

# PHOTOVOLTAIC ROOF MOUNT SYSTEM

8 MODULES-ROOF MOUNTED - 3.160 kW DC, 6.000 kW AC

1013 SILAS MOORE RD, BENSON, NC 27504



TOP TIER SOLAR SOLUTIONS

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

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	05/24/22	



Wyssling Consulting, PLLC  
76 N Meadowbrook Drive Alpine UT 84004  
North Carolina COA # P-2308  
Signed 5/24/2023

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## PROJECT DATA

PROJECT ADDRESS: 1013 SILAS MOORE RD, BENSON, NC 27504  
OWNER: TIMOTHY HUGGINS  
DESIGNER: ESR  
SCOPE: 3.160 KW DC ROOF MOUNT SOLAR PV SYSTEM WITH 8 MISSION SOLAR: MSE395SX9R 395W PV MODULES WITH 8 SOLAREEDGE: S440 POWER OPTIMIZERS AND 01 SOLAREEDGE: SE6000H-US (240V/6000W) INVERTER

AUTHORITIES HAVING JURISDICTION:  
BUILDING: HARNETT COUNTY  
ZONING: HARNETT COUNTY  
UTILITY: DUKE ENERGY PROGRESS

## SHEET INDEX

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PV-6	ELECTRICAL LINE DIAGRAM
PV-7	WIRING CALCULATIONS
PV-8	LABELS
PV-9+	EQUIPMENT SPECIFICATIONS

