

1011 N Causeway Blvd, Suite 19 ♦ Mandeville, Louisiana 70471 ♦ Phone: 985.624.5001 ♦ Fax: 985.624.5303

August 2022

Property Owner: Terry Brooks

Property Address: 410 Southwest Sweetbriar Drive, Lake City, FL 32024

#### **RE:** Goundmount Installation

I have reviewed the address referenced above to determine the adequacy of the existing area supports the proposed installation of an array of solar panels in the ground.

The photovoltaic ground mount structure offered by Unirac is found to be of sufficient capacity for the design loads when installed in accordance with the drawings and calculations attached, and manufacturer's instructions. The foundation shall be installed as marked on the drawings to the depth specified in the drawing table. To the best of my professional knowledge and belief, the product and system installation will be in compliance with all state and local building codes and guidelines at the time of our review.

#### **Evaluation Criteria:**

Windspeed: 165

Applied Codes: ASCE 7-16 FBC 2020 NEC 2017

Risk Category: II

Wind Exposure Category: C Ground Snow Load: 0 PSF

Footing Depth: 5.09'

N-S Leg Spacing: 81.29" E-W Leg Spacing: 78.58"

#### **Connection of Array to Ground:**

Manufacturer: UNIRAC

Model: ULA (Unirac Large Array)

Foundation Type: Drilled Cast-In-Hole Concrete Pile

#### Limitations

Unirac's ground mount system is to be installed per manufacturer's specifications and in accordance with accepted industry-wide safety standards. Electrical engineering is beyond our scope of the installation.

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August 2022

Property Owner: Terry Brooks

Property Address: 410 Southwest Sweetbriar Drive, Lake City, FL 32024

#### **RE: Photovoltaic System Roof Installations**

I have reviewed the existing structure referenced above to determine the adequacy of the existing structure support the proposed installation of an array of solar panels on the roof.

Based on my review, the existing structure is adequate to support the proposed solar panel installation. This assessment is based on recent on-site inspection by solar inspectors and photographs of the existing structure. The photovoltaic system is designed to withstand uplift and downward forces; our assessment is regarding the structure's support of the array. Stresses induced by the introduction of individual mount loads on the rafters or truss top chord are within acceptable limits as shown on the attached calculations. The structural considerations used in our review and assessment include the following:

#### **Evaluation Criteria:**

Applied Codes: ASCE 7-16 FBC 2020 NEC 2017

Risk Category: II

Design Wind Speed (3-second gust): 165 MPH

Wind Exposure Category: C Ground Snow Load: 0 PSF Seismic Design Category: D

#### **Existing Structure:**

Roof Material: Tile

Roofing Structure: 2x Wood Rafters/Truss Top Chord

Roof Slope: 3/12

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#### Effect of the Solar Array on Structure Loading:

#### **Gravity Loads:**

Per IBC Section 1607.12.5.1, the areas of the roof where solar panels are located are considered inaccessible, and therefore not subject to roof live loading. Live load in these areas is replaced by the dead load of the solar array, 3 psf. The total gravity load on the structure is therefore reduced and the structure may remain unaltered. Connections of the mounts to the underlying structure are to be installed in a staggered pattern, except at the array ends, to distribute the loading evenly to the roof structure. The stresses within the rafters or truss top chord due to the introduction of discrete mount loads are within acceptable l imits, as shown on the attached calculations.

#### Wind Load:

The solar panel array will be flush mounted (no more than 6" above the surrounding roof surface, and parallel to the roof surface. Any additional wind loading on the structure due to the presence of the array is negligible. The array structure is designed by the manufacturer to withstand uplift and downward forces resulting from wind and snow loads. The attached calculations verify the capacity of the connection of the solar array to the roof to resist uplift due to wind loads, the governing load case.

#### Snow Load:

The reduced friction of the glass surface of the solar panels allows for the lower slope factor (C<sub>s</sub>) per Section 7.4 of ASCE 7-16 resulting in a reduced design snow load for the structure. This analysis conservatively considered the snow load to be unchanged.

#### Seismic Load:

Analysis shows that additional seismic loads due to the array installation will be small. Even conservatively neglecting the wall materials, the solar panel installation represents an increase in the total weight of the roof and corresponding seismic load of less than 10%. This magnitude of additional forces meets the requirements of the exception in Section 11B.4 of ASCE 7-16. The existing lateral force resisting system of the structure is therefore allowed to remain unaltered.



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## PRINCIPAL Engineering

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#### Conclusion:

To the best of my professional knowledge and belief, the subject construction and photovoltaic system installation will be in compliance with all state and local building codes and guidelines in effect at the time of our review.

#### Limitations:

Engineer's assessment of the existing structure is based on recent field reports and current photographs of the elements of the structure that were readily accessible at the time of inspection. The design of the solar panel racking (mounts, rails, connectors, etc.), connections between the racking and panels, and electrical engineering related to the installation are the responsibility of others. The photovoltaic system installation must be by competent personnel in accordance with manufacturer recommendations and specifications and should meet or exceed industry standards for quality. The contractor is responsible for ensuring that the solar array is installed according to the approved plans and must notify the engineer of any undocumented damage or deterioration of the structure, or of discrepancies between the conditions depicted in the approved plans and those discovered on site so that the project may be reevaluated and altered as required. Engineer does not assume any responsibility for improper installation of the proposed photovoltaic system.



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# Uplift and Wind Downforce Calculation Summary (ASCE 7-16) Mount, Rack, & Panel Proportioning Point Load Check and Rafter Stress Analysis

Property Owner:	Terry Brooks	Max. Individual Panel Dimensions		S
Project Address:	410 Southwest Sweetbriar Drive	Length (in)	Width (in)	Area (sf)
City, State:	Lake City, FL 32024	77	39	20.85

Building Characteristics, Design Input, and Adjustment Factors					
Roof Dimensions: Length:		Greater Dimension 149			
Width:		Least Dimension: 73			
Roof Height (h):	30	Fig 30.4-1, valid under 60'			
Pitch: 3 on 12 =	14.0°	Must be less than 45° ✓			
Roof Configuration	Hip				
Roof Structure	2x Rafters				
Roof Material	Plywood				
Risk Category:	II				
Basic Wind Speed:	165	From 26.5-1			
Exposure Category:	С	Fig. 26.7			
Topographic Factor (K <sub>zt</sub> )	1.40	Fig. 26.8-1			
Wind Pressure @ h=30, p <sub>net30</sub>	See Table Bel	Fig. 30.4-1			
Ht. & Exposure Adjustment (λ)	1.4	Fig. 30.4-1			
Adjusted Wind Pressures, p <sub>net</sub>	See Table Bel	Eq. 30.4-1			
Effective Wind Area (sf):	10.43	(Area per individual mount)			
Roof Zone Strip (	a), in ft, Fig. 3	30.4-1, Note 5			
1 - Least Roof Horizontal Dimension (L or V	/) x 0.10	7.3			
2 - Roof Height x 0.4		12			
3 - Least Roof Horizontal Dimension (L or V	/) x 0.04	2.92			
4 - Least of (1) and (2)		7.3			
5 - Greater of (3) and (4)		7.3			
6 - Greater of (5) and 3 feet		<b>a=</b> 7.3			



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	Net Design Pressures, p <sub>net</sub> (Fig 30.4-1), Components & Cladding				
	Uplift (-psf)		Factored Pressure		
		P <sub>30net</sub>	IK <sub>zt</sub> P <sub>30net</sub>	(0.6W, ASCE 7-16)	θ
gable /hip /flat					
Gable					2014-0-27
	Zone 1 Zone 2e & 3 Zone 2r	62.6 90.3 117.7	122.7 177.0 230.7	73.6 106.2 138.4	7° < θ ≤ 20° & h/D ≤ 0.5
۵					
Hip					2011.01.277



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	Snow Load	
Ground Snow Load, pg	0.0	From ASCE 7 or AHJ
Terrain Category:	С	Para 6.5.6.3
Exposure	Fully	
Exposure FactorCe	0.9	Table 7-2
Thermal Factor, Ct	1.2	Table 7-3
Importance Factor, I <sub>s</sub>	1.0	Table 1.5.2
Roof Configuration	Hip	
Roof Slope	14.0°	
Distance from Eave to Ridge	36.5	
p <sub>m</sub> , Minimum required Snow Load	0.00 psf	Para. 7.3.4
pf, Calculated Snow Load	0.00	Eq. 7.3-1
pf, Design Snow Load	0.00 psf	

Rail & Mount Selection		
Manufacturer:	Sunmodo	Allowable Mount Spacing by Uplift Pressure
Model:	TopTile	< 35 psf: 2 rails, mounts @ 4 ft. o.c.
Substrate	Plywood	35 to 53 psf: 2 rails, mounts @ 2 ft. o.c.
Connector:	Tripod Connector	53 to 70 psf: 3 rails, mounts @ 4 ft. o.c.
		70 to 105 psf: 3 rails, mounts @ 2 ft. o.c.
Allowable Uplift:	450 lb., max.	105 to 140 psf: 4 rails, mounts @ 2 ft. o.c.
	•	> 140 psf: Mount capacity exceeded

	Rail & Mount Layout by Zone				
Zone 1:	3 rails, mounts @ 2 ft. o.c.	Zone 2r:	4 rails, mounts @ 2 ft. o.c.		
Zone 1':	N/A	Zone 3:	4 rails, mounts @ 2 ft. o.c.		
Zone 2:	N/A	Zone 3e:	N/A		
Zone 2e:	4 rails, mounts @ 2 ft. o.c.	Zone 3r:	N/A		
Zone 2n:	N/A				
(From rail analysis, allowable spacing and number of rails are controlled by individual mount pullout before rail bending)					



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# NEW PHOTOVOLTAIC SYSTEM 27.65 KW DC 410 SW SWEETBRIAR DR,LAKE CITY,FL 32024





## GENERAL NOTES

#### 1.1.1 PROJECT NOTES:

1.1.2 THIS PHOTOVOLTAIC (PV) SYSTEM SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE (NEC) ARTICLE 690, ALL MANUFACTURERS'S LISTING AND INSTALLATION INSTRUCTIONS, AND THE RELEVANT CODES AS SPECIFIED BY THE AUTHORITY HAVING JURISDICTION'S (AHJ) APPLICABLE CODES.

- 1.1.3 THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION
- 1.1.4 GROUND FAULT DETECTION AND INTERRUPTION (GFDI) DEVICE IS INTEGRATED WITH THE MICRO-INVERTER IN ACCORDANCE WITH NEC 690.41(B) 1.1.5 ALL PV SYSTEM COMPONENTS; MODULES, UTILITY-INTERACTIVE INVERTERS, AND SOURCE CIRCUIT COMBINER BOXES ARE IDENTIFIED AND LISTED FOR USE IN PHOTOVOLTAIC SYSTEMS AS REQUIRED BY NEC 690.4: PV MODULES: UL1703, IEC61730, AND IEC61215, AND NFPA 70 CLASS C FIRE INVERTERS: UL 1741 CERTIFIED, IEEE 1547, 929, 519 COMBINER BOX(ES): UL 1703 OR UL 1741 ACCESSORY
- 1.1.6 MAX DC VOLTAGE CALCULATED USING MANUFACTURER PROVIDED TEMP COEFFICIENT FOR VOC. IF UNAVAILABLE, MAX DC VOLTAGE CALCULATED ACCORDING TO NEC 690.7.
- 1.1.7 ALL INVERTERS, PHOTOVOLTAIC MODULES, PHOTOVOLTAIC PANELS, AND SOURCE CIRCUIT COMBINERS INTENDED FOR USE IN A PHOTOVOLTAIC POWER SYSTEM WILL BE IDENTIFIED AND LISTED FOR THE APPLICATION PER 690.4. SHALL BE INSTALLED ACCORDING TO ANY INSTRUCTIONS FROM LISTING OR LABELING [NEC 110.3].
- 1.1.8 ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE. IF EXPOSED TO SUNLIGHT, IT SHALL BE UV RESISTANT. ALL PLAQUES AND SIGNAGE WILL BE INSTALLED AS REQUIRED BY THE NEC AND AHJ.

