LANCE RESIDENCE

NEW PHOTOVOLTAIC SYSTEM PROJECT - 18.690 kW DC / 15.960 kW AC

PROJECT INFORMATION

PROPERTY OWNER
NAME: JIM LANCE
PHONE: -

CONTRACTOR
NAME: SANTAN SOLAR
PHONE: -

DESIGN SPECIFICATIONS
OCCUPANCY: R-3
CONSTRUCTION TYPE: SINGLE FAMILY RESIDENCE
ZONING: RESIDENTIAL
GROUND SNOW LOAD: 0 PSF
WIND EXPOSURE: B
WIND SPEED : 120 MPH

APPLICABLE CODES & STANDARDS
RESIDENTIAL: FLORIDA BUILDING CODE, 8TH EDITION 2023 (FBC)
BUILDING: NATIONAL ELECTRICAL CODE, NEC 2020 CODE BOOK, NFPA 70
ELECTRICAL: FLORIDA FIRE PREVENTION CODE, 8TH EDITION 2023 (FFPC)
FIRE: FLORIDA RESIDENTIAL CODE, 8TH EDITION 2023 (FRC)

TYPE OF INTERCONNECTION: LOAD SIDE TAP IN MSP

SCOPE OF WORK
SYSTEM SIZE: STC: 42 X 445W = 18.690kW
PTC: 42 X 409.4W = 17.195kW
(42) URECO FBM445M7G-BB (445W) MODULES
(42) ENPHASE IQ8HC-72-M-US MICROINVERTERS
(1) 100A PV LOAD CENTER
(1) 100A FUSED AC DISCONNECT WITH 90A FUSES

MSP UPGRADE: NO

MAIN BREAKER DERATE: NO

RACKING & MOUNTING

PV ATTACHMENT TYPE: K2 SPLICE FOOT XL #14 FOR METAL ROOF

RACKING TYPE: K2 CROSSRAIL 44-X- ROOF
MOUNT RACKING HARDWARE

VINCENT MWUMVANEZA LICENSE No. 86986 STATE OF FLORIDA PROFESSIONAL ENGINEER
Exp:02/28/2025
STRUCTURAL ONLY

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Vincent Mwumvaneza Digitally signed by Vincent Mwumvaneza Date: 2024.10.22 14:46:28 -04'00'

COORDINATES:
29.924887, -82.713356

AERIAL VIEW

SHEET #	SHEET NAME
T-1	COVER SHEET
T-2	PLAN NOTES
PV-1	SITE PLAN LAYOUT
PV-2	ATTACHMENT DETAILS
PV-3	MOUNTING DETAILS
E-1	ELECTRICAL DIAGRAM
E-1.1	ELECTRICAL CALCULATIONS
E-2	WARNING LABELS
S-1	SPEC SHEET
S-2	SPEC SHEET
S-3	SPEC SHEET
S-4	SPEC SHEET

SanTan Solar

596 E GERMANN RD
#101GILBERT,
AZ 85297
LICENSE TYPE
LICENSE #:
PHONE # +1 (480) 584-4281

DESIGNER: OMA

LANCE RESIDENCE

321 SW WELL ST,
FORT WHITE,
FL 32038

APN:00000014350000
DATE:10/10/2024

SHEET
T-1
COVER SHEET

1.1. PROJECT NOTES:

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

1.3. THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION

1.4. GROUND FAULT DETECTION AND INTERRUPTION (GFDI) DEVICE IS INTEGRATED WITH THE MICROINVERTER IN ACCORDANCE WITH NEC 690.5(A)

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 & NEC 690.60: 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

1.6. MAX DC VOLTAGE CALCULATED USING MANUFACTURER PROVIDED TEMP COEFFICIENT FOR VOC. IF UNAVAILABLE, MAX DC VOLTAGE CALCULATED ACCORDING TO NEC 690.7.

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 (D). SHALL BE INSTALLED ACCORDING TO ANY INSTRUCTIONS FROM LISTING OR LABELING [NEC 110.3].

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.

1.9. SCOPE OF WORK:

1.10. 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-MOUNTED PORTION OF THE PHOTOVOLTAIC SYSTEMS DETAILED IN THIS DOCUMENT.

1.11. WORK INCLUDES:

1.12. PV ROOF ATTACHMENTS - K2 SPLICE FOOT XL #14 FOR METAL ROOF &

1.13. PV RACKING SYSTEM INSTALLATION - K2 CROSSRAIL 44-X ROOF MOUNT RACKING HARDWARE

1.14. PV MODULE AND INVERTER INSTALLATION - URECO FBM445M7G-BB (445W) MODULES /ENPHASE IQ8HC-72-M-US MICROINVERTERS

1.15. PV EQUIPMENT GROUNDING

1.16. PV SYSTEM WIRING TO A ROOF-MOUNTED JUNCTION BOX

1.17. PV LOAD CENTERS (IF INCLUDED)

1.18. PV METERING/MONITORING (IF INCLUDED)

1.19. PV DISCONNECTS

1.20. PV GROUNDING ELECTRODE & BONDING TO (E) GEC

1.21. PV FINAL COMMISSIONING

1.22. (E) ELECTRICAL EQUIPMENT RETROFIT FOR PV

1.23. SIGNAGE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE

1.24. SITE NOTES:

1.25. A LADDER WILL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.

1.26. THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE AND THIS SYSTEM IS A UTILITY INTERACTIVE SYSTEM WITH NO STORAGE BATTERIES.

1.27. THE SOLAR PV INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.

1.28. PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PER SECTION NEC 110.26.

1.29. 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.

1.30. EQUIPMENT LOCATIONS:

1.31. ALL EQUIPMENT SHALL MEET MINIMUM SETBACKS AS REQUIRED BY NEC 110.26.

1.32. WIRING SYSTEMS INSTALLED IN DIRECT SUNLIGHT MUST BE RATED FOR EXPECTED OPERATING TEMPERATURE AS SPECIFIED BY NEC 690.31 (A),(C) AND NEC TABLES 310.15 (B)(2)(A) AND 310.15 (B)(3)(C)

1.33. JUNCTION AND PULL BOXES PERMITTED INSTALLED UNDER PV MODULES ACCORDING TO NEC 690.34.

1.34. ADDITIONAL AC DISCONNECT(S) SHALL BE PROVIDED WHERE THE INVERTER IS NOT WITHIN SIGHT OF THE AC SERVICING DISCONNECT.

