

PHOTOVOLTAIC ROOF MOUNT SYSTEM

17 MODULES-ROOF MOUNTED - 6.715 KW DC, 4.930 KW AC

373 CHINABERRY LN, ANGIER, NC 27501



TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	04/11/2023	



Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
North Carolina COA # P-2308
Signed 4/11/2023

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MARY BOLIN
RESIDENCE
373 CHINABERRY LN,
ANGIER, NC 27501

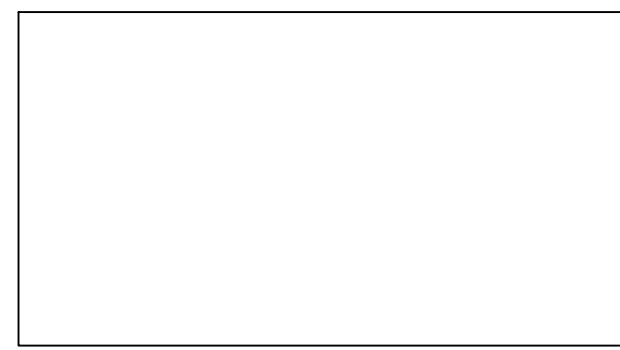
PROJECT DATA

PROJECT ADDRESS: 373 CHINABERRY LN, ANGIER, NC 27501
OWNER: MARY BOLIN
DESIGNER: ESR
SCOPE: 6.715 KW DC ROOF MOUNT SOLAR PV SYSTEM WITH 17 MISSION SOLAR: MSE395SX9R 395W PV MODULES WITH 17 ENPHASE IQ8PLUS-72-2-US 290W MICRO INVERTERS EQUIPPED WITH RAPID SHUTDOWN
01 ENPHASE IQ 3T BATTERY
AUTHORITIES HAVING JURISDICTION: BUILDING: HARNETT COUNTY
ZONING: HARNETT COUNTY
UTILITY: DUKE ENERGY PROGRESS

SHEET INDEX

- PV-1 COVER SHEET
- PV-2 SITE PLAN
- PV-3 ROOF PLAN & MODULES
- PV-4 ELECTRICAL PLAN
- PV-5 STRUCTURAL DETAIL
- PV-6 ELECTRICAL LINE DIAGRAM
- PV-7 WIRING CALCULATIONS
- PV-8 LABELS
- PV-9 PLACARD
- PV-10+ EQUIPMENT SPECIFICATIONS

SIGNATURE



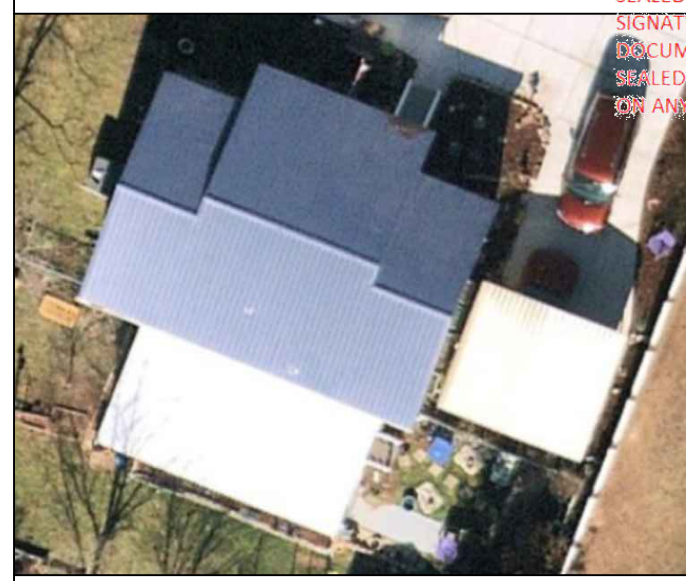
GENERAL NOTES

1. ALL COMPONENTS ARE UL LISTED AND CEC CERTIFIED, WHERE WARRANTED.
2. THE SOLAR PV SYSTEM WILL BE INSTALLED IN ACCORDANCE WITH ARTICLE 690 OF THE NEC 2017.
3. THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION.
4. ALL CONDUCTORS OF A CIRCUIT, INCLUDING THE EGC, MUST BE INSTALLED IN THE SAME RACEWAY, OR CABLE, OR OTHERWISE RUN WITH THE PV ARRAY CIRCUIT CONDUCTORS WHEN THEY LEAVE THE VICINITY OF THE PV ARRAY.
5. WHERE METALLIC CONDUIT CONTAINING DC CONDUCTORS IS USED INSIDE THE BUILDING, IT SHALL BE IDENTIFIED AS "CAUTION: SOLAR CIRCUIT" EVERY 10FT.
6. HEIGHT OF THE AC DISCONNECT SHALL NOT EXCEED 6'-7" PER NEC CODE 240.24.
7. A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH CEC 690.47 AND 250.50 THROUGH 60 AND 250-166 SHALL BE PROVIDED. PER NEC GROUNDING ELECTRODE SYSTEM OF EXISTING BUILDING MAY BE USED AND BONDED TO THE SERVICE ENTRANCE. IF EXISTING SYSTEM IS INACCESSIBLE OR INADEQUATE A SUPPLEMENTAL GROUNDING ELECTRODE WILL BE USED AT THE INVERTER LOCATION CONSISTING OF A UL LISTED 8 FT. GROUND ROD WITH ACORN CLAMP. GROUNDING ELECTRODE CONDUCTORS SHALL BE NO LESS THAN #8 AWG AND NO LARGER THAN #6 AWG COPPER AND BONDED TO THE EXISTING GROUNDING ELECTRODE TO PROVIDE FOR A COMPLETE SYSTEM.
8. PHOTOVOLTAIC MODULES ARE TO BE CONSIDERED NON-COMBUSTIBLE.
9. PHOTOVOLTAIC INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
10. ALL WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNED AND LISTED FOR SUCH USE. WIRING MUST BE PERMANENTLY AND COMPLETELY HELD OFF THE ROOF SURFACE.
11. ALL SINAGE TO BE PLACED IN ACCORDANCE WITH THE LOCAL BUILDING CODE. IF EXPOSED TO SUNLIGHT, IT SHALL BE UV RESISTANT. ALL PLAQUES AND SINAGE WILL BE INSTALLED AS REQUIRED BY THE NEC AND AHJ.
12. INVERTER(S) USED IN UNGROUNDED SYSTEM SHALL BE UL 1741 LISTED.
13. THE INSTALLATION OF EQUIPMENT AND ALL ASSOCIATED WIRING AND INTERCONNECTION SHALL BE PERFORMED ONLY BY QUALIFIED PERSONS [NEC 690.4(C)]
14. ALL OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED (OR BETTER), INCLUDING ALL ROOF MOUNTED TRANSITION BOXES AND SWITCHES.
15. ALL EQUIPMENT SHALL BE PROPERLY GROUNDED AND BONDED IN ACCORDANCE WITH NEC ARTICLE 250.
16. SYSTEM GROUNDING SHALL BE IN ACCORDANCE WITH NEC 690.41.
17. PV SYSTEM CIRCUITS INSTALLED ON OR IN BUILDINGS SHALL INCLUDE A RAPID SHUTDOWN FUNCTION IN ACCORDANCE WITH NEC 690.12
18. DISCONNECTING MEANS SHALL BE LOCATED IN A VISIBLE, READILY ACCESSIBLE LOCATION WITHIN THE PV SYSTEM EQUIPMENT OR A MAXIMUM OF 10 FEET AWAY FROM THE SYSTEM [NEC 690.13(A)]
19. ALL WIRING METHODS SHALL BE IN ACCORDANCE WITH NEC 690.31
20. WORK CLEARANCES AROUND ELECTRICAL EQUIPMENT WILL BE MAINTAINED PER NEC 110.26(A)(1), 110.26(A)(2) AND 110.26(A)(3).
21. ROOFTOP MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED & IDENTIFIED IN ACCORDANCE WITH UL1703
22. ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER NEC.
23. THE ENCHARGE BATTERY AS PART OF THE ENSEMBLE SYSTEM DOES NOT EXPORT POWER TO THE GRID IN ANY STORAGE MODE.

VICINITY MAP



HOUSE PHOTO



CODE REFERENCES

- 2018 NORTH CAROLINA BUILDING CODE
- 2018 NORTH CAROLINA RESIDENTIAL CODE
- 2018 NORTH CAROLINA FIRE CODE
- 2017 NATIONAL ELECTRICAL CODE



DRAWN BY ESR
SHEET NAME COVER SHEET
SHEET SIZE ANSI B 11" X 17"
SHEET NUMBER PV-1

PROJECT DESCRIPTION:

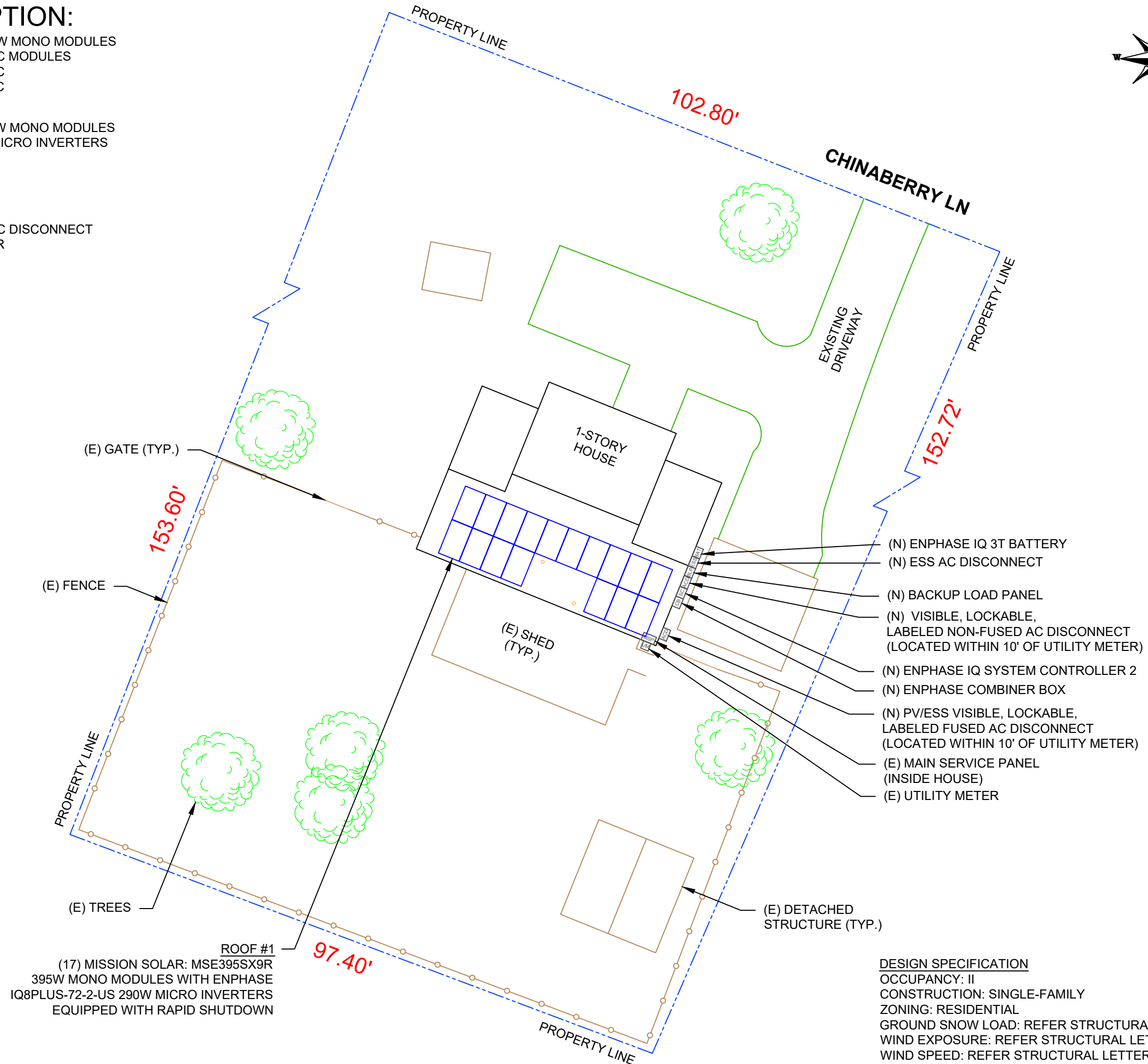
17 X MISSION SOLAR: MSE395SX9R 395W MONO MODULES
 ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES
 DC SYSTEM SIZE: 17 x 395 = 6.715KW DC
 AC SYSTEM SIZE: 17 x 290 = 4.930KW AC

EQUIPMENT SUMMARY

17 MISSION SOLAR: MSE395SX9R 395W MONO MODULES
 17 ENPHASE IQ8PLUS-72-2-US 290W MICRO INVERTERS
 EQUIPPED WITH RAPID SHUTDOWN
01 ENPHASE IQ 3T BATTERY

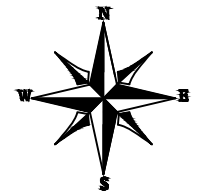
ROOF ARRAY AREA #1:- 367.88 SQ FT.