#### 1.2.1 SCOPE OF WORK:

1.2.2 PRIME CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND SPECIFICATIONS OF THE GRID-TIED PHOTOVOLTAIC SYSTEM RETROFIT. PRIME CONTRACTOR WILL BE RESPONSIBLE FOR COLLECTING EXISTING ONSITE REQUIREMENTS TO DESIGN, SPECIFY, AND INSTALL THE EXTERIOR ROOF & GROUND-MOUNTED PORTION OF THE PHOTOVOLTAIC SYSTEMS DETAILED IN THIS DOCUMENT

#### 1.3.1 WORK INCLUDES:

- 1.3.2 PV RACKING SYSTEM INSTALLATION UNIRAC SOLAR
- 1.3.3 PV MODULE AND INVERTER INSTALLATION CANADIAN SOLAR CS3N-395MS / ENPHASE IQ8PLUS-72-2-US INVERTER
- 1.3.4 PV EQUIPMENT ROOF & GROUND MOUNT
- 1.3.5 PV SYSTEM WIRING TO A ROOF-MOUNTED JUNCTION BOX
- 1.3.6 PV LOAD CENTERS (IF INCLUDED)
- 1.3.7 PV METERING/MONITORING (IF INCLUDED)
- 1.3.8 PV DISCONNECTS
- 1.3.9 PV GROUNDING ELECTRODE & BONDING TO (E) GEC
- 1.3.10 PV FINAL COMMISSIONING
- 1.3.11 (E) ELECTRICAL EQUIPMENT RETROFIT FOR PV
- 1.3.12 SIGNAGE PLACED IN ACCORDANCE WITH LOCAL BUILDING

#### PROJECT INFORMATION

#### **OWNER**

NAME: TERRY BROOKS

# PROJECT MANAGER NAME: SHAHIN HAYNES PHONE: 8665071461

## CONTRACTOR NAME

ADT SOLAR LLC, PHONE: 5052180838



#### SCOPE OF WORK

SYSTEM SIZE: STC:70 X 395W= 27.65 kW DC

PTC: 70 x 372.75W = 26.09 kW DC (70) CANADIAN SOLAR CS3N-395MS (70) ENPHASE IQ8PLUS-72-2-US

#### ATTACHMENT TYPE: ROOF & GROUND MOUNT

MSP UPGRADE: NO

**UTILITY METER UPGRADE: NO** 

#### **AUTHORITIES HAVING JURISDICTION**

BUILDING: COLUMBIA COUNTY ZONING: COLUMBIA COUNTY

UTILITY: CLAY ELECTRIC COOPERATIVE, INC (FL)

METER NO: 156190857

#### **DESIGN SPECIFICATION**

OCCUPANCY:

CONSTRUCTION: SINGLE-FAMILY ZONING: RESIDENTIAL

GROUND SNOW LOAD: REFER STRUCTURAL LETTER WIND EXPOSURE: REFER STRUCTURAL LETTER

WIND SPEED: 165 MPH

#### APPLICABLE CODES & STANDARDS

BUILDING: IBC 2018, IRC 2018, FBC 2020 (7TH EDITION)

ELECTRICAL: NEC 2017 FIRE: IFC 2020

## **VICINITY MAP**



## SATELLITE VIEW



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E-602	ELECTRICAL CALCULATIONS
E-603	PLACARD
R-001-R017	RESOURCE DOCUMENT

#### CONTRACTOR



22171 MCH RD MANDEVILLE, LA 70471 PHONE: 9152011490

PROJECT NAME & ADDRESS

TERRY BROOKS

410 SW SWEETBRIAR DR, LAKE CITY, FL 32024

**COUNTY:-COLUMBIA COUNTY** 

#### SYSTEM SIZE

DC SIZE: 27.650 KW DC-(STC) AC SIZE: 20.300 KW AC



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SHEET TITLE

## **COVER PAGE**

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SHEET NUMBER

G-001

#### 2.1.1 SITE NOTES:

- 2.1.2 A LADDER WILL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH CONVENTION IF THREE PHASE C OR L3- BLUE, OSHA REGULATIONS.
- 2.1.3 THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE AND THIS SYSTEM IS A UTILITY INTERACTIVE SYSTEM WITH NO STORAGE BATTERIES.
- 2.1.4 THE SOLAR PV INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
- 2.1.5 PROPERACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PERSECTION NEC 110.26.
- 2.1.6 ROOF COVERINGS SHALL BE DESIGNED, INSTALLED, AND MAINTAINED IN ACCORDANCE WITH THIS CODE AND THE APPROVED MANUFACTURER'S INSTRUCTIONS SUCH THAT THE ROOF COVERING SERVES TO PROTECT THE BUILDING OR STRUCTURE. 2.2.1 EQUIPMENT LOCATIONS:
- 2.2.2 ALL EQUIPMENT SHALL MEET MINIMUM SETBACKS AS REQUIRED BY 2.5.5 EQUIPMENT GROUNDING CONDUCTORS SHALLBE SIZED NEC 110.26.
- 2.2.3 WIRING SYSTEMS INSTALLED IN DIRECT SUNLIGHT MUST BE RATED MANUFACTORERS' INSTRUCTIONS. FOR EXPECTED OPERATING TEMPERATURE AS SPECIFIED BY NEC 690.31 2.5.6 EACH MODULE WILL BE GROUNDED USING WEEB (A),(C) AND NEC TABLES 310.15 (B)(2)(A) AND 310.15 (B)(3)(C).
- 2.2.4 JUNCTION AND PULL BOXES PERMITTED INSTALLED UNDER PV MODULES ACCORDING TO NEC 690.34.
- 2.2.5 ADDITIONAL AC DISCONNECT(S) SHALL BE PROVIDED WHERE THE INVERTER IS NOT WITHIN SIGHT OF THE AC SERVICING DISCONNECT. 2.2.6 ALL EQUIPMENT SHALL BE INSTALLED ACCESSIBLE TO QUALIFIED PERSONNEL ACCORDING TO NEC APPLICABLE CODES.
- 2.2.7 ALL COMPONENTS ARE LISTED FOR THEIR PURPOSE AND RATED FOR OUTDOOR USAGE WHEN APPROPRIATE.

#### 2.3.1 STRUCTURAL NOTES:

- 2.3.2 RACKING SYSTEM & PV ARRAY WILL BE INSTALLED ACCORDING TO CODE-COMPLIANT INSTALLATION MANUAL. TOP CLAMPS REQUIRE A DESIGNATED SPACE BETWEEN MODULES. AND RAILS MUSTALSO EXTEND A MINIMUM DISTANCE BEYOND EITHER EDGE OF THE ARRAY/SUBARRAY, ACCORDING TO RAI MANUFACTURER'S INSTRUCTIONS.
- 2.3.3 JUNCTION BOX WILL BE INSTALLED PER MANUFACTURERS' SPECIFICATIONS. IF ROOF-PENETRATING TYPE, IT SHALL BE FLASHED & SEALED PER LOCAL REQUIREMENTS.
- 2.3.4 ROOFTOP PENETRATIONS FOR PV RACEWAY WILLBE COMPLETED AND SEALED W/ APPROVED CHEMICAL SEALANT PER CODE BY A LICENSED CONTRACTOR.
- 2.3.5 ALL PV RELATED ROOF ATTACHMENTS TO BE SPACED NO GREATER THAN THE SPAN DISTANCE SPECIFIED BY THE RACKING MANUFACTURER.
- 2.3.6 WHEN POSSIBLE, ALL PV RELATED RACKING ATTACHMENTS WILL BE STAGGERED AMONGST THE ROOF FRAMING MEMBERS.

#### 2.4.1 WIRING & CONDUIT NOTES:

- 2.4.2 ALL CONDUIT AND WIRE WILL BE LISTED AND APPROVED FOR THEIR PURPOSE. CONDUIT AND WIRE SPECIFICATIONS AREBASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING.
- 2.4.3 CONDUCTORS SIZED ACCORDING TO NEC 690.8, NEC 690.7.
- 2.4.4 VOLTAGE DROP LIMITED TO 1.5%.
- 2.4.5 DC WIRING LIMITED TO MODULE FOOTPRINT. MICROINVERTER WIRING SYSTEMS SHALL BE LOCATED AND SECURED UNDER THE ARRAY W/ SUITABLE WIRING CLIPS.

2.4.6 AC CONDUCTORS COLORED OR MARKED AS FOLLOWS: PHASE A OR L1- BLACK PHASE B OR L2- RED. OR OTHER YELLOW, ORANGE\*\*, OR OTHER CONVENTION NEUTRAL-WHITE OR GREY IN 4-WIRE DELTA CONNECTED SYSTEMS THE PHASE WITH HIGHER VOLTAGE TO BE MARKED ORANGE [NEC 110.15].

#### 2.5.1 GROUNDING NOTES:

2.5.2 GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, AND GROUNDING DEVISES EXPOSED TO THE ELEMENTS SHALL BE RATED FOR SUCH USE.

2.5.3 PV EQUIPMENT SHALL BE GROUNDED ACCORDING TO NEC 690.43 AND MINIMUM NEC TABLE 250.122.

2.5.4 METAL PARTS OF MODULE FRAMES, MODULE RACKING, AND ENCLOSURES CONSIDERED GROUNDED IN ACCORD WITH 250.134 AND 250.136(A).

ACCORDING TO NEC 690.45 AND MICROINVERTER

GROUNDING CLIPS AS SHOWN IN

MANUFACTURERDOCUMENTATION AND APPROVED BY THE AHJ IF WEEBS ARE NOT USED. MODULE GROUNDING LUGS MUST BE INSTALLED AT THE SPECIFIED GROUNDING LUG HOLES PER THE MANUFACTURERS' INSTALLATION REQUIREMENTS.

2.5.7 THE GROUNDING CONNECTION TO A MODULE SHALL BE ARRANGED SUCH THAT THE REMOVAL OFA MODULE DOES NOT INTERRUPT A GROUNDING CONDUCTOR TO ANOTHER MODULE. 2.5.8 GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLORED GREEN OR MARKED GREEN IF #4 AWG OR LARGER [NEC 250.119]

2.5.9 THE GROUNDING ELECTRODE SYSTEM COMPLIES WITH NEC 690.47 AND NEC 250.50 THROUGH 250.106. IF EXISTING SYSTEM IS INACCESSIBLE, OR INADEQUATE, A GROUNDING ELECTRODE SYSTEM PROVIDED ACCORDING TO NEC 250, NEC 690.47 AND AHJ.

2.5.10 GROUND-FAULT DETECTION SHALL COMPLY WITH NEC 690.41(B)(1) AND (2) TO REDUCE FIRE HAZARDS

#### 2.6.1 DISCONNECTION AND OVER-CURRENT PROTECTION NOTES:

2.6.2 DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHENTHE SWITCH IS OPENED THE CONDUCTORS REMAINING ENERGIZED ARECONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS). 2.6.3 DISCONNECTS TO BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH 2.6.4 PV SYSTEM CIRCUITS INSTALLED ON OR IN BUILDINGS SHALL INCLUDE A RAPID SHUTDOWN FUNCTION TO REDUCE SHOCK HAZARD FOR EMERGENCY RESPONDERS IN ACCORDANCE WITH 690.12(A) THROUGH (D). 2.6.5 ALL OCPD RATINGS AND TYPES SPECIFIED ACCORDING TO NEC 690.8, 690.9, AND 240.

2.6.6 MICROINVERTER BRANCHES CONNECTED TO A SINGLE BREAKER OR GROUPED FUSES IN ACCORDANCE WITH NEC

2.6.7 IF REQUIRED BY AHJ, SYSTEM WILL INCLUDE ARC-FAULT CIRCUIT PROTECTION ACCORDING TO NEC 690.11 AND UL1699B.

#### 2.7.1 INTERCONNECTION NOTES:

2.7.2 LOAD-SIDE INTERCONNECTION SHALL BE IN ACCORDANCE WITH [NEC 705.12 (B)] 2.7.3 THE SUM OF THE UTILITY OCPD AND INVERTER CONTINUOUS OUTPUT MAY NOT EXCEED 120% OF BUSBAR RATING [NEC 705.12(B)(2)(3)(b)]. 2.7.4 THE SUM OF 125 PERCENT OF THE POWER SOURCE(S) OUTPUT CIRCUIT CURRENT AND THE RATING OF THE OVERCURRENT DEVICE PROTECTING THE BUSBAR SHALL NOT EXCEED 120 PERCENT OF THE AMPACITY OF THE BUSBAR, PV DEDICATED BACKFEED BREAKERS MUST BE LOCATED OPPOSITE END OF THE BUS FROM THE UTILITY SOURCE OCPD INEC 705.12(B)(2)(3)]. 2.7.5 AT MULTIPLE ELECTRIC POWER SOURCES OUTPUT COMBINER PANEL, TOTAL RATING OF ALL

OVERCURRENT DEVICES SHALL NOT EXCEED AMPACITY OF BUSBAR. HOWEVER, THE COMBINED OVERCURRENT DEVICE MAY BE EXCLUDED ACCORDING TO NEC 705.12 (B)(2)(3)(C). 2.7.6 FEEDER TAP INTERCONECTION (LOADSIDE) ACCORDING TO NEC 705.12 (B)(2)(1) 2.7.7 SUPPLY SIDE TAP INTERCONNECTION ACCORDING TO NEC 705.12 (A) WITH SERVICE ENTRANCE CONDUCTORS IN ACCORDANCE WITH NEC 230.42 2.7.8BACKFEEDING BREAKER FOR ELECTRIC POWER SOURCES OUTPUT IS EXEMPT FROM ADDITIONAL FASTENING [NEC 705.12 (B)(5)].