1.35. ALL EQUIPMENT SHALL BE INSTALLED ACCESSIBLE TO QUALIFIED PERSONNEL ACCORDING TO NEC APPLICABLE CODES.

1.36. ALL COMPONENTS ARE LISTED FOR THEIR PURPOSE AND RATED FOR OUTDOOR USAGE WHEN APPROPRIATE.

1.37. STRUCTURAL NOTES:

1.38. RACKING SYSTEM

1.39. PV ARRAY WILL BE INSTALLED ACCORDING TO CODE-COMPLIANT INSTALLATION MANUAL. TOP CLAMPS REQUIRE A DESIGNATED SPACE BETWEEN MODULES, AND RAILS MUST ALSO EXTEND

1.40. A MINIMUM DISTANCE BEYOND EITHER EDGE OF THE ARRAY/SUBARRAY, ACCORDING TO RAIL MANUFACTURER'S INSTRUCTIONS.

1.41. JUNCTION BOX WILL BE INSTALLED PER MANUFACTURERS' SPECIFICATIONS. IF ROOF-PENETRATING TYPE, IT SHALL BE FLASHED SEALED PER LOCAL REQUIREMENTS.

1.42. ROOFTOP PENETRATIONS FOR PV RACEWAY WILL BE COMPLETED AND SEALED WITH APPROVED CHEMICAL SEALANT PER CODE BY A LICENSED CONTRACTOR.

1.43. ALL PV RELATED ROOF ATTACHMENTS TO BE SPACED NO GREATER THAN THE SPAN DISTANCE SPECIFIED BY THE RACKING MANUFACTURER.

1.44. WHEN POSSIBLE, ALL PV RELATED RACKING ATTACHMENTS WILL BE STAGGERED AMONGST THE ROOF FRAMING MEMBERS.

1.45. WIRING & CONDUIT NOTES:

1.46. ALL CONDUIT AND WIRE WILL BE LISTED AND APPROVED FOR THEIR PURPOSE. CONDUIT AND WIRE SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING.

1.47. CONDUCTORS SIZED ACCORDING TO NEC 690.8, NEC 690.7.

1.48. VOLTAGE DROP LIMITED TO 2%.

1.49. DC WIRING LIMITED TO MODULE FOOTPRINT. MICROINVERTER WIRING SYSTEMS SHALL BE LOCATED AND SECURED UNDER THE ARRAY WITH SUITABLE WIRING CLIPS.

1.50. AC CONDUCTORS COLORED OR MARKED AS FOLLOWS: PHASE A OR L1- BLACK PHASE B OR L2- RED, OR OTHER CONVENTION IF THREE PHASE PHASE C OR L3- BLUE, 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

1.51. GROUNDING NOTES:

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

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

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

1.55. EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC 690.45 AND MICROINVERTER MANUFACTURER'S INSTRUCTIONS.

1.56. EACH MODULE WILL BE GROUNDED USING WEEB GROUNDING CLIPS AS SHOWN IN MANUFACTURER DOCUMENTATION 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.

1.57. THE GROUNDING CONNECTION TO A MODULE SHALL BE ARRANGED SUCH THAT THE REMOVAL OF A MODULE DOES NOT INTERRUPT A GROUNDING CONDUCTOR TO ANOTHER MODULE.

1.58. GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLORED GREEN OR MARKED GREEN IF #4 AWG OR LARGER [NEC 250.119]

1.59. 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.

1.60. GROUND-FAULT DETECTION SHALL COMPLY WITH NEC 690.5 IN GENERAL AND NEC 690.5 (A)(1) SPECIFICALLY.

1.61. DISCONNECTION AND OVER-CURRENT PROTECTION NOTES:

1.62. DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING ENERGIZED ARE CONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS).

1.63. DISCONNECTS TO BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH

1.64. RAPID SHUTDOWN OF ENERGIZED CONDUCTORS BEYOND 10 FT OF PV ARRAY OR 5 FT INSIDE A BUILDING WITHIN 10 SECONDS. CONTROLLED CONDUCTORS ≤30V AND ≤240VA [NEC 690.12]. LOCATION OF LABEL ACCORDING TO AHJ

1.65. ALL OCPD RATINGS AND TYPES SPECIFIED ACCORDING TO NEC 690.8, 690.9, AND 240.

1.66. MICROINVERTER BRANCHES CONNECTED TO A SINGLE BREAKER OR GROUPED FUSES IN ACCORDANCE WITH NEC 110.3(B).

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

1.68. INTERCONNECTION NOTES:

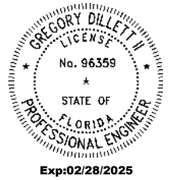
1.69. THE SUM OF THE UTILITY OCPD AND INVERTER CONTINUOUS INPUT MAY NOT EXCEED 120% OF BUSBAR RATING.

1.70. WHEN SUM OF THE PV SOURCES EQUALS >100% OF BUSBAR RATING, PV DEDICATED BACKFEED BREAKERS MUST BE LOCATED OPPOSITE END OF THE BUS FROM THE UTILITY SOURCE OCPD.

1.71. AT MULTIPLE PV OUTPUT COMBINER PANEL, TOTAL RATING OF ALL OVERCURRENT DEVICES SHALL NOT EXCEED AMPACITY OF BUSBAR. HOWEVER, THE COMBINED OVERCURRENT DEVICE MAY BE EXCLUDED.

1.72. SUPPLY SIDE TAP INTERCONNECTION SHOULD BE WITH SERVICE ENTRANCE CONDUCTORS.

1.73. BACKFEEDING BREAKER FOR UTILITY-INTERACTIVE INVERTER OUTPUT IS EXEMPT FROM ADDITIONAL FASTENING



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596 E GERMANN RD
#101GILBERT,
AZ 85297
LICENSE TYPE
LICENSE #:
PHONE # +1 (480) 584-4281

