

11/17/2023

RE: Structural Certification for Installation of Residential Solar
KARI TRAVIS:194 SW LOGSTON CT, FORT WHITE, FL, 32038

Attn: To Whom It May Concern

This Letter is for the existing roof framing which supports the new PV modules as well as the attachment of the PV system to existing roof framing. From the field observation report, the roof is made of Metal roofing over 1/2 inch plywood supported by 2X4 Trusses at 24 inches. The slope of the roof was approximated to be 18 degrees.

After review of the field observation data and based on our structural capacity calculation, **the existing roof framing has been determined to be adequate to support the imposed loads without structural upgrades.** Contractor shall verify that existing framing is consistent with the described above before install. Should they find any discrepancies, a written approval from SEOR is mandatory before proceeding with install. Capacity calculations were done in accordance with applicable building codes.

<u>Code</u>	2020 Florida Building Code (ASCE 7-16)		
<u>Risk category</u>		<u>II</u>	<u>Wind Load</u> (component and Cladding)
<u>Roof Dead Load</u>	Dr	10 psf	V 120 mph
<u>PV Dead Load</u>	DPV	3 psf	Exposure C
<u>Roof Live Load</u>	Lr	20 psf	
<u>Ground Snow</u>	S	0 psf	

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

Sincerely,

Vincent Mwumvaneza, P.E
EV Engineering LLC



This item has been electronically signed and sealed by Vincent Mwumvaneza using a Digital Signature and Date. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Vincent
Mwum
vaneza

Digitally signed
by Vincent
Mwumvaneza
Date:
2023.11.17
16:02:50 -05'00'

Structural Letter for PV Installation

Date: 11/17/2023
Job Address: 194 SW LOGSTON CT
FORT WHITE, FL, 32038
Job Name: KARI TRAVIS
Job Number: 231117KT

Scope of Work

This Letter is for the existing roof framing which supports the new PV modules as well as the attachment of the PV system to existing roof framing. All PV mounting equipment shall be designed and installed per manufacturer's approved installation specifications.

Table of Content

Sheet	
2	Cover
3	Attachment checks
4	Roof Framing Check
5	Seismic Check and Scope of work

Engineering Calculations Summary

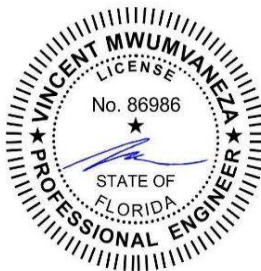
Code	2020 Florida Building Code (ASCE 7-16)	
Risk category		II
Roof Dead Load	Dr	10 psf
PV Dead Load	DPV	3 psf
Roof Live Load	Lr	20 psf
Ground Snow	S	0 psf
Wind Load	(component and Cladding)	
	V	120 mph
	Exposure	C

References

NDS for Wood Construction

Sincerely,

Vincent Mwumvaneza, P.E
EV Engineering LLC



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Wind Load Cont.

Risk Category =	II	
V =	120 mph	ASCE 7-16 Figure 26.5-1B
Exposure =	C	
K_{zt} =	1.0	ASCE 7-16 Sec 26.8.2
K_z =	0.85	ASCE 7-16 Table 26.10-1
K_d =	0.85	ASCE 7-16 Table 26.6-1
K_e =	1.00	ASCE 7-16 Table 26.9-1
$q_h = 0.00256 K_z K_{zt} K_d K_e V^2 =$	26.55 psf	
Pitch =	18.0 Degrees	
$V_E =$	1.0	
$V_a =$	0.6 considering 1 module	

Uplift (W)	Zone(1,2e)	Zone(2r, 2n)	Zone(3e)	Zone(3r)
Fig. 30.3-2 $GC_p =$	-1.1	-2	-2	-2.4
Eq. 29.4-7 $P = q_h(GC_p)(V_E)(V_a) =$	-17.52	-31.86	-31.86	-38.23
$GC_p =$	0.5			Figure 30.3-2
$P = q_h(GC_p)(V_E)(V_a) =$	7.97			Equation 29.4-7

Rafter Attachments: 0.6D+0.6W (CD=1.6)

Connection Check

RTMini-(2) SS304x60mm Withdrawal Value=	894 lbs	Manufacturer Test
Lag Screw Penetration (Minimum)	2 in	
Safety Factor	2	
Allowable Capacity=	447 lbs	

Zone	Average Trib Width	Area (ft)	Uplift (lbs)	Down (lbs)
Zone(1,2e)	4	10.2	123.5	110.0
Zone(2r, 2n)	4	10.2	209.8	110.0
Zone(3e)	2	5.1	104.9	110.0
Zone(3r)	2	5.1	124.1	110.0
Conservative Max=			209.8	< 447

CONNECTION IS OK

1. Pv seismic dead weight is negligible to result in significant seismic uplift, therefore the wind uplift governs

Vertical Load Resisting System Design

Trusses

Max Length, L =	8.0 ft	(Beam maximum Allowable Horizontal Span)
Tributary Width, W_T =	24 in	
Dr =	10 psf	20 plf
L_r =	20 psf	
W_{down} =	7.97 psf	15.9 plf
Pv =	3 psf	6 plf

Load Case: DL+0.6W (CD=1.6)

Pv max Shear =	110.0 lbs	
Max Moment, M_u =	173 lb-ft	Conservative
Max Shear, $V_u = wL/2 + Pv$ Point Load =	214 lb	

Note: Proposed loading will add less than 5% of the existing loads.

Member Capacity

2X4	Design Value	C_L	C_F	C_i	C_r	K_F	ϕ	λ	Adjusted Value
F_b =	900 psi	1.0	1.5	1.0	1.15	2.54	0.85	0.8	1553 psi
F_v =	180 psi	N/A	N/A	1.0	N/A	2.88	0.75	0.8	180 psi
E =	1600000 psi	N/A	N/A	1.0	N/A	N/A	N/A	N/A	psi
E_{min} =	580000 psi	N/A	N/A	1.0	N/A	1.76	0.85	N/A	580000 psi

Depth, d =	3.5 in
Width, b =	1.5 in
Cross-Sectional Area, A =	5.25 in ²
Moment of Inertia, I_{xx} =	5.35938 in ⁴
Section Modulus, S_{xx} =	3.0625 in ³

Allowable Moment, $M_{all} = F_b S_{xx}$ =	396.2 lb-ft	DCR = M_u / M_{all} =	0.44 < 1
Allowable Shear, $V_{all} = 2/3 F_v A$ =	630.0 lb	DCR = V_u / V_{all} =	0.34 < 1

Satisfactory

Satisfactory

Siesmic Loads Check

Roof Dead Load	10 psf
% or Roof with Pv	29.4%
Dpv and Racking	3 psf
Average Total Dead Load	10.9 psf
Increase in Dead Load	3.5% OK

The increase in seismic Dead weight as a result of the solar system is less than 10% of the existing structure and therefore no further seismic analysis is required.

Limits of Scope of Work and Liability

We have based our structural capacity determination on information in pictures and a drawing set titled PV plans - KARI TRAVIS. The analysis was according to applicable building codes, professional engineering and design experience, opinions and judgments. The calculations produced for this structure's assessment are only for the proposed solar panel installation referenced in the stamped plan set and were made according to generally recognized structural analysis standards and procedures.

KARI TRAVIS
NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM
WITH BATTERY BACKUP SYSTEM
DC SYSTEM SIZE (11.2 KW)

SYSTEM DETAILS

DESCRIPTION	NEW GRID-INTERACTIVE PHOTOVOLTAIC SYSTEM WITH BATTERY STORAGE
DC RATING OF SYSTEM	SYSTEM SIZE :11.2 KW DC STC
AC RATING OF SYSTEM	15 KW
AC OUTPUT CURRENT	62.5 A
NO. OF MODULES	(28) CS6R-400MS-HL (400W) CANADIAN SOLAR MODULES
NO. OF INVERTERS	(1) SOL-ARK-15K-2P INVERTER
NO.OF BATTERIES	(6) EG4-LL 48V BATTERIES
NO.OF OPTIMIZER	(28) TS4-A-O TIGO OPTIMIZER
ARRAY STRINGING	(01) BRANCH OF 10 MODULES (02) BRANCHES OF 09 MODULES

SITE DETAILS

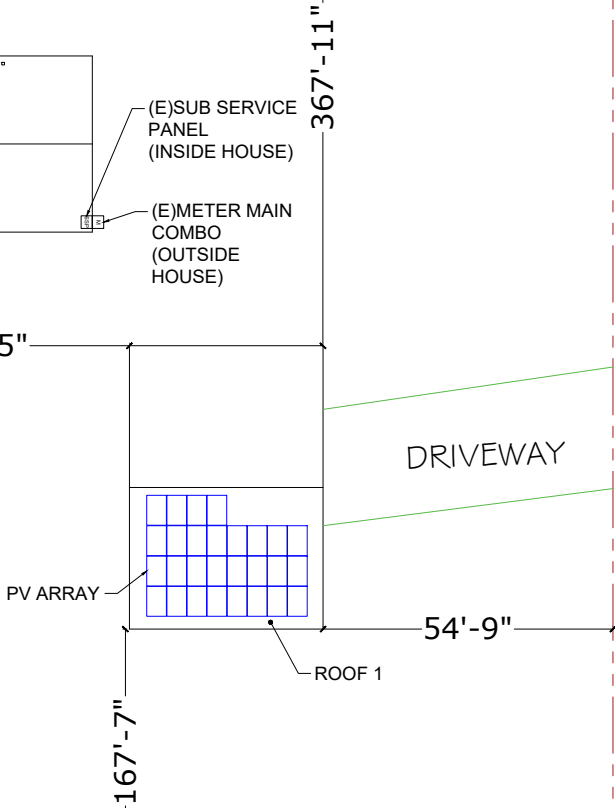
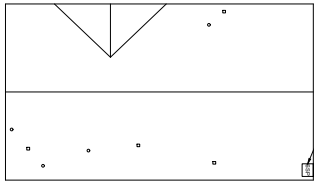
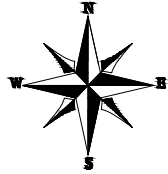
ASHRAE EXTREME LOW	-5°C
ASHRAE 2% HIGH	34°C
GROUND SNOW LOAD	0 PSF
WIND SPEED	120 MPH (ASCE 7-16)
RISK CATEGORY	II
WIND EXPOSURE CATEGORY	C