#### CONTRACTOR



22171 MCH RD MANDEVILLE, LA 70471 PHONE: 9152011490

PROJECT NAME & ADDRESS

**TERRY BROOKS** 410 SW SWEETBRIAR DR, LAKE CITY, FL 32024

**COUNTY:-COLUMBIA COUNTY** 

#### SYSTEM SIZE

DC SIZE: 27.650 KW DC-(STC) AC SIZE: 20.300 KW AC



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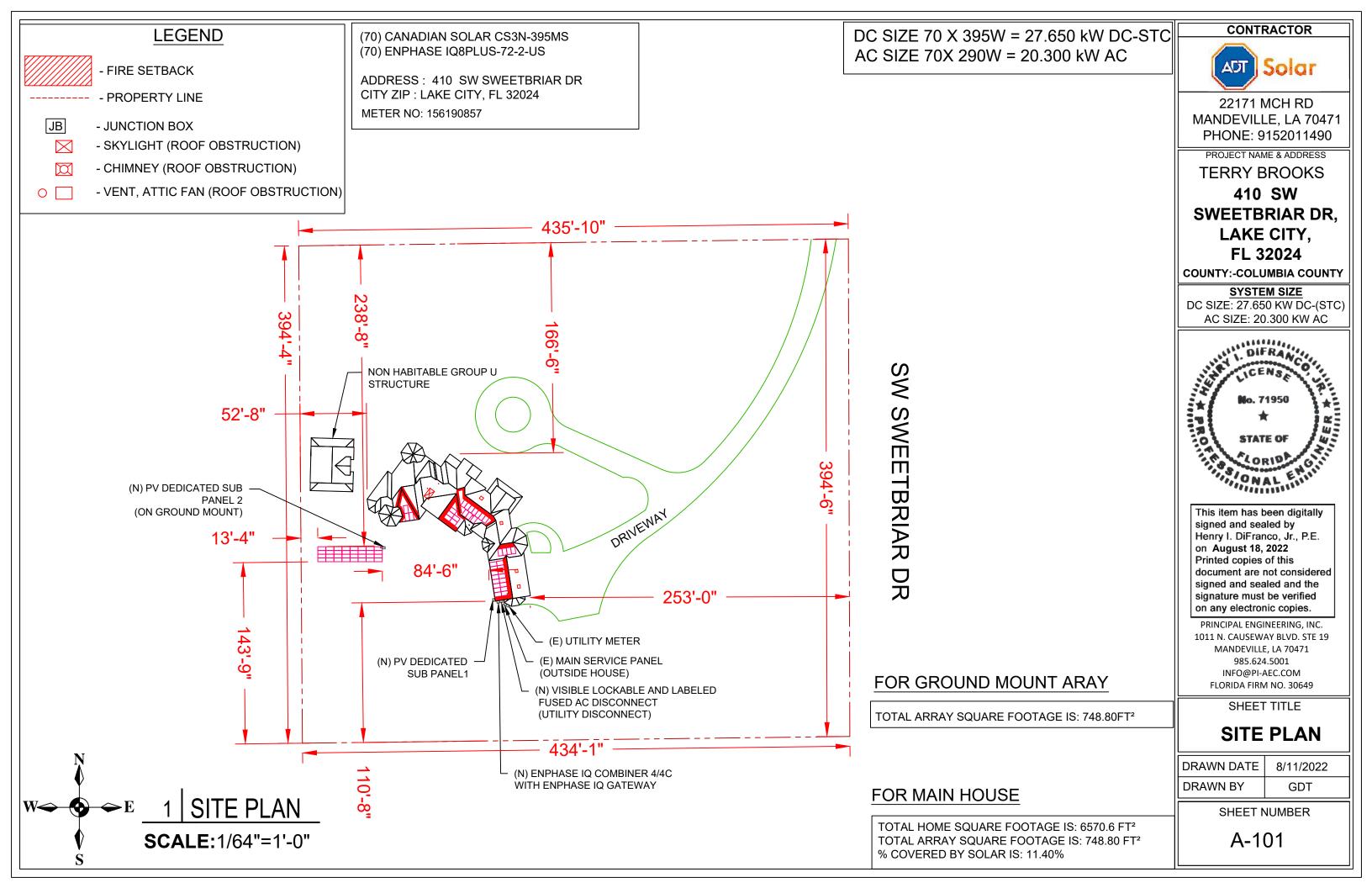
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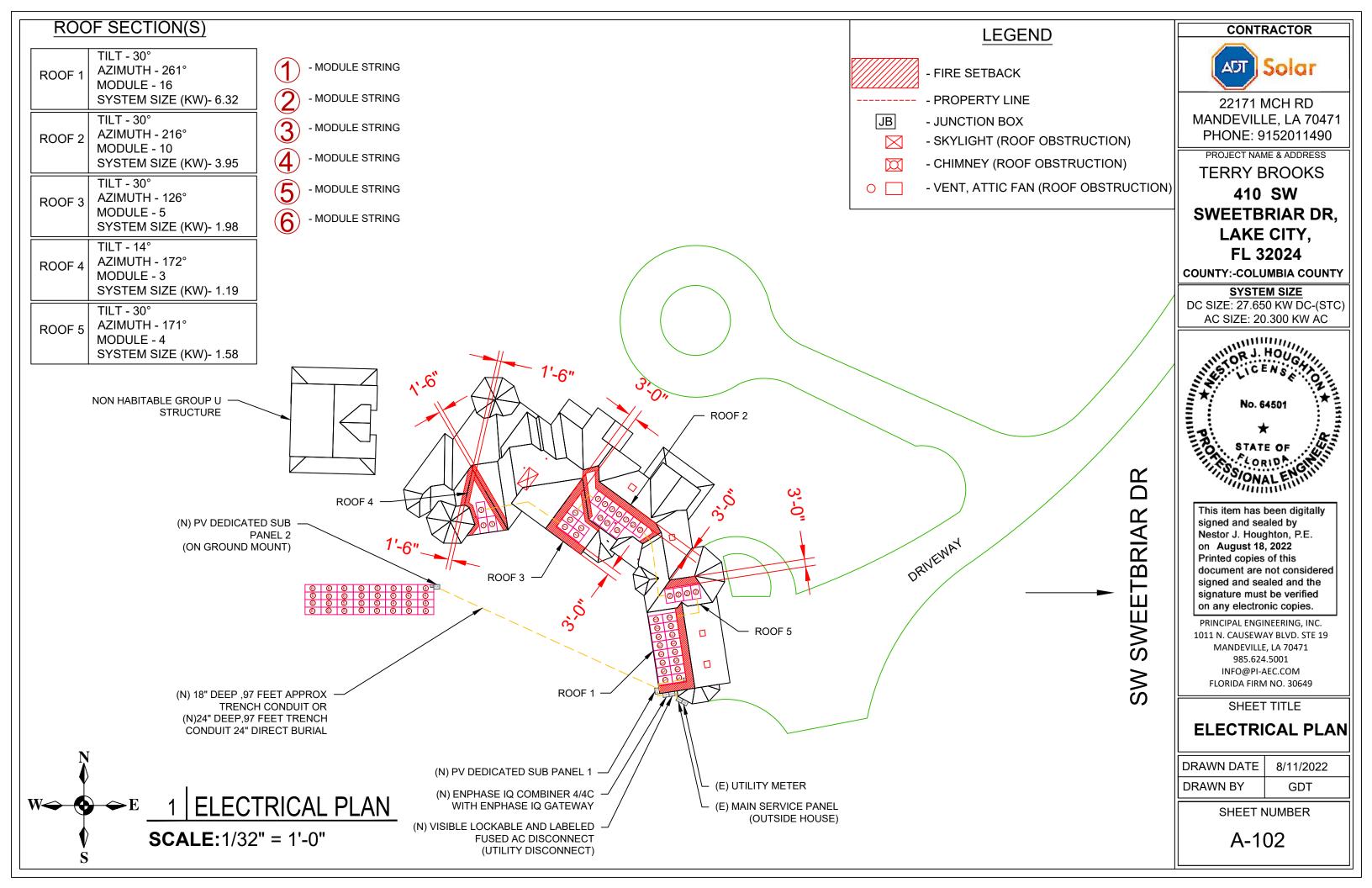
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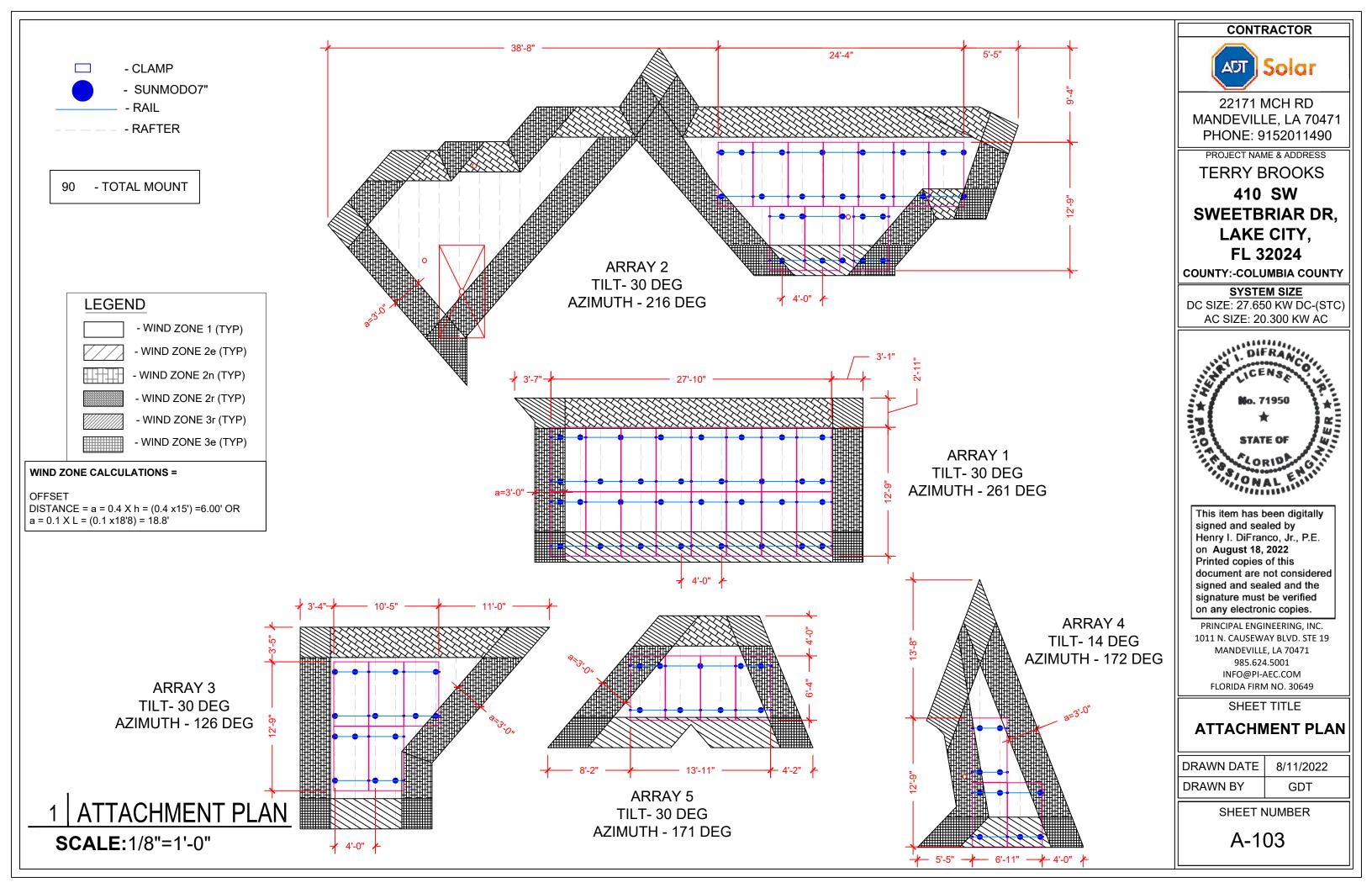
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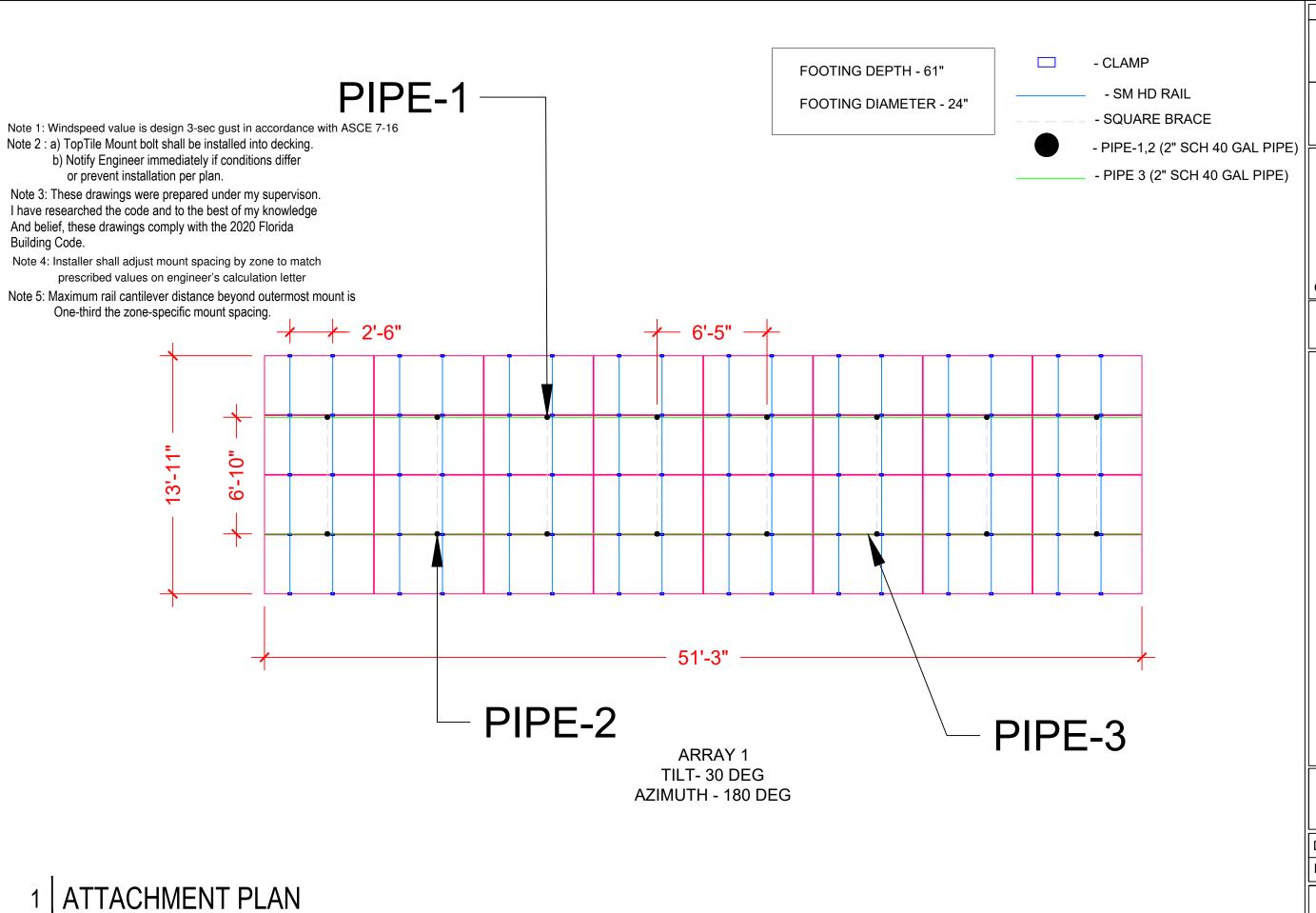
SHEET NUMBER

G-002









**SCALE:**3/16"=1'-0"

CONTRACTOR



22171 MCH RD MANDEVILLE, LA 70471 PHONE: 9152011490

PROJECT NAME & ADDRESS

**TERRY BROOKS** 

410 SW SWEETBRIAR DR, LAKE CITY, FL 32024

**COUNTY:-COLUMBIA COUNTY** 

#### SYSTEM SIZE

DC SIZE: 27.650 KW DC-(STC) AC SIZE: 20.300 KW AC



This item has been digitally signed and sealed by Henry I. DiFranco, Jr., P.E. on August 18, 2022 Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