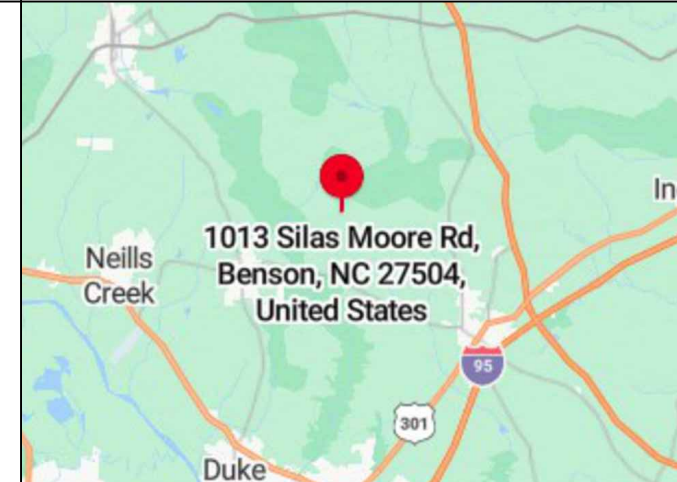
## SIGNATURE



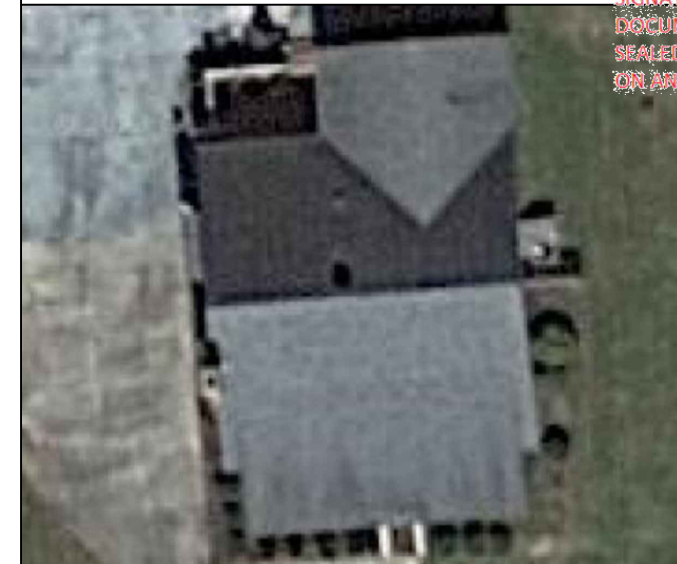
## GENERAL NOTES

- ALL COMPONENTS ARE UL LISTED AND CEC CERTIFIED, WHERE WARRANTED.
- THE SOLAR PV SYSTEM WILL BE INSTALLED IN ACCORDANCE WITH ARTICLE 690 OF THE NEC 2017.
- THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION.
- 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.
- WHERE METALLIC CONDUIT CONTAINING DC CONDUCTORS IS USED INSIDE THE BUILDING, IT SHALL BE IDENTIFIED AS "CAUTION: SOLAR CIRCUIT" EVERY 10FT.
- HEIGHT OF THE AC DISCONNECT SHALL NOT EXCEED 6'-7" PER NEC CODE 240.24.
- 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.
- PHOTOVOLTAIC MODULES ARE TO BE CONSIDERED NON-COMBUSTIBLE.
- PHOTOVOLTAIC INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
- 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.
- 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.
- INVERTER(S) USED IN UNGROUNDED SYSTEM SHALL BE UL 1741 LISTED.
- THE INSTALLATION OF EQUIPMENT AND ALL ASSOCIATED WIRING AND INTERCONNECTION SHALL BE PERFORMED ONLY BY QUALIFIED PERSONS [NEC 690.4(C)]
- ALL OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED (OR BETTER), INCLUDING ALL ROOF MOUNTED TRANSITION BOXES AND SWITCHES.