NOTE: VISIBLE, LOCKABLE, LABELED AC DISCONNECT
 LOCATED WITHIN 10' OF UTILITY METER



- (N) ENPHASE IQ 3T BATTERY
- (N) ESS AC DISCONNECT
- (N) BACKUP LOAD PANEL
- (N) VISIBLE, LOCKABLE, LABELED NON-FUSED AC DISCONNECT (LOCATED WITHIN 10' OF UTILITY METER)
- (N) ENPHASE IQ SYSTEM CONTROLLER 2
- (N) ENPHASE COMBINER BOX
- (N) PV/ESS VISIBLE, LOCKABLE, LABELED FUSED AC DISCONNECT (LOCATED WITHIN 10' OF UTILITY METER)
- (E) MAIN SERVICE PANEL (INSIDE HOUSE)
- (E) UTILITY METER

DESIGN SPECIFICATION
 OCCUPANCY: II
 CONSTRUCTION: SINGLE-FAMILY
 ZONING: RESIDENTIAL
 GROUND SNOW LOAD: REFER STRUCTURAL LETTER
 WIND EXPOSURE: REFER STRUCTURAL LETTER
 WIND SPEED: REFER STRUCTURAL LETTER



TOP TIER

SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

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DRAWN BY

ESR

SHEET NAME

SITE PLAN

SHEET SIZE

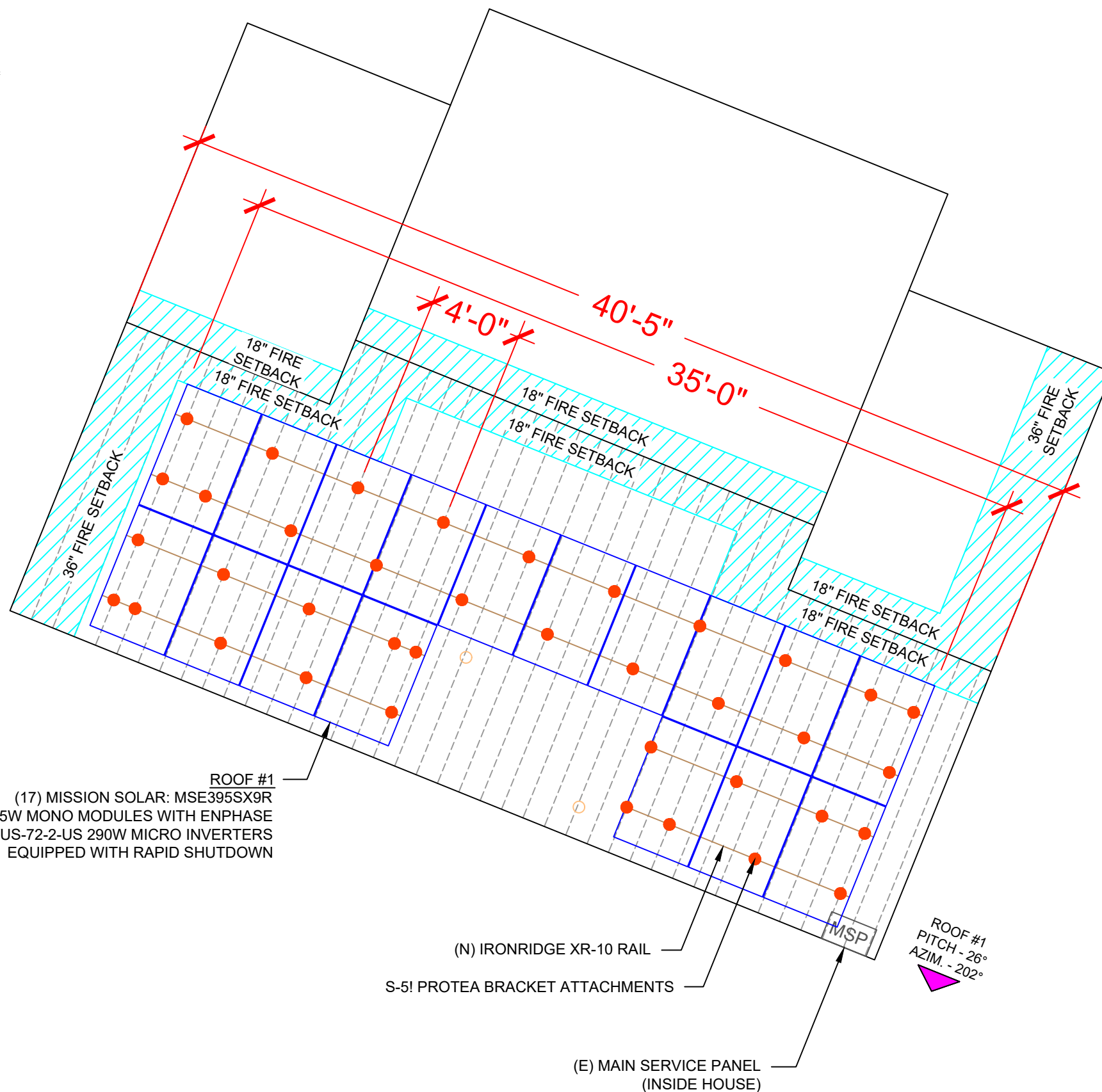
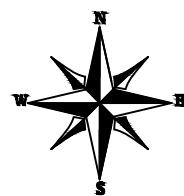
ANSI B
 11" X 17"

SHEET NUMBER

PV-2

MODULE TYPE, DIMENSIONS & WEIGHT

NUMBER OF MODULES = 17 MODULES
 MODULE TYPE = MISSION SOLAR: MSE395SX9R 395W MONO MODULES
 MODULE WEIGHT = 48.5 LBS / 22.0KG.
 MODULE DIMENSIONS = 75.08" x 41.50" = 21.64 SF



ROOF DESCRIPTION				
ROOF TYPE				METAL
ROOF	# OF MODULES	ROOF PITCH	AZIMUTH	SEAM SPACING
#1	17	26°	202°	12"

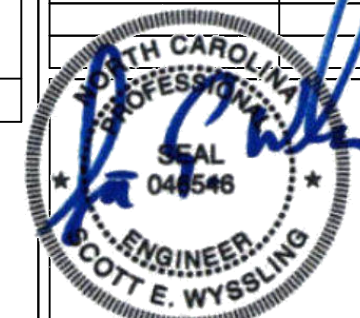
ARRAY AREA & ROOF AREA CALC'S		
TOTAL PV ARRAY AREA (SQ. FT.)	TOTAL ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
367.88	2830.48	13



TOP TIER SOLAR SOLUTIONS

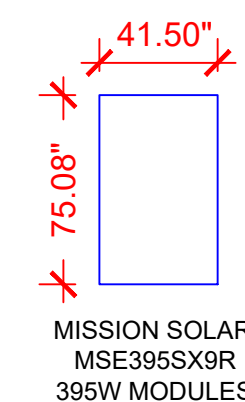
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MISSION SOLAR: MSE395SX9R 395W MODULES

ROOF #1
 (17) MISSION SOLAR: MSE395SX9R 395W MONO MODULES WITH ENPHASE IQ8PLUS-72-2-US 290W MICRO INVERTERS EQUIPPED WITH RAPID SHUTDOWN

LEGEND	
SC	- ENPHASE IQ SYSTEM CONTROLLER 2
SD	- SOLADECK
PM	- PV PRODUCTION METER
CB	- COMBINER BOX
ACD	- AC DISCONNECT
BLP	- BACKUP LOAD PANEL
UM	- UTILITY METER
MSP	- MAIN SERVICE PANEL
ESS	- ESS AC DISCONNECT
BAT	- ENPHASE IQ BATTERY
INV	- INVERTER
JB	- JUNCTION BOX
○	- VENT, ATTIC FAN (ROOF OBSTRUCTION)
●	- ROOF ATTACHMENT
---	- SEAM
---	- CONDUIT

