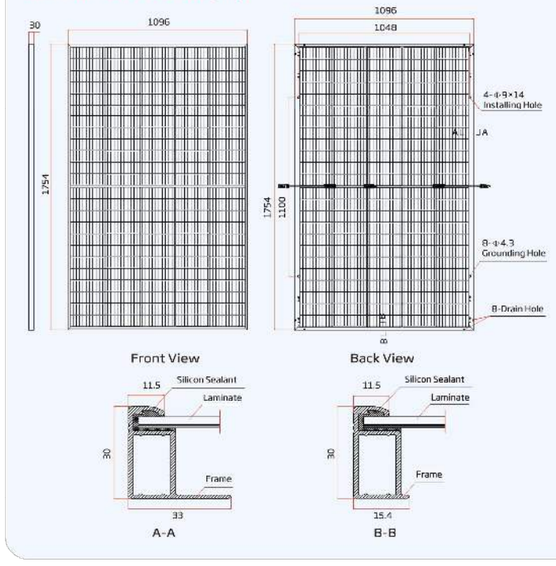
Comprehensive Products and System Certificates

IEC61215/IEC61730/IEC61701/IEC62716/UL61730
ISO 9001: Quality Management System
ISO 14001: Environmental Management System
ISO14064: Greenhouse Gases Emissions Verification
ISO45001: Occupational Health and Safety Management System

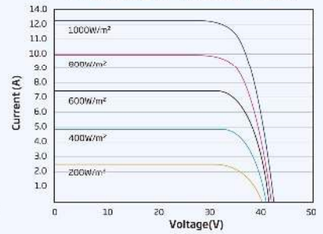
Trinasolar

Vertex S BACKSHEET MONOCRYSTALLINE MODULE

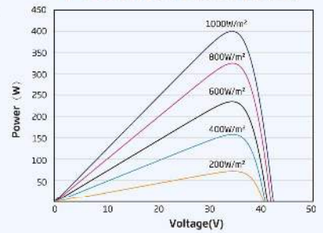
DIMENSIONS OF PV MODULE(mm)



I-V CURVES OF PV MODULE(400 W)



P-V CURVES OF PV MODULE(400W)



ELECTRICAL DATA (STC)

Peak Power Watts-PMAX (Wp)*	380	385	390	395	400	405
Power Tolerance-PMAX (W)	0~+5					
Maximum Power Voltage-VMPP (V)	33.4	33.6	33.8	34.0	34.2	34.4
Maximum Power Current-IMPP (A)	11.38	11.46	11.54	11.62	11.70	11.77
Open Circuit Voltage-Voc (V)	40.4	40.6	40.8	41.0	41.2	41.4
Short Circuit Current-Isc (A)	12.00	12.07	12.14	12.21	12.28	12.34
Module Efficiency η m (%)	19.8	20.0	20.3	20.5	20.8	21.1

STC: Irradiance 1000W/m2, Cell Temperature 25℃, Air Mass AM1.5. *Measuring tolerance: ±3%.

Electrical characteristics with different power bin (reference to 10% Irradiance ratio)

Total Equivalent power -PMAX (Wp)	407	412	417	423	428	433
Maximum Power Voltage-VMPP (V)	33.4	33.6	33.8	34.0	34.2	34.4
Maximum Power Current-IMPP (A)	12.19	12.26	12.34	12.44	12.51	12.59
Open Circuit Voltage-Voc (V)	40.4	40.6	40.8	41.0	41.2	41.4
Short Circuit Current-Isc (A)	12.92	13.00	13.08	13.20	13.25	13.36
Irradiance ratio (rear/front)	10%					

Power Bifaciality:70±5%.

ELECTRICAL DATA (NOCT)

Maximum Power-PMAX (Wp)	286	290	294	298	302	305
Maximum Power Voltage-VMPP (V)	31.4	31.6	31.8	31.9	32.1	32.4
Maximum Power Current-IMPP (A)	9.12	9.18	9.24	9.32	9.38	9.42
Open Circuit Voltage-Voc (V)	38.0	38.2	38.4	38.6	38.8	38.9
Short Circuit Current-Isc (A)	9.67	9.73	9.78	9.84	9.90	9.94

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	120 cells
Module Dimensions	1754×1096×30 mm (69.06×43.15×1.18 inches)
Weight	21.0 kg (46.3 lb)
Glass	3.2 mm (0.13 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	EVA/POE
Backsheet	Transparent backsheet
Frame	30mm(1.18 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm² (0.006 inches²), Portrait: 350/280 mm(13.78/11.02 inches) Landscape: N 1100 mm /P 1100 mm (43.31/43.31 inches)
Connector	MC4 EVO2 / TS4*

*Please refer to regional datasheet for specified connector.