- ALL EQUIPMENT SHALL BE PROPERLY GROUNDED AND BONDED IN ACCORDANCE WITH NEC ARTICLE 250.
- SYSTEM GROUNDING SHALL BE IN ACCORDANCE WITH NEC 690.41.
- PV SYSTEM CIRCUITS INSTALLED ON OR IN BUILDINGS SHALL INCLUDE A RAPID SHUTDOWN FUNCTION IN ACCORDANCE WITH NEC 690.12
- 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)]
- ALL WIRING METHODS SHALL BE IN ACCORDANCE WITH NEC 690.31
- WORK CLEARANCES AROUND ELECTRICAL EQUIPMENT WILL BE MAINTAINED PER NEC 110.26(A)(1), 110.26(A)(2) AND 110.26(A)(3).
- ROOFTOP MOUNTED PHOTOVOLTAIC PANELS AND MODULES SHALL BE TESTED, LISTED & IDENTIFIED IN ACCORDANCE WITH UL1703
- ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER NEC.

## 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

PROJECT NAME & ADDRESS

TIMOTHY HUGGINS  
RESIDENCE  
1013 SILAS MOORE RD,  
BENSON, NC 27504

DRAWN BY

ESR

SHEET NAME

COVER SHEET

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-1

# PROJECT DESCRIPTION:

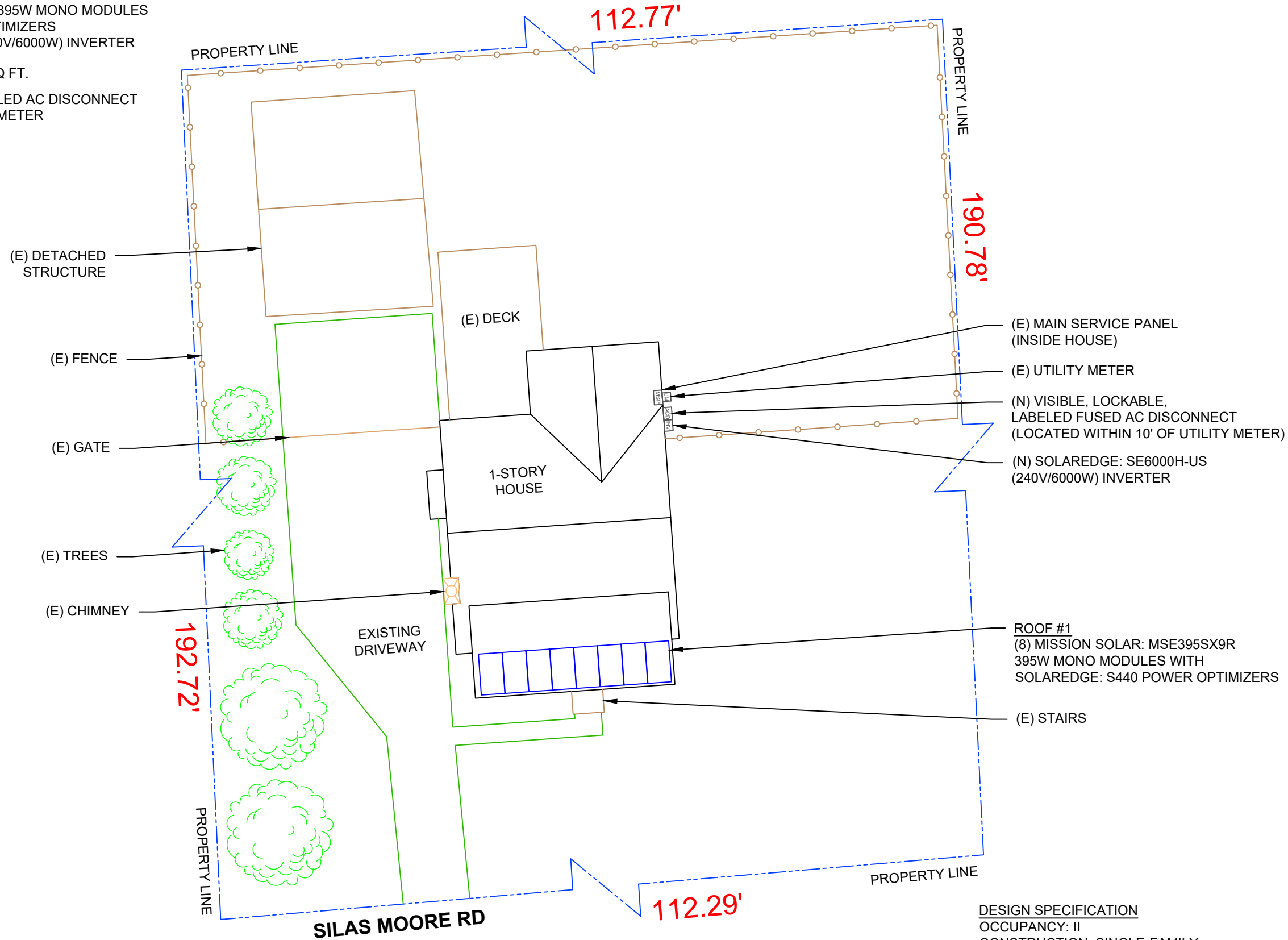
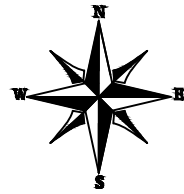
8 X MISSION SOLAR: MSE395SX9R 395W MONO MODULES  
 ROOF MOUNTED SOLAR PHOTOVOLTAIC MODULES  
 DC SYSTEM SIZE: 3.160 kW DC  
 AC SYSTEM SIZE: 6.000 kW AC