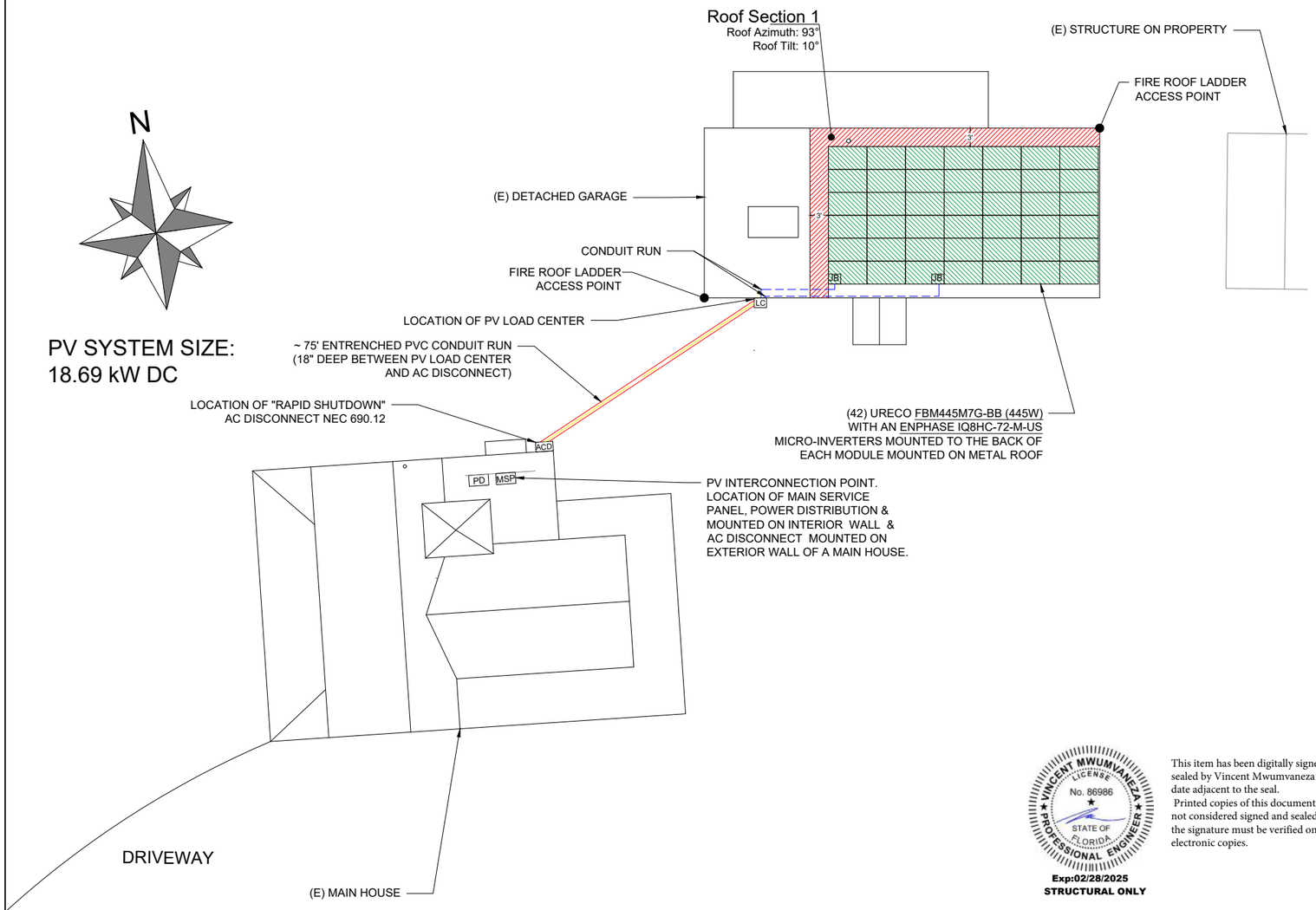
DESIGNER: OMA

LANCE RESIDENCE

321 SW WELL ST,
FORT WHITE,
FL 32038

APN:00000014350000
DATE:10/10/2024

SHEET
T-2
PLAN NOTES



CONSTRUCTION NOTES

1. SOLAR PHOTOVOLTAIC SYSTEM TO BE INSTALLED ON RESIDENTIAL STRUCTURE.
2. THIS PROJECT HAS BEEN DESIGNED IN COMPLIANCE WITH THE IBC SECTION 1609 TO WITHSTAND A BASIC WIND SPEED OF 120 MPH MPH (3 SECOND GUST), WIND EXPOSURE B.
3. THE ROOF MEMBERS ARE 2 "X 6" RAFTERS AT 24" ON CENTER. CONNECTION TO STRUCTURE SHALL NOT BE WITHIN 11" OF NAILING PLATES.
4. THE SOLAR PHOTOVOLTAIC INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
5. ALL CONDUCTORS AND CONDUITS MOUNTED ON ROOF SHALL BE MINIMUM 7/8" ABOVE ROOF SURFACE (INCLUDING CABLES UNDERNEATH MODULES AND RACKING).
6. ROOF ACCESS POINTS SHALL BE PROVIDED PER THE FOLLOWING
   - 6.1. LOCATED IN AREAS NOT REQUIRING PLACEMENT OF GROUND LADDERS OVER OPENINGS SUCH AS DOORS OR WINDOWS.
   - 6.2. LOCATED AT STRONG POINTS OF CONSTRUCTION IN LOCATIONS WHERE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS: TREES, WIRES, OR SIGNS.
7. SETBACKS AT RIDGES CAN BE REDUCED TO 18 INCHES IN COMPLIANCE WITH 2023 FFPC/2021 IFC 1204.2.1.2 TOTAL PLAN VIEW AREA = 2217 SQFT TOTAL PV AREA = 42(75.12 IN)(44.65 IN)/(144 IN^2) = 978.28 SQFT (978.28 SQFT/ 2217 SQFT)100 = 44.13% TOTAL PV AREA POPULATES 44.13% OF TOTAL PLAN VIEW AREA AND IS NOT WITHIN THE 33% REQUIREMENT.

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LEGEND	
	NEW SOLAR PANELS
UM	UTILITY METER
MSP	MAIN SERVICE PANEL
PD	POWER DISTRIBUTION
LC	PV LOAD CENTER
ACD	AC DISCONNECT

321 SW WELL ST

PV SYSTEM SITE PLAN

SCALE: 3/64" = 1'-0"