PRINCIPAL ENGINEERING, INC. 1011 N. CAUSEWAY BLVD. STE 19 MANDEVILLE, LA 70471 985.624.5001 INFO@PI-AEC.COM FLORIDA FIRM NO. 30649

SHEET TITLE

## ATTACHMENT PLAN

DRAWN DATE	8/11/2022	
DRAWN BY	GDT	

SHEET NUMBER

A-104

## ROOF SECTION(S) ROOF MATERIAL -S TILE ROOF 1 RAFTER SIZE - 2"X4" O.C. SPACING - 24" SOLAR MODULE **ROOF MATERIAL -**S TILE ROOF 2 RAFTER SIZE - 2"X4" O.C. SPACING - 24" SOLAR MODULE -**ROOF MATERIAL -**S TILE ROOF 3 RAFTER SIZE - 2"X4" O.C. SPACING - 24" ROOF MATERIAL -S TILE ROOF 4 RAFTER SIZE - 2"X4" O.C. SPACING - 24" **ROOF MATERIAL -**S TILE ROOF 5 RAFTER SIZE - 2"X4" 30° O.C. SPACING - 24" 13'-10" ROOF 1 ROOF 2 1'-0" 1'-0" SOLAR **MODULE SOLAR MODULE** SOLAR -**MODULE** 6 30° 10'-10" 1'-0" ROOF 3 1'-0" ROOF 4 **ROOF 5** STRUCTURAL PLAN All dimensions and information provided by ADT Solar inspection. **SCALE:**3/16"=1'-0"

CONTRACTOR



22171 MCH RD MANDEVILLE, LA 70471 PHONE: 9152011490

PROJECT NAME & ADDRESS

TERRY BROOKS
410 SW

SWEETBRIAR DR, LAKE CITY, FL 32024

**COUNTY:-COLUMBIA COUNTY** 

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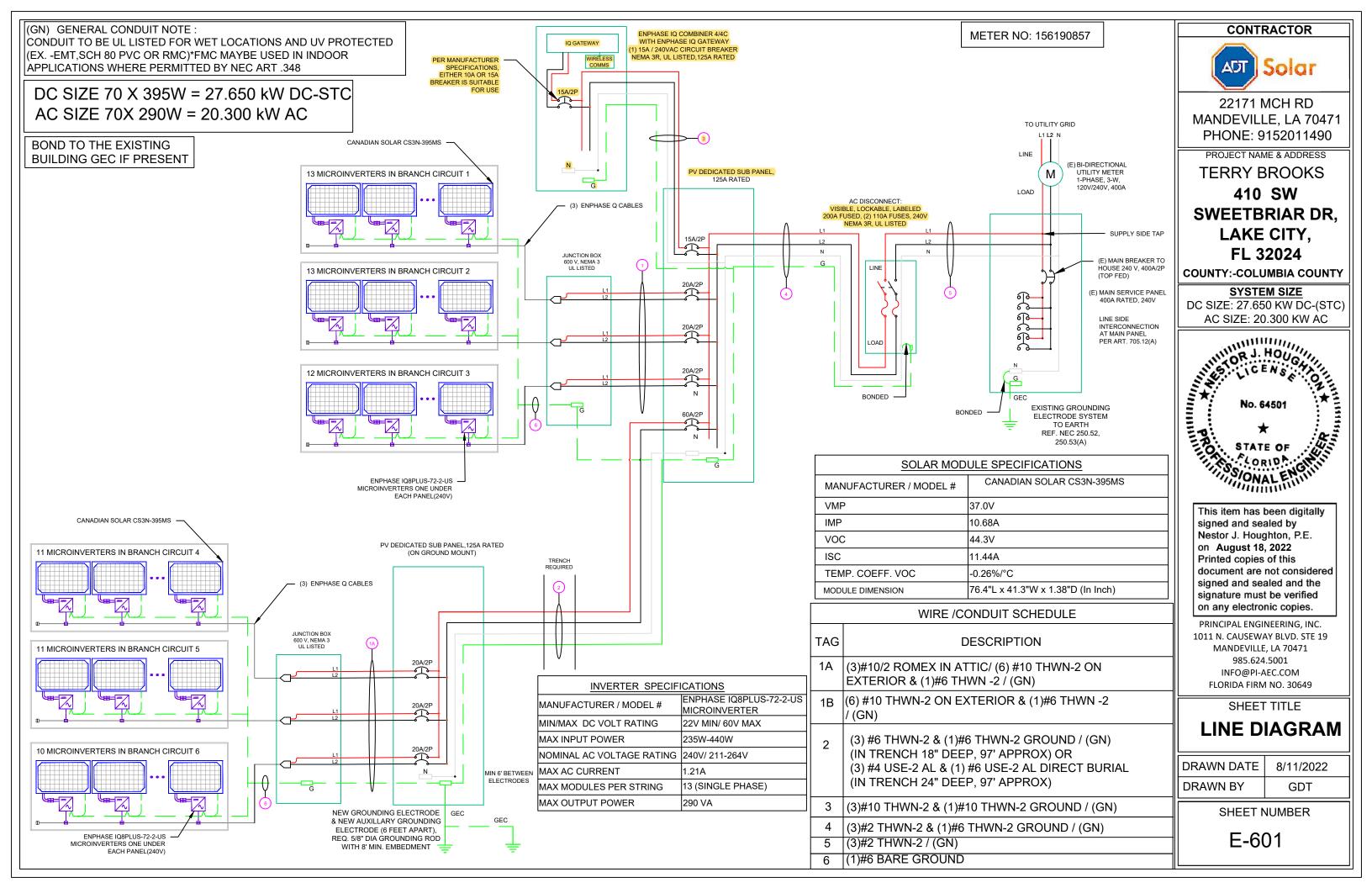
SHEET TITLE

## STRUCTURAL PLAN

DRAWN DATE	8/11/2022
DRAWN BY	GDT

SHEET NUMBER

A-105



AMBIENT TEMPERATURE SPECS		
RECORD LOW TEMP	-5°	
AMBIENT TEMP (HIGH TEMP 2%)	36°	
CONDUIT HEIGHT	0.5"	
CONDUCTOR TEMPERATURE RATE	90°	

PERCENT OF VALUES	NUMBER OF CURRENT CARRYING CONDUCTORS
.80	4-6
.70	7-9
.50	10-20

## **CALCULATIONS:**

## 1. CURRENT CARRYING CONDUCTOR

(A) <u>BEFORE PV DEDICATED SUB PANEL</u>
AMBIENT TEMPERATURE - (36)°C ...NEC 310.15(B)(3)(c)
TEMPERATURE DERATE FACTOR - 0.91 ...NEC 310.15(B)(2)(a)
GROUPING FACTOR - 0.8...NEC 310.15(B)(3)(a)

## **CONDUCTOR AMPACITY**

- $= (INV O/P CURRENT) \times 1.25 / A.T.F / G.F ...NEC 690.8(B)$
- $= [(13 \times 1.21) \times 1.25] / [0.91 \times 0.8]$
- = 27.01A

SELECTED CONDUCTOR - #10 THWN-2 ...NEC 310.15(B)(16)

(B) <u>BEFORE PV DEDICATED SUB PANEL(ON GROUND MOUNT)</u>

TEMPERATURE DERATE FACTOR - 0.91 GROUPING FACTOR - 0.8

**CONDUCTOR AMPACITY** 

- $= (TOTAL INV O/P CURRENT) \times 1.25 / 0.91 / 0.8 ... NEC 690.8(B)$
- $= [(11 \times 1.21) \times 1.25] / [0.91 \times 0.8]$
- = 22.85 A

**SELECTED CONDUCTOR - #10 THWN-2 ...NEC 310.15(B)(16)** 

(C) AFTER PV DEDICATED SUB PANEL(ON GROUND MOUNT)

TEMPERATURE DERATE FACTOR - 0.91 GROUPING FACTOR - 1

**CONDUCTOR AMPACITY** 

- $= (TOTAL INV O/P CURRENT) \times 1.25 / 0.91 / 1 ... NEC 690.8(B)$
- $= [(32 \times 1.21) \times 1.25] / [0.91 \times 1]$
- = 53.19 A

**SELECTED CONDUCTOR - #6 THWN-2 ...NEC 310.15(B)(16)** 

(D) AFTER PV DEDICATED SUB PANEL TEMPERATURE DERATE FACTOR - 0.91 GROUPING FACTOR - 1

**CONDUCTOR AMPACITY** 

- = (TOTAL INV O/P CURRENT) x 1.25 / 0.91/1 ...NEC 690.8(B)
- $= [(70 \times 1.21) \times 1.25] / [0.91 \times 1]$
- = 116.35 A SELECTED CONDUCTOR - #2 THWN-2 ...NEC 310.15(B)(16)
- 2. PV OVER CURRENT PROTECTION ...NEC 690.9(B) = TOTAL INVERTER O/P CURRENT x 1.25
- $= (70 \times 1.21) \times 1.25 = 105.88 \text{ A}$
- 3. VOLTAGE DROP CALCULATION
  VOLTAGE DROP= (0.2 x LENGTH OF CONDUCTOR x
  CURRENT x RESISTANCE IN CONDUCTOR) / 240
  = (0.2 x 97 x 84.70 x 0.19 ( FOR #2 AWG WIRE) ) / 240
  = 1.30%

VOLTAGE DROP IS WITHIN PERMISSIBLE LIMIT OF 2%.HENCE OK

### CONTRACTOR



22171 MCH RD MANDEVILLE, LA 70471 PHONE: 9152011490

PROJECT NAME & ADDRESS

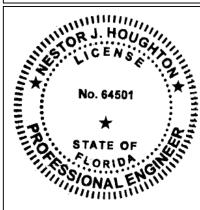
TERRY BROOKS

410 SW SWEETBRIAR DR, LAKE CITY, FL 32024

COUNTY:-COLUMBIA COUNTY

SYSTEM SIZE

DC SIZE: 27.650 KW DC-(STC) AC SIZE: 20.300 KW AC



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PRINCIPAL ENGINEERING, INC.
1011 N. CAUSEWAY BLVD. STE 19
MANDEVILLE, LA 70471
985.624.5001
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FLORIDA FIRM NO. 30649

# SHEET TITLE ELECTRICAL CALCULATIONS

DRAWN DATE	8/11/2022
DRAWN BY	GDT

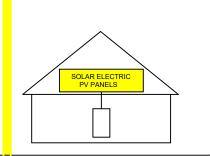
SHEET NUMBER

E-602

## WARNING: PHOTOVOLTAIC **POWER SOURCE**

## **SOLAR PV SYSTEM EQUIPPED** WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE 'OFF' **POSITION TO SHUT** DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY



## **AC DISCONNECT**



DO NOT TOUCH TERMINALS. **TERMINALS ON BOTH LINE AND** LOAD SIDES MAY BE ENERGIZED IN THE **OPEN POSITION** 

**PHOTOVOLTAIC SYSTEM** AC DISCONNECT

# OPERATING VOLTAGE: VOLTS OPERATING CURRENT: AMPS

## **AC COMBINER BOX**

**PHOTOVOLTAIC MICROINVERTERS** LOCATED UNDER **EACH PV MODULE IN ROOFTOP ARRAY** 

PHOTOVOLTAIC SYSTEM **EQUIPPED WITH RAPID SHUTDOWN** 

RATED AC OUTPUT CURRENT: NOM. OPERATING VOLTAGE:



**KW SOLAR DISCONNECT LOCATED** 

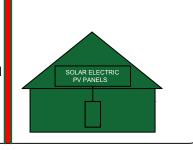






**EMERGENCY RESPONDER** THIS SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

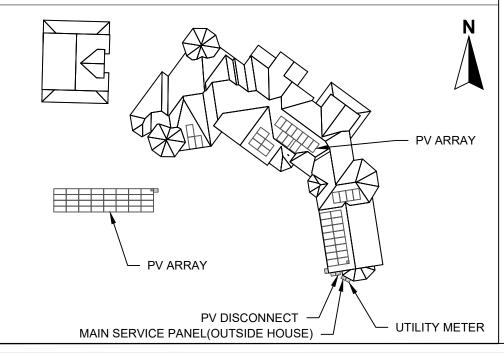
TURN RAPID SHUTDOWN SWITCH TO THE 'OFF' POSITION TO SHUTDOWN ENTIRE PV SYSTEM.



THE LABEL SHALL BE REFLECTIVE, WITH ALL LETTERS CAPITALIZED AND HAVING A MINIMUM HEIGHT OF 3/8 IN. (9.5 MM), IN WHITE ON A RED BACKGROUND.

# **CAUTION**

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



#### CONTRACTOR



22171 MCH RD MANDEVILLE, LA 70471 PHONE: 9152011490

PROJECT NAME & ADDRESS

TERRY BROOKS

410 SW SWEETBRIAR DR. LAKE CITY. FL 32024

**COUNTY:-COLUMBIA COUNTY** 

#### **SYSTEM SIZE**

DC SIZE: 27.650 KW DC-(STC) AC SIZE: 20.300 KW AC



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SHEET TITLE

## **PLACARD**

DRAWN DATE	8/11/2022
DRAWN BY	GDT

SHEET NUMBER

E-603







## **HiKuBlack Mono PERC BLACK FRAME ON BLACK BACKSHEET** F23 Frame 380 W ~ 405 W CS3N-380 | 385 | 390 | 395 | 400 | 405MS

#### MORE POWER



Module power up to 405 W Module efficiency up to 19.9 %



Lower LCOE & BOS 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, enhanced wind load up to 6000 Pa\*



**Industry Leading Product Warranty on Materials** 



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 FSEC (US Florida) / UL 61730 / IEC 61701 / IEC 62716



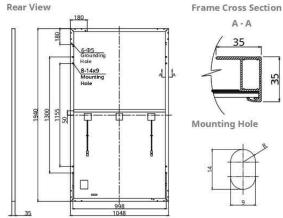


\* The specific certificates applicable to different module types and markets will vary, and therefore not all of the certifications listed herein will simultaneously apply to the products you order or use. Please contact your local Canadian Solar sales representativ to confirm the specific certificates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

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 63 GW of premium-quality solar modules across the world.