GOVERNING CODES

FLORIDA RESIDENTIAL CODE, 7TH EDITION 2020 (FRC)
FLORIDA BUILDING CODE, 7TH EDITION 2020 (FBC)
FLORIDA FIRE PREVENTION CODE, (FFPC)7TH EDITION, NFPA 1, 2018
NATIONAL ELECTRICAL CODE, NEC 2017 CODE BOOK, NFPA 70

SHEET INDEX

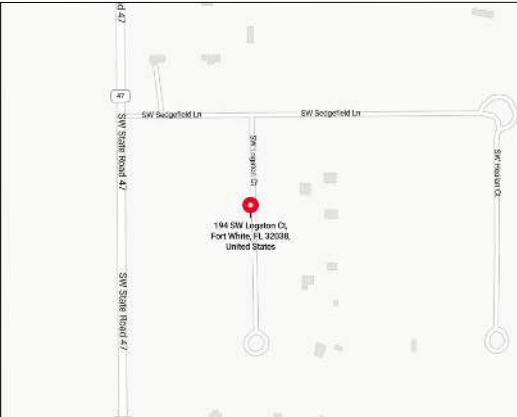
SHEET NO.	SHEET NAME
A - 00	SITE MAP & VICINITY MAP
S - 01	SYMBOLS & SYSTEM DESCRIPTION
S - 02	ROOF PLAN & MODULES
S - 03	ARRAY LAYOUT
S - 04	STRUCTURAL ATTACHMENT DETAIL
E - 01	ELECTRICAL LINE DIAGRAM
E - 02	WIRING CALCULATIONS
E - 03	SYSTEM LABELING
DS - 01	MODULE DATASHEET
DS - 02	INVERTER DATASHEET
DS - 03	BATTERY DATASHEET
DS - 04	OPTIMIZER DATASHEET
DS - 05	RACKING DATASHEET
DS - 06	ATTACHMENT DATASHEET
DS - 07	GROUNDING AND BONDING DATASHEET



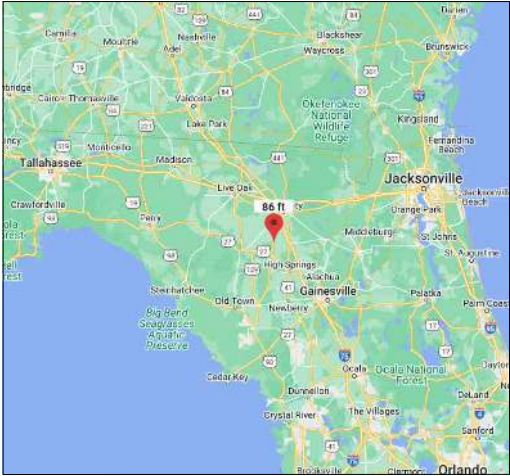
SITE MAP (N.T.S)



VICINITY MAP



WIND FLOW MAP



SYNERGY SOLLAR
8595 103RD ST,
32210 JACKSONVILLE,
FLORIDA, USA
CONTACT: 3609100892
EMAIL:ANDREI@SYNERGYSOLAR.US

Signature with Seal



This item has been electronically signed and sealed by Vincent Mwumvaneza using a Digital Signature and Date. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Digitally signed by Vincent Mwumvaneza
Date: 2023.11.17 15:59:42 -05'00'

KARI TRAVIS

194 SW LOGSTON CT,
FORT WHITE, FL, 32038

REVISIONS

REV	ENGG.	DESCRIPTION	DATE

PERMIT DEVELOPER

DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME

SITE MAP &
VICINITY MAP

SHEET NUMBER

A-00

SYMBOLS:

Section.....



Sheet where section is located

Elevation



Detail ID Letter

Sheet where section is located

Detail



Detail ID Letter

Sheet where section is located

Detail
(Enlarged Plan)



Detail ID Letter

Area to be enlarged

Sheet where section is located

Keyed Notes

1

Keyed note designation on applicable sheet

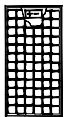
Ground Terminal



Grounding Point/rod....



Solar Panel



00

Module with Source Circuit number

Combiner Panel

CP

DC Disconnect

DCD

Main Service Panel

MSP

Fuse



Overcurrent Breaker ..



Inverter



Transformer



Automatic
Transfer Switch

ATS

ABBREVIATIONS:

AC	Alternating Current
APPROX	Approximate
AWG	American Wire Gauge
CP	Combiner Panel
DC	Direct Current
DCD	Direct Current Disconnect
DISC	Disconnect
(E)	Existing
EL	Elevation
EQ	Equal
JB	Junction Box
MCP	Main Combiner Panel
MFR	Manufacturer
MIN	Minimum
MISC	Miscellaneous
(N)	New
OCPD	OverCurrent Protection Device
POCC	Point Of Common Coupling
PV	Photovoltaic
SF	Squarefoot/feet
STC	Standard Test Conditions
TBD	To Be Determined
TYP	Typical
VIF	Verify In Field
WP	Weather Proof

SYSTEM DESCRIPTION

This system is a grid-tied PV system, with PV generation consisting of 28 CS6R-400MS-HL (400W) CANADIAN SOLAR MODULES with a combined STC rated dc output power of 11.2 KW. The modules are connected into 1 SOL-ARK-15K-2P INVERTER. The inverter has electronic maximum power point tracking to maximize energy captured by the PV modules. The inverter also has an internal ground fault detection and interruption device that is set to disconnect the array in the event that a ground fault that exceeds one ampere should occur. The inverter has DC and AC disconnect integrated system and labels are provided as required by the National Electrical Code.

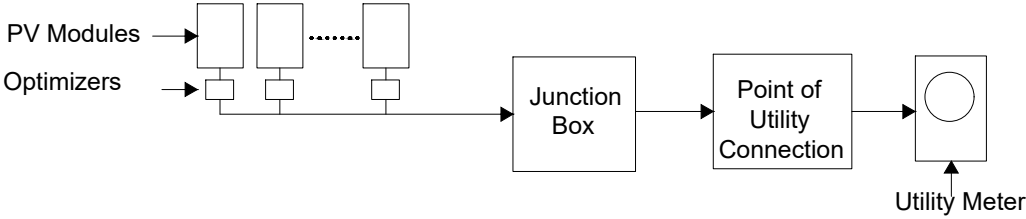


Figure 1: PV System Block Diagram

When the sun is shining, power from the PV array is fed into the inverter, where it is converted from DC to AC. The inverter output is then used to contribute to the power requirements of the occupancy. If PV power meets the requirements of the loads of the occupancy, any remaining PV power is sold back to the utility. When utility power is available, but PV power is not available, building loads are supplied by the utility.

The inverter meets the requirements of IEEE 1547 and UL 1741. This means that if it detects a loss of utility power, it will automatically disconnect from the utility. When utility voltage is restored, the inverter automatically reconnects to the utility grid after verifying utility voltage and frequency stability.



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Signature with Seal

KARI TRAVIS

194 SW LOGSTON CT,
FORT WHITE, FL, 32038

REVISIONS	DATE				
	DESCRIPTION				
	REV	ENGG.			

PERMIT DEVELOPER	
DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME
SYMBOLS & SYSTEM DESCRIPTION

SHEET NUMBER
S-01

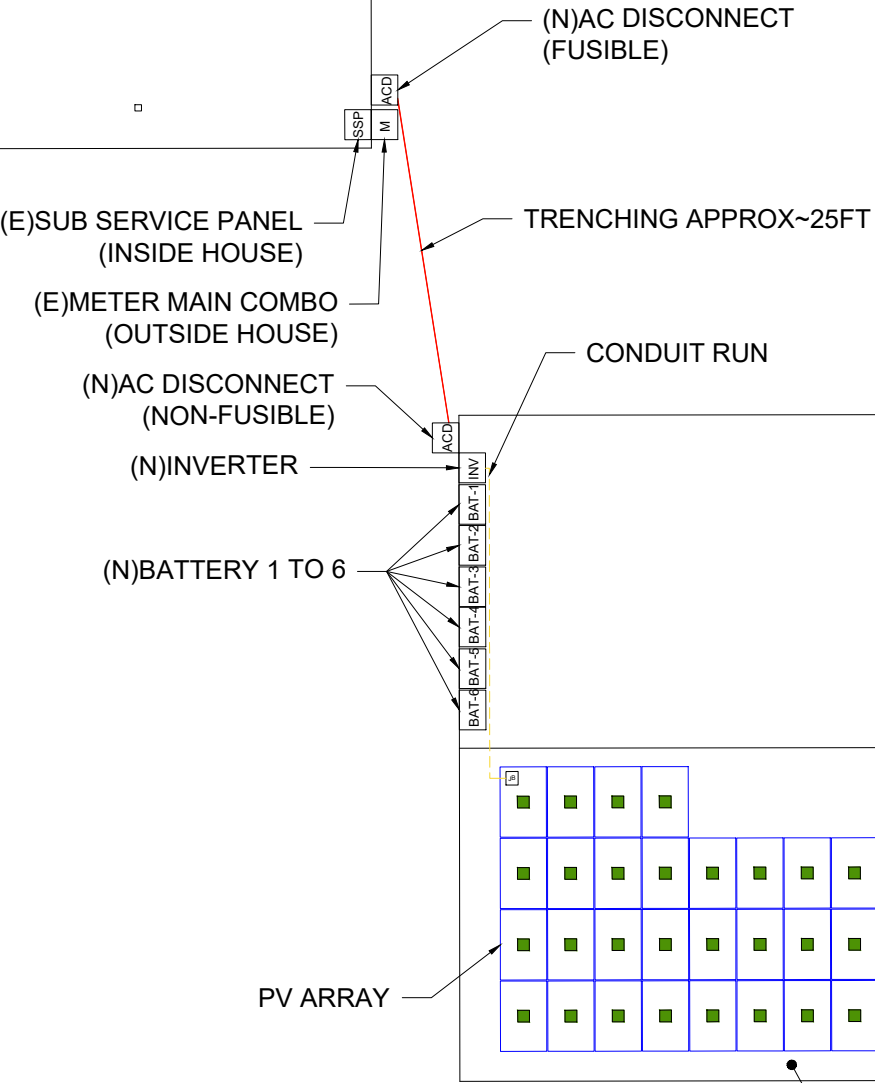
MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 28 MODULES
MODULE TYPE = CS6R-400MS-HL (400W) CANADIAN SOLAR MODULES
MODULE WEIGHT = 49.4 LBS/22.4 KG.
MODULE DIMENSIONS = 67.8 " X 44.6" = 21.00 SF

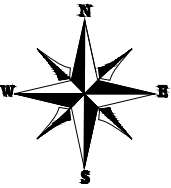
NUMBER OF INVERTER = 1 STRING INVERTER
INVERTER TYPE = SOL-ARK-15K-2P INVERTER

DC SYSTEM SIZE: 11.2 KW
AC SYSTEM SIZE: 15 KW

(E) BACK YARD



(E) FRONT YARD



GENERAL INSTALLATION PLAN NOTES:

1) ROOF ATTACHMENTS TO TRUSSES SHALL BE INSTALLED AS SHOWN IN SHEET S-03 AND AS FOLLOWS FOR EACH WIND ZONE:.