TEMPERATURE RATINGS

NOCT(Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of PMAX	- 0.34%/°C
Temperature Coefficient of Voc	- 0.25%/°C
Temperature Coefficient of Isc	0.04%/°C

MAXIMUMRATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC)
	1500V DC (UL)
Max Series Fuse Rating	25A

WARRANTY

25 year Product Workmanship Warranty
25 year Power Warranty
2% first year degradation
0.55% Annual Power Attenuation
(Please refer to product warranty for details)

PACKAGING CONFIGUREATION

Modules per box: 36 pieces
Modules per 40' container: 828 pieces

Trinasolar

Version number: TSM_NA_2022_A
www.trinasolar.com

PROJECT, HOME
195 SW WAVERLY LN.
LAKE CITY, FL 32024

AHJ: COLUMBIA COUNTY

MADISON SERVICE COMPANY, LLC

MODULE DATASHEET

DATE: 12/8/2023
DRAWN BY: OE

PV-8.1

ENPHASE.

DATA SHEET

IQ8 and IQ8+ Microinverters

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

Enphase 25 year limited warranty

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.

UL CERTIFIED SAFETY

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

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings[1]	W	235 – 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 – 37	29 – 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[2] [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**
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range[3]	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
Max units per 20 A (L-L) branch circuit[4]		16	13
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
CEC weighted efficiency	%	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	
Acoustic noise at 1 m		<60 dBA	
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) No enforced DC/AC ratio. See the compatibility calculator at https://link.enphase.com/module-compatibility (2) Maximum continuous input DC current is 10.6A (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

IQ8SP-DS-0002-01-EN-US-2021-10-19

PROJECT, HOME
195 SW WAVERLY LN.
LAKE CITY, FL 32024

AHJ: COLUMBIA COUNTY

MADISON SERVICE COMPANY, LLC

INVERTER DATASHEET

DATE: 12/8/2023
DRAWN BY: OE

PV-8.2

Data Sheet
Enphase Networking

Enphase IQ Envoy

The **Enphase IQ Envoy**™ communications gateway delivers solar production and energy consumption data to Enphase Enlighten™ monitoring and analysis software for comprehensive, remote maintenance and management of the Enphase IQ System.

With integrated revenue grade production metering and optional consumption monitoring, Envoy IQ is the platform for total energy management and integrates with the Enphase Ensemble™and the Enphase IQ Battery™.

Smart

- Enables web-based monitoring and control
- Bidirectional communications for remote upgrades
- Supports power export limiting and zeroexport applications

Simple

- Easy system configuration using Enphase Installer Toolkit™ mobile app
- Flexible networking with Wi-Fi, Ethernet, or cellular

Reliable

- Designed for installation indoors or outdoors
- Five-year warranty

CERTIFIED SAFETY

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE.