SanTan Solar

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FL 32038

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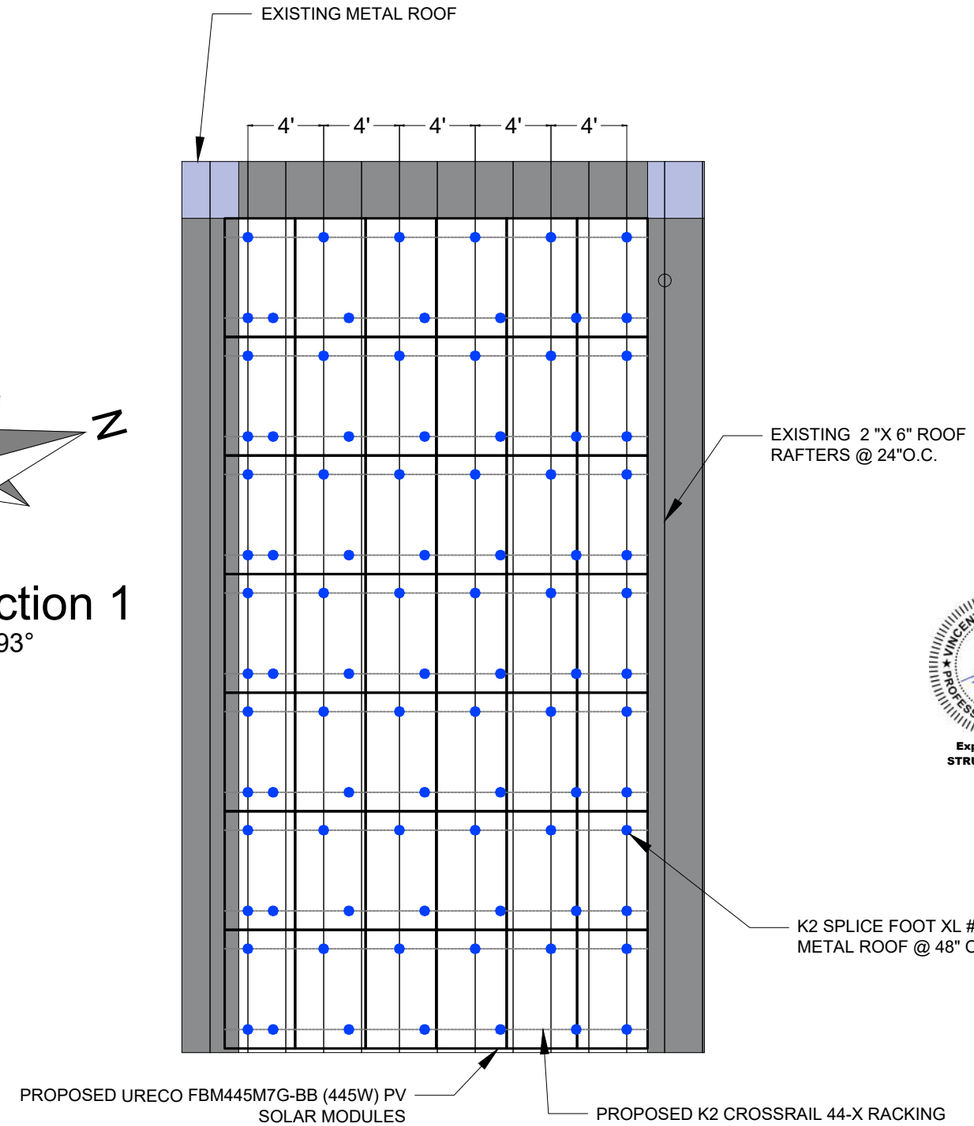
SHEET
PV-1
SITE PLAN LAYOUT

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:
EXPOSURE CATEGORY: B
RISK CATEGORY: II
MEAN ROOF HEIGHT: 15FT
ROOF SLOPE: 7°-20°



N

Roof Section 1

Roof Azimuth: 93°
Roof Tilt: 10°

LEGENDS

- WIND ZONE 1
- WIND ZONE 2
- WIND ZONE 3

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PV SYSTEM MOUNTING DETAILS

SCALE: 1/8" = 1'-0"

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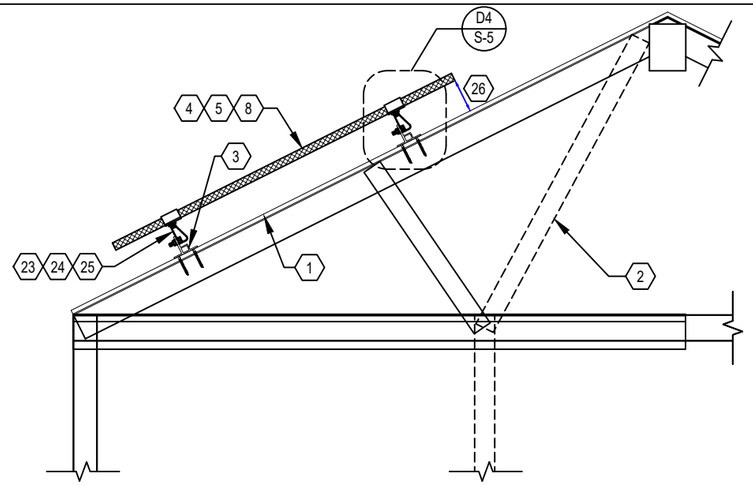
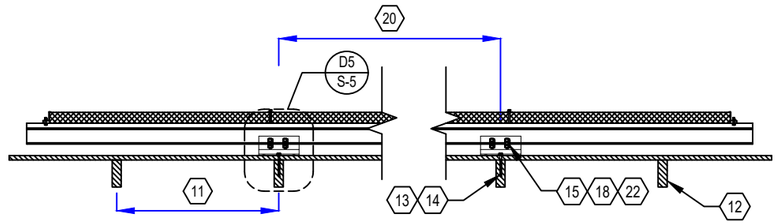
SHEET
PV-2
ATTACHMENT DETAILS



D1 RACKING DETAIL (TRANSVERSE)

NOT TO SCALE



D2 RACKING DETAIL (LONGITUDINAL)

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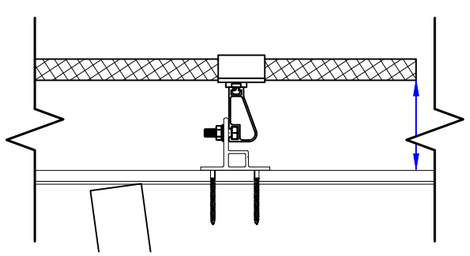
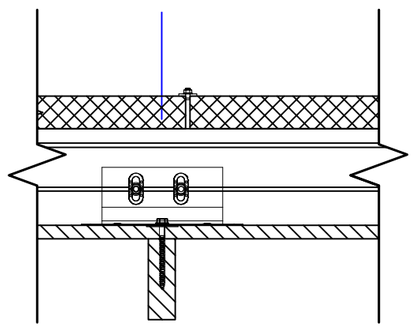
1. ROOF MATERIAL: METAL ROOF
2. ROOF STRUCTURE: RAFTERS
3. ATTACHMENT TYPE: K2 SPLICE FOOT XL #14
4. MODULE MANUFACTURER: URECO
5. MODULE MODEL: FBM445M7G-BB (445W)
6. MODULE LENGTH: 75.12"
7. MODULE WIDTH: 44.65"
8. MODULE WEIGHT: 53.35 LBS.
9. SEE SHEET S-1 FOR DIMENSION(S)
10. MIN. FIRE OFFSET: 18"
11. RAFTERS SPACING: 24" O.C.
12. RAFTERS SIZE: 2 "X 6" NOMINAL
13. LAG BOLT DIAMETER: 5/16 IN.
14. LAG BOLT EMBEDMENT: 2.5 IN.
15. TOTAL # OF ATTACHMENTS: 91
16. TOTAL AREA: 978.28 SQ. FT.
17. TOTAL WEIGHT: 2240.70 LBS.
18. WEIGHT PER ATTACHMENT: 24.62 LBS.
19. DISTRIBUTED LOAD: 2.29 PSF
20. MAX. HORIZONTAL STANDOFF: 48 IN.
21. MAX. VERTICAL STANDOFF:
    LANDSCAPE: 26 IN., PORTRAIT: 51 IN.
22. STANDOFF STAGGERING: YES
23. RAIL MANUFACTURER AND MODEL
    (OR EQUIV.):K2 CROSSRAIL 44-X
24. RAIL WEIGHT: 0.436 PLF.
25. MAX. RAFTERS SPAN: 12 FT.
26. MODULE CLEARANCE: 3 IN. MIN., 6 IN. MAX.