WIND ZONE 1: MAX SPAN 4'-0"
O.C. WIND ZONE 2: MAX SPAN 4'-0"
O.C. WIND ZONE 3: MAX SPAN 2'-0"
O.C.

2) EXISTING RESIDENTIAL BUILDING ROOF WITH MEAN ROOF HEIGHT 15FT AND SEAMS SPACED 9" O.C.

CONTRACTOR TO FIELD VERIFY AND SHALL REPORT TO THE ENGINEER IF ANY DISCREPANCIES EXIST BETWEEN PLANS AND IN FIELD CONDITIONS.

I CERTIFY THAT THE INSTALLATION OF THE MODULES IS IN COMPLIANCE WITH FBC: RESIDENTIAL CHAPTER 3.BUILDING STRUCTURE WILL SAFELY ACCOMMODATE LATERAL AND UPLIFT WIND LOADS, AND EQUIPMENT DEAD LOADS. *



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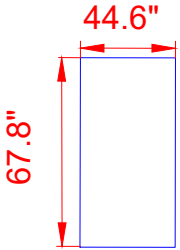
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FORT WHITE, FL, 32038

LEGENDS

- M - METER MAIN COMBO
- SSP - SUB SERVICE PANEL
- JB - JUNCTION BOX
- BAT - BATTERY
- ACD - AC DISCONNECT
- INV - INVERTER
- FIRE SETBACK
- ROOF ACCESS POINT
- OPTIMIZERS
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- CONDUIT



CS6R-400MS-HL
(400W) CANADIAN
SOLAR MODULES

REV	ENG.	DESCRIPTION	DATE			

PERMIT DEVELOPER	
DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME	
ROOF PLAN & MODULES	

SHEET NUMBER	
S-02	

ROOF DESCRIPTION:

(ROOF #1)

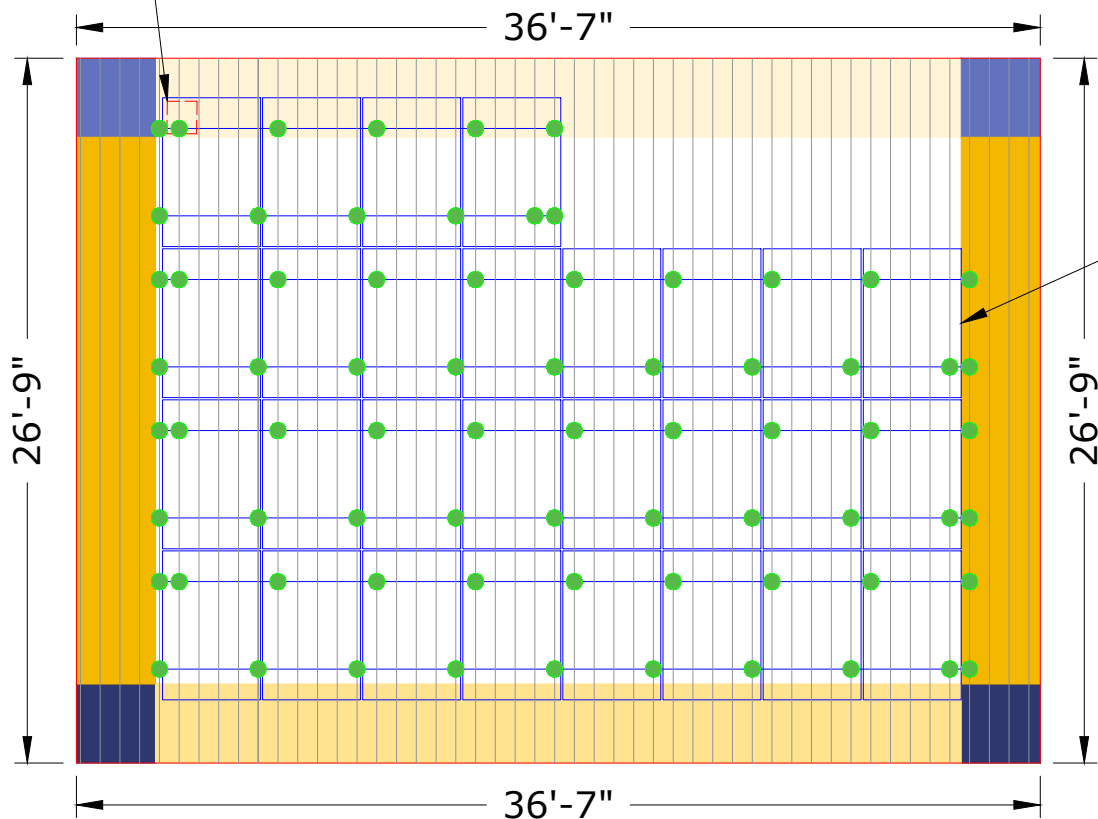
MODULES - 28
ROOF TILT - 18°
ROOF AZIMUTH - 180°
SEAMS SPACING - @ 9" O.C.

WIND LOAD INFORMATION:
THIS SYSTEM HAS BEEN DESIGN TO MEET
THE REQUIREMENTS OF THE 7TH EDITION OF
THE FLORIDA BUILDING CODE AND USED
THE FOLLOWING DESIGN PARAMETERS:
ULTIMATE WIND SPEED: 120 MPH
EXPOSURE CATEGORY: C
RISK CATEGORY: II
MEAN ROOF HEIGHT: 15FT
ROOF SLOPE: 7°-20°
TOTAL NO. OF ATTACHMENT: 72

Signature with Seal
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SYNERGY
SYNERGY SOLLAR
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EMAIL: ANDREI@SYNERGYSOLLAR.US

JUNCTION BOX



SOLAR MODULE

LEGENDS

- JUNCTION BOX
- FIRE SETBACK
- VENT, ATTIC FAN (ROOF OBSTRUCTION)
- PV ROOF ATTACHMENT
- COUPLING
- METAL SEAM
- RAIL

WIND ZONE 1

- WIND ZONE 1
- WIND ZONE 1'

WIND ZONE 2

- WIND ZONE (2)
- WIND ZONE (2r)
- WIND ZONE (2e)
- WIND ZONE (2n)

WIND ZONE 3

- WIND ZONE (3)
- WIND ZONE (3r)
- WIND ZONE (3e)