Enphase IQ Envoy

MODEL NUMBERS	
Enphase IQ Envoy™ ENV-IQ-AM1-240	Enphase IQ Envoy communications gateway with integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional consumption monitoring (+/- 2.5%). Includes one 200A continuous rated production CT (current transformer).
ACCESORIES (Order Seperately)	
Enphase Mobile Connect™ CELLMODEM-M1 (4G based LTE-M/5-year data plan) CELLMODEM-M1-B (4G-based LTE-M1/5-year data plan)	Plug and play industrial grade cellular modem with data plan 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.)
Consumption Monitoring CT CT-200-SPLIT	Split-core consumption CTs enable whole home metering.
Ensemble Communications Kit COMMS-KIT-01	Installed at the IQ Envoy. For communications with Enphase Encharge™ storage and Enphase Enpower™ smart switch. Includes USB cable for connection to IQ Envoy or Enphase IQ Combiner™ and allows wireless communication with Encharge and Enpower.
POWER REQUIREMENTS	
Power requirements	120/240 VAC split-phase. Max 20 A overcurrent protection required.
Typical Power Consumption	5W
CAPACITY	
Number of microinverters polled	Up to 600
MECHANICAL DATA	
Dimensions (WxHxD)	21.3 x 12.6 x 4.5 cm (8.4" x 5" x 1.8")
Weight	17.6 oz (498 g)
Ambient temperature range	-40° to 65° C (-40° to 149° F) -40° to 46° C (-40° to 115° F) if installed in an enclosure
Environmental rating	IP30. For installation indoors or in an NRTL-certified, NEMA type 3R enclosure.
Altitude	To 2000 meters (6,560 feet)
Production CT	- Limited to 200A of continuous current / 250A OCPD – 72kW AC - Internal aperture measures 19.36mm to support 250MCM THWN conductors (max) - UL2808 certified for revenue grade metering
Consumption CT	- For electrical services to 250A with parallel runs up to 500A - Internal aperture measures 0.84" x 0.96" (21.33mm x 24.38mm) to support 3/0 THWN conductor - UL2808 certified, for use at service entrance for services up to 250Vac
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Ethernet	802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
Mobile	CELLMODEM-M1 (4G) or CELLMODEM-M1-B (4G). Not included. Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
COMPLIANCE	
Compliance	UL 61010-1 CAN/CSA C22.2 No. 61010-1 47 CFR, Part 15, Class B, ICES 003 IEC/EN 61010-1:2010, EN50065-1, EN61000-4-5, EN61000-6-1, EN61000-6-2 Metering: ANSI C12.20 accuracy class 0.5 (PV production only)

To learn more about Enphase offerings, visit **enphase.com**

ENPHASE.

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AHJ: COLUMBIA COUNTY

MADISON SERVICE COMPANY, LLC

COMBINER DATASHEET

DATE: 12/8/2023
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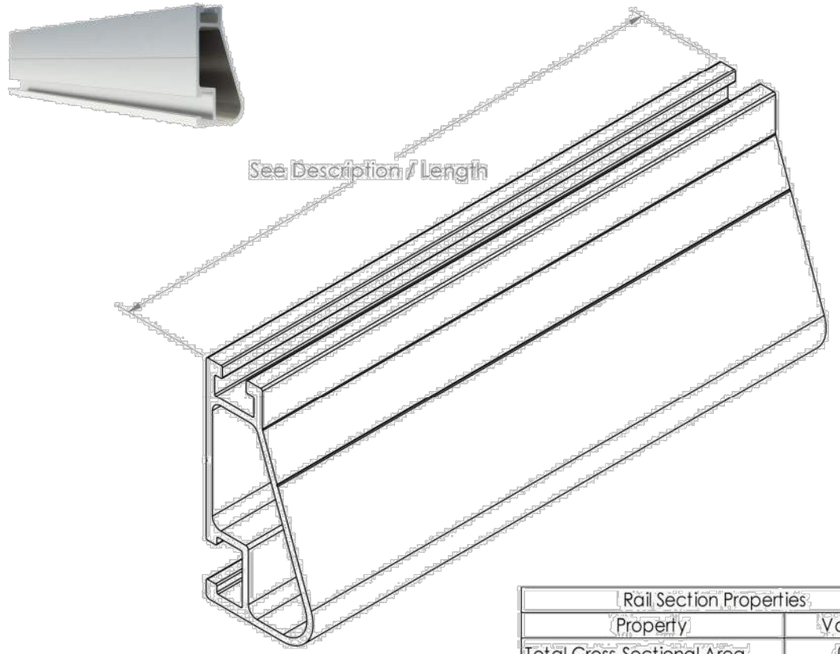
PV-8.3

Cut Sheet

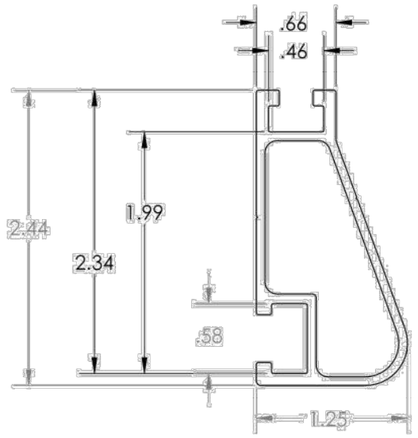
IRONRIDGE

XR100 Rail



Rail Section Properties	
Property	Value
Total Cross-Sectional Area	0.582 in^2
Section Modulus (X-axis)	0.297 in^3
Moment of Inertia (X-axis)	0.390 in^4
Moment of Inertia (Y-axis)	0.085 in^4
Torsional Constant	0.214 in^3
Polar Moment of Inertia	0.126 in^4