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

#### **ENGINEERING DRAWING (mm)**



## **ELECTRICAL DATA | STC\***

ELECTRICAL DATA   STC				_		_	
CS3N	380MS	385MS	3901	is	395MS	400MS	405MS
Nominal Max. Power (Pmax)	380 W	385 W	390	V	395 W	400 W	405 W
Opt. Operating Voltage (Vmp)	36.4 V	36.6 V	36.8	٧	37.0 V	37.2 V	37.4 V
Opt. Operating Current (Imp)	10.44 A	10.52	410.60	Þ	10.68 A	10.76 A	10.83 A
Open Circuit Voltage (Voc)	43.7 V	43.9 V	44.1	٧	44.3 V	44.5 V	44.7 V
Short Circuit Current (Isc)	11.26 A	11.32	411.3	A	11.44 A	11.50 A	11.56 A
Module Efficiency	18.7%	18.9%	19.2	6	19.4%	19.7%	19.9%
Operating Temperature	-40°C ~	+85°C		L			
Max. System Voltage	1000V	(UL)					
Module Fire Performance	TYPE 2	(UL 617	730 10	000	OV)		
Max. Series Fuse Rating	20 A						
Application Classification	Class A						
Power Tolerance	0~+10	0 W					
* Under Standard Test Conditions (STC)	of irradia	nce of 100	00 W/m <sup>2</sup>	, st	ectrum AM	1.5 and	cell temperature

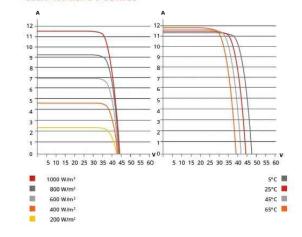
#### **ELECTRICAL DATA | NMOT\***

CS3N	380MS	385MS	390MS	395MS	400MS	405MS
Nominal Max. Power (Pmax)	284 W	288 W	291 W	295 W	299 W	303 W
Opt. Operating Voltage (Vmp)	34.0 V	34.2 V	34.4 V	34.6 V	34.7 V	34.9 V
Opt. Operating Current (Imp)	8.35 A	8.42 A	8.48 A	8.54 A	8.60 A	8.66 A
Open Circuit Voltage (Voc)	41.2 V	41.4 V	41.6 V	41.8 V	41.9 V	42.1 V
Short Circuit Current (Isc)	9.08 A	9.13 A	9.18 A	9.23 A	9.28 A	9.33 A
* Under Nominal Module Operating Te	mperature	(NMOT). i	irradiance	of 800 W/s	m² spectri	ım AM 1.5. ambiei

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

#### CS3N-400MS / I-V CURVES



#### MECHANICAL DATA

WECHANICAL DATA	
Specification	Data
Cell Type	Mono-crystalline
Cell Arrangement	132 [2 X (11 X 6) ]
Dimensions	1940 X 1048 X 35 mm
Dimensions	(76.4 X 41.3 X 1.38 in)
Weight	23.4 kg (51.6 lbs)
Front Cover	3.2 mm tempered glass
Frame	Anodized aluminium alloy
J-Box	IP68, 3 bypass diodes
Cable	12 AWG (UL)
Cable Length (Including Connector)	Portrait: 400 mm (15.7 in) (+) / 280 mm (11.0 in) (-) (supply additional cable jumper: 2 lines/pallet); land-scape: 1250 mm (49.2 in)*
Connector	T4 or MC4 series
Per Pallet	30 pieces
Per Container (40' HQ)	720 pieces
* For detailed information, ple technical representatives.	ease contact your local Canadian Solar sales an

#### TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.34 % / °C
Temperature Coefficient (Voc)	-0.26 % / °C
Temperature Coefficient (Isc)	0.05 % / °C
Nominal Module Operating Tempera	ture 42 ± 3°C

#### PARTNER SECTION

## SHEET TITLE **RESOURCE DOCUMENT**

CONTRACTOR

22171 MCH RD

MANDEVILLE, LA 70471

PHONE: 9152011490

PROJECT NAME & ADDRESS TERRY BROOKS 410 SW SWEETBRIAR DR, LAKE CITY, FL 32024

**COUNTY:-COLUMBIA COUNTY** 

SYSTEM SIZE

DC SIZE: 27.650 KW DC-(STC)

AC SIZE: 20.300 KW AC

Solar

DRAWN DATE	8/11/2022
DRAWN BY	GDT

SHEET NUMBER

R-001

CSI SOLAR (USA) CO., LTD.

Jan. 2022 | All rights reserved | PV Module Product Datasheet v2.9C25\_F23\_J3\_NA

<sup>\*</sup> For detailed information, please refer to Installation Manual.







## 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.



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



IQ8 Series Microinverters 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.



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

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

#### 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 || double-insulated enclosure
- Optimized for the latest highpowered 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 (DCI		108-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings <sup>1</sup>	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	ν	27 - 37	29 - 45
Operating range	V	25 - 48	25 - 58
Min/max start voltage	ν	30 / 48	30 / 58
Max input DC voltage	ν	50	60
Max DC current <sup>2</sup> [module Isc]	А		15
Overvoltage class DC port			ж
DC port backfeed current	mA		0
PV array configuration		1x1 Ungrounded array; No additional DC side protection	on required; AC side protection requires max 20A per branch circu
OUTPUT DATA (AC)		108-60-2-US	IQ8PLUS-72-2-US
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range <sup>3</sup>	٧	2	240 / 211 – 264
Max continuous output current	А	1.0	1.21
Nominal frequency	Hz		60
Extended frequency range	Hz		50 - 68
Max units per 20 A (L-L) branch circ	uit <sup>4</sup>	16	13
Total harmonic distortion			<5%
Overvoltage class AC port			111
AC port backfeed current	mA		30
Power factor setting			1.0
Grid-tied power factor (adjustable)		0.85 le	ading - 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)

Environ. category / UV exposure rating	NEMA Type 6 / outdoor	
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure	
Pollution degree	PD3	
Acoustic noise at 1 m	<60 dBA	
Approved for wet locations	Yes	
Cooling	Natural convection - no fans	
Weight	1.08 kg (2.38 lbs)	
Dimensions (HxWxD)	212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
DC Connector type	MC4	
Relative humidity range	4% to 100% (condensing)	
Ambient temperature range	-40°C to +60°C (-40°F to +140°F)	

	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
Certifications	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

(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 beyonc 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

#### CONTRACTOR



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RESOURCE
DOCUMENT

DRAWN DATE 8/11/2022
DRAWN BY GDT

SHEET NUMBER

Data Sheet Enphase Networking

# Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4 X-IQ-AM1-240-4C



The Enphase IQ Combiner 4/4C with Enphase IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

#### Smart

- · Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- · Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

#### Simple

- Centered mounting brackets support single stud mounting
- · Supports bottom, back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

#### Reliable

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



### Enphase IQ Combiner 4/4C

ID Combiner 4 (Y-IO-AM1-240-4)	10 Combiner 4 with Englace 10 Cataway printed circuit board for integrated musicus grade DV production materials (AA)
IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 with Enghase IQ Gateway printed circuit board for integrated revenue grade PV production metering (APC12.20+/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system iQ System Controller 2 and to deflect heat.
IQ Combiner 4C (X-IQ-AM1-240-4C)	IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CRELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem 'or systems up to neo to 6 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service it he installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect he
ACCESSORIES AND REPLACEMENT PARTS	(not included, order separately)
Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.
ELECTRICAL SPECIFICATIONS	y plantage with a cold for the
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (nput from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06' (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors     60 A breaker branch input: 4 to 1/0 AWG copper conductors     Main lug combined output: 10 to 2/0 AWG copper conductors     Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-\$P-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphas Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

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

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22171 MCH RD MANDEVILLE, LA 70471 PHONE: 9152011490

PROJECT NAME & ADDRESS

TERRY BROOKS
410 SW
SWEETBRIAR DR,

LAKE CITY, FL 32024

COUNTY:-COLUMBIA COUNTY

SYSTEM SIZE

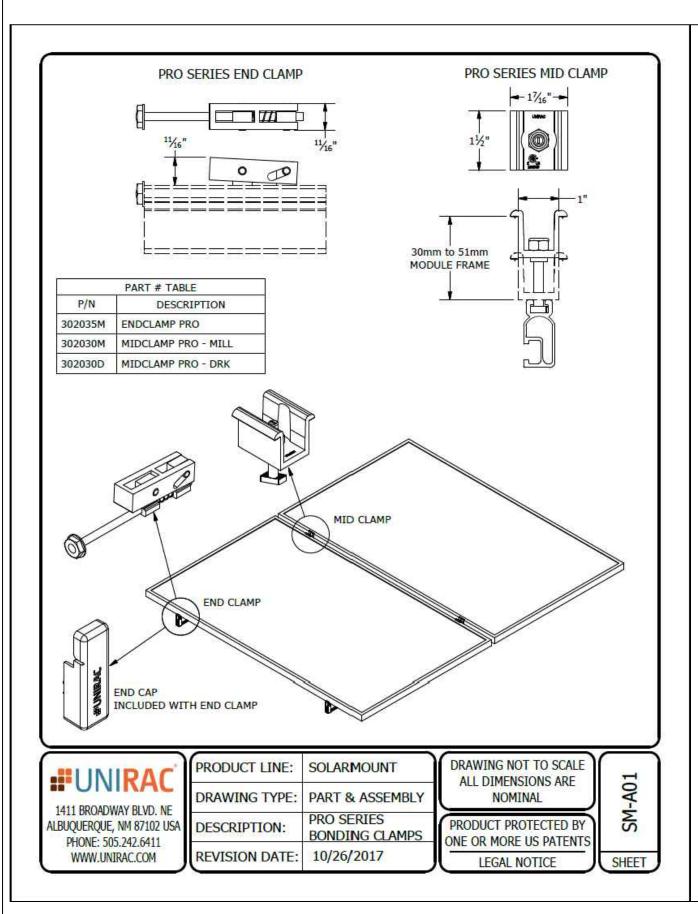
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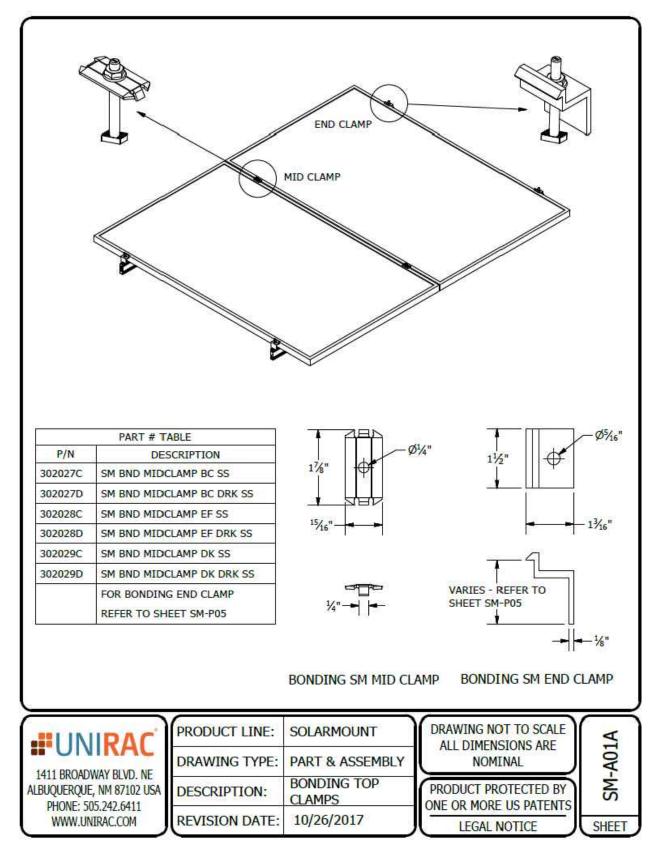
## RESOURCE DOCUMENT

DRAWN DATE	8/11/2022
DRAWN BY	GDT

**ENPHASE.** 

SHEET NUMBER





CONTRACTOR



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410 SW
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LAKE CITY,
FL 32024