PROJECT NAME & ADDRESS

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 ANGIER, NC 27501

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ESR

SHEET NAME
ROOF PLAN & MODULES

SHEET SIZE
**ANSI B
 11" X 17"**

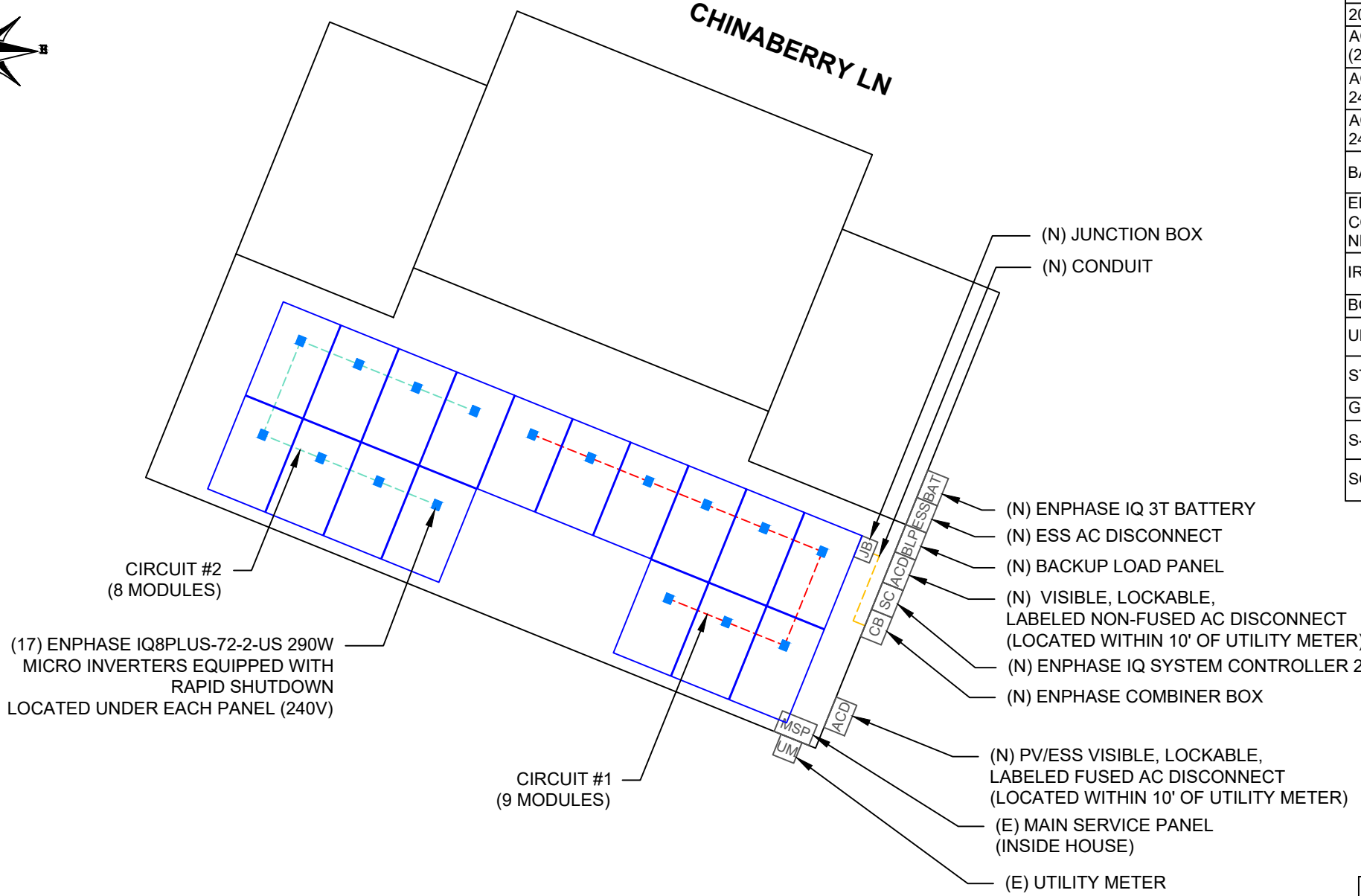
SHEET NUMBER
PV-3

1 ROOF PLAN & MODULES

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

DC SYSTEM SIZE: 17 x 395 = 6.715KW DC
 AC SYSTEM SIZE: 17 x 290 = 4.930KW AC
 (17) MISSION SOLAR: MSE395SX9R 395W MONO MODULES
 WITH (17) ENPHASE IQ8PLUS-72-2-US 290W MICRO
 INVERTERS EQUIPPED WITH RAPID SHUTDOWN
 LOCATED UNDER EACH PANEL (240V)

CIRCUIT LEGENDS	
	CIRCUIT #1
	CIRCUIT #2



BILL OF MATERIALS	
EQUIPMENT DESCRIPTION	QTY
SOLAR PV MODULES: MISSION SOLAR: MSE395SX9R 395W MONO MODULES	17
MICRO INVERTERS: ENPHASE IQ8PLUS-72-2-US 290W MICRO INVERTERS EQUIPPED WITH RAPID SHUTDOWN	17
JUNCTION BOX: 6"X6"X4" UL LISTED, STEEL WATER TIGHT NEMA TYPE 3R, UL LISTED	1
COMBINER BOX: ENPHASE IQ COMBINER X-IQ-AM1-240-4/4C 120/240VAC, 1φ, 3W 125A RATED BUS BAR, NEMA 3R SOLAR LOADS ONLY UL 1741 COMPLIANT	1
20A BREAKERS	2
AC DISCONNECT: PV/ESS FUSED AC DISCONNECT, 100A FUSED, (2) 100A FUSES 240V NEMA 3R, UL LISTED	1
AC DISCONNECT: ESS AC DISCONNECT 30A, 240V NEMA 3R, UL LISTED	1
AC DISCONNECT: NON-FUSED AC DISCONNECT 30A, 240V NEMA 3R, UL LISTED	1
BATTERY: ENPHASE IQ 3T BATTERY	1
ENPHASE IQ SYSTEM CONTROLLER 2 :ENPHASE IQ SYSTEM CONTROLLER 2 EP200G101-M240US01 NEMA 3R, 200A RATED, 240V	1
IRONRIDGE XR10 RAIL (RAIL 168" (14 FEET) BLACK) (XR-10-168B)	12
BONDED SPLICE, XR10 (XR10-BOSS-01-M1)	6
UNIVERSAL MODULE CLAMP, BLACK (UFO-CL-01-B1)	40
STOPPER SLEEVE, 40MM, BLACK (UFO-STP-40MM-B1)	12
GROUNDING LUG (XR-LUG-03-A1)	3
S-5! PROTEA BRACKET ATTACHMENTS	35
SQUARE-BOLT BONDING HARDWARE (BHW-SQ-02-A1)	35

TOP TIER
SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

















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LEGEND			
	- ENPHASE IQ SYSTEM CONTROLLER 2		- ESS AC DISCONNECT
	- SOLADECK		- ENPHASE IQ BATTERY
	- PV PRODUCTION METER		- INVERTER
	- COMBINER BOX		- JUNCTION BOX
	- AC DISCONNECT		- VENT, ATTIC FAN (ROOF OBSTRUCTION)
	- BACKUP LOAD PANEL		- ROOF ATTACHMENT
	- UTILITY METER		- SEAM
	- MAIN SERVICE PANEL		- CONDUIT



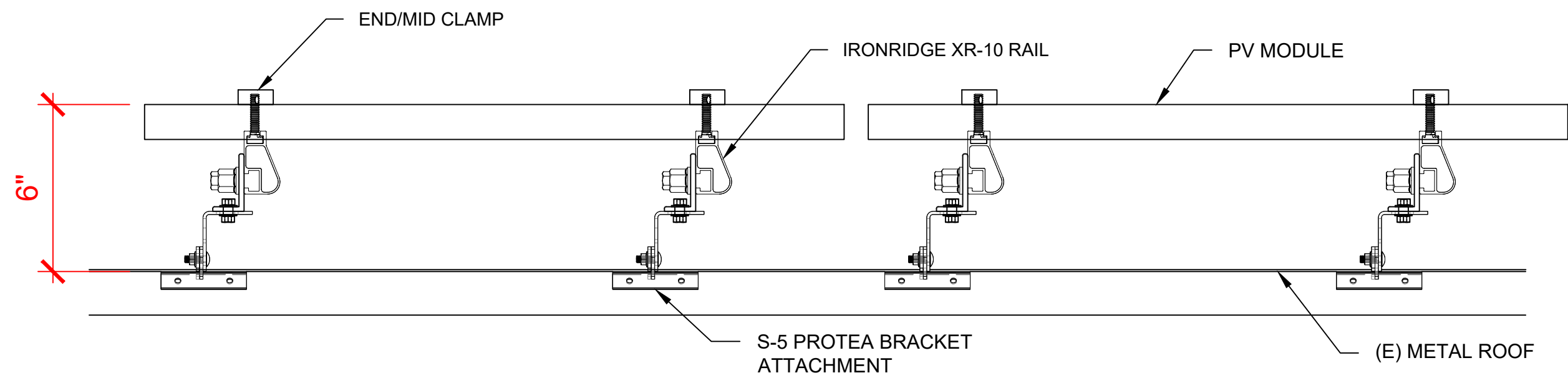
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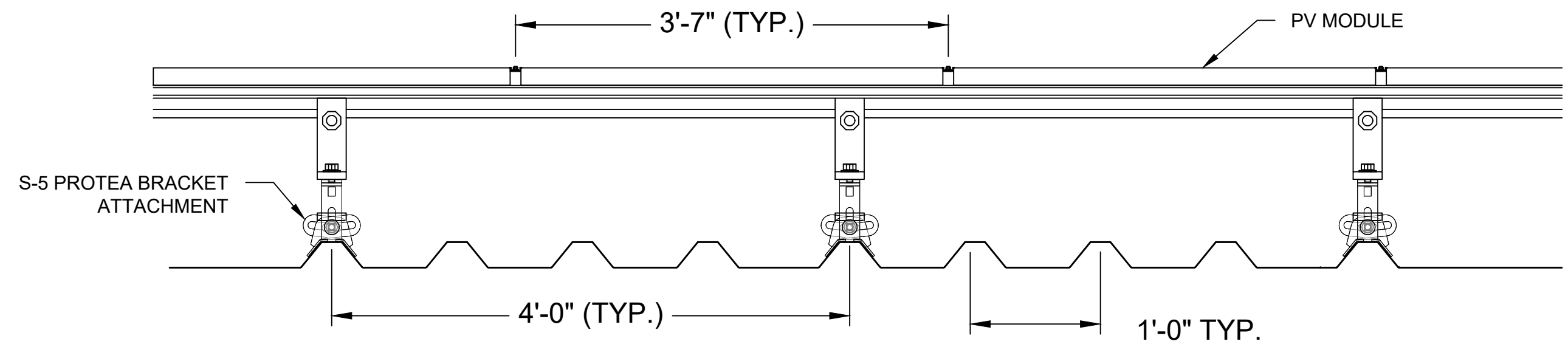


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1 | **STRUCTURAL ATTACHMENT (Side view)**
 PV-5 | SCALE: N.T.S