ROOF 1

KARI TRAVIS

194 SW LOGSTON CT,
FORT WHITE, FL, 32038

REV	ENG.	DESCRIPTION	DATE			

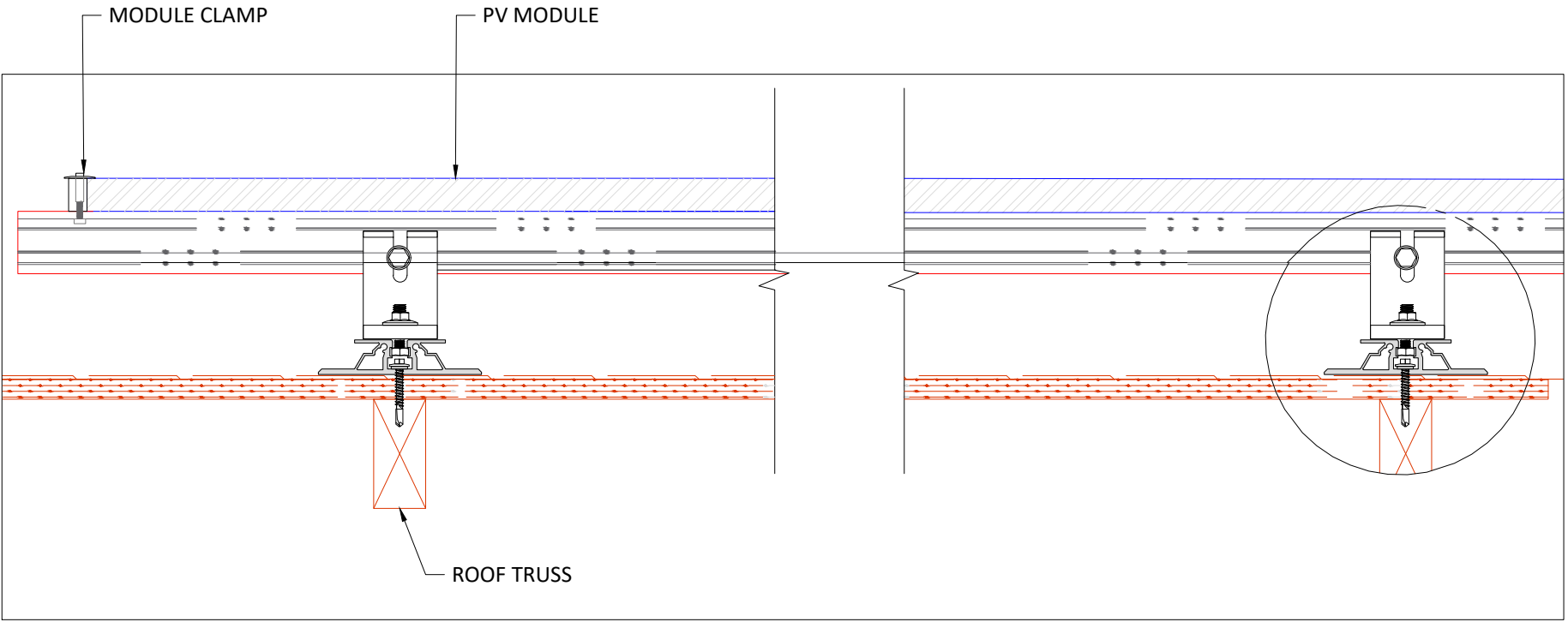
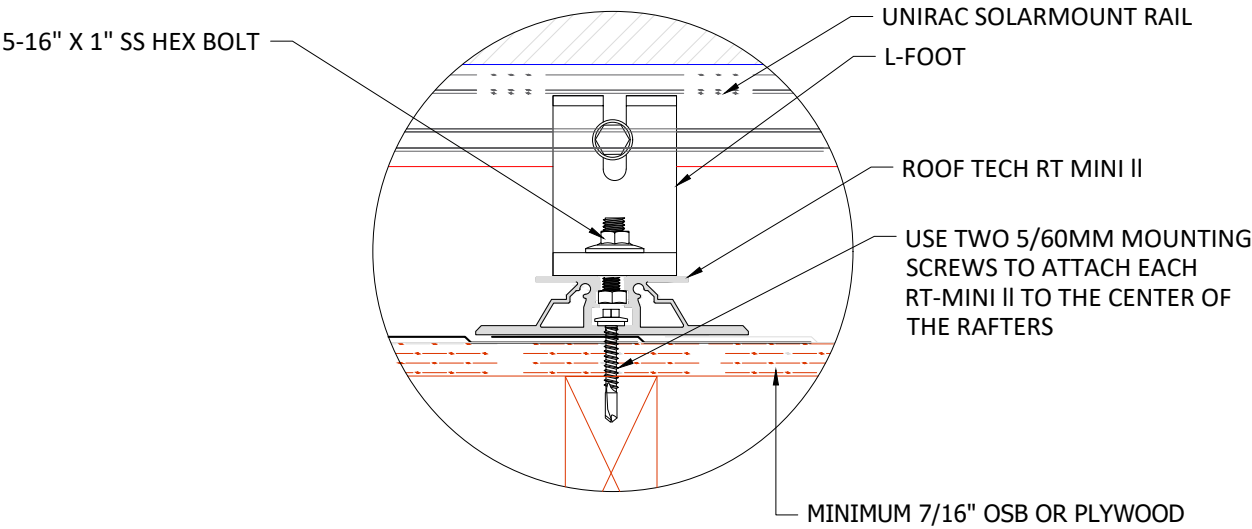
PERMIT DEVELOPER	
DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME
ARRAY LAYOUT

SHEET NUMBER
S-03

PHOTOVOLTAIC MODULE GENERAL NOTES:

- 1. APPLICABLE CODE: 2020 FLORIDA BUILDING CODE 7th ED. & ASCE 7-16
MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES
- 2. BOLT DIAMETER AND EMBEDMENT LENGTHS ARE DESIGNED PER NDS(2012)
REQUIREMENTS. ALL BOLT CAPACITIES ARE BASED ON A DOUG-FIR#2
WOOD ROOF TRUSS AS EMBEDMENT MATERIAL.
- 3. ALL WIND DESIGN CRITERIA AND PARAMETERS ARE FOR HIP AND GABLE
RESIDENTIAL ROOFS, CONSIDERING FROM A 4° TO A MAXIMUM 27° (1/12 TO A
MAXIMUM 6/12 PITCH) ROOF IN SCHEDULE. ALL RESIDENTIAL ROOFS SHALL NOT
EXCEED 15'-0" MEAN ROOF HEIGHT.
- 4. ROOF SEALANTS SHALL CONFIRM TO ASTM C920 AND ASTM 6511.
- 5. THIS SHEET REFLECTS STRUCTURAL CONNECTIONS ONLY. REFER TO
MANUFACTURERS' MANUAL FOR ALL ARCHITECTURAL, MECHANICAL,
ELECTRICAL, AND SOLAR SPECS.
- 6. ALL ALUMINUM COMPONENTS SHALL BE ANODIZED ALUMINUM 6105-T5 UNLESS
OTHERWISE NOTED.
- 7. LAG BOLTS SHALL BE ASTM A276 STAINLESS STEEL UNLESS OTHERWISE NOTED.
- 8. ALL RAILING AND MODULES SHALL BE INSTALLED PER
MANUFACTURERS' INSTRUCTIONS.
- 9. I CERTIFY THAT THE INSTALLATION OF THE MODULES IS IN COMPLIANCE
WITH FBC:BUILDING CHAPTER 16 AND FRC:RESIDENTIAL CHAPTER 3.
BUILDING STRUCTURE WILL SAFELY ACCOMMODATE CALCULATED
WIND LATERAL AND UPLIFT FORCES, AND EQUIPMENT DEAD LOADS.



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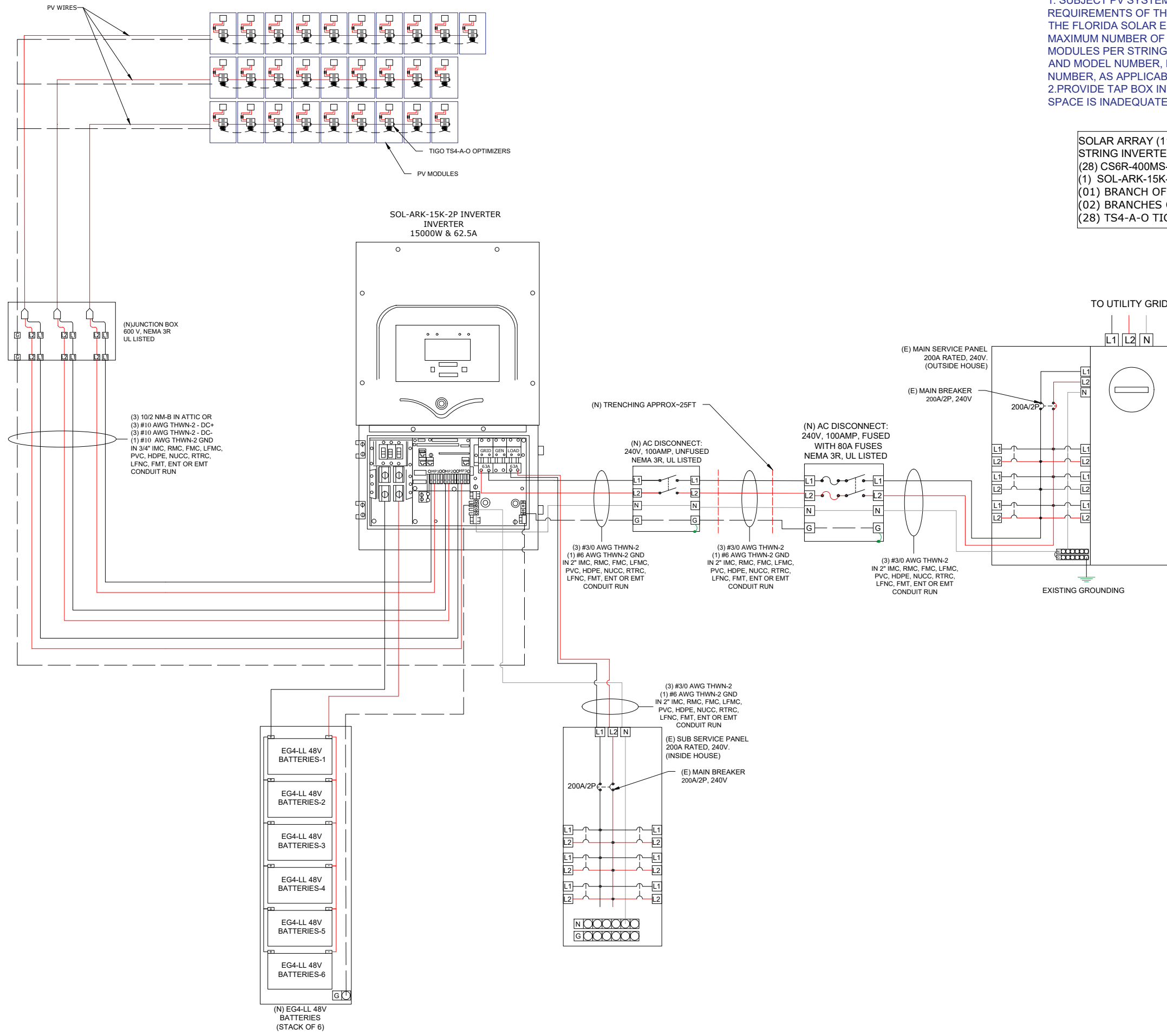
194 SW LOGSTON CT,
FORT WHITE, FL, 32038

REV	ENG	DESCRIPTION	DATE			

PERMIT DEVELOPER	
DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME
STRUCTURAL ATTACHMENT DETAILS

SHEET NUMBER
S-04



NOTE:
1. SUBJECT PV SYSTEMS HAS BEEN DESIGNED TO MEET THE REQUIREMENTS OF THE NEC 2017, NFPA 70 AND THOSE SET FORTH BY THE FLORIDA SOLAR ENERGY CENTER CERTIFICATION, INCLUDING MAXIMUM NUMBER OF MODULE STRINGS, MAXIMUM NUMBER OF MODULES PER STRING, MAXIMUM OUTPUT, MODULE MANUFACTURER AND MODEL NUMBER, INVERTER MANUFACTURER AND MODEL NUMBER, AS APPLICABLE.
2. PROVIDE TAP BOX IN COMPLIANCE WITH 312.8 IF PANEL GUTTER SPACE IS INADEQUATE.