D4 DETAIL (TRANSVERSE)

NOT TO SCALE



D5 DETAIL (LONGITUDINAL)

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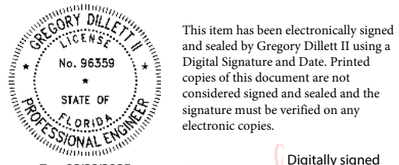
SHEET
PV-3
MOUNTING DETAILS



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Gregory M Dillett

Digitally signed by Gregory M Dillett
Date: 2024.10.22 14:46:53 -04'00'

METER # 326051410
MAIN SERVICE PANEL
LOAD SIDE TAP
NEC 705. 12(B)(2) LOAD SIDE.
POWER PRODUCTION SOURCES

(N) 42 URECO FBM445M7G-BB (445W) MODULES
WITH AN ENPHASE IQ8HC-72-M-US MICRO-INVERTER
ATTACHED TO THE BACK OF EVERY MODULE.

PV CIRCUIT 5: 8 MODULES/PARALLEL

PV CIRCUIT 4: 8 MODULES/PARALLEL

PV CIRCUIT 3: 8 MODULES/PARALLEL

PV CIRCUIT 2: 9 MODULES/PARALLEL

PV CIRCUIT 1: 9 MODULES/PARALLEL

1A

1A

1

1

1

(N) JUNCTION BOX-2
WITH IRREVERSIBLE
GROUND SPLICE

GROUND LEVEL - HOUSE EXTERIOR ROOF TOP

2A

(N) JUNCTION BOX-1
WITH IRREVERSIBLE
GROUND SPLICE

2

(N) ENPHASE IQ
COMMERCIAL ENVOY
COMMUNICATIONS
GATEWAY

2B

(N) 125A PV LOAD
CENTER

15A
20A
20A
20A
20A
20A
20A

(N) ~75' TRENCHING

90A

3
4
3
3

(N) 100A FUSED AC
DISCONNECT

LOAD-SIDE
SOLAR TAP
NEC 705. 12(B)(2)

**POINT OF
DELIVERY AND
INTERCONNECTION**

M

EXISTING WIRES

EXISTING
240V/400A
DISTRIBUTION BOX
SINGLE PHASE

400A

TO E LOADS

(E) GROUNDING
ELECTRODE OR
(UFER)

EXISTING WIRES

200A

EXISTING
240V/200A
MAIN SERVICE PANEL
SINGLE PHASE

NOTE: IN BETWEEN EACH ARRAY THE EMT IS USED AS THE GROUNDING / BONDING, GROUND CLAMPS ARE AT EACH END OF THE EMT CONDUIT WITH THE WIRE THEN FREE AIR'D TO THE GROUND CLAMP ON THE RACKING RAIL

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SHEET
E-1
ELECTRICAL DIAGRAM

PV Module Ratings @ STC

Module Make/Model	URECO FBM445M7G-BB (445W)
Max Power-Point Current (Imp)	12.79A
Max Power-Point Voltage (Vmp)	34.80V
Open-Circuit Voltage (Voc)	41.90V
Short-Circuit Current (Isc)	13.48A
Max Series Fuse (OCPD)	30A
Nominal Maximum Power at STC (Pmax)	445W
Maximum System Voltage	1000V
Voc Temperature Coefficient	-0.27%/°C

SYSTEM SUMMARY

	BRANCH #1	BRANCH #2	BRANCH #3	BRANCH #4	BRANCH #5
INVERTERS PER BRANCH	9	9	8	8	8
MAX AC CURRENT	14.22A	14.22A	12.64A	12.64A	12.64A
MAX AC OUTPUT POWER	3420W	3420W	3040W	3040W	3040W
ARRAY STC POWER	18690W				
ARRAY PTC POWER	17195W				
MAX AC CURRENT	66.36A				
MAX AC POWER	15960W				
DERATED (CEC) AC POWER	16679W				

Inverter Ratings

Inverter Make/Model	ENPHASE IQ8HC-72-M-US
Max DC Volt Rating	60V
Continous Output Power	380W
Max Nominal Voltage	240V
Max AC Current	1.58A
Max OCPD Rating	20A

DESIGN TEMPERATURES

ASHRAE EXTREME LOW	-4°C
ASHRAE 2% HIGH	40°C

Conduit and Conductor Schedule

Tag	Description	Wire Gauge	# of Conductors	Conduit Type	Conduit Size
1	Enphase Q cable - THWN-2	10 AWG	3	N/A - Free Air	N/A - Free Air
1	Bare Copper Ground (EGC/GEC)	6 AWG	1	N/A - Free Air	N/A - Free Air
1A	Enphase Q cable - THWN-2	10 AWG	2	N/A - Free Air	N/A - Free Air
1A	Bare Copper Ground (EGC/GEC)	6 AWG	1	N/A - Free Air	N/A - Free Air
2	THWN-2	10 AWG	6	EMT	3/4"
2	THWN-2 - Ground	10 AWG	1	EMT	3/4"
2A	THWN-2	10 AWG	4	EMT	3/4"
2A	THWN-2	10 AWG	1	EMT	3/4"
2B	THWN-2	10 AWG	3	N/A - Free Air	N/A - Free Air
3	THWN-2	3 AWG	3	EMT	1-1/4"
3	THWN-2 - Ground	8 AWG	1	EMT	1-1/4"
4	THWN-2	3 AWG	3	PVC	1-1/4"
4	THWN-2 - Ground	8 AWG	1	PVC	1-1/4"

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Exp:02/28/2025

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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 THWN-2	PV LOAD CENTER TO AC DISCONNECT	75	66.36	0.245	240	1.016

SanTan Solar

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LICENSE TYPE
LICENSE #:
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DESIGNER: OMA

LANCE RESIDENCE

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FL 32038

APN:00000014350000
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SHEET
E-1.1
ELECTRICAL CALCULATIONS

⚠ WARNING

ELECTRIC SHOCK HAZARD

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

PHOTOVOLTAIC MODULES PRODUCE DC VOLTAGE WHENEVER THEY ARE EXPOSED TO SUNLIGHT

LABEL LOCATION:
INVERTER(S), AC DISCONNECT(S), AC COMBINER PANEL (IF APPLICABLE).
PER CODE(S): NEC 2020: 690.13(B)

⚠ WARNING

PHOTOVOLTAIC SYSTEM COMBINER PANEL

DO NOT ADD LOADS

LABEL LOCATION:
PHOTOVOLTAIC AC COMBINER (IF APPLICABLE).
PER CODE(S): NEC 2020:705.12(B)(3)(3)

PHOTOVOLTAIC SYSTEM
⚠ AC DISCONNECT ⚠

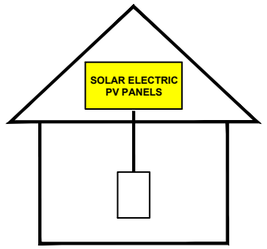
OPERATING VOLTAGE: 240 VOLTS

OPERATING CURRENT: 66.36 AMPS

LABEL LOCATION:
AC DISCONNECT(S), PHOTOVOLTAIC SYSTEM POINT OF INTERCONNECTION.
PER CODE(S): NEC 2020: 690.54

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.