APPROVED MATERIALS:
6005-T6, 6005A-T61, 6105-T5, 6N01-T6
(34,000 PSI YIELD STRENGTH MINIMUM)



Clear Part Number	Black Part Number	Description / Length	Material	Weight
XR-100-168A	XR-100-168B	XR100, Rail 168" (14 Feet)	6000-Series Aluminum	9.55 lbs.
XR-100-204A	XR-100-204B	XR100, Rail 204" (17 Feet)		11.60 lbs.

v1.10

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RACKING DATASHEET

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PV-8.4

Tech Brief

IRONRIDGE

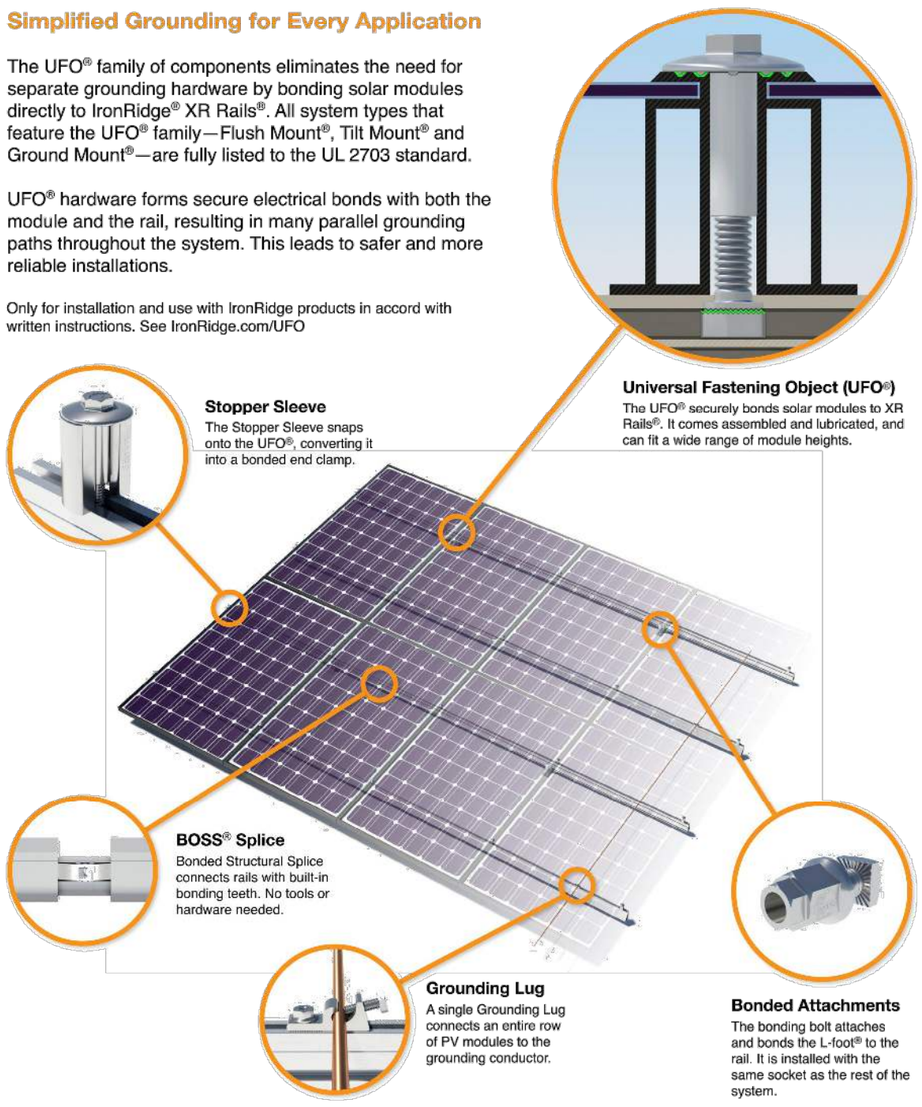
UFO® Family of Components

Simplified Grounding for Every Application

The UFO® family of components eliminates the need for separate grounding hardware by bonding solar modules directly to IronRidge® XR Rails®. All system types that feature the UFO® family—Flush Mount®, Tilt Mount® and Ground Mount®—are fully listed to the UL 2703 standard.

UFO® hardware forms secure electrical bonds with both the module and the rail, resulting in many parallel grounding paths throughout the system. This leads to safer and more reliable installations.