SOLAR ARRAY (11.2 KW-DC STC)
STRING INVERTER (15 KW - AC RATING OF SYSTEM)
(28) CS6R-400MS-HL (400W) CANADIAN SOLAR MODULES
(1) SOL-ARK-15K-2P INVERTER (290 VA)
(01) BRANCH OF 10 MODULES
(02) BRANCHES OF 09 MODULES
(28) TS4-A-O TIGO OPTIMIZER


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194 SW LOGSTON CT,
FORT WHITE, FL, 32038

REVISIONS	DATE				
	DESCRIPTION				
	REV	ENG			

PERMIT DEVELOPER	
DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME	
ELECTRICAL LINE DIAGRAM	
SHEET NUMBER	
E-01	

ELECTRICAL CALCULATIONS:

1. CURRENT CARRYING CONDUCTOR

(A) BEFORE IQ COMBINER PANEL
AMBIENT TEMPERATURE = 34°C
CONDUIT INSTALLED AT MINIMUM DISTANCE OF 7/8 INCHES ABOVE ROOFNEC 310.15(B)(3)(c)
TEMPERATURE DERATE FACTOR - 0.96 ...NEC 310.15(B)(2)(a)
GROUPING FACTOR - 0.8...NEC 310.15(B)(3)(a)

CONDUCTOR AMPACITY
= (OPTIMIZER CURRENT) x 1.56 / A.T.F / G.F ...NEC 690.8(B)
= [15 x 1.56] / 0.96 / 0.8
= 30.47 A
SELECTED CONDUCTOR - #10 THWN-2 ...NEC 310.15(B)(16)

(B) AFTER IQ COMBINER PANEL
TEMPERATURE DERATE FACTOR - 0.96
GROUPING FACTOR - 1

CONDUCTOR AMPACITY
=(TOTAL INV O/P CURRENT) x 1.25 / 0.96 / 1 ...NEC 690.8(B)
=[(1 x 62.5) x 1.25] /0.96 / 1
= 81.38 A
SELECTED CONDUCTOR - #4 THWN-2 ...NEC 310.15(B)(16)

2. PV OVER CURRENT PROTECTION ..NEC 690.9(B)
=TOTAL INVERTER O/P CURRENT x 1.25
=(1 x 62.5) x 1.25 = 78.13 A
SELECTED OCPD = 80A

SELECTED EQUIPMENT GROUND CONDUCTOR (EGC) = #8 THWN-2 ... NEC 250.122(A)

MAX VOLTAGE DROP CALCULATION						
CABLE SIZE	CABLE DESCRIPTION	ONE WAY DISTANCE IN FEET (D)	BRANCH CURRENT (I)	RESISTANCE OF CONDUCTOR(R)	VOLTAGE (V)	% VOLTAGE DROP=(0.2*D*I*R)/V
3/0 THWN-2	AC-DISCONNECT-1 TO AC-DISCONNECT-2	25	62.5	0.0766	240	0.099

BATTERY SPECIFICATIONS	
NAME	EG4-LL
MAX VOLATGE	51.2 V
MAX CAPACITY	100 AH

ELECTRICAL NOTES

- ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.THE TERMINALS ARE RATED FOR 75 DEGREE C.
- CONDUCTOR TERMINATION AND SPLICING AS PER NEC 110.14
- WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
- WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
- MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
- THE POLARITY OF THE GROUNDED CONDUCTORS IS NEGATIVE .
- UTILITY HAS 24-HR UNRESTRICTED ACCESS TO ALL PHOTOVOLTAIC SYSTEM COMPONENTS LOCATED AT THE SERVICE ENTRANCE.
- MODULES CONFORM TO AND ARE LISTED UNDER UL 1703.
- RACKING CONFORMS TO AND IS LISTED UNDER UL 2703.
- CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT PER NEC ARTICLE 300.6 (C) (1) AND ARTICLE 310.10 (D).
- CONDUCTORS EXPOSED TO WET LOCATIONS SHALL BE SUITABLE FOR USE IN WET LOCATIONS PER NEC ARTICLE 310.10 (C).

MODULE SPECIFICATION	
MODEL NO.	CS6R-400MS-HL (400W) CANADIAN SOLAR MODULES
PEAK POWER	400 W
RATED VOLTAGE (Vmpp)	30.8 V
RATED CURRENT (Impp)	12.99 A
OPEN CIRCUIT VOLTAGE (Voc)	36.8 V
SHORT CIRCUIT CURRENT (Isc)	13.85 A

INVERTER SPECIFICATIONS	
MANUFACTURER	SOLARK INVERTER
	SOL-ARK-15K-2P
OUPUT POWER	15000W
MAX DC VOLTAGE	500V
MAX OUTPUT POWER	15000W
CONTINUOUS OUTPUT CURRENT	62.5 A

OPTIMIZER SPECIFICATIONS	
MANUFACTURER	TS4-A-0 TIGO OPTIMIZER
MAX POWER	700W
MAX CURRENT	15 A



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Signature with Seal

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REVISIONS	DATE				
	DESCRIPTION				
	REV	ENG.			

PERMIT DEVELOPER	
DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME	
WIRING CALCULATIONS	
SHEET NUMBER	
E-02	

**WARNING**

ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND
LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION

LABEL LOCATION:
AC DISCONNECT, POINT OF INTERCONNECTION,
COMBINER PANEL
(PER CODE: NEC 690.13(B))

**WARNING PHOTOVOLTAIC
POWER SOURCE**

LABEL LOCATION:
CONDUIT RUNWAY
(PER CODE: NEC690.31(G)(3)(4))

**WARNING**

DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION:
MAIN SERVICE DISCONNECT
(NEC 705.12(B)(3-4) & NEC 690.59)

ADHESIVE FASTENED SIGNS:

- ANSI Z535.4-2011 PRODUCT SAFETY SIGNS AND LABELS, PROVIDES GUIDELINES FOR SUITABLE FONT SIZES, WORDS, COLORS, SYMBOLS, AND LOCATION REQUIREMENTS FOR LABELS. NEC 110.21(B)(1)
- THE LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED. NEC 110.21(B)(3)
- ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT. IFC 605.11.1.3

PHOTOVOLTAIC SYSTEM AC DISCONNECT
RATED AC OPERATING CURRENT 62.50 AMPS
AC NOMINAL OPERATING VOLTAGE 240 VOLTS

LABEL LOCATION:
AC DISCONNECT, INVERTER
(PER CODE: NEC 690.54)

WARNING
INVERTER OUTPUT CONNECTION DO NOT
RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
POINT OF INTERCONNECTION, MAIN SERVICE DISCONNECT
(PER CODE: NEC 705.12 (B)(2)(c))
[Not required if panelboard is rated not less than sum of ampere ratings
of all overcurrent devices supplying it]

**CAUTION**

TRI POWER SOURCES
SECOND SOURCE IS PV SYSTEM
THIRD SOURCE IS DC BATTERY

**PHOTOVOLTAIC SYSTEM
EQUIPPED WITH RAPID
SHUTDOWN**

LABEL LOCATION:
AC DISCONNECT, DC DISCONNECT, POINT OF
INTERCONNECTION
(PER CODE: NEC 690.56(C)(3))

**WARNING**

INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS
OVERCURRENT DEVICE

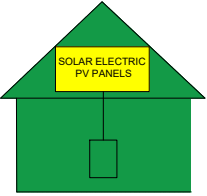
EMERGENCY CONTACT
3609100892

**WARNING**

DEDICATED SOLAR PANELS DO
NOT CONNECT ANY OTHER LOADS

**EMERGENCY RESPONDER
THIS SOLAR PV SYSTEM IS
EQUIPPED WITH RAPID SHUT DOWN**

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



NEC 690.56(C)(1) AND NFPA 111.12.2.1.1.1.1.11.12.2.1.4


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REVISIONS	REV	ENG.	DESCRIPTION	DATE				

PERMIT DEVELOPER	
DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME
SYSTEM LABELING

SHEET NUMBER
E-03



HiKu6 (All-Black)

ALL BLACK MONO PERC

380 W ~ 405 W

CS6R-380 | 385 | 390 | 395 | 400 | 405MS-HL

MORE POWER



Module power up to 405 W
Module efficiency up to 20.7 %



Lower LCOE & system cost



Comprehensive LID / LeTID mitigation technology, up to 50% lower degradation



Better shading tolerance

MORE RELIABLE



Minimizes micro-crack impacts



Heavy snow load up to 8100 Pa,
wind load up to 5000 Pa*



Industry Leading Product Warranty on Materials and Workmanship*



Linear Power Performance Warranty*

1st year power degradation no more than 2%

Subsequent annual power degradation no more than 0.55%

*Subject to the terms and conditions contained in the applicable Canadian Solar Limited Warranty Statement. Also this 25-year limited product warranty is available only for products installed and operating on residential rooftops in certain regions.

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001:2015 / Quality management system
ISO 14001:2015 / Standards for environmental management system
ISO 45001: 2018 / International standards for occupational health & safety

PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730 / CE
CEC listed (US California) / FSEC (US Florida)
UL 61730 / IEC 61701 / IEC 62716
Take-e-way



* The specific certificates applicable to different module types and markets will vary, and therefore not all of the certifications listed herein will simultaneously apply to the products you order or use. Please contact your local Canadian Solar sales representative to confirm the specific certificates available for your Product and applicable in the regions in which the products will be used.

CSI SOLAR (USA) CO., LTD. is committed to providing high quality solar photovoltaic modules, solar energy and battery storage solutions to customers. The company was recognized as the No. 1 module supplier for quality and performance/price ratio in the IHS Module Customer Insight Survey. Over the past 20 years, it has successfully delivered over 70 GW of premium-quality solar modules across the world.

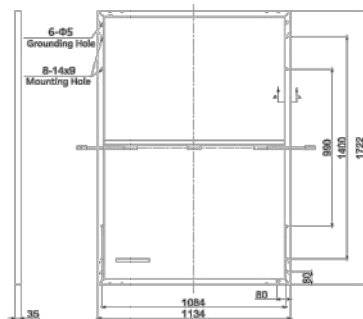
* For detailed information, please refer to the Installation Manual.

CSI SOLAR (USA) CO., LTD.