**COUNTY:-COLUMBIA COUNTY** 

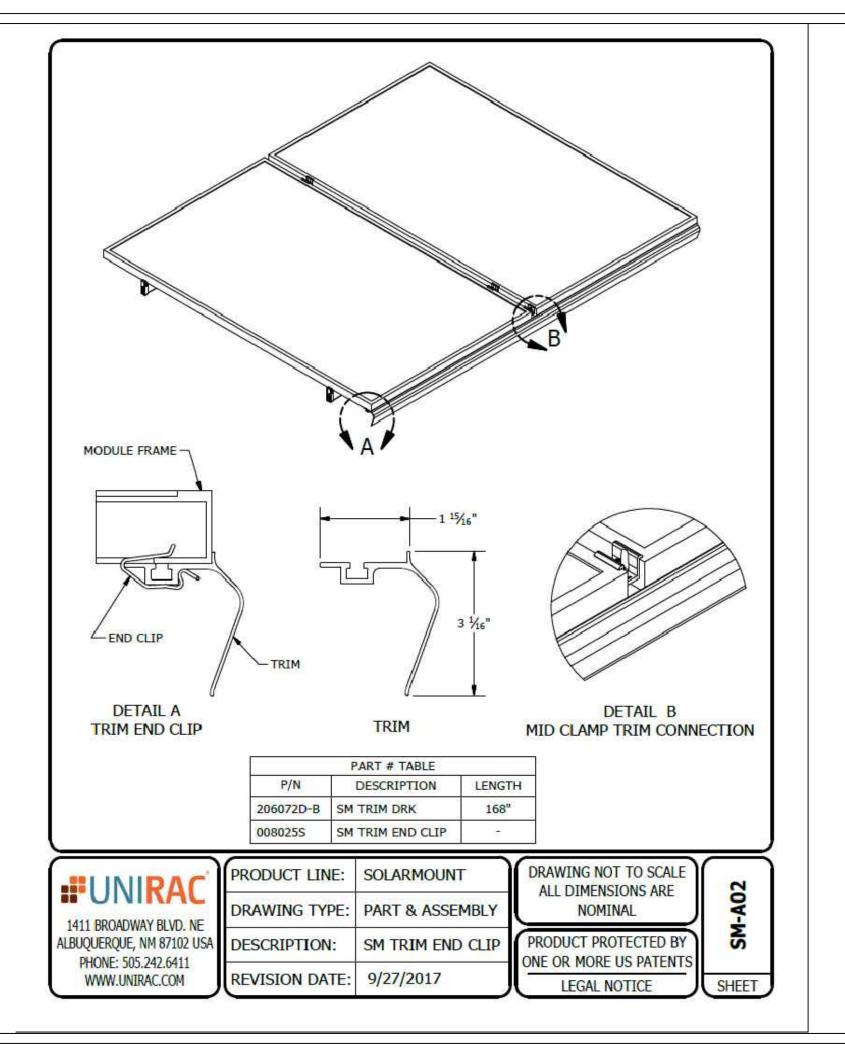
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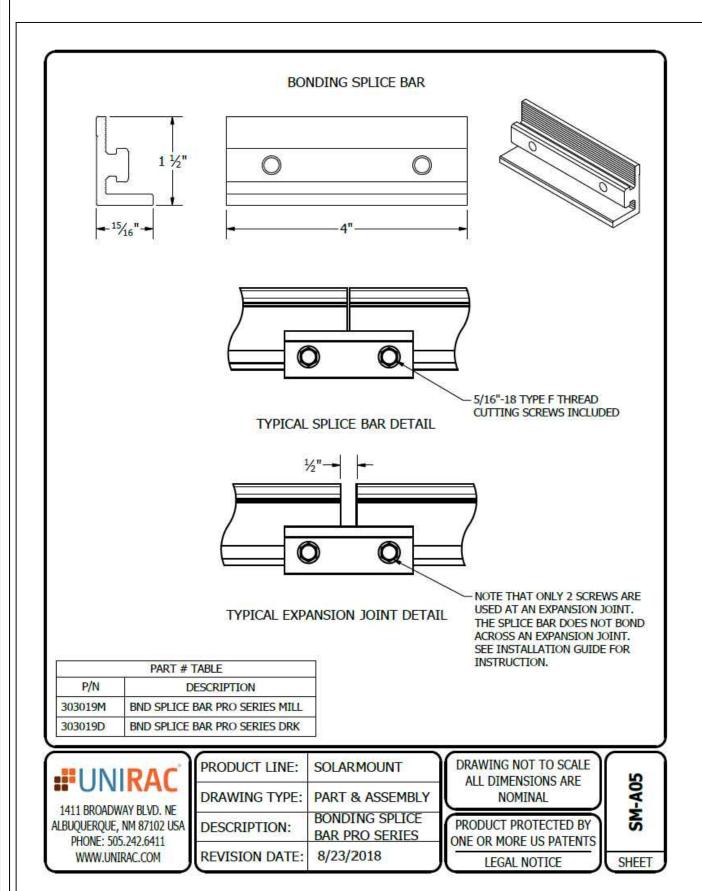
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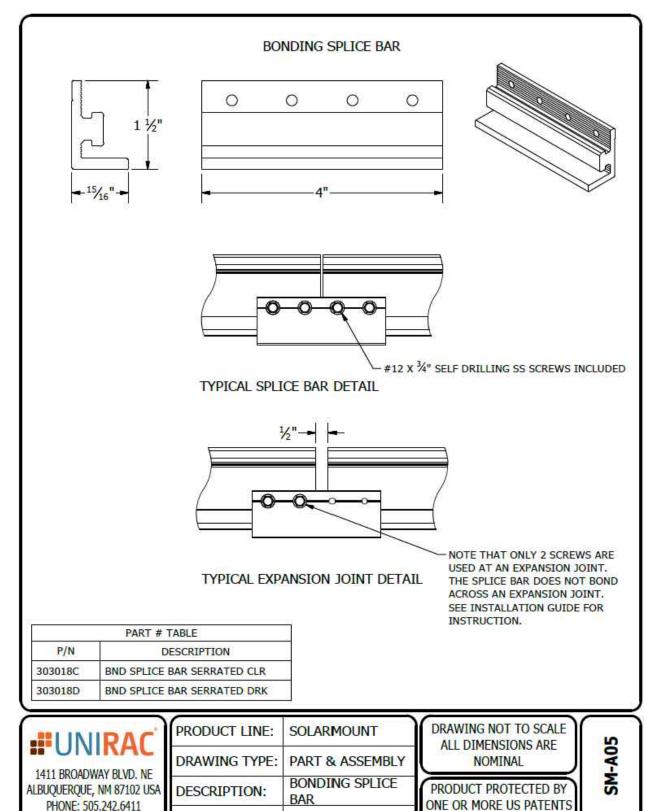
SHEET TITLE

# RESOURCE DOCUMENT

DRAWN DATE	8/11/2022
DRAWN BY	GDT

SHEET NUMBER





9/27/2017

LEGAL NOTICE

SHEET

REVISION DATE:

PHONE: 505.242.6411

WWW.UNIRAC.COM

CONTRACTOR



22171 MCH RD MANDEVILLE, LA 70471 PHONE: 9152011490

PROJECT NAME & ADDRESS

TERRY BROOKS 410 SW SWEETBRIAR DR, LAKE CITY, FL 32024

**COUNTY:-COLUMBIA COUNTY** 

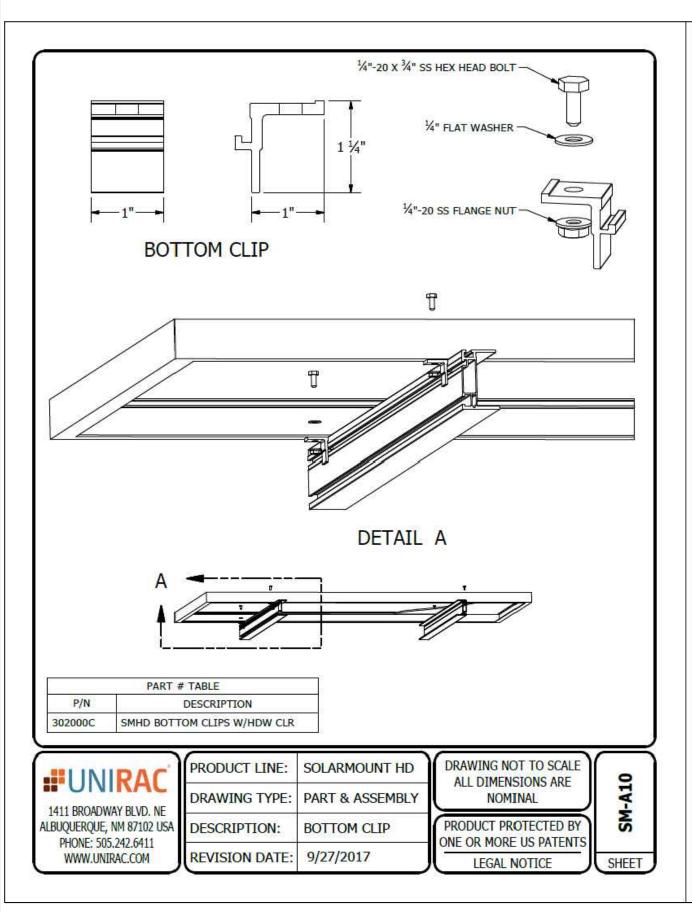
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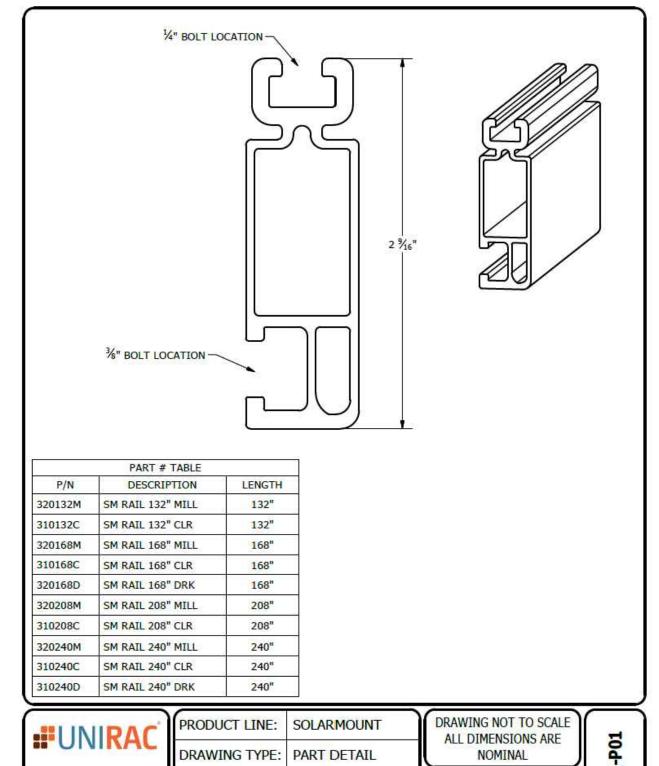
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DRAWN DATE 8/11/2022 **DRAWN BY** GDT

SHEET NUMBER





PART DETAIL

9/11/2017

STANDARD RAIL

NOMINAL

PRODUCT PROTECTED BY

ONE OR MORE US PATENTS

LEGAL NOTICE

SHEET

DRAWING TYPE:

DESCRIPTION:

REVISION DATE:

1411 BROADWAY BLVD. NE

ALBUQUERQUE, NM 87102 USA

PHONE: 505.242.6411 WWW.UNIRAC.COM

CONTRACTOR



22171 MCH RD MANDEVILLE, LA 70471 PHONE: 9152011490

PROJECT NAME & ADDRESS

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**COUNTY:-COLUMBIA COUNTY** 

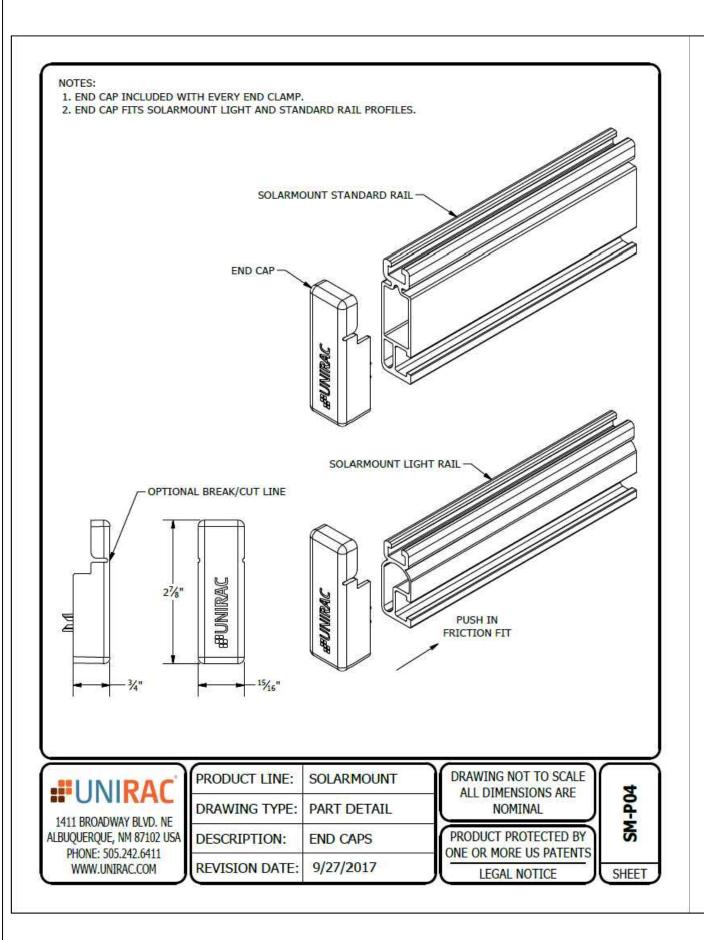
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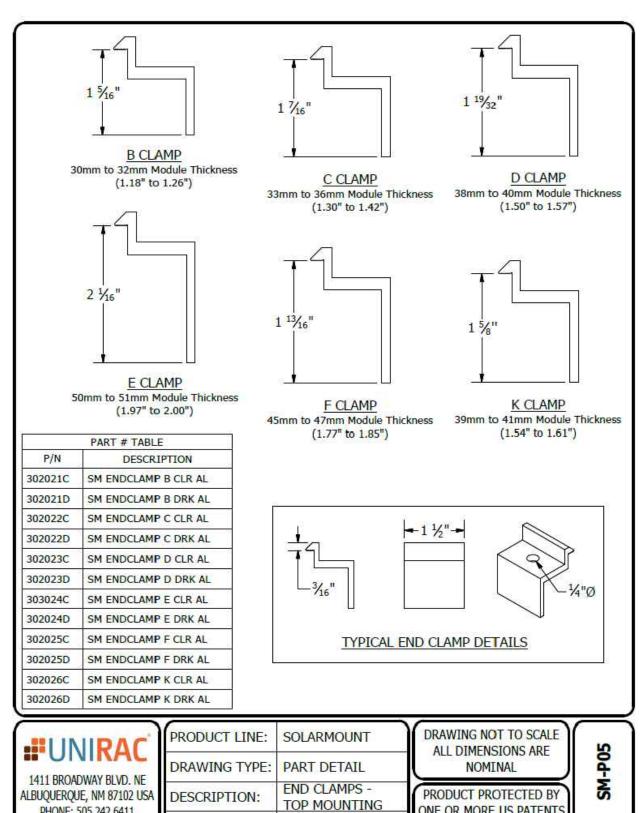
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LEGAL NOTICE

SHEET

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PROJECT NAME & ADDRESS

TERRY BROOKS 410 SW SWEETBRIAR DR, LAKE CITY, FL 32024

**COUNTY:-COLUMBIA COUNTY** 

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## SHEET TITLE **RESOURCE DOCUMENT**

DRAWN DATE	8/11/2022
DRAWN BY	GDT

SHEET NUMBER



SunModo's innovative

TopTile™ Mount is the world's
first PV mounting system that is
mounted entirely above the
tiles. The mounting system
spares an installer the need to
deconstruct the tile roof. The
system also allows installation
on the ridges of curved tiles for
superior water leak protection.
The TopTile Mounts are easy to
install which significantly
reduces installation time.