LABEL LOCATION:
ON OR NO MORE THAT 3 M (10 FT) FROM THE SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED.

⚠ WARNING

POWER SOURCE OUTPUT CONNECTION

DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
ADJACENT TO PV BREAKER (IF APPLICABLE).
PER CODE(S): , NEC 2020: 705.12(B)(3)(2)

⚠ WARNING

DUAL POWER SUPPLY

SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM

FCDLABLES.COM 02-023

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

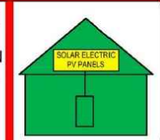
LABEL LOCATION:
UTILITY SERVICE ENTRANCE/METER, INVERTER/DC DISCONNECT IF REQUIRED BY LOCAL AHJ, OR OTHER LOCATIONS AS REQUIRED BY LOCAL AHJ.
PER CODE(S): NEC 2020: 690.56(C)(2)

⚠ WARNING

THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE, SHALL NOT EXCEED AMPACITY OF BUSBAR.

EMERGENCY RESPONDER
THIS SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN

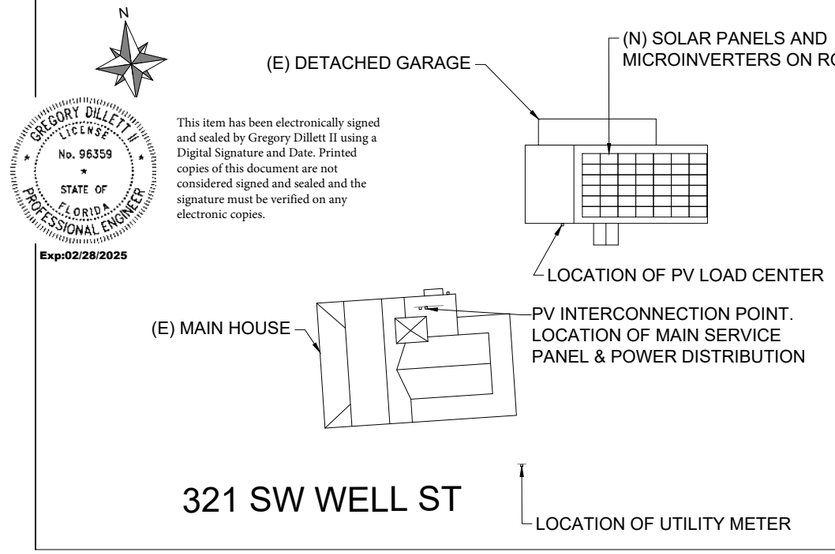
TURN RAPID SHUTDOWN SWITCH TO THE 'OFF' POSITION TO SHUT DOWN THE ENTIRE PV SYSTEM.



NEC690.56(C)(1) AND NFPA 111.12.2.1.1.1.1,11.12.2.1.4

CAUTION:

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



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CAUTION
SOLAR CIRCUIT ⚠

PERMANENT SIGNAGE NOTES:

1. NOT ALL PLACARDS SHOWN MAY BE REQUIRED BY LOCAL AHJ. CONTRACTOR TO VERIFY PLACARD REQUIREMENTS WITH LOCAL AHJ BEFORE INSTALLATION.
2. ALL PLAQUES AND SIGNAGE REQUIRED BY THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE
3. ALTERNATE POWER SOURCE PLACARD SHALL BE METALLIC OR PLASTIC, ENGRAVED OR MACHINE PRINTED LETTERS IN A CONTRASTING COLOR TO THE PLAQUE. THIS PLAQUE WILL BE ATTCHED BY POP RIVETS OR SCREWS OR OTHER APPROVED METHOD.
4. DIRECTORY PLACARD MARKING CONTENT AND FORMAT: RED BACKGROUND, WHITE LETTERING, MINIMUM 3/8" LETTER HIEGHT, ALL CAPITAL LETTERS, ARIAL OR SIMILAR FONT, NON BOLD, REFLECTIVE WEATHER RESISTANT MATERIAL SUITABLE FOR THE ENVIRONMENT.

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E-2
WARNING LABELS

URE
UNITED RENEWABLE ENERGY

FBM445M7G-BB / 120 cells
445 Watt Mono-Crystalline PV Module

UL 61730, CE-compliant
Quality Controlled PV-TÜV
SUD IEC 61215:2016,
IEC 61730:2016
Type 1/Class C Fire Rating

URE modules use state-of-the-art cell cutting technology, and advanced module manufacturing experience to provide leading power density and long term reliability.

Key Features

- At 445 Watts and 20.57% Efficiency URE Solar Panels are Industry Leaders in Output and Efficiency
- 25 Year Output Warranty and 25 Year Product Guarantee
- Super All Black Design with more Uniform Appearance for High Profile Residential Installations
- High Quality Solar Cell Technology allows URE to be a major international exporter to Solar Module manufacturers in the United States and Europe
- Excellent Performance in Low Light and Poor Weather Conditions to Maximize Energy Harvest
- Winner of Taiwan Excellence Award 7 Consecutive Years for Highest Efficiency Module

THE IDEAL SOLUTION FOR:

- Rooftop arrays on residential buildings
- Residential ground mount arrays

UNITED RENEWABLE ENERGY
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URE
UNITED RENEWABLE ENERGY

Electrical Data

Model - STC		FBM440M7G-BB	FBM445M7G-BB	FBM450M7G-BB	FBM455M7G-BB
Maximum Rating Power (Pmax)	[W]	440	445	450	455
Module Efficiency	[%]	20.34	20.57	20.80	21.03
Open Circuit Voltage (Voc)	[V]	41.70	41.90	42.10	42.30
Maximum Power Voltage	[V]	34.60	34.80	35.00	35.20
Short Circuit Current (Isc)	[A]	13.41	13.48	13.56	13.63
Maximum Power Current	[A]	12.72	12.79	12.86	12.93

*Standard Test Condition (STC): Cell Temperature 25 °C, Irradiance 1000 W/m², AM 1.5
*Values without tolerance are typical numbers.Measurement tolerance: ± 3%