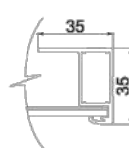
1350 Treat Blvd, Suite 500, Walnut Creek, CA 94598, USA | www.csisolar.com/na | service.ca@csisolar.com

ENGINEERING DRAWING (mm)

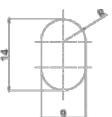
Rear View



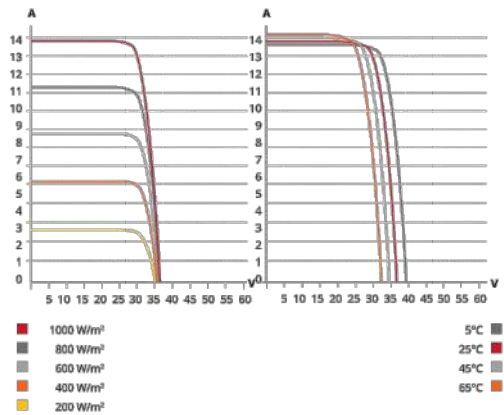
Frame Cross Section A-A



Mounting Hole



CS6R-400MS-HL / I-V CURVES



ELECTRICAL DATA | STC*

CS6R-380/385/390/395/400/405MS-HL

Nominal Max. Power (P _{max})	380 W	385 W	390 W	395 W	400 W	405 W
Opt. Operating Voltage (V _{mp})	30.0 V	30.2 V	30.4 V	30.6 V	30.8 V	31.0 V
Opt. Operating Current (I _{mp})	12.69 A	12.77 A	12.84 A	12.91 A	12.99 A	13.07 A
Open Circuit Voltage (V _{oc})	36.0 V	36.2 V	36.4 V	36.6 V	36.8 V	37.0 V
Short Circuit Current (I _{sc})	13.55 A	13.63 A	13.70 A	13.77 A	13.85 A	13.93 A
Module Efficiency	19.5%	19.7%	20.0%	20.2%	20.5%	20.7%
Operating Temperature	-40°C ~ +85°C					
Max. System Voltage	1000V (IEC/UL)					
Module Fire Performance	TYPE 2 (UL 61730 1000V) or CLASS C (IEC 61730)					
Max. Series Fuse Rating	25 A					
Application Classification	Class A					
Power Tolerance	0 ~ + 10 W					

* Under Standard Test Conditions (STC) of Irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL DATA | NMOT*

CS6R-380/385/390/395/400/405MS-HL

Nominal Max. Power (P _{max})	284 W	288 W	291 W	295 W	299 W	303 W
Opt. Operating Voltage (V _{mp})	28.1 V	28.3 V	28.4 V	28.6 V	28.8 V	29.0 V
Opt. Operating Current (I _{mp})	10.12 A	10.19 A	10.26 A	10.33 A	10.39 A	10.45 A
Open Circuit Voltage (V _{oc})	33.9 V	34.1 V	34.2 V	34.4 V	34.6 V	34.7 V
Short Circuit Current (I _{sc})	10.91 A	10.98 A	11.05 A	11.11 A	11.17 A	11.23 A

* Under Nominal Module Operating Temperature (NMOT), Irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

* The specifications and key features contained in this datasheet may deviate slightly from our actual products due to the on-going innovation and product enhancement. CSI Solar Co., Ltd. reserves the right to make necessary adjustment to the information described herein at any time without further notice.
Please be kindly advised that PV modules should be handled and installed by qualified people who have professional skills and please carefully read the safety and installation instructions before using our PV modules.

CSI SOLAR (USA) CO., LTD.

Aug 2022 | All rights reserved | PV Module Product Datasheet v1.1C25_F23_J1_NA



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REVISONS	REV	ENG.	DESCRIPTION	DATE				

PERMIT DEVELOPER	
DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME
MODULE DATASHEET

SHEET NUMBER
DS-01



AC Output Power 15kW On-Grid & Off-Grid	
Connections	120/240/208V Split Phase
Continuous AC Power with PV	15000W 62.5A-L (240V)
Continuous AC Power from Batteries	12000W 50A-L (240V)
Surge AC Power 10sec	18000VA L-L (240V)
Surge AC Power 100ms	22500VA L-L (240V)
Total Harmonic Distortion (THD)	Less Than or Equal to 3%
Parallel Stacking	Yes - Up to 12
Frequency	60/50Hz
Continuous AC Power with Grid or Generator	48000W 200A L-L (240V) 24000W 200A L-N (120V)
CEC Efficiency	96.5% (Peak 97.5%)
Idle Consumption Typical—No Load	90W
Sell Back Power Modes	Limited to Household/Fully Grid-Tied
Design (DC to AC)	Transformerless DC
Response Time (Grid-Tied to Off-Grid)	5ms
Power Factor	+/- 0.9 - 1.0

General	
Dimensions (H x W x D)	31.8" x 18.3" x 10.9"
Weight	135 lbs
Enclosure	IP65 / NEMA 3R
Ambient Temperature	-40~60°C, >45°C Derating
Installation Style	Wall-Mounted
Wi-Fi & LAN Communication	Included
Standard Warranty (verified by HALT Testing)	10 Years

Protections & Certifications	
Electronics Certified Safety by SGS Labs to NEC & UL Specs - NEC 690.4B & NEC 705.4/6	Yes
Grid Sell Back — UL1741-2010/2018, IEE-E1547a-2003/2014, FCC 15 Class B, UL1741SA, CA Rule 21, HECO Rule 14H	Yes
PV DC Disconnect Switch — NEC 240.15	Integrated
Ground Fault Detection — NEC 690.5	Integrated
PV Rapid Shutdown Control — NEC 690.12	Integrated
PV Arc Fault Detection — NEC 690.11	Integrated
PV Input Lightning Protection	Integrated
PV String Input Reverse Polarity Protection	Integrated
AC Output Breakers - 200A	Integrated
2 x 200A Battery Breaker / Disconnect	Integrated
Surge Protection	DC Type II / AC Type II



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[illegible]

PERMIT DEVELOPER	
DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME

INVERTER DATASHEET

SHEET NUMBER

DS-02

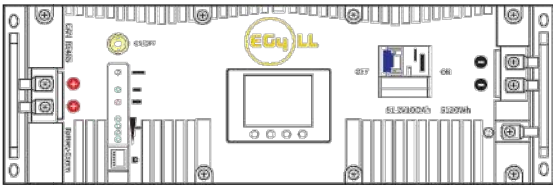


EG4®-LL 48V 100AH Battery

5.12 KWH Storage
Capacity

10-Year Warranty

UL 1973 Listed
ETL Conforms to UL
9540A



Our EG4-LL batteries offer second to none performance and longevity. Get peace of mind knowing our batteries are designed to last for more than 7000 deep charge and discharge cycles and have a life cycle of more than 15 years with an 80% depth of discharge daily.

On-board LCD Touch Screen

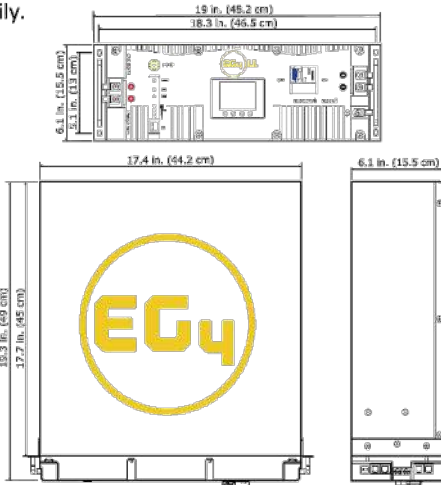
Easy to see BMS monitoring, and selectable closed-loop communications with EG4, Schneider, Sol-Ark, Victron, Growatt, Megarevo, Luxpower, and Deye inverters.

Dual On-board Fire Arrestors

Offer fail-safe operation in high-risk environments and protect against rare hardware failure on high voltage solar charge controllers.

Parallel up to 64 Batteries

For maximum power, our 6 DIP switch option allows you to have 327.6 kWh while preserving BMS communications.



EG4®-LL 48V 100AH Battery

Module Operating Parameters			
Parameter	BMS	Recommended Setting on System	
Voltage	51.2V	/	
Capacity	100Ah	/	
Charging Voltage (Bulk/Absorb)	56.8V	56.2V (+/- 0.2V)	
Float	/	54V (+/- 0.2V)	
Low DC Cutoff	44.8V	47-45.6V (start high, lower as needed)	
Charging Current	100A (Max. continuous)	30-50A	
Discharging Current	100A (Max. continuous)	90A	
Environmental Parameters			
Charging Range	32° – 113°F (0°C to 45°C)		
Discharging Range	-4°F – 122°F (-20°C to 50°C)		
Storage Range	-4°F – 122°F (-20°C to 50°C)		
Ingress Protection	IP20		
Charging/ Discharging Parameters			
Charge	Spec	Delay	Recovery
Cell Voltage Protection	3.8V	1 sec	3.45V
Module Voltage Protection	60.0V	1 sec	55.2V
Over Charging Current 1	>102A	20 sec	/
Over Charging Current 2	≥120A	3 sec	/
Temperature Protection	<23°F or >158°F <-5°C or >70°C	1 sec	>32°F or <140°F >0°C or 60°C
Discharge	Spec	Delay	Recovery
Cell Voltage Protection	2.3V	1 sec	3.1V
Module Voltage Protection	44.8V	1 sec	48V
Over-Charging Current 1	>102A	30 sec	60 sec
Over-Charging Current 2	>150A	3 sec	60 sec
Short Circuit	>300A	<0.1 mS	
Temperature Protection	<-4°F or >167°F <-20°C or >75°C	1 sec	>14°F or <149°F >-10°C or <65°C
PCB Temp Protection	>221°F (>105°C)	1 sec	@ <176°F (<80°C)



EG4®-LL 48V 100AH Battery

General Specifications			
Parameter	Spec		Condition
Cell Balance	120mA	Passive Balance	Cell Voltage Difference >40mV
Temperature Accuracy	3%	Cycle Measurement	Measuring Range -40°F – 212°F (-40°C – 100°C)
Voltage Accuracy	0.5%	Cycle Measurement	For Cells & Module
Current Accuracy	3%	Cycle Measurement	Measuring Range -200A - 200A
SOC	5%	/	Integral Calculation
Power Consumption	Sleep & Off Mode	<300uA	Storage/Transport/Standby
Power Consumption	Operating Mode	<25mA	Charging/Discharging
Communication Ports	RS485/CAN		Can be customized
Maximum Modules in Series			1
Maximum Modules in Parallel			64
Physical Specifications			
Dimensions (HxWxD)	6.1 in.x19 in.x17.4 in. (15.5 cmx48.2 cmx44.2 cm)		
Weight	99.6 lbs. (45.2 kg)		
Standards and Certifications			
Module	ETL Listed to UL Standard 9540A:2019		
Cell	UL:1973		



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REVISONS	DATE					
	DESCRIPTION					
	REV	ENGG				

PERMIT DEVELOPER

DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME

BATTERY
DATASHEET

SHEET NUMBER

DS-03



TS4-A-O

Module-level PV Optimizer

The TS4-A-O (Optimization) is the advanced add-on optimization solution that brings smart module functionality to standard PV modules for higher reliability. Improve energy efficiency by upgrading underperforming PV systems or adding smart features to new installations.