2 | **ATTACHMENT DETAIL (FRONT VIEW)**
 PV-5 | SCALE: N.T.S

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ESR

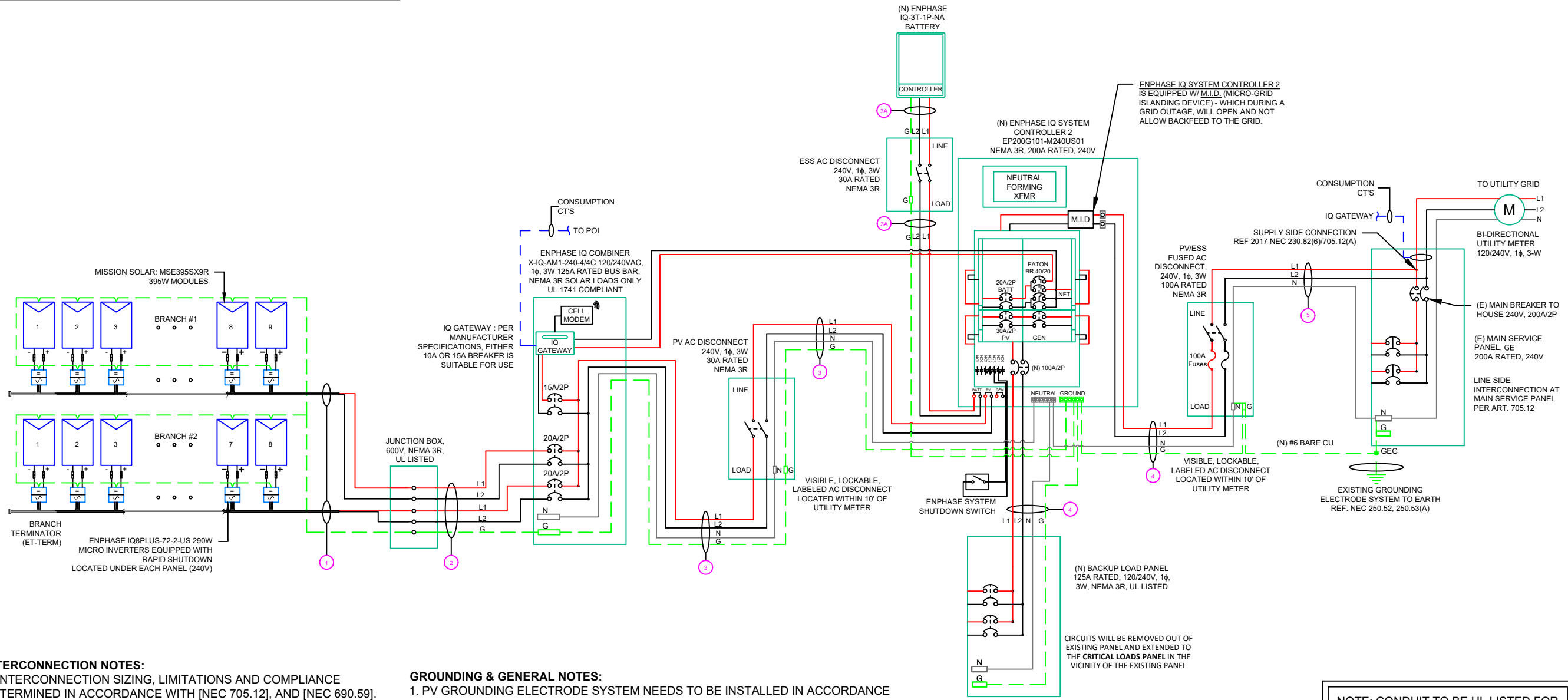
SHEET NAME
STRUCTURAL DETAIL

SHEET SIZE
**ANSI B
 11" X 17"**

SHEET NUMBER
PV-5

DC SYSTEM SIZE: 17 x 395 = 6.715KW DC
 AC SYSTEM SIZE: 17 x 290 = 4.930KW AC

(17) MISSION SOLAR: MSE395SX9R 395W MONO MODULES
 WITH (17) ENPHASE IQ8PLUS-72-2-US 290W MICRO INVERTERS
 EQUIPPED WITH RAPID SHUTDOWN
 LOCATED UNDER EACH PANEL (240V)
 (1) BRANCH CIRCUIT OF 9 MODULES ARE
 (1) BRANCH CIRCUIT OF 8 MODULES ARE CONNECTED IN PARALLEL



INTERCONNECTION NOTES:

1. INTERCONNECTION SIZING, LIMITATIONS AND COMPLIANCE DETERMINED IN ACCORDANCE WITH [NEC 705.12], AND [NEC 690.59].
2. GROUND FAULT PROTECTION IN ACCORDANCE WITH [NEC 215.9], [NEC 230.95].
3. ALL EQUIPMENT TO BE RATED FOR BACKFEEDING.
4. PV BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUSBAR RELATIVE TO THE MAIN BREAKER.

DISCONNECT NOTES:

1. DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING LIVE ARE CONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS)
2. AC DISCONNECT MUST BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH
3. DISCONNECT MEANS AND THEIR LOCATION SHALL BE IN ACCORDANCE WITH [NEC 225.31] AND [NEC 225.32].

GROUNDING & GENERAL NOTES:

1. PV GROUNDING ELECTRODE SYSTEM NEEDS TO BE INSTALLED IN ACCORDANCE WITH [NEC 690.43]
2. PV INVERTER IS UNGROUNDED, TRANSFORMER-LESS TYPE.
3. DC GEC AND AC EGC TO REMAIN UNSPLICED, OR SPLICED TO EXISTING ELECTRODE
4. ANY EXISTING WIRING INVOLVED WITH PV SYSTEM CONNECTION THAT IS FOUND TO BE INADEQUATE PER CODE SHALL BE CORRECTED PRIOR TO FINAL INSPECTION.
5. JUNCTION BOX QUANTITIES, AND PLACEMENT SUBJECT TO CHANGE IN THE FIELD - JUNCTION BOX BOX DEPICTED ON ELECTRICAL DIAGRAM REPRESENT WIRE TYPE TRANSITIONS.
6. AC DISCONNECT NOTED IN EQUIPMENT SCHEDULE OPTIONAL IF OTHER AC DISCONNECTING MEANS IS LOCATED WITHIN 10' OF SERVICE DISCONNECT.
7. RACEWAYS AND CABLES EXPOSED TO SUNLIGHT ON ROOFTOPS SHOULD BE INSTALLED MORE THAN 7/8" ABOVE THE ROOF USING CONDUIT SUPPORTS.

RACKING NOTE:

1. BOND EVERY OTHER RAIL WITH #6 BARE COPPER

NOTE: CONDUIT TO BE UL LISTED FOR WET LOCATIONS AND UV PROTECTED

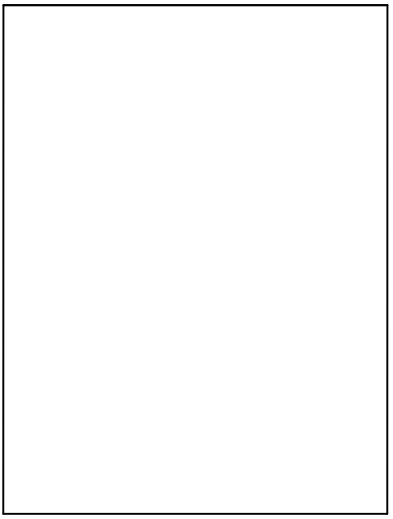
QTY	CONDUCTOR INFORMATION	CONDUIT TYPE	CONDUIT SIZE
(4)	#12AWG - ENPHASE ENGAGE CABLE (L1 & L2 NO NEUTRAL)	N/A	N/A
(1)	#6AWG - BARE COPPER IN FREE AIR		
(4)	#10AWG - CU, THWN-2	EMT OR LFMC	3/4"
(1)	#10AWG - CU, THWN-2 GND		
(2)	#10AWG - CU, THWN-2	EMT, LFMC OR PVC	3/4"
(1)	#10AWG - CU, THWN-2 N		
(1)	#10AWG - CU, THWN-2 GND	EMT, LFMC OR PVC	3/4"
(2)	#10AWG - CU, THWN-2		
(1)	#3AWG - CU, THWN-2	EMT, LFMC OR PVC	1"
(1)	#3AWG - CU, THWN-2 N		
(2)	#3AWG - CU, THWN-2	EMT, LFMC OR PVC	1"
(1)	#3AWG - CU, THWN-2 N		



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SHEET NAME
ELECTRICAL LINE DIAGRAM

SHEET SIZE
**ANSI B
 11" X 17"**

SHEET NUMBER
PV-6

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	ENPHASE IQ8PLUS-72-2-US 290W MICRO INVERTERS EQUIPPED WITH RAPID SHUTDOWN
MIN/MAX DC VOLT RATING	30V MIN/ 58V MAX
MAX INPUT POWER	235W-440W
NOMINAL AC VOLTAGE RATING	240V/ 211-264V
MAX AC CURRENT	1.21A
MAX MODULES PER CIRCUIT	13 (SINGLE PHASE)
MAX OUTPUT POWER	290 VA

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	MISSION SOLAR: MSE395SX9R 395W MODULE
VMP	36.99V
IMP	10.68A
VOC	45.18V
ISC	11.24A
TEMP. COEFF. VOC	-0.259%/°C
MODULE DIMENSION	75.08"L x 41.50"W x 1.57"D (In Inch)

AMBIENT TEMPERATURE SPECS	
RECORD LOW TEMP	-9°
AMBIENT TEMP (HIGH TEMP 2%)	38°
MODULE TEMPERATURE COEFFICIENT OF Voc	-0.259%/°C

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



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AC CALCULATIONS																						
CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FULL LOAD AMPS "FLA" (A)	FLA*1.25 (A)	OC PD SIZE (A)	NEUTRAL SIZE	GROUND SIZE	CONDUCTOR SIZE	75°C AMPACITY (A)	AMPACITY CHECK #1	AMBIENT TEMP. (°C)	TOTAL CC CONDUCTORS IN RACEWAY	90°C AMPACITY (A)	DERATION FACTOR FOR AMBIENT TEMPERATURE NEC 310.15(B)(2)(a)	DERATION FACTOR FOR CONDUCTORS PER RACEWAY NEC 310.15(B)(3)(a)	90°C AMPACITY DERATED (A)	AMPACITY CHECK #2	FEEDER LENGTH (FEET)	CONDUCTOR RESISTANCE (OHM/KFT)	VOLTAGE DROP AT FLA (%)	CONDUIT SIZE	CONDUIT FILL (%)
CIRCUIT 1	JUNCTION BOX	240	10.89	13.6125	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	38	2	30	0.91	1	27.3	PASS			0.38	N/A	#N/A
CIRCUIT 2	JUNCTION BOX	240	9.68	12.1	20	N/A	BARE COPPER #6 AWG	CU #12 AWG	25	PASS	38	2	30	0.91	1	27.3	PASS			0.30	N/A	#N/A
JUNCTION BOX	COMBINER PANEL 1	240	10.89	13.6125	20	N/A	CU #10 AWG	CU #10 AWG	35	PASS	38	4	40	0.91	0.8	29.12	PASS	25	1.24	0.281	3/4" EMT	19.79362
COMBINER PANEL 1	AC DISCONNECT	240	20.57	25.7125	30	CU #10 AWG	CU #10 AWG	CU #10 AWG	35	PASS	38	2	40	0.91	1	36.4	PASS	5	1.24	0.106	3/4" EMT	15.8349
AC DISCONNECT	SYSTEM CONTROLLER 2	240	20.57	25.7125	30	CU #10 AWG	CU #10 AWG	CU #10 AWG	35	PASS	38	2	40	0.91	1	36.4	PASS	5	1.24	0.106	3/4" EMT	15.8349
SYSTEM CONTROLLER 2	ESS AC DISCONNECT	240	5.3	6.625	20	N/A	CU #10 AWG	CU #10 AWG	35	PASS	38	2	40	0.91	1	36.4	PASS	5	1.24	0.027	3/4" EMT	11.87617
ESS AC DISCONNECT	BATTERY	240	5.3	6.625	20	N/A	CU #10 AWG	CU #10 AWG	35	PASS	38	2	40	0.91	1	36.4	PASS	5	1.24	0.027	3/4" EMT	11.87617
SYSTEM CONTROLLER 2	BACKUP LOAD PANEL	240	100	83	100	CU #3 AWG	CU #6 AWG	CU #3 AWG	100	PASS	38	2	115	0.91	1	104.65	PASS	5	0.245	0.102	1" EMT	39.65278
SYSTEM CONTROLLER 2	PV/ESS AC DISCONNECT	240	25.87	32.3375	100	CU #3 AWG	CU #6 AWG	CU #3 AWG	100	PASS	38	2	115	0.91	1	104.65	PASS	5	0.245	0.026	1" EMT	39.65278
PV/ESS AC DISCONNECT	POI	240	25.87	32.3375	100	CU #3 AWG	N/A	CU #3 AWG	100	PASS	38	2	115	0.91	1	104.65	PASS	5	0.245	0.026	1" EMT	33.78472

Circuit 1 Voltage Drop	0.874
Circuit 2 Voltage Drop	0.794

INSTALLATION NOTES:

IQ 3T BATTERY/IQ SYSTEM CONTROLLER MOUNTING NOTES:

1. THERE MUST BE NO HIGHLY FLAMMABLE OR EXPLOSIVE MATERIALS NEARBY.
2. THE AMBIENT TEMPERATURE SHOULD BE WITHIN THE RANGE OF 5 ~ 131°F (-15 ~ 55°C)
3. THE IQ/ENPOWER HOUSING IS NEMA TYPE 3R AND CAN BE INSTALLED INDOORS OR OUTDOORS. THE TERMINAL BLOCKS ACCEPTS COPPER CONDUCTORS OF NO. 12 - 8 AWG.
4. MAINTAIN AT LEAST THREE FEET OF CLEARANCE IN FRONT OF EACH PRODUCT. ALLOW AT LEAST 15CM (SIX INCHES) CLEARANCE ON TOP AND BOTTOM OF THE PRODUCT SO THAT THE VENTS ON THE TOP AND BOTTOM OF THE UNITS ARE NOT BLOCKED FOR AIR CIRCULATION.
5. UP TO TWO IQ 10T (OR SIX IQ 3T) UNITS CAN BE DAISY CHAINED ON ONE CIRCUIT. FOR INSTALLATIONS WITH MORE THAN THIS NUMBER OF UNITS, THERE MUST BE A SEPARATE COMBINER PANEL, SUBPANEL, OR CIRCUIT COMBINER WITH OVER CURRENT PROTECTION TO COMBINE THE DAISY CHAINED CIRCUITS, AND YOU MUST RUN ONLY ONE CIRCUIT FOR ALL THE IQ UNITS TO THE ENPOWER (OR TO ENPHASE IQ COMBINER FOR GRID-TIED-ONLY INSTALLATIONS).