## The TopTile™ Mount Advantage

- ✓ No more lifting roof tiles, broken tiles or finding rafters.
- ✓ Mounting stanchion can be mounted on a tile ridge independent of rafter position.
- ✓ Hand bendable flashing and EPDM Rubber Boot for easy fit and superior leak protection.
- ✓ High-Velocity Hurricane Zone Approved - Passed TAS 100 (a) Wind -Driven Rain Test

## Key Features of TopTile™Mount System



The TopTile™ Mount System features three mounting options that secure panels 4-7 inches above the tile surface, using stanchions with water-proof sealing washers and moldable flashing. Installers can choose either SunModo's patented deck mounting system when anchoring into deck or a rafter mounting system. The system can also be mounted to a flat concrete surface. Available Stanchion heights are 5" and 7"; 6" and 8" and can be achieved with 1"spacer.

#### Rafter Mounting System: (K10206-005/007)

These Stanchion Mounts can be used for direct rafter installation. Flat tiles allow lateral flexibility to locate the rafter.

#### Wood Deck Mounting System: (K10207-105/107)

These Tripod Mounts are used for curved tiles or flat tiles to mount directly into roof decking without removing tiles.

### Concrete Deck Mounting System: (K10290-005/007)

These Stanchion Mounts can be mounted directly to a flat concrete surface with a customer supplied expansion anchor.

## Technical Data

Application Tile Roof	
Material High grade aluminum, 304 stainless steel hardware	
Finish	Clear anodized
<b>Flashing Size</b> 9.00 x 12.50 x 0.03 inch	
Stanchion Height	5" and 7"; 6" and 8" height can be achieved with 1" spacer
Roof Attachment	Rafter (wood) , decking (wood and concrete)
Structural Integrity	IBC and IRC compliant
Warranty 20 years	

SunModo, Corp. Vancouver, WA., USA • www.sunmodo.com • 360.844.0048 • info@sunmodo.com

## CONTRACTOR



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COUNTY:-COLUMBIA COUNTY

FL 32024

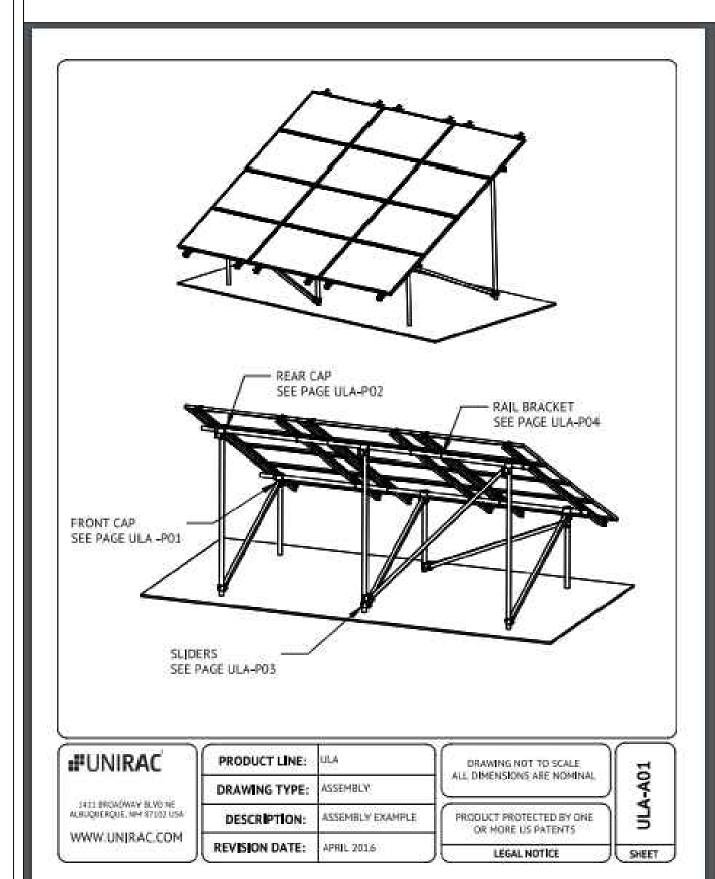
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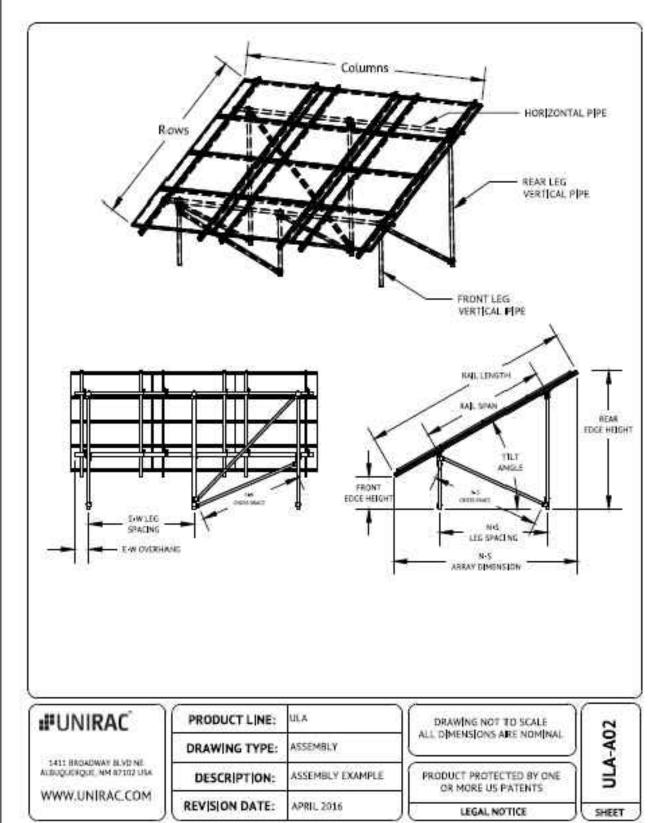
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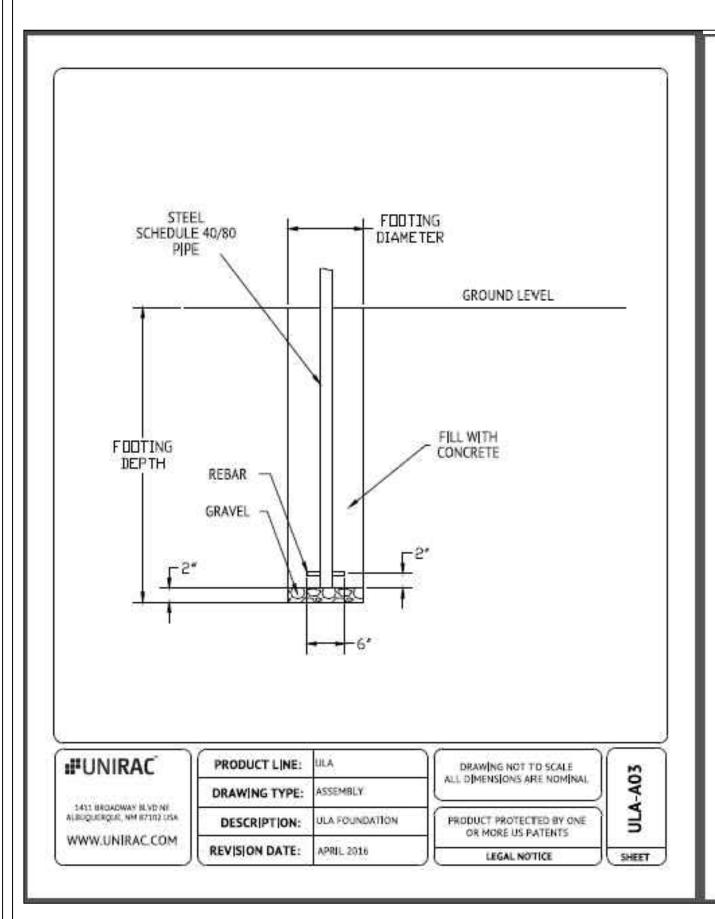
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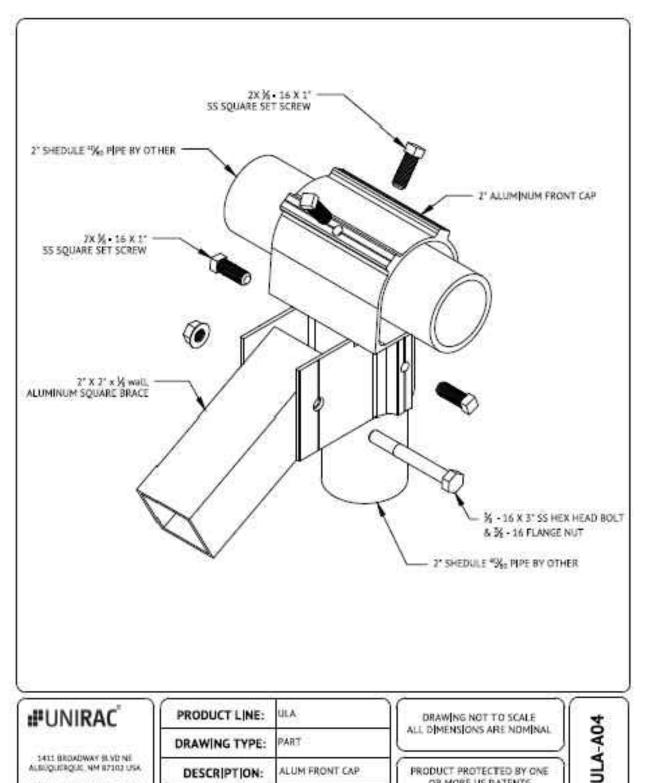
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DRAWN BY GDT

SHEET NUMBER





PART

ALUM FRONT CAP

**APRIL 2016** 

PRODUCT PROTECTED BY ONE

OR MORE US PATENTS

LEGAL NOTTICE

SHEET

DRAWING TYPE:

DESCRIPTION:

REVISION DATE:

1411 BRDADWAY BLYD NE ALBUQUERQUE, NM 87103 USA

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22171 MCH RD MANDEVILLE, LA 70471 PHONE: 9152011490

PROJECT NAME & ADDRESS

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**COUNTY:-COLUMBIA COUNTY** 

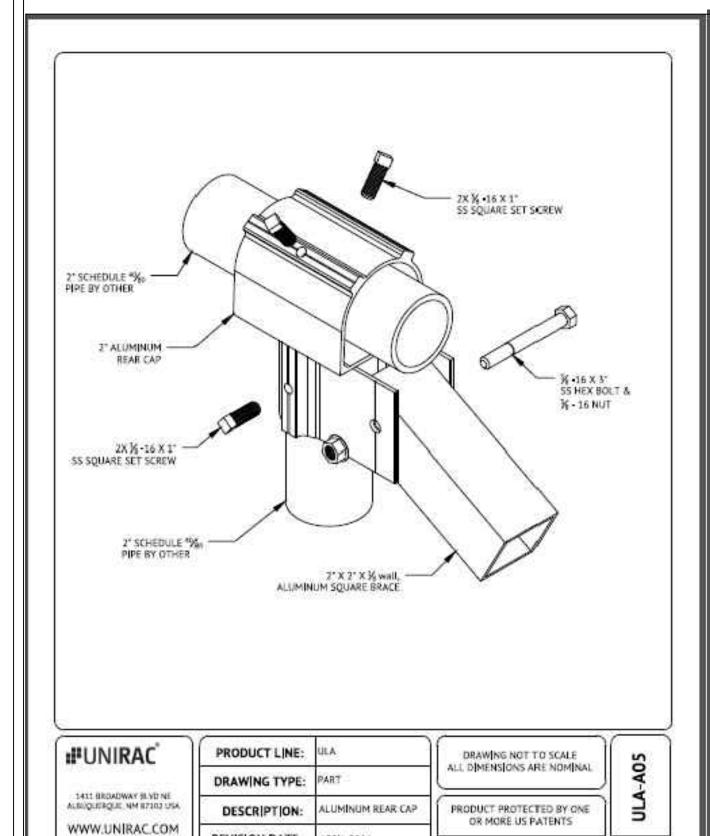
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DRAWN DATE | 8/11/2022 **DRAWN BY** GDT

SHEET NUMBER

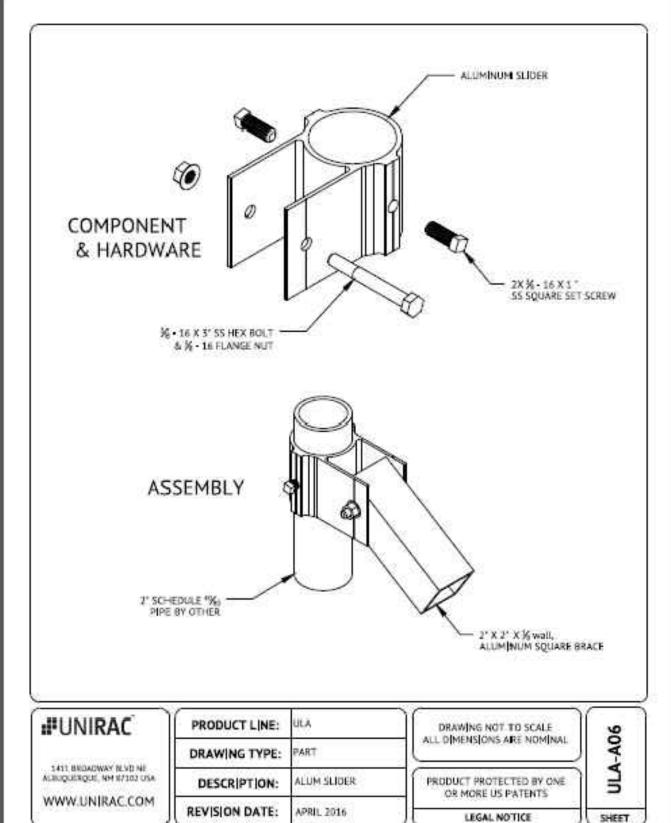


REVISION DATE:

**APRIL 2016** 

LEGAL NOTICE

SHEET



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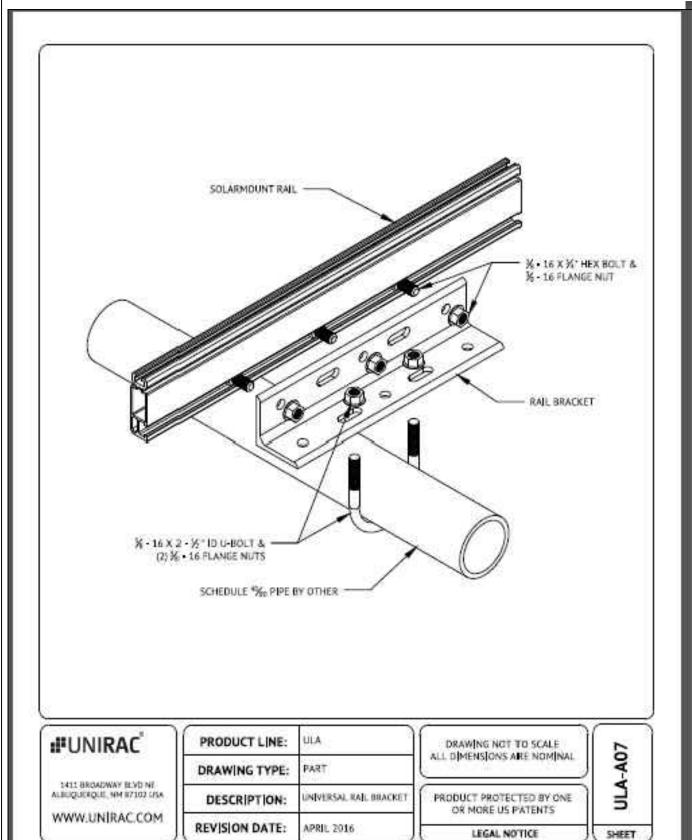
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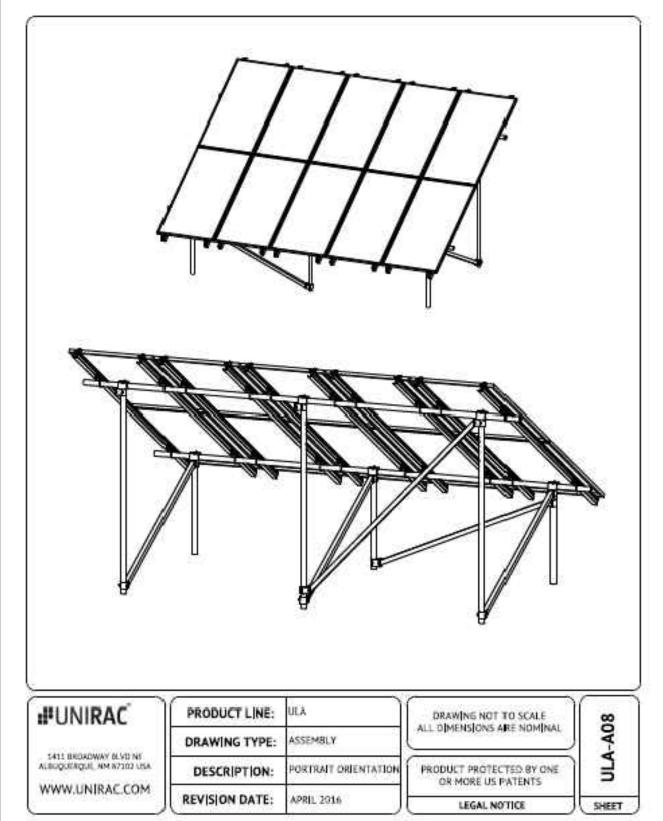
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FL 32024

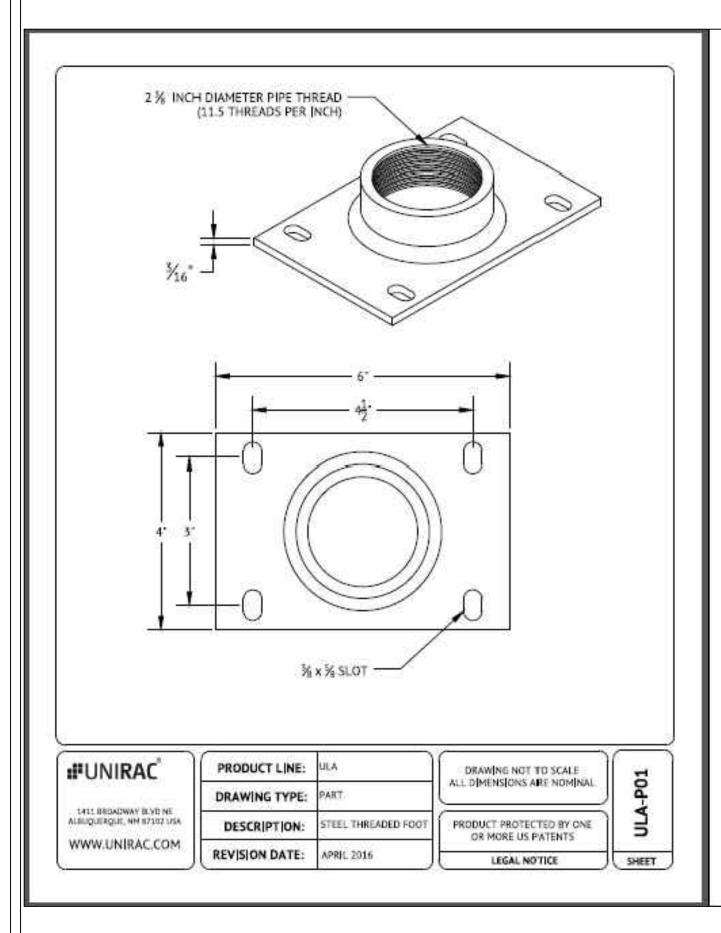
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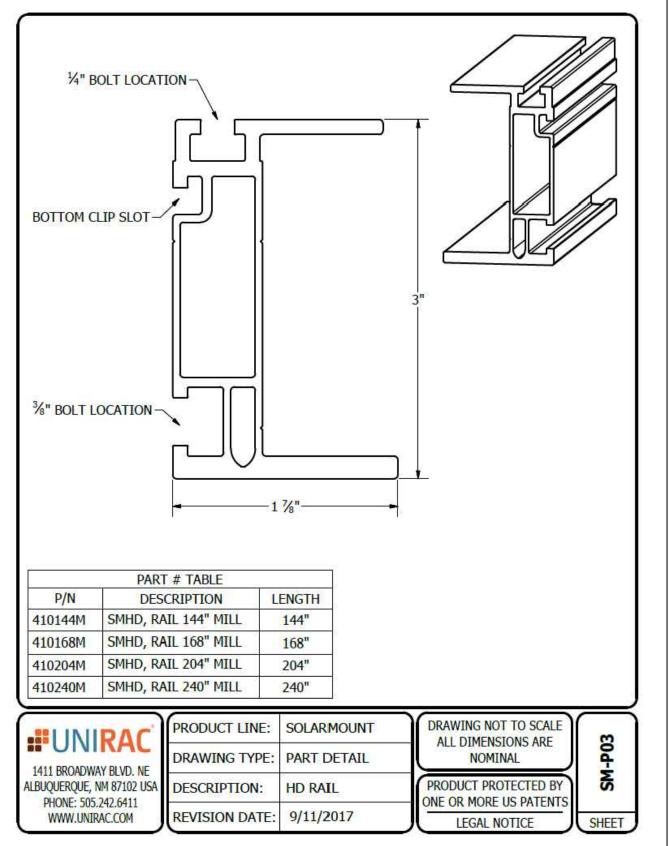
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#### U-BUILDER PROJECT REPORT

VERSION: 3.1.6

PROJECT TITLE	PROJECT ID	CREATED
ULA	D3CABA90	Aug. 9, 2022, 10:07 a.m.

NAME	Terry Brook
ADDRESS	410 SW Sweetbriar Dr, Lake City, FL 32024, US
CITY, STATE	Lake City, F
MODULE	Canadian Solar CS3N-395M

Designed by achavarria@theprocompanies.com

ULA

Canadian Solar

Canadian Solar 32 - CS3N-395MS 701.18 ft<sup>2</sup> 12.64 KW

NOTE: Installation of the project is intended to happen within the year of project designed in UBuilder. If it's past one year please rerun the design or contact Unirac Engineering Services.

#### ENGINEERING REPORT

#### Plan review

TOTAL NUMBER OF MODULES	32
TOTAL NUMBER OF TABLES	1
TOTAL KW	12.64 KW

#### **Loads Used for Design**

BUILDING CODE	ASCE 7-10
BASIC WIND SPEED	110.00 mph
GROUND SNOW LOAD	0.00 pst
RISK CATEGORY	
SEISMIC (SS)	0.099
SEISMIC (S1)	0.055
ELEVATION	81.00 ft
WIND EXPOSURE	C
VELOCITY PRESSURE, QZ	22.31 pst

#### Loads Determined by Zip 32024

CITY, STATE	Lake City, FL
BASIC WIND SPEED	119.00 mph
GROUND SNOW LOAD	0.00 psf

#### Inspection

PRODUCT	ULA
MODULE MANUFACTURER	Canadian Solar
MODEL	32 - CS3N-395MS
MODULE WATTS	395 watts
MODULE LENGTH	76.40"
MODULE WIDTH	41.30"
MODULE THICKNESS	1.38"
MODULE WEIGHT	49.60 lbs
TILT	30 degrees
CLAMP TYPE	Standard
FOUNDATION TYPE	CONCRETE
FRONT EDGE HEIGHT	2.00 ft
RAIL TYPE	GFT
NS DIAGNOL BRACE	YES

## CONTRACTOR



22171 MCH RD MANDEVILLE, LA 70471 PHONE: 9152011490

PROJECT NAME & ADDRESS
TERRY BROOKS

410 SW SWEETBRIAR DR, LAKE CITY, FL 32024

COUNTY:-COLUMBIA COUNTY

### SYSTEM SIZE

DC SIZE: 27.650 KW DC-(STC) AC SIZE: 20.300 KW AC

SHEET TITLE
RESOURCE
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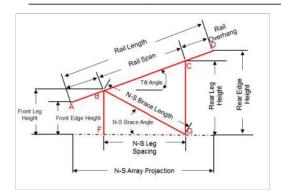
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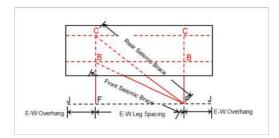
#### Site Area 1 / Table Size 1 (count:1)

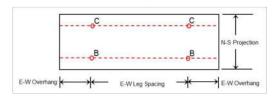
NUMBER OF MODULES:	33
TOTAL KW:	12.64 KV
TABLE SIZE:	4 X i
RAIL USED:	GF
DRIENTATION:	LANDSCAP
SUGGESTED ROW SPACING	112.50

(Not required for design. Calculated based on latitude, tilt, and no module shading between 10am and 2pm on Dec. 21st. Customer is responsible for final row spacing and energy production.)

#### GEOMETRY







### **Member Description**

N-S RAIL LENGTH: AD	168.95"
	100.23
N-S RAIL SPAN: BC	93.86"
N-S RAIL OVERHANG: AB, CD	37.54"
FRONT EDGE HEIGHT	24.00 "
REAR EDGE HEIGHT	108.47 "
FRONT LEG LENGTH: BF	35.08"
REAR LEG LENGTH: CG	82.01"
N-S BRACE LENGTH: BG	83.45"
N-S BRACE ANGLE	23.04 degrees
N-S LEG SPACING: FG	81.29"
E-W ARRAY LENGTH	612.95"
E-W SPAN/LEG SPACING	78.58"
E-W OVERHANG: JF,FJ	31.43"
NUMBER OF POSTS	16

#### LOAD VARIABLES

Dead Loads	psf
VERTICAL	2.20
HORIZONTAL	1.27

Wind Loads on table (Front Post)	psf
LC 0, A	-34.16
LC 0, B	-9.49
LC 180, A	39.85
LC 180, B	49 34

wind Loads on table (Rear Post)	psr
LC 0, A	-34.16
LC 0, B	-47.44
LC 180, A	39.85
LC 180, B	18.98

Seismic Load	%
VERTICAL	2.11
HORIZONTAL	10.98

Snow Load	psf
VERTICAL	0.00
HORIZONTAL	0.00

Snow Load	psf
VERTICAL	0.00
HORIZONTAL	0.00

#### NORTH-SOUTH(N-S) RAIL DESIGN

Maximum Loads	GFT
MAXIMUM VERTICAL LOAD	101.23 plf
MINIMUM VERTICAL LOAD	-83.62 plf
MAXIMUM AXIAL LOAD	4.56 plf
MINIMUM AXIAL LOAD	1.90 plf
MAXIMUM MOMENT VERTICAL	380.15 ft-lbs
MAXIMUM SHEAR	282.80 lbs
MAXIMUM AXIAL (NORTH-SOUTH)	180.87 lbs
MAXIMUM DEFLECTION	0.01"

### CONTRACTOR



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PROJECT NAME & ADDRESS

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**COUNTY:-COLUMBIA COUNTY** 

SYSTEM SIZE

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DRAWN DATE 8/11/2022 DRAWN BY GDT

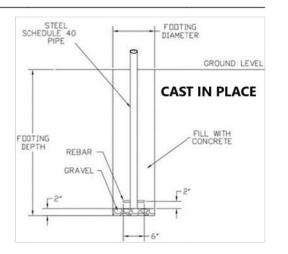
SHEET NUMBER

#### FOUNDATION

Design Inputs	pcf
CONCRETE DENSITY	140.00
SOIL DENSITY	110.00

#### **Concrete Design**

	:
FOOTING DIAMETER	24.00"
FOOTING DEPTH	5.09 ft



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