Complies with 2017 and 2020 NEC rapid shutdown requirements.

The TS4-A-O add-on supports PV modules up to 700W.

Included Features



Module-level **optimization** for increased energy yield and greater design flexibility



Manual or automatic module-level **shutdown**. Complies with NEC 2017 and 2020.



Module-level **monitoring** for energy production tracking and system management

Easy Installation

Snap to standard module frame or remove brackets for rack mounting

Smart Commissioning

Configure and commission with your Android or iOS mobile device



12/9/21

PSD-00015-00

TS4-A-O SPECIFICATIONS

Environmental

Operating Temperature Range -40°C to +70°C (-40°F to +158°F)

Outdoor Rating IP68, NEMA 3R

Maximum Elevation 2000m

Mechanical

Dimensions W=138.4mm, L= 139.7mm, H= 22.9mm

Weight 520g

Electrical

Max Input Voltage (V_{oc} @ Lowest Temperature) 80V

Input Voltage Range 16 - 80V*

Maximum Current 15A

Maximum Power 700W

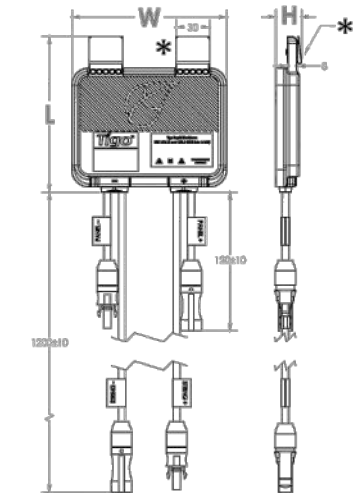
Cable Length (in/out) 0.12/1.2m (standard), 0.62/1.2m (optional)

Connectors MC4 (standard), EVO2 (optional)

Communication Type Wireless

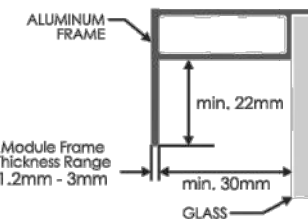
Recommended Fuse Rating 30A

TAP required for module-level shutdown and CCA required for monitoring with TS4-A-O.
*Maximum output voltage of the TS4 is dependent on the PV module voltage. Refer to PV modules nameplate.



*Clips can be removed for rack mounting

Module frame specifications for mounting TS4-A



ORDERING INFORMATION

Standard	Description
461-00252-32	1500V UL / 1000V IEC, 0.12/1.2m cable, MC4
Options	Description
461-00252-62	1500V UL / 1000V IEC, 0.62/1.2m, MC4
461-00261-62	1500V UL / IEC, 0.62/1.2m, EVO2
461-00261-32	1500V UL / IEC, 0.12/1.2m cable, EVO2

For sales info:

sales@tigoenergy.com

For product info:

Visit tigoenergy.com/products

For technical info:

Visit support.tigoenergy.com

For additional info and product selection assistance, use Tigo's online design tool at tigoenergy.com/design



PV 2.0



Tigo[®]

Tigo Energy, Inc. | www.tigoenergy.com | sales@tigoenergy.com



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REVISIONS	DATE				
	DESCRIPTION				
	REV	ENG			

PERMIT DEVELOPER

DATE 11/17/2023

DESIGNER OSK

REVIEWER

SHEET NAME

OPTIMIZER
DATASHEET

SHEET NUMBER

DS-04

SOLARMOUNT



SOLARMOUNT defined the standard in solar racking. Features are designed to get installers off the roof faster. Our grounding & bonding process eliminates copper wire and grounding straps to reduce costs. Systems can be configured with standard or light rail to meet your design requirements at the lowest cost possible. The superior aesthetics package provides a streamlined clean edge for enhanced curb appeal, with no special brackets required for installation.



Now Featuring:
THE NEW FACE OF SOLAR RACKING
Superior Aesthetics Package



LOSE ALL OF THE COPPER & LUGS
System grounding through Enphase microinverters and trunk cables



SMALL IS THE NEXT NEW BIG THING
Light Rail is Fully Compatible with all SM Components



ENHANCED DESIGN & LAYOUT TOOLS
Featuring Google Map Capabilities within U-Builder

FAST INSTALLATION. SUPERIOR AESTHETICS

OPTIMIZED COMPONENTS • VERSATILITY • DESIGN TOOLS • QUALITY PROVIDER

SOLARMOUNT



OPTIMIZED COMPONENTS

INTEGRATED BONDING & PRE-ASSEMBLED PARTS

Components are pre-assembled and optimized to reduce installation steps and save labor time. Our new grounding & bonding process eliminates copper wire and grounding straps or bonding jumpers to reduce costs. Utilize the microinverter mount with a wire management clip for an easier installation.

VERSATILITY

ONE PRODUCT - MANY APPLICATIONS

Quickly set modules flush to the roof or at a desired tilt angle. Change module orientation to portrait or landscape while securing a large variety of framed modules on flat, low slope or steep pitched roofs. Available in mill, clear and dark anodized finishes to outperform your projects financial and aesthetic aspirations.

AUTOMATED DESIGN TOOL

DESIGN PLATFORM AT YOUR SERVICE

Creating a bill of materials is just a few clicks away with U-Builder, a powerful online tool that streamlines the process of designing a code compliant solar mounting system. Save time by creating a user profile, and recall preferences and projects automatically when you log in. You will enjoy the ability to share projects with customers: there's no need to print results and send to a distributor, just click and share.



BONDING & GROUNDING
MECHANICAL LOADING
SYSTEM FIRE CLASSIFICATION

UNIRAC CUSTOMER SERVICE MEANS THE HIGHEST LEVEL OF PRODUCT SUPPORT



TECHNICAL SUPPORT

Unirac's technical support team is dedicated to answering questions & addressing issues in real time. An online library of documents including engineering reports, stamped letters and technical data sheets greatly simplifies your permitting and project planning process.



CERTIFIED QUALITY PROVIDER

Unirac is the only PV mounting vendor with ISO certifications for 9001:2015, 14001:2015 and OHSAS 18001:2007, which means we deliver the highest standards for fit, form, and function. These certifications demonstrate our excellence and commitment to first class business practices.

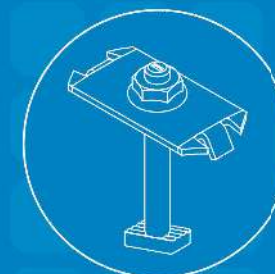


BANKABLE WARRANTY

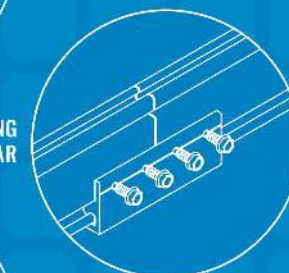
Don't leave your project to chance. Unirac has the financial strength to back our products and reduce your risk. Have peace of mind knowing you are receiving products of exceptional quality. SOLARMOUNT is covered by a twenty five (25) year limited product warranty and a five (5) year limited finish warranty.

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

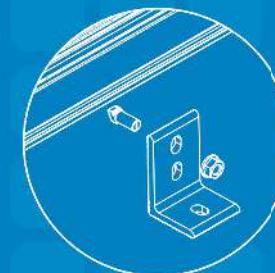
PUB2017E028 PRINTED



INTEGRATED BONDING
MIDCLAMP



INTEGRATED BONDING
SPLICE BAR



INTEGRATED BONDING
L-FOOT w/ T-BOLT



INTEGRATED BONDING
MICROINVERTER MOUNT w/
WIRE MANAGEMENT

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Signature with Seal

KARI TRAVIS

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FORT WHITE, FL, 32038

REVISIONS	DATE				
	DESCRIPTION				
REV	ENG				

PERMIT DEVELOPER

DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME

RACKING
DATASHEET

SHEET NUMBER

DS-05

RT-MINI II

A Self-flashing PV Mount Featuring Roof Tech's AlphaSeal™ Technology



RT-MINI II is suitable for all systems with any L-Foot

- ✓ No Caulking or Pre-Drilling Required
- ✓ Universal Attachment to Any Slope
- ✓ Metal, EPDM, TPO, SBS, & Asphalt Roofs
- ✓ Wide Range of Applications & Ultimate Flexibility on the Roof
- ✓ No Need to Bend Rails
1 5/8 North & South Adjustment

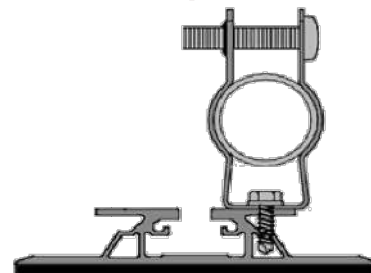


Installation Manual

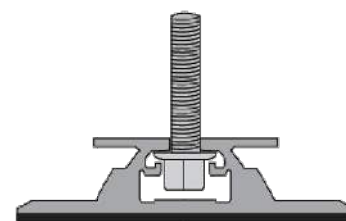


ICC ESR 3575

Conduit Strap Installation



RT Serrated Hex Flange Bolt/Nut:
5/16-18 x 1"



RT-MINI II

Flexible Flashing Certified by the International Code Council (ICC)

Components

RT2-00-MINIBK2

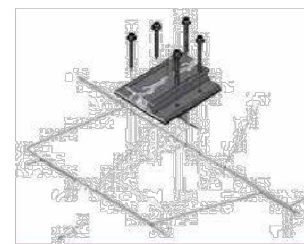


MINI II base : 20 ea.
Screw : 40 ea.
Extra RT-Butyl : 4 ea.