AC DISCONNECT INSTALL NOTES:

1. INSTALL AN AC DISCONNECT THAT CAN BREAK THE MAXIMUM RATED CURRENT OF THE BRANCH CIRCUIT UNDER LOAD. THE AC DISCONNECT MUST BE INSTALLED IN LINE-OF-SIGHT OF IQ, PER NEC 2017 706.7(A).
2. EACH IQ UNIT IS SUITABLE FOR USE WITH UP TO NO. 8 AWG WIRES ON A MAXIMUM 40 A BRANCH CIRCUIT. IF MORE THAN 32 A OF IQ BATTERIES (CORRESPONDING TO A 40 A BRANCH CIRCUIT) ARE INSTALLED, A SEPARATE SUBPANEL MUST BE INSTALLED BETWEEN THE IQ UNITS AND ENPOWER TO COMBINE THE ENPOWER CIRCUITS TOGETHER. ALL CIRCUIT BREAKERS IN THE SUBPANEL MUST BE SUITABLE FOR BACK-FEEDING, PER NEC 408.36(D).
3. VERIFY THAT AC VOLTAGE AT THE SITE IS WITHIN RANGE: SINGLE-PHASE L1 TO L2 VOLTAGE MUST MEASURE BETWEEN 211 AND 264 VAC, WHILE L-N SHOULD MEASURE BETWEEN 106 AND 132 VAC.

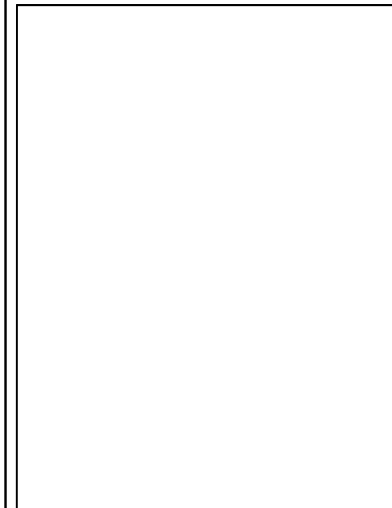
RECOMMENDED:

1. THE BUILDING SHOULD BE DESIGNED TO WITHSTAND EARTHQUAKES.
2. THE WATERPROOF AND PROPERLY VENTILATED AREA IS RECOMMENDED. (IP55)
3. INSTALL THE PRODUCT OUT OF REACH OF CHILDREN AND ANIMALS.

ELECTRICAL NOTES

1. ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
2. ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
3. WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
4. WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
5. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
6. WHERE SIZES OF JUNCTION BOX, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
7. ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
8. MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
9. MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
10. TEMPERATURE RATINGS OF ALL CONDUCTORS, TERMINATIONS, BREAKERS, OR OTHER DEVICES ASSOCIATED WITH THE SOLAR PV SYSTEM SHALL BE RATED FOR AT LEAST 75 DEGREE C.

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	04/11/2023	



PROJECT NAME & ADDRESS

**MARY BOLIN
RESIDENCE**

**373 CHINABERRY LN,
ANGIER, NC 27501**

DRAWN BY
ESR

SHEET NAME
WIRING CALCULATIONS

SHEET SIZE
**ANSI B
11" X 17"**

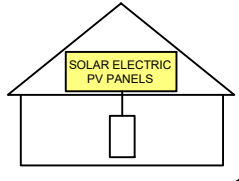
SHEET NUMBER
PV-7

**CAUTION:
AUTHORIZED SOLAR
PERSONNEL ONLY!**

LABEL-1:
LABEL LOCATION:
AC DISCONNECT

**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- 5:
LABEL LOCATION:
AC DISCONNECT
CODE REF: FFPC 11.12.1.1.1.1 & NEC 690.56(C)

**ESS
AC DISCONNECT**

NOMINAL OPERATING AC VOLATGE **240 V**

RATED AC OUTPUT CURRENT **5.3 A**

LABEL- 10:
LABEL LOCATION:
ESS AC DISCONNECT
CODE REF: NEC 690.54

**PV/ESS
AC DISCONNECT**

NOMINAL OPERATING AC VOLATGE **240 V**

RATED AC OUTPUT CURRENT **25.87 A**

LABEL- 11:
LABEL LOCATION:
PV/ESS AC DISCONNECT
CODE REF: NEC 690.54

⚠ WARNING

ELECTRIC SHOCK HAZARD

TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

LABEL- 2:
LABEL LOCATION:
AC DISCONNECT
COMBINER
MAIN SERVICE PANEL
SUBPANEL
MAIN SERVICE DISCONNECT
CODE REF: NEC 690.13(B)

**RAPID SHUTDOWN SWITCH
FOR SOLAR PV SYSTEM**

LABEL- 6:
LABEL LOCATION:
AC DISCONNECT
CODE REF: NEC 690.56(C)(2)

**⚠ WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM**

LABEL- 3:
LABEL LOCATION:
UTILITY METER
MAIN SERVICE PANEL
SUBPANEL
CODE REF: NEC 705.12(C) & NEC 690.59

**PHOTOVOLTAIC
AC DISCONNECT**

LABEL- 7:
LABEL LOCATION:
AC DISCONNECT
CODE REF: NEC 690.13(B)

⚠ WARNING

**TURN OFF PHOTOVOLTAIC AC
DISCONNECT PRIOR TO
WORKING INSIDE PANEL**

LABEL- 4:
LABEL LOCATION:
MAIN SERVICE PANEL
SUBPANEL
MAIN SERVICE DISCONNECT
COMBINER
CODE REF: NEC 110.27(C) & OSHA 1910.145 (f) (7)

**PHOTOVOLTAIC
AC DISCONNECT**

NOMINAL OPERATING AC VOLATGE **240 V**

RATED AC OUTPUT CURRENT **20.57 A**

LABEL- 8:
LABEL LOCATION:
MAIN SERVICE PANEL
SUBPANEL
AC DISCONNECT
CODE REF: NEC 690.54

**MAIN PHOTOVOLTAIC
SYSTEM DISCONNECT**

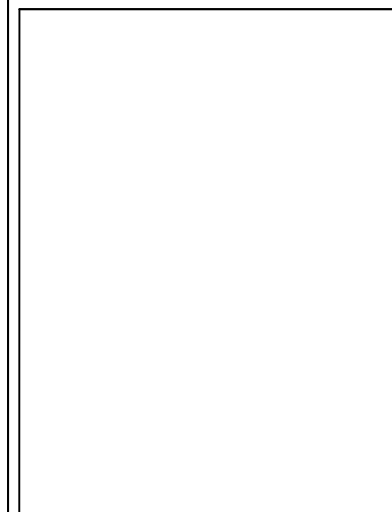
LABEL- 9:
LABEL LOCATION:
MAIN SERVICE DISCONNECT (ONLY IF MAIN SERVICE DISCONNECT IS PRESENT)
CODE REF: NEC 690.13(B)



TOP TIER SOLAR SOLUTIONS

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PROJECT NAME & ADDRESS

**MARY BOLIN
RESIDENCE**

**373 CHINABERRY LN,
ANGIER, NC 27501**

DRAWN BY
ESR

SHEET NAME
LABELS

SHEET SIZE
**ANSI B
11" X 17"**

SHEET NUMBER
PV-8

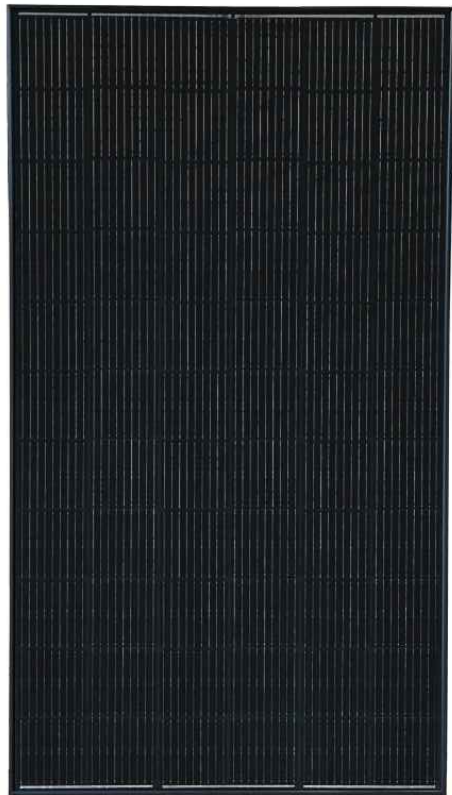
MSE PERC 66



395W

Class leading power output **-0 to +3%**

Positive Power Tolerance



True American Quality True American Brand

Mission Solar Energy is headquartered in San Antonio, Texas where we manufacture our modules. We produce American, high-quality solar modules ensuring the highest-in-class power output and best-in-class reliability. Our product line is tailored for residential, commercial and utility applications. Every Mission Solar Energy solar module is certified and surpasses industry standard regulations, proving excellent performance over the long term.

Demand the best. Demand Mission Solar Energy.



Certified Reliability

- Tested to UL 61730 & IEC Standards
- PID resistant
- Resistance to salt mist corrosion



Advanced Technology

- 9 Busbar
- Passivated Emitter Rear Contact
- Ideal for all applications



Extreme Weather Resilience

- Up to 5,400 Pa front load & 3,600 Pa back load
- Tested load to UL 61730
- 40 mm frame



BAA Compliant for Government Projects

- Buy American Act
- American Recovery & Reinvestment Act

FRAME-TO-FRAME WARRANTY

Degradation guaranteed not to exceed 2% in year one and 0.58% annually from years two to 30 with 84.08% capacity guaranteed in year 25. For more information, visit www.missionsolar.com/warranty

CERTIFICATIONS

CEC



UL 61730 / IEC 61215 / IEC 61730 / IEC 61701

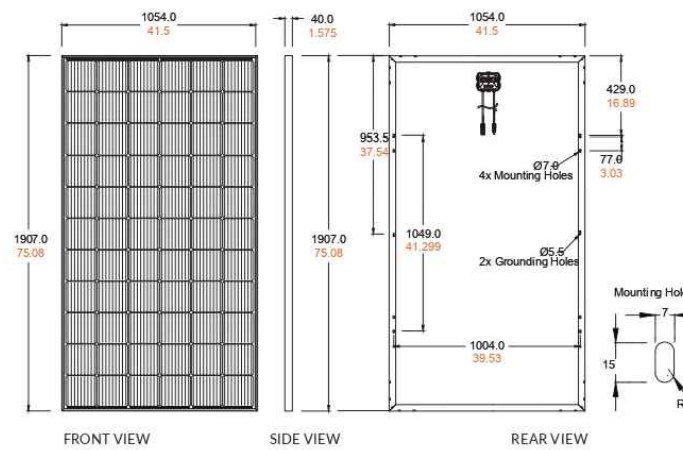
If you have questions or concerns about certification of our products in your area, please contact Mission Solar Energy.