Only for installation and use with IronRidge products in accord with written instructions. See IronRidge.com/UFO



Stopper Sleeve
The Stopper Sleeve snaps onto the UFO®, converting it into a bonded end clamp.

Universal Fastening Object (UFO®)
The UFO® securely bonds solar modules to XR Rails®. It comes assembled and lubricated, and can fit a wide range of module heights.

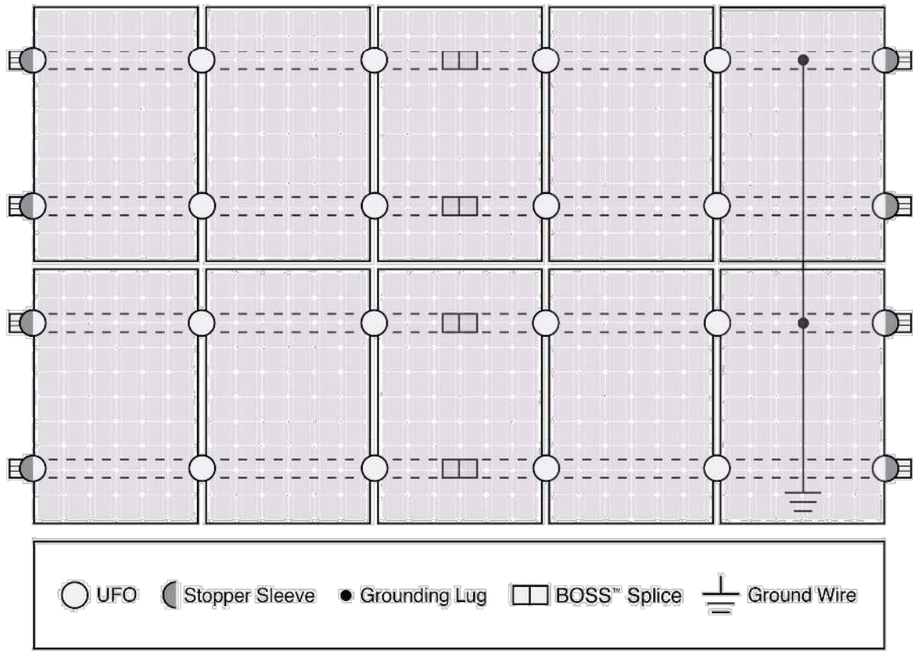
BOSS® Splice
Bonded Structural Splice connects rails with built-in bonding teeth. No tools or hardware needed.

Grounding Lug
A single Grounding Lug connects an entire row of PV modules to the grounding conductor.

Bonded Attachments
The bonding bolt attaches and bonds the L-foot® to the rail. It is installed with the same socket as the rest of the system.

Tech Brief

System Diagram



Approved Enphase microinverters can provide equipment grounding of IronRidge systems, eliminating the need for grounding lugs and field installed equipment ground conductors (EGC). A minimum of two microinverters mounted to the same rail and connected to the same Engage cable is required. Refer to installation manuals for additional details.

UL Certification

The IronRidge® Flush Mount®, Tilt Mount®, and Ground Mount Systems have been listed to UL 2703 by Intertek Group plc.

UL 2703 is the standard for evaluating solar mounting systems. It ensures these devices will maintain strong electrical and mechanical connections over an extended period of time in extreme outdoor environments.

Go to IronRidge.com/UFO

Cross-System Compatibility			
Feature	Flush Mount	Tilt Mount	Ground Mount
XR Rails®	✔	✔	XR100 & XR1000
UFO®/Stopper	✔	✔	✔
BOSS® Splice	✔	✔	N/A
Grounding Lugs	1 per Row	1 per Row	1 per Array
Microinverters & Power Optimizers	Compatible with most MLPE manufacturers. Refer to system installation manual.		
Fire Rating	Class A	Class A	N/A
Modules	Tested or Evaluated with over 400 Framed Modules Refer to installation manuals for a detailed list.		

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ROOF ATTACHMENT DATASHEET

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PV-8.5

S-5!®
The Right Way

The right way to attach almost anything to metal roofs!