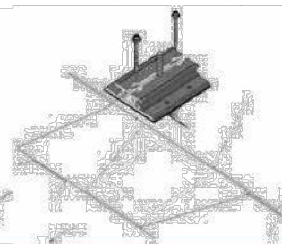
Optional Items:

5 x 60mm Mounting Screw (RT2-04-SD5-60) : 100 ea./Bag
5/16 X 25MM Flange Bolt & Nut (RT2-04-FBN25) : 100 ea./Bag
RT-Butyl (RT2-04-MNBUTYL) : 10 ea./Box

Deck Installation OSB & PLY



Rafter Installation Hybrid Mounting



Roof Tech Inc. AlphaSeal™ Technology has been used on over one million residential PV systems since 1994. It is the first PV mounting system with Flexible Flashing certified by the ICC, engineered to withstand wind speeds up to 180 mph and ground snow up to 90 psf.

Engineered to ASTM D 1761
(Standard Test Methods for Mechanical Fasteners in Wood)

ICC ESR-3575



ASTM2140 Testing

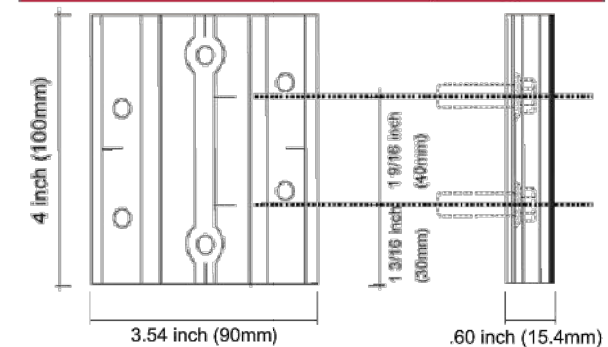


P.E. Letters

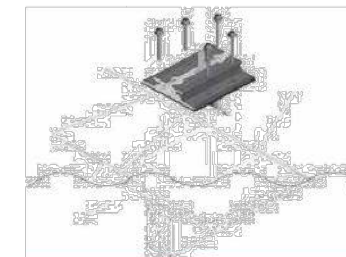


Support & Downloads

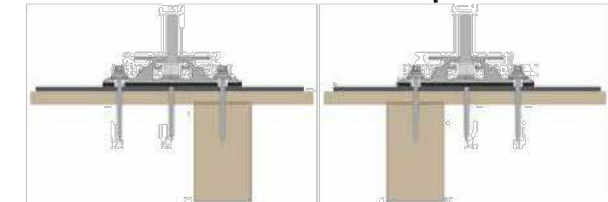
Dimensions in (mm)



Offset Rafter Installation



Offset Rafter Attachment Options

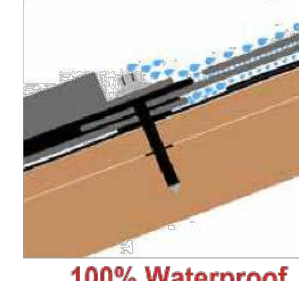


Metal Flashing Retrofit



Shedding Water?

Flexible Flashing



100% Waterproof

Roof Tech Inc.
www.roof-tech.us info@roof-tech.us
10620 Trenea Street, Suite 230, San Diego, CA 92131
858.935.6064

August 2022



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REVIEWS	DESCRIPTION	DATE			
REV	ENG.				

PERMIT DEVELOPER

DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME

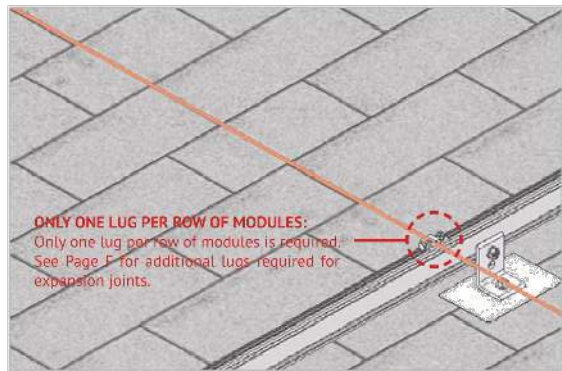
ATTACHMENT
DATASHEET

SHEET NUMBER

DS-06



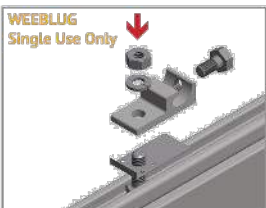
STANDARD SYSTEM GROUNDING I-3
INSTALLATION GUIDE PAGE



GROUNDING LUG MOUNTING DETAILS:
Details are provided for both the WEEB and IlSCO products. The WEEBLug has a grounding symbol located on the lug assembly. The IlSCO lug has a green colored set screw for grounding indication purposes. Installation must be in accordance with NFPA NEC 70, however the electrical designer of record should refer to the latest revision of NEC for actual grounding conductor cable size.
Required if not using approved integrated grounding microinverters

GROUNDING LUG - BOLT SIZE & DRILL SIZE		
GROUND LUG	BOLT SIZE	DRILL SIZE
WEEBLug	1/4"	N/A - Place in Top SM Rail Slot
ILSCO Lug	#10-32	7/32"

- Torque value depends on conductor size.
- See product data sheet for torque value.



WEEBLUG CONDUCTOR - UNIRAC P/N 008002S:
Apply Anti Seize and insert a bolt in the aluminum rail and through the clearance hole in the stainless steel flat washer. Place the stainless steel flat washer on the bolt, oriented so the dimples will contact the aluminum rail. Place the lug portion on the bolt and stainless steel flat washer. Install stainless steel flat washer, lock washer and nut. Tighten the nut until the dimples are completely embedded into the rail and lug.
TORQUE VALUE 10 ft lbs. (See Note on PG.A)
See product data sheet for more details, Model No. WEEB-LUG-6.7

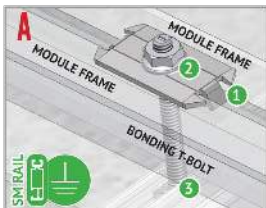


ILSCO LAY-IN LUG CONDUCTOR - UNIRAC P/N 008009P: Alternate Grounding Lug - Drill, deburr hole and bolt thru both rail walls per table.
TORQUE VALUE 5 ft lbs. (See Note on PG.A)
See ILSCO product data sheet for more details, Model No. GBL-4DBT.

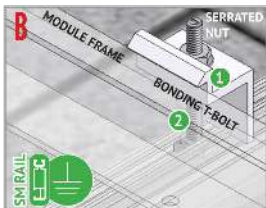
NOTE: ISOLATE COPPER FROM ALUMINUM CONTACT TO PREVENT CORROSION



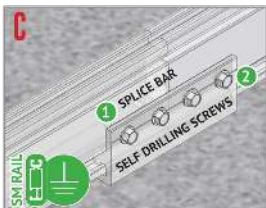
BONDING CONNECTION GROUND PATHS M
INSTALLATION GUIDE PAGE



BONDING MIDCLAMP ASSEMBLY
1. Stainless steel Midclamp points, 2 per module, pierce module frame anodization to bond module to module through clamp.
2. Serrated flange nut bonds stainless steel clamp to stainless steel T-bolt.
3. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, clamp, and modules to grounded SM rail.



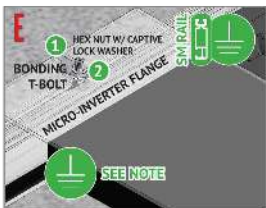
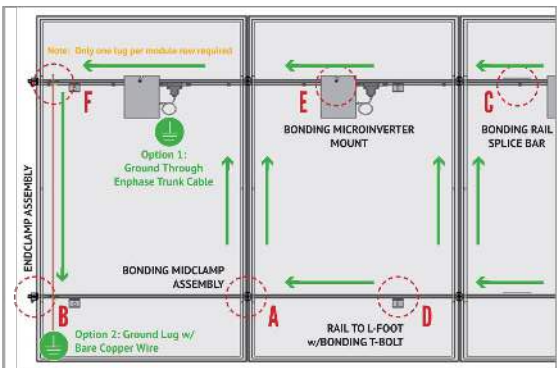
ENDCLAMP ASSEMBLY
1. Serrated flange nut bonds aluminum Endclamp to stainless steel T-bolt.
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and Endclamp to grounded SM rail.
Note: End clamp does not bond to module frame.



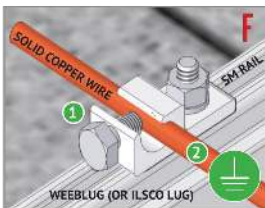
BONDING RAIL SPLICE BAR
1. Stainless steel self-drilling screws drill and tap into splice bar and rail, creating bond between splice bar and each rail section.
2. Aluminum splice bar spans across rail gap to create rail to rail bond. Rail on at least one side of splice will be grounded.
Note: Splice bar and bonded connection are non-directional. The splice bar function is rail alignment and bonding.



RAIL TO L-FOOT w/BONDING T-BOLT
1. Serrated flange nut removes L-foot anodization to bond L-Foot to stainless steel T-bolt.
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail.



BONDING MICROINVERTER MOUNT
1. Hex nut with captive lock washer bonds metal microinverter flange to stainless steel T-bolt.
2. Serrated T-bolt head penetrates rail anodization to bond T-bolt, nut, and L-foot to grounded SM rail. System ground (including racking and modules) may be achieved through the trunk cable of approved microinverter systems. See page I for details.
NOTE: See NOTE



RACK SYSTEM GROUND
1. WEEB washer dimples pierce anodized rail to create bond between rail and lug.
2. Solid copper wire connected to lug is routed to provide first system ground connection.
NOTE: IlSCO lug can also be used when secured to the side of the rail. See page I-5 for details.



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REVISIONS	DATE				
	DESCRIPTION				
REV	ENG.				

PERMIT DEVELOPER	
DATE	11/17/2023
DESIGNER	OSK
REVIEWER	

SHEET NAME
GROUNDING AND BONDING DATASHEET
SHEET NUMBER
DS-07