Class Leading
390-400W

BASIC DIMENSIONS

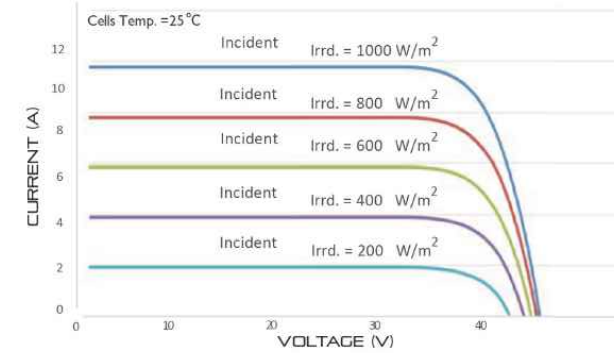
[UNITS: MM/IN]



CURRENT-VOLTAGE CURVE

MSE385SX9R: 385WP, 66 CELL SOLAR MODULE

Current-voltage characteristics with dependence on irradiance and module temperature



CERTIFICATIONS AND TESTS

IEC	61215, 61730, 61701
UL	61730



CEC



Mission Solar Energy

8303 S. New Braunfels Ave., San Antonio, Texas 78235
www.missionsolar.com | info@missionsolar.com

Mission Solar Energy reserves the right to make specification changes without notice.
C-SA2-MKTG-0027 REV 4 03/18/2022

MSE PERC 66

ELECTRICAL SPECIFICATION

PRODUCT TYPE	MSExxxSX9R (xxx = P _{max})				
Power Output	P _{max}	W _p	390	395	400
Module Efficiency	%		19.4	19.7	19.9
Tolerance	%		0/+3	0/+3	0/+3
Short Circuit Current	I _{sc}	A	11.19	11.24	11.31
Open Circuit Voltage	V _{oc}	V	45.04	45.18	45.33
Rated Current	I _{mp}	A	10.63	10.68	10.79
Rated Voltage	V _{mp}	V	36.68	36.99	37.07
Fuse Rating	A		20	20	20
System Voltage	V		1,000	1,000	1,000

TEMPERATURE COEFFICIENTS

Normal Operating Cell Temperature (NOCT)	43.75°C (±3.7%)
Temperature Coefficient of P _{max}	-0.367%/°C
Temperature Coefficient of Voc	-0.259%/°C
Temperature Coefficient of I _{sc}	0.033%/°C

OPERATING CONDITIONS

Maximum System Voltage	1,000Vdc
Operating Temperature Range	-40°F to 185°F (-40°C to +85°C)
Maximum Series Fuse Rating	20A
Fire Safety Classification	Type 1*
Front & Back Load (UL Standard)	Up to 5,400 Pa front and 3,600 Pa back load, Tested to UL 61730
Hail Safety Impact Velocity	25mm at 23 m/s

*Mission Solar Energy uses quality sourced materials that result in a Type 1 fire rating. Please note, the "Fire Class" Rating is designated for the fully-installed PV system, which includes, but is not limited to, the module, the type of mounting used, pitch and roof composition.

MECHANICAL DATA

Solar Cells	P-type mono-crystalline silicon
Cell Orientation	66 cells (6x11)
Module Dimension	1,907mm x 1,054mm x 40mm
Weight	48.5 lbs. (22 kg)
Front Glass	3.2mm tempered, low-iron, anti-reflective
Frame	40mm Anodized
Encapsulant	Ethylene vinyl acetate (EVA)
Junction Box	Protection class IP67 with 3 bypass-diodes
Cable	1.2m, Wire 4mm ² (12AWG)
Connector	Staubli PV-KBT4/6II-UR and PV-KST4/6II-UR, MC4, Renhe 05-8

SHIPPING INFORMATION

Container Feet	Ship To	Pallet	Panels	390W Bin
53'	Most States	30	780	304.20 kW
Double Stack	CA	26	676	263.64 kW

PALLET [26 PANELS]

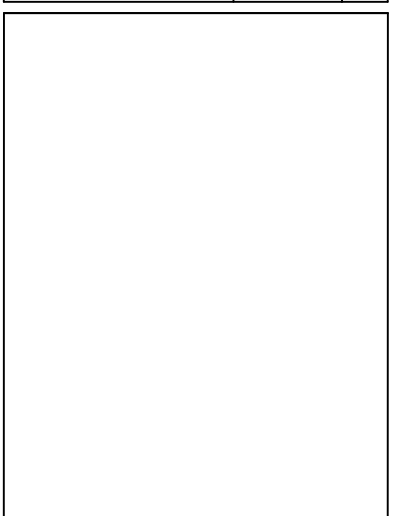
Weight	Height	Width	Length
1,300 lbs. (572 kg)	47.56 in (120.80 cm)	46 in (116.84 cm)	77 in (195.58 cm)

TOP TIER SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	04/11/2023	



PROJECT NAME & ADDRESS

MARY BOLIN
RESIDENCE
373 CHINABERRY LN,
ANGIER, NC 27501

DRAWN BY
ESR

SHEET NAME
EQUIPMENT SPECIFICATION

SHEET SIZE
**ANSI B
11" X 17"**

SHEET NUMBER
PV-9



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.



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



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



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

Easy to install

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

High productivity and reliability

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

Microgrid-forming

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

* Only when installed with IQ System Controller 2, meets UL 1741.

** IQ8 and IQ8Plus supports split phase, 240V installations only.

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings ¹	W	235 – 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 – 37	29 – 45
Operating range	V	25 – 48	25 – 58
Min/max start voltage	V	30 / 48	30 / 58
Max input DC voltage	V	50	60
Max DC current ² [module Isc]	A		15
Overvoltage class DC port			II
DC port backfeed current	mA		0
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range ³	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
AC short circuit fault current over 3 cycles	A _{rms}	2	
Max units per 20 A (L-L) branch circuit ⁴		16	13
Total harmonic distortion		<5%	
Overvoltage class AC port		III	
AC port backfeed current	mA	30	
Power factor setting		1.0	
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging	
Peak efficiency	%	97.5	97.6
CEC weighted efficiency	%	97	97
Night-time power consumption	mW	60	
MECHANICAL DATA			
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)	
Relative humidity range		4% to 100% (condensing)	
DC Connector type		MC4	
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEET547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 1071-01	

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

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

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INITIAL DESIGN	04/11/2023	

PROJECT NAME & ADDRESS

MARY BOLIN
RESIDENCE
373 CHINABERRY LN,
ANGIER, NC 27501

DRAWN BY

ESR

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER

PV-10

Enphase IQ Combiner 4/4C

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



X-IQ-AM1-240-4C

X-IQ-AM1-240-4



To learn more about Enphase offerings, visit enphase.com

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

MODEL NUMBER	
IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 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 a silver solar shield to match the IQ Battery system and 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 (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.
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, 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	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Envy breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 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-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, 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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TOP TIER
SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

1530 CENTER PARK DR #2911,
CHARLOTTE, NC 28217,
UNITED STATES

REVISIONS

DESCRIPTION	DATE	REV
INITIAL DESIGN	04/11/2023	

PROJECT NAME & ADDRESS

MARY BOLIN
RESIDENCE

373 CHINABERRY LN,
ANGIER, NC 27501

DRAWN BY

ESR

SHEET NAME
EQUIPMENT
SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-11

IQ Battery 3T

The **IQ Battery 3T** all-in-one AC-coupled storage system is reliable, smart, simple, and safe. It has a total usable energy capacity of 3.36 kWh and includes four embedded grid-forming microinverters with 1.28 kW power rating. It provides backup capability and installers can quickly design the right system size to meet the needs of both new and retrofit solar customers.



Reliable

- Proven high-reliability IQ Series Microinverters
- 10-years limited warranty, extendable to 15-years¹
- Four embedded IQ8X-BAT microinverters
- Passive cooling (no moving parts/fans)
- UL listed
- Meets CA Rule 21 (UL 1741-SA) and IEEE 1547:2018 (UL 1741-SB, 3rd Ed.)

Smart

- Grid-forming capability for backup operation
- Remote software and firmware upgrade
- Mobile app-based monitoring and control
- Support for self consumption
- Utility time of use (TOU) optimization

Simple

- Fully integrated AC battery system
- Quick and easy plug-and-play installation
- Interconnects with standard household AC wiring

Safe

- Safety tested battery cells and module
- Lithium iron phosphate (LFP) chemistry for maximum safety and longevity

1. Terms and conditions apply.

To learn more about Enphase offerings, visit enphase.com
IQB-3T-DS-0109-EN-US-12-23-2022



IQ Battery 3T

MODEL NUMBER	
ENCHARGE-3T-1P-NA	IQ Battery 3T with integrated Enphase IQ Series Microinverters and battery management unit (BMU). Includes: - One IQ Battery 3T base unit (B03-T01-US00-1-3) - One IQ Battery 3T cover kit with cover and wall mounting bracket (B03T-C-0430-0)
OUTPUT (AC)	
	@240 VAC²
Rated (continuous) output power	1.28 kVA
Peak output power	1.92 kVA (10 seconds)
Nominal voltage / range	240/211–264VAC
Nominal frequency / range	60/57–63 Hz
Rated output current	5.3A
Peak output current	8.2A (10 seconds)
Power factor (adjustable)	0.85 leading ... 0.85 lagging
Maximum units per 20A branch circuit	Three units (single-phase)
Interconnection	Single-phase
Maximum AC short circuit fault current over 3 cycles	23.2 Arms
Round trip efficiency ³	89%
BATTERY	
Total capacity	3.5 kWh
Usable capacity	3.36 kWh
Round trip efficiency	96%
Nominal DC voltage	67.2V
Maximum DC voltage	75.6V
Ambient operating temperature range	-15°C to 55°C (5°F to 131°F) non-condensing
Optimum operating temperature range	0°C to 30°C (32°F to 86°F)
Chemistry	Lithium iron phosphate (LFP)
MECHANICAL DATA	
Dimensions (WxHxD)	430 mm x 775 mm x 188 mm (16.9 in x 30.5 in x 7.4 in)
Weight	One individual 40.5 kg (89.3 lbs) base unit plus 8.3 kg (18.3 lbs) cover and mounting bracket; total 48.8 kg (107.6 lbs)
Enclosure	Outdoor – NEMA 3R
IQ8X-BAT Microinverter enclosure	NEMA type 6
Cooling	Natural convection – No fans
Altitude	Up to 2,500 meters (8,200 feet)
Mounting	Wall mount
FEATURES AND COMPLIANCE	
Compatibility	Compatible with grid-tied PV systems. Compatible with M215/M250 and IQ Series Microinverters, IQ System Controller, and IQ Gateway for backup operation.
Communication	Wireless 2.4 GHz
Services	Backup, self-consumption, TOU, Demand Charge, NEM Integrity
Monitoring	Enphase Installer App monitoring options; API integration
Compliance	CA Rule 21 (UL 1741-SA), IEEE 1547:2018 (UL 1741-SB, 3 rd Ed.) CAN/CSA C22.2 No. 107.1-16 UL 9540, UL 9540A, UN 38.3, UL 1998, UL 991, NEMA Type 3R, AC156 EMI: 47 CFR, Part 15, Class B, ICES 003 Cell Module: UL 1973, UN 38.3 Inverters: UL 62109-1, IEC 62109-2
LIMITED WARRANTY	
Limited Warranty	>70% capacity, up to 10-years or 4,000 cycles ⁴ , extendable to 15-years ¹
<ol style="list-style-type: none"> 1. Terms and conditions apply. 2. Supported in both grid-connected and backup operation. 3. AC to battery to AC at 50% power rating. 4. Whichever occurs first. Restrictions apply. 	