ProteaBracket™

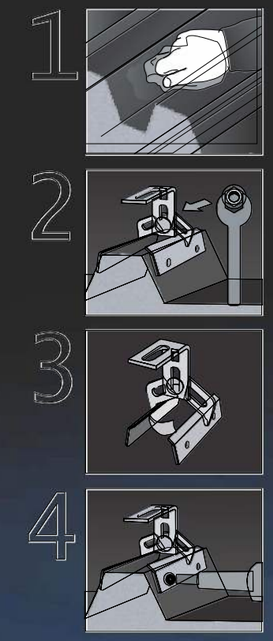
ProteaBracket™ is the most versatile attachment solution on the market, fitting most metal trapezoidal sheet profiles with and without intermediate insulation. It features an adjustable attachment base and multiple solar module attachment options (illustrated on back) to accommodate varying widths and heights. There are no messy sealants to apply and no chance for leaks; the ProteaBracket comes with factory-applied, adhesive rubber sealant to ensure quick installation and a weather-proof fit.

The ProteaBracket is mounted directly onto the crown of the panel, straddling the profile. No surface preparation is necessary; simply wipe away excess oil and debris, align, and apply. Secure ProteaBracket through all 6 pre-punched holes.

ProteaBracket is the perfect match for the S-5-PV Kit, for a solar attachment solution that is both economical and easy to use.

S-5!® ProteaBracket™ is a versatile bracket that adjusts easily to most trapezoidal roof profiles.

S-5! PV kits have an M8 bolt and are suitable for use with all S-5! clamps.



S-5!® The Right Way

ProteaBracket™ is the perfect solar attachment solution for most trapezoidal exposed-fastened metal roof profiles. No messy sealants to apply: the factory-applied adhesive rubber sealant weather-proofs and makes installation easy.

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

Each **ProteaBracket™** comes with a factory-applied, adhesive rubber sealant on the base. A structural A2 stainless steel bimetal attachment bracket, ProteaBracket is compatible with most common metal roofing materials.

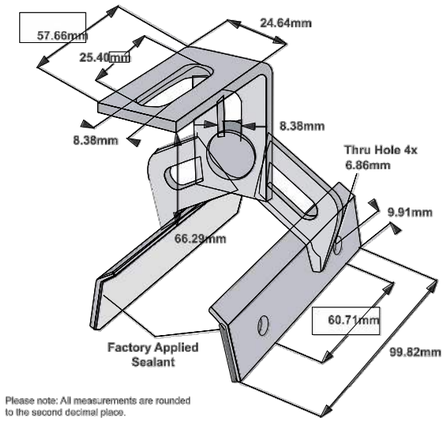
All four pre-punched holes must be used to achieve tested strength. For design assistance, contact Safintra South Africa (and see our website **www.safintra.co.za**), or visit **www.S-5.com** for the independent lab test data that can be used for load-critical designs and applications. Also, please visit S-5! website for more information including metallurgical compatibilities and specifications.

Multiple Attachment Options:

ProteaBracket™ with Top Rail option for PV attachment

ProteaBracket™ with S-5-PV Kit option (if not using a rail)

ProteaBracket™



Please note: All measurements are rounded to the second decimal place.

FLUTELINE

VERSATILE

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

S-5! Brackets and clamps are not tested for performance as part of a Fall Arrest or Personal Safety system. These applications need to be tested as a dynamic system and warranties or test results must be issued by the system provider.
Safintra, Safal Group and its subsidiaries provide no warranties or any assurances in this application, and will accept no claims of any nature whatsoever arising out of any such applications.

Products are protected by multiple international patents. For published data regarding holding strength, bolt torque, patents and trademarks visit the S-5! website at www.S-5.com.

Sole Agents for Africa:

SAFINTRA
world class roofing systems
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ROOF ATTACHMENT DATASHEET

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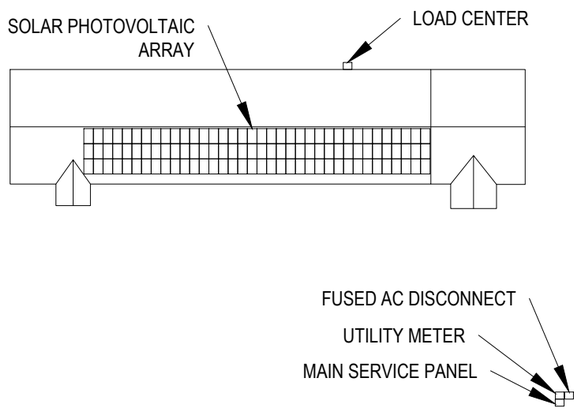
PV-8.6

⚠ CAUTION ⚠

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

SERVICE 1 OF 1



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PLACARD

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PV-9