Mechanical Data

Item	Specification
Dimensions	1908 mm (L)[1] x 1134 mm (W)[1] x 35 mm (D)[2] / 75.12" (L)[1] x 44.65" (W)[1] x 1.38" (D)[2]
Weight	24.2 kg / 53.35 lbs
Solar Cell	12x10 pieces monocrystalline solar cells series strings
Front Glass	White toughened safety glass, 3.2mm thickness
Cell Encapsulation	EVA (Ethylene-Viny-Acetate)
Back Cover	Black composite film
Frame	Black anodized aluminum profile
Junction Box	IP 68, 3 diodes
Connectors Type	Staubli MC4
Cable	1200mm (cable length can be customized), 4mm²
Package Configuration	31 pcs Per Pallet, 744 pcs per 40' HQ container

[1] : With assembly tolerance of ± 2 mm [± 0.08 "]
[2] : With assembly tolerance of ± 0.8 mm [± 0.03 "]

Operating Conditions

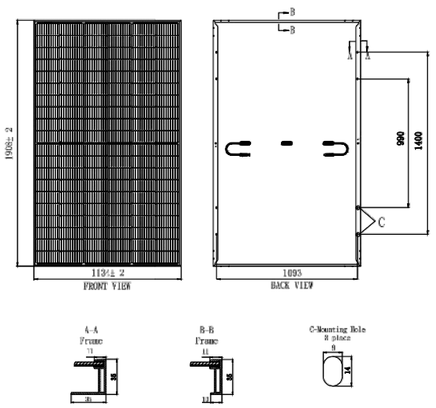
Item	Specification
Mechanical Load	5400 Pa
Maximum System Voltage	1000V
Series Fuse Rating	30 A
Operating Temperature	-40 to 85 °C

Temperature Characteristics

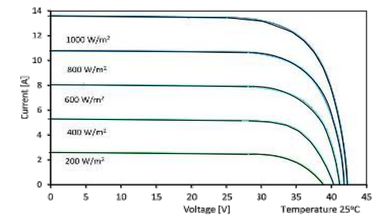
Item	Specification
Nominal Module Operating Temperature	45°C ± 2°C
Temperature Coefficient of Isc	0.048 % / °C
Temperature Coefficient of Voc	-0.27 % / °C
Temperature Coefficient of Pmax	-0.33 % / °C

*Nominal module operating temperature (NMOT): Air mass AM 1.5, irradiance 800W/m², temperature 20°C, windspeed 1 m/s.
*Reduction in efficiency from 1000W/m² to 200W/m² at 25°C: 3.5 ± 2%.

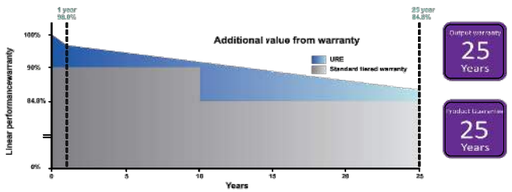
Engineering Drawing (mm)



Dependence on Irradiance



Reliability with Warranty



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S-1
SPEC SHEET

ENPHASE.

DATA SHEET

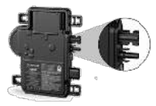
IQ8HC Microinverter

Our newest IQ8 Series 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 55-nm technology with high-speed digital logic and has superfast 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 IQ Battery, IQ Gateway, and the Enphase App monitoring and analysis software.

Enphase 25 year limited warranty

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



Connect PV modules quickly and easily to the IQ8 Series Microinverters that have integrated MC4 connectors.

CERTIFIED SAFETY

IQ8 Series Microinverters are UL Listed as PV rapid shutdown equipment and conform with various regulations when installed according to the manufacturer's instructions.

*Meets UL 1741 only when installed with IQ System Controller 2 or 3.

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Easy to install

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

High productivity and reliability

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

Microgrid-forming

- Complies with the latest advanced grid support
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) and IEEE 1547:2018 (UL 1741-SB)

NOTE:

- IQ8 Series Microinverters cannot be mixed together with previous generations of Enphase microinverters (IQ7 Series, IQ6 Series, and so on) in the same system.
- IQ Microinverters ship with default settings that meet North America's IEEE 1547 interconnection standard requirements. Region-specific adjustments may be requested by an Authority Having Jurisdiction (AHJ) or utility representative, according to the IEEE 1547 interconnection standard. An IQ Gateway is required to make these changes during installation.

IQ8HC Microinverter

INPUT DATA (DC)	UNITS	IQ8HC-72-M-US/IQ8HC-72-M-DOM-US[1]
Commonly used module pairings [2]	W	320–540
Module compatibility	–	To meet compatibility, PV modules must be within the maximum input DC voltage and maximum module I_{sc} listed below. Module compatibility can be checked at https://enphase.com/installers/microinverters/calculator.
MPPT voltage range	V	29.5–45
Operating range	V	18–58
Minimum/Maximum start voltage	V	22/58
Maximum input DC voltage	V	60
Maximum continuous operating DC current	A	14
Maximum input DC short-circuit current	A	25
Maximum module I_{sc}	A	20
Overvoltage class DC port	–	II
DC port backfeed current	mA	0
PV array configuration	–	Ungrounded array; no additional DC side protection required; AC side protection requires max. 20 A per branch circuit

OUTPUT DATA (AC)	UNITS	IQ8HC-72-M-US @240 VAC IQ8HC-72-M-DOM-US @240 VAC	IQ8HC-72-M-US @208 VAC IQ8HC-72-M-DOM-US @ 208 VAC
Peak output power	VA	384	366
Maximum continuous output power	VA	380	360
Nominal grid voltage (L-L)	V	240, split-phase (L-L), 180°	208, single-phase (L-L), 120°
Minimum and maximum grid voltage [3]	V	211-264	183-229
Maximum continuous output current	A	1.58	1.73
Nominal frequency	Hz	60	
Extended frequency range	Hz	47-68	
AC short-circuit fault current over three cycles	A_{rms}	2.70	
Maximum units per 20 A (L-L) branch circuit [4]	–	10	9
Total harmonic distortion	%	<5	
Overvoltage class AC port	–	III	
AC port backfeed current	mA	18	
Power factor setting	–	1.0	
Grid-tied power factor (adjustable)	–	0.85 leading ... 0.85 lagging	
Peak efficiency	%	97.3	97.2
CEC weighted efficiency	%	97.0	96.5
Nighttime power consumption	mW	22	26
MECHANICAL DATA			
Ambient temperature range	°C (°F)	-40 to 65 (-40 to 149)	
Relative humidity range	%	4 to 100 (condensing)	
DC connector type	–	Stäubli MC4	
Dimensions (H × W × D); Weight	mm (in); kg (lb)	212 (8.3) × 175 (6.9) × 30.2 (12); 1.1 (2.43)	
Cooling	–	Natural convection – no fans	
Approved for wet locations; Pollution degree	–	Yes; PD3	
Enclosure	–	Class II double-insulated, corrosion-resistant polymeric enclosure	
Environmental category; UV exposure rating	–	NEMA Type 6; outdoor	