To learn more about Enphase offerings, visit enphase.com

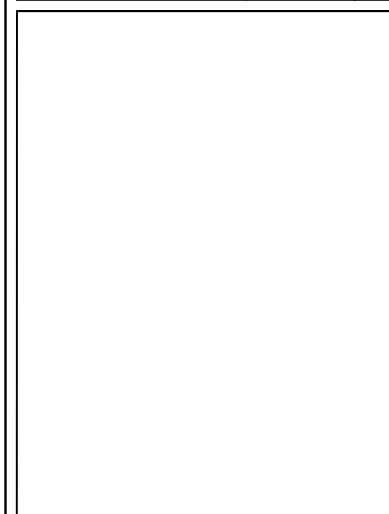
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IQB-3T-DS-0109-EN-US-12-23-2022



TOP TIER SOLAR SOLUTIONS

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MARY BOLIN
RESIDENCE

373 CHINABERRY LN,
ANGIER, NC 27501

DRAWN BY
ESR

SHEET NAME
**EQUIPMENT
SPECIFICATION**

SHEET SIZE
**ANSI B
11" X 17"**

SHEET NUMBER
PV-12

Enphase IQ System Controller 2

The **Enphase IQ System Controller 2** connects the home to grid power, the IQ Battery system, and solar PV. It provides microgrid interconnection device (MID) functionality by automatically detecting and seamlessly transitioning the home energy system from grid power to backup power in the event of a grid failure. It consolidates interconnection equipment into a single enclosure and streamlines grid independent capabilities of PV and storage installations by providing a consistent, pre-wired solution for residential applications.

Reliable

- Durable NEMA type 3R enclosure
- Ten-year limited warranty

Smart

- Controls safe connectivity to the grid
- Automatically detects grid outages
- Provides seamless transition to backup

Simple

- Connects to the load or service equipment¹ side of the main load panel
- Centered mounting brackets support single stud mounting
- Supports conduit entry from the bottom, bottom left side, and bottom right side
- Supports whole home and partial home backup and subpanel backup
- Up to 200A main breaker support
- Includes neutral-forming transformer for split phase 120/240V backup operation
- IQ System Controller supports backward compatibility with older generation of PV microinverters (M215, M250 and S series), making it simple for home owners to upgrade their systems
- Easy integration with generator from major manufacturers

1. IQ System Controller 2 is not suitable for use as service equipment in Canada.



To learn more about Enphase offerings, visit enphase.com



Enphase IQ System Controller 2

MODEL NUMBER	
EP200G101-M240US01	Enphase IQ System Controller 2 with neutral-forming transformer (NFT), Microgrid Interconnect Device (MID), breakers, and screws. Streamlines grid-independent capabilities of PV and battery installations.
ACCESSORIES and REPLACEMENT PARTS	
EP200G-NA-XA-E3	Replacement IQ System Controller 2 printed circuit board
EP200G-NA-HD-200A	Eaton type BR circuit breaker hold-down screw kit, BRHDK125
CT-200-SPLIT	200 A split core current transformers for Generator metering (+/- 2.5%)
Circuit breakers (as needed) ^{2,3}	Not included, must order separately:
• BRK-100A-2P-240V: Main breaker, 2 pole, 100A, 25kAIC, CSR2100	• BRK-20A-2P-240V-B: Circuit breaker, 2 pole, 20A, 10kAIC, BR220B
• BRK-125A-2P-240V: Main breaker, 2 pole, 125A, 25kAIC, CSR2125N	• BRK-30A-2P-240V: Circuit breaker, 2 pole, 30A, 10kAIC, BR230B
• BRK-150A-2P-240V: Main breaker, 2 pole, 150A, 25kAIC, CSR2150N	• BRK-40A-2P-240V: Circuit breaker, 2 pole, 40A, 10kAIC, BR240B
• BRK-175A-2P-240V: Main breaker, 2 pole, 175A, 25kAIC, CSR2175N	• BRK-60A-2P-240V: Circuit breaker, 2 pole, 60A, 10kAIC, BR260
• BRK-200A-2P-240V: Main breaker, 2 pole, 200A, 25kAIC, CSR2200N	• BRK-80A-2P-240V: Circuit breaker, 2 pole, 80A, 10kAIC, BR280
EP200G-HNDL-R1	IQ System Controller 2 installation handle kit (order separately)
EP200G-LITKIT	IQ System Controller 2 literature kit, including labels, feed-through headers, screws, filler plates, and QIG
BRK-20A40A-2P-240V	2 pole, 20A/40A, 10kAIC, BQC220240
ELECTRICAL SPECIFICATIONS	
Assembly rating	Continuous operation at 100% of its rating
Nominal voltage / range (L-L)	240 VAC / 100 - 310 VAC
Voltage measurement accuracy	±1% V nominal (±1.2V L-N and ±2.4V L-L)
Auxiliary contact for load control, excess PV control, and generator two-wire control	24V, 1A
Nominal frequency / range	60 Hz / 56 - 63 Hz
Frequency measurement accuracy	±0.1 Hz
Maximum continuous current rating	160A
Maximum input overcurrent protection device	200A
Maximum output overcurrent protection device	200A
Maximum overcurrent protection device rating for Generator circuit ⁴	80A
Maximum overcurrent protection device rating for storage branch circuit ⁴ (the storage branch circuit can be replaced with PV)	80A
Maximum overcurrent protection device rating for IQ8 PV combiner branch circuit ⁴	80A
Neutral Forming Transformer (NFT)	• Breaker rating (pre-installed): 40A between L1 and Neutral, 40A between L2 and Neutral • Continuous rated power: 3600VA • Maximum continuous unbalance current: 30A @ 120V • Peak rated power: 8800VA for 30 seconds • Peak unbalanced current: 80A @ 120V for 30 seconds
MECHANICAL DATA	
Dimensions (WxHxD)	50cm x 91.6cm x 24.6cm (19.7 in x 36 in x 9.7 in)
Weight	39.4 kg (87 lbs)
Ambient temperature range	-40° C to +50° C (-40° F to 122° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NEMA type 3R, polycarbonate construction
Altitude	To 2500 meters (8200 feet)
WIRE SIZES	
Connections (All lugs are rated to 90C)	• Main lugs and backup load lugs • CSR breaker bottom wiring lugs • BR breakers (wire provided) • AC combiner lugs, Encharge lugs, and generator lugs • Neutral (large lugs)
	Cu/Al: 1 AWG - 300 KCMIL Cu/Al: 2 AWG - 300 KCMIL 6 AWG 14 AWG - 2 AWG Cu/Al: 6 AWG - 300 KCMIL
Neutral and ground bars	Large holes (5/16-24 UNF) Small holes (10-32 UNF)
	14 AWG - 1/0 AWG 14 AWG - 6 AWG
COMPLIANCE	
Compliance	UL 1741, UL 1741 SA, UL 1741 PCS, UL1998, UL869A ⁵ , UL67 ⁵ , UL508 ⁵ , UL50E ⁵ CSA 22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003, AC156. IQ System Controller 2 is approved for Use as Service Equipment in the United States ⁵ IFETEL homology number: RCPENEP22-2078

2. Compatible with BRHDK125 Hold-Down Kit to comply with 2017 NEC 710.15E for back-fed circuit breakers.
3. The IQ System Controller 2 is rated 22 kAIC.
4. Not included. Installer must provide properly rated breaker per circuit breaker list above.
5. Sections from these standards were used during the safety evaluation and included in the UL 1741 listing.

To learn more about Enphase offerings, visit enphase.com

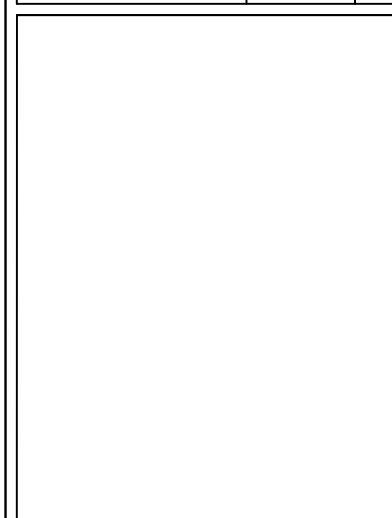
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TOP TIER SOLAR SOLUTIONS

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PROJECT NAME & ADDRESS

MARY BOLIN
RESIDENCE

373 CHINABERRY LN,
ANGIER, NC 27501

DRAWN BY
ESR

SHEET NAME
**EQUIPMENT
SPECIFICATION**

SHEET SIZE
**ANSI B
11" X 17"**

SHEET NUMBER
PV-13



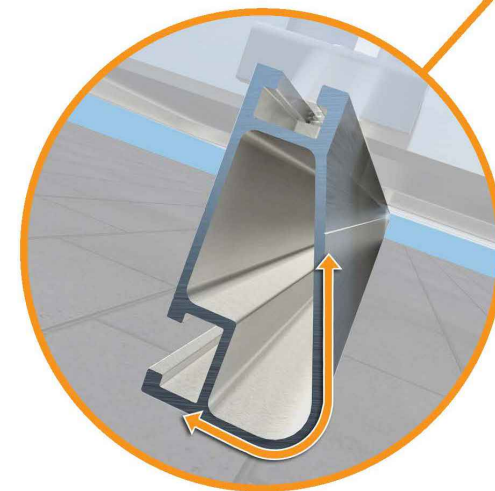
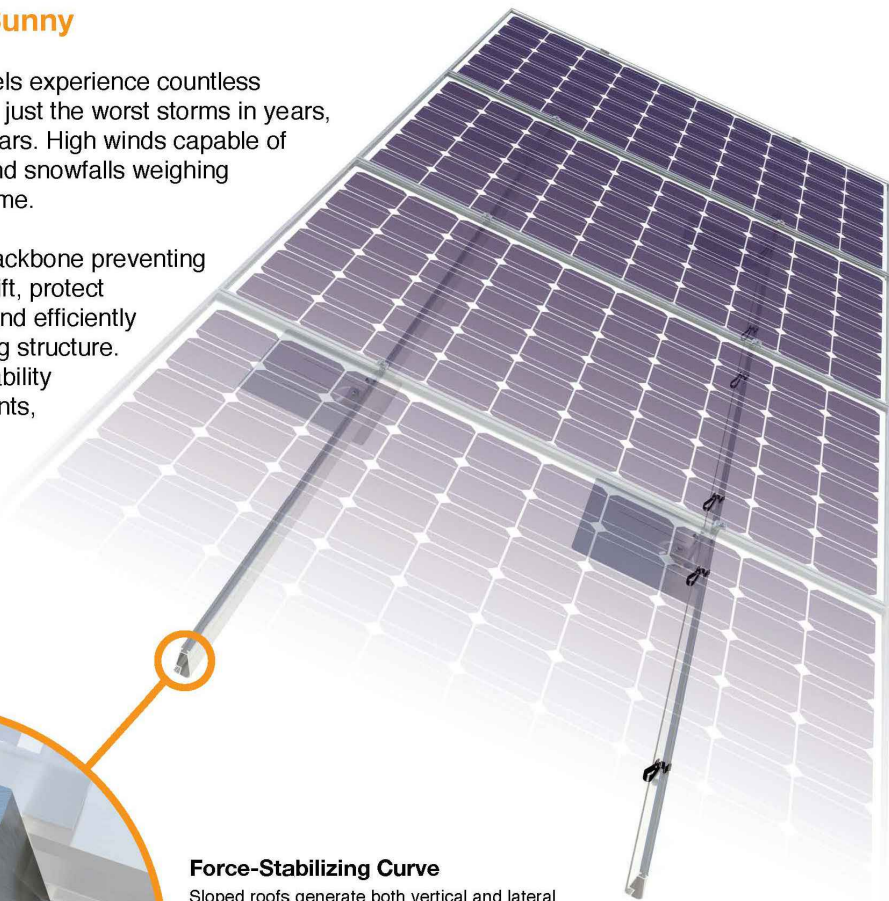
Tech Brief

XR Rail Family

Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.



Force-Stabilizing Curve

Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs



XR Rails are compatible with FlashFoot and other pitched roof attachments.



IronRidge offers a range of tilt leg options for flat roof mounting applications.

Corrosion-Resistant Materials

All XR Rails are made of marine-grade aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.



XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.



XR10

XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves 6 foot spans, while remaining light and economical.

- 6' spanning capability
- Moderate load capability
- Clear anodized finish
- Internal splices available



XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 8 feet.

- 8' spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available



XR1000

XR1000 is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans 12 feet or more for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone 1, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed span tables and certifications.

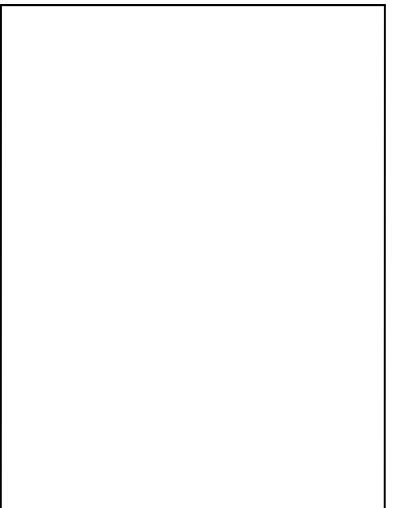
Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	100						
	120						
	140	XR10		XR100		XR1000	
	160						
10-20	100						
	120						
	140						
	160						
30	100						
	160						
40	100						
	160						
50-70	160						
80-90	160						

TOP TIER
SOLAR SOLUTIONS

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ANSI B
11" X 17"

SHEET NUMBER
PV-14

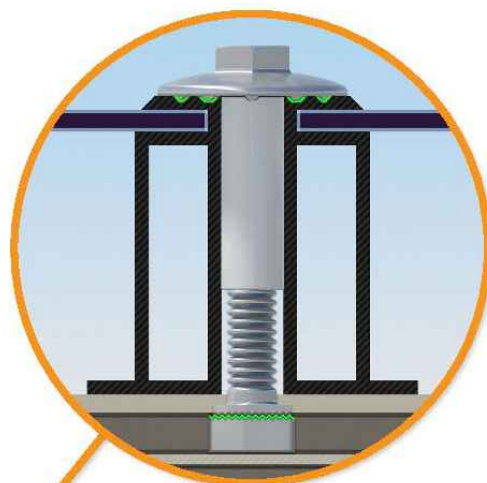


UFO Family of Components

Simplified Grounding for Every Application

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

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



Universal Fastening Object (UFO)

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



Stopper Sleeve

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



Bonded Splice

Each Bonded Splice uses self-drilling screws to form a secure connection. No bonding strap needed.



Grounding Lug

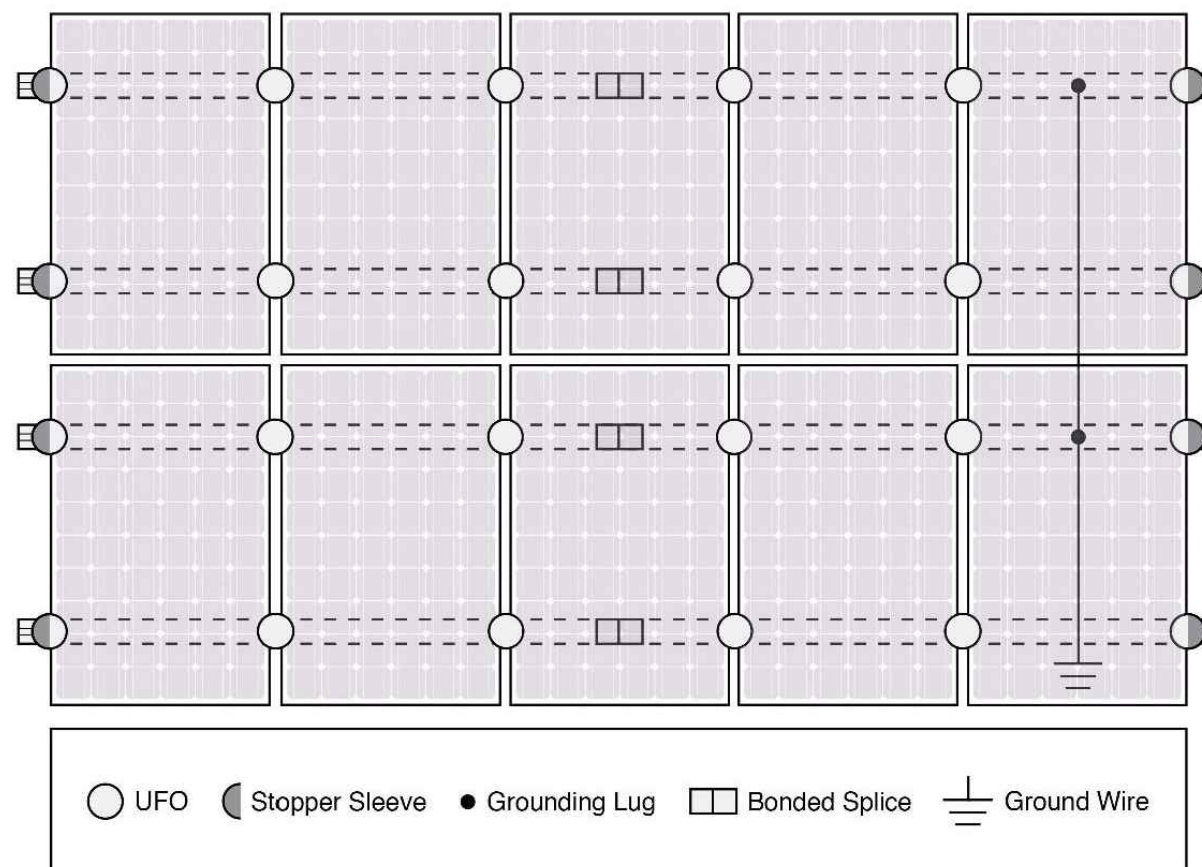
A single Grounding Lug connects an entire row of PV modules to the grounding conductor.



Bonded Attachments

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

System Diagram



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

UL Certification

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

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

[Go to IronRidge.com/UFO](http://www.ironridge.com/UFO)

Cross-System Compatibility

Feature	Flush Mount	Tilt Mount	Ground Mount
XR Rails	✓	✓	XR1000 Only
UFO/Stopper	✓	✓	✓
Bonded Splice	✓	✓	N/A
Grounding Lugs	1 per Row	1 per Row	1 per Array
Microinverters & Power Optimizers	Enphase - M250-72, M250-60, M215-60, C250-72 Darfon - MIG240, MIG300, G320, G640 SolarEdge - P300, P320, P400, P405, P600, P700, P730		
Fire Rating	Class A	Class A	N/A
Modules	Tested or Evaluated with over 400 Framed Modules Refer to installation manuals for a detailed list.		



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SPECIFICATION

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-15

S-5![®]

The Right Way!

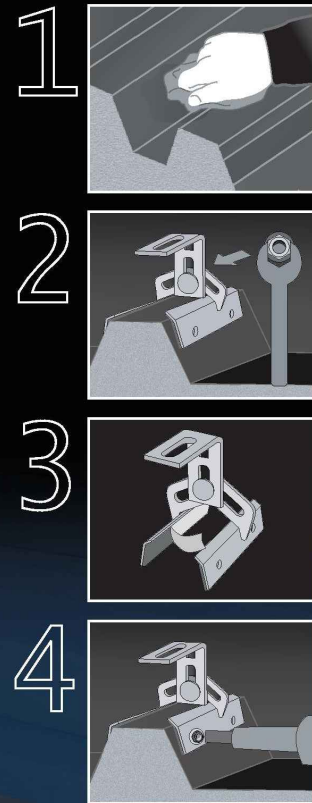
ProteaBracket[™]

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

Installation is simple! The ProteaBracket is mounted directly onto the crown of the panel, straddling the profile. No surface preparation is necessary; simply wipe away excess oil and debris, align, and apply. Secure ProteaBracket through its pre-punched holes, using the hardened drill point S-5![®] screws.

ProteaBracket is the perfect match for our S-5-PV Kit and spares you the hassle of cold-bridging! For a solar attachment solution that is both economical and easy to use, choose ProteaBracket.*

*When ProteaBracket is used in conjunction with the S-5-PV Kit, an additional nut is required during installation.



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

ProteaBracket[™]

888-825-3432 | www.S-5.com

S-5![®]

The Right Way!

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

Each ProteaBracket[™] comes with a factory-applied, adhesive rubber sealant on the base. A structural A2 stainless steel bimetal attachment bracket, ProteaBracket is compatible with most common metal roofing materials. All four pre-punched holes must be used to achieve tested strength. Mounting hardware is furnished with the ProteaBracket. For design assistance, ask your distributor, or visit www.S-5.com for the independent lab test data that can be used for load-critical designs and applications. Also, please visit our website for more information including metallurgical compatibilities and specifications. S-5![®] holding strength is unmatched in the industry.

Multiple Attachment Options:

Side Rail Option



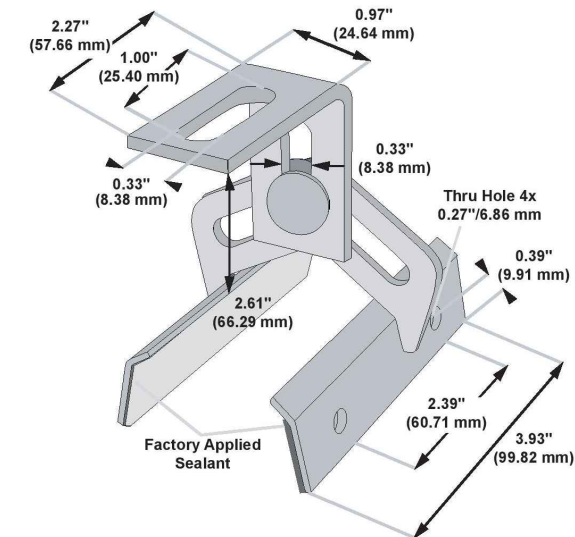
Top Rail Option



S-5-PV Kit Option

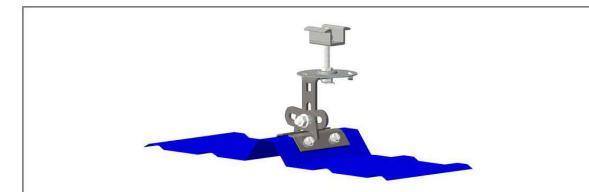


ProteaBracket[™]



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

Example Applications



S-5-PV Kit demonstrated with a ProteaBracket on a trapezoidal profile.

Example Profile



Distributed by

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

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TOP TIER
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SHEET NUMBER

PV-16