[1] IQ8HC-72-M-DOM-US is undergoing compliance, and the specs are preliminary. This SKU is made in the USA, and the PCBA, Electrical Parts, and Enclosure are domestically manufactured to meet the requirements of eligibility to be considered for the ITC domestic content bonus adder.
[2] No enforced DC/AC ratio.
[3] Nominal voltage range can be extended beyond nominal if required by the utility.
[4] Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

IQ8HC-MC4-DSH-00047-5.0-EN-US-2024-07-19

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SHEET
S-2
SPEC SHEET

CONNECTING STRENGTH

CROSSRAIL 44-X

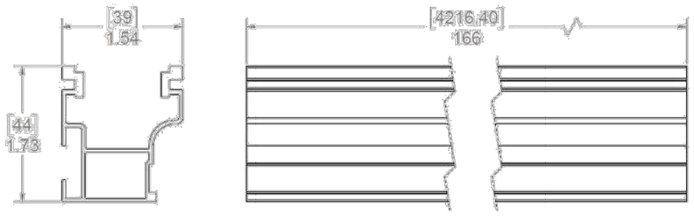
Mechanical Properties

	CrossRail 44-X
Material	6000 Series Aluminum
Ultimate Tensile Strength	37.7 ksi (260 MPa)
Yield Strength	34.8 ksi (240 MPa)
Weight	0.47 lbs/ft (0.699 kg/m)
Finish	Mill or Dark Anodized

Sectional Properties

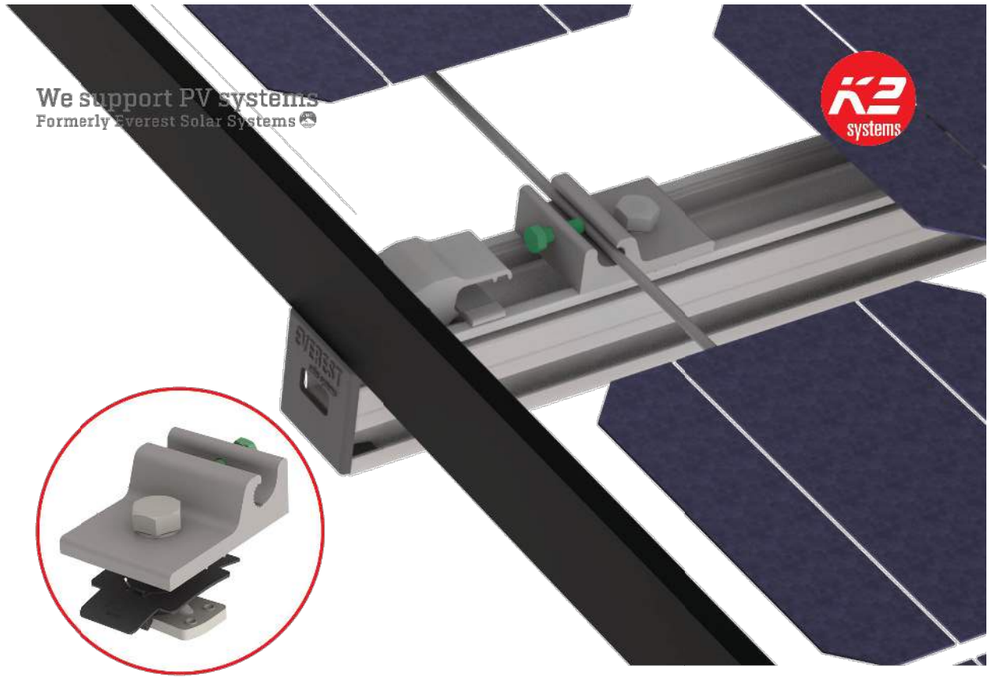
	CrossRail 44-X
Sx	0.1490 in3 (0.3785 cm3)
Sy	0.1450 in3 (0.3683 cm3)
A (X-Section)	0.4050 in2 (1.0287 cm2

Units: [mm] in



Notes:

- Structural values and span charts determined in accordance with Aluminum Design Manual and ASCE 7-16
- UL2703 Listed System for Fire and Bonding



Everest Ground Lug

PRODUCT SHEET

Part Number	Description
4000006-H	Everest Ground Lug Set, 13mm Hex

- Top mount configuration
- No copper wire bending makes for simple installation
- MK3 technology provides highest rail engagement
- UL 2703 Listed
- Compatible with 8AWG and 6AWG solid copper wire
- Works with all CrossRail profiles.

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S-3
SPEC SHEET

Splice Foot XL #14 Kit

DATA SHEET

PRODUCT FEATURES

/ All-in-one mount and splice foot

/ K2 EverSeal technology

/ Available in mill and dark

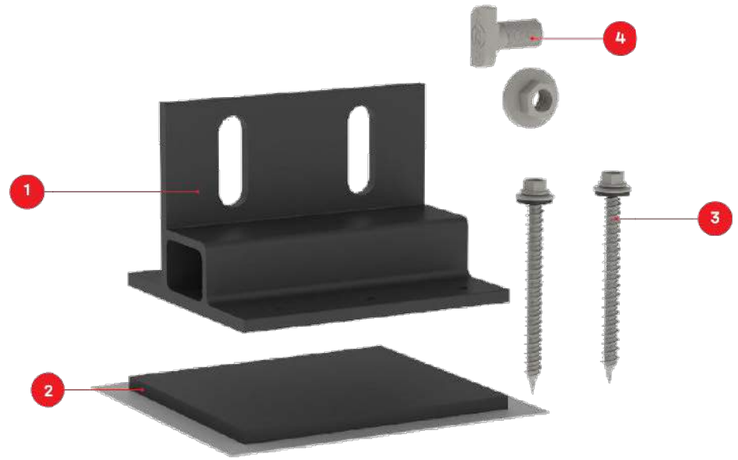
/ 30+ years of proven water sealing technology on asphalt

/ Optimized for CrossRail systems and components

/ No L-Foot needed

/ T-Bolt hardware included

TECHNICAL DATA



Splice Foot XL

Item Number	Description	Part Number
1	Splice Foot XL	4000165 | Splice Foot XL #14 Kit, Dark 4000300 | Splice Foot XL #14 Kit, Mill
2	K2 EverSeal	
3	#14 × 3in x 5/16in Hex Head Screw	
4	T-Bolt & Hex Nut Set	

	Splice Foot XL
Roof Type	Composition shingle, EPDM, TPO, Bitumen, Asphalt
Material	Aluminum with stainless steel hardware
Finish	Mill
Roof Connection	#14 × 3in x 5/16in Hex Head Screw
Code Compliance	UL 2703
Compatibility	CrossRail 44-X, 48-X, 48-XL, 80

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