## EQUIPMENT SUMMARY

8 MISSION SOLAR: MSE395SX9R 395W MONO MODULES  
 8 SOLAREEDGE: S440 POWER OPTIMIZERS  
 01 SOLAREEDGE: SE6000H-US (240V/6000W) INVERTER

ROOF ARRAY AREA #1:- 173.12 SQ FT.

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



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DRAWN BY  
**ESR**

SHEET NAME  
**SITE PLAN**

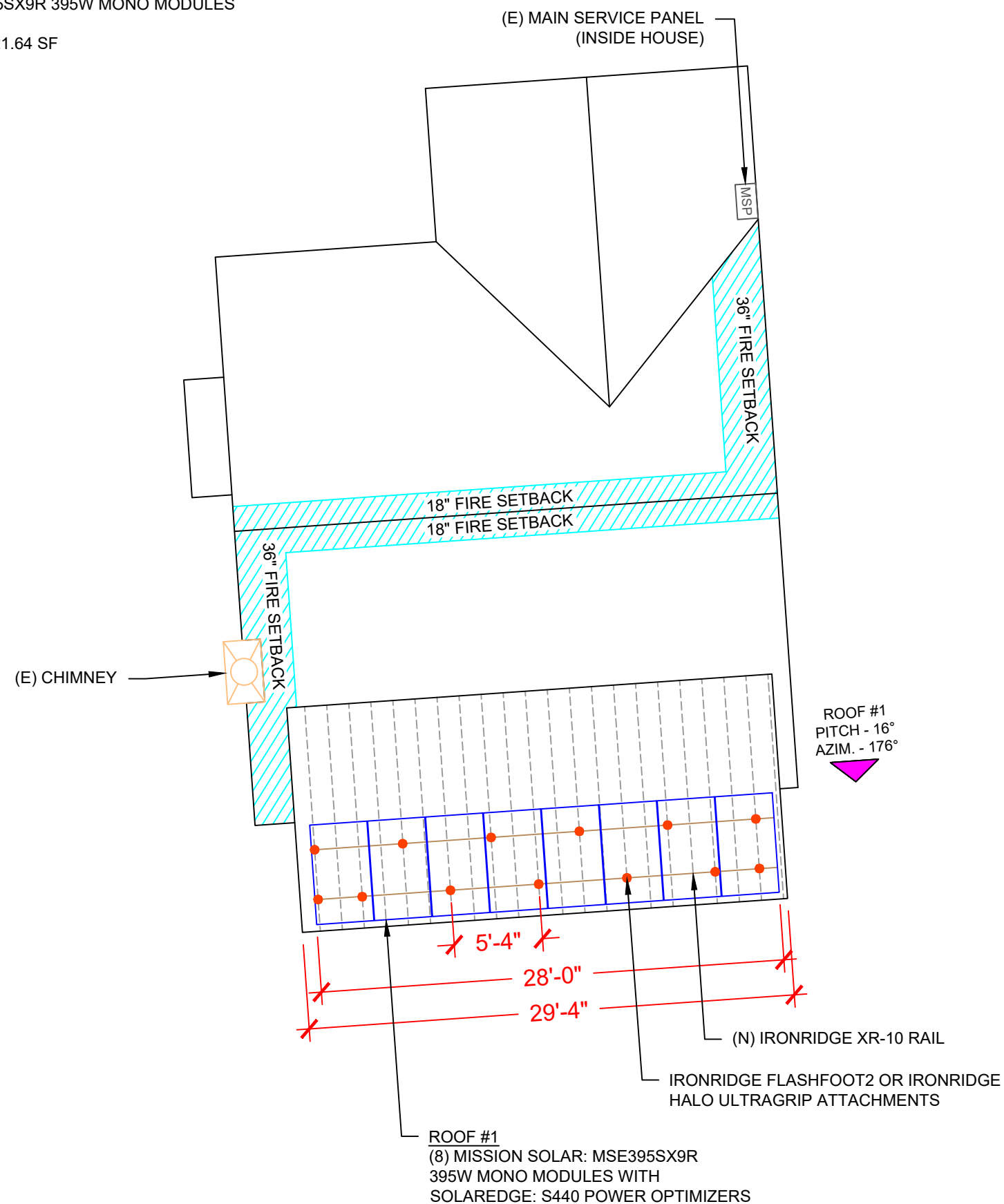
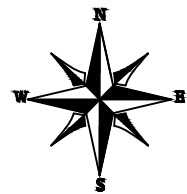
SHEET SIZE  
**ANSI B  
 11" X 17"**

SHEET NUMBER  
**PV-2**

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

**MODULE TYPE, DIMENSIONS & WEIGHT**

NUMBER OF MODULES = 8 MODULES  
 MODULE TYPE = MISSION SOLAR: MSE395SX9R 395W MONO MODULES  
 MODULE WEIGHT = 48.5 LBS / 22.0 kg.  
 MODULE DIMENSIONS = 75.08" x 41.50" = 21.64 SF



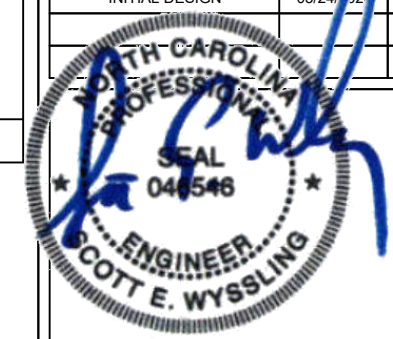
ROOF DESCRIPTION					
ROOF TYPE			ASPHALT SHINGLE		
ROOF LAYER			1 LAYER		
ROOF	# OF MODULES	ROOF PITCH	AZIMUTH	RAFTER SIZE	RAFTER SPACING
#1	8	16°	176°	2"X6"	16"

ARRAY AREA & ROOF AREA CALC'S		
TOTAL PV ARRAY AREA (SQ. FT.)	TOTAL ROOF AREA (Sq. Ft.)	ROOF AREA COVERED BY ARRAY (%)
173.12	1522.73	11

**TOP TIER SOLAR SOLUTIONS**

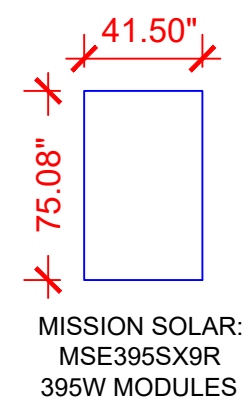
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**LEGEND**

- SD - SOLADECK
- INV - INVERTER
- ACD - AC DISCONNECT
- UM - UTILITY METER
- MSP - MAIN SERVICE PANEL
- - VENT, ATTIC FAN (ROOF OBSTRUCTION)
- - ROOF ATTACHMENT
- — — — — - RAFTER
- — — — — - CONDUIT

PROJECT NAME & ADDRESS

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**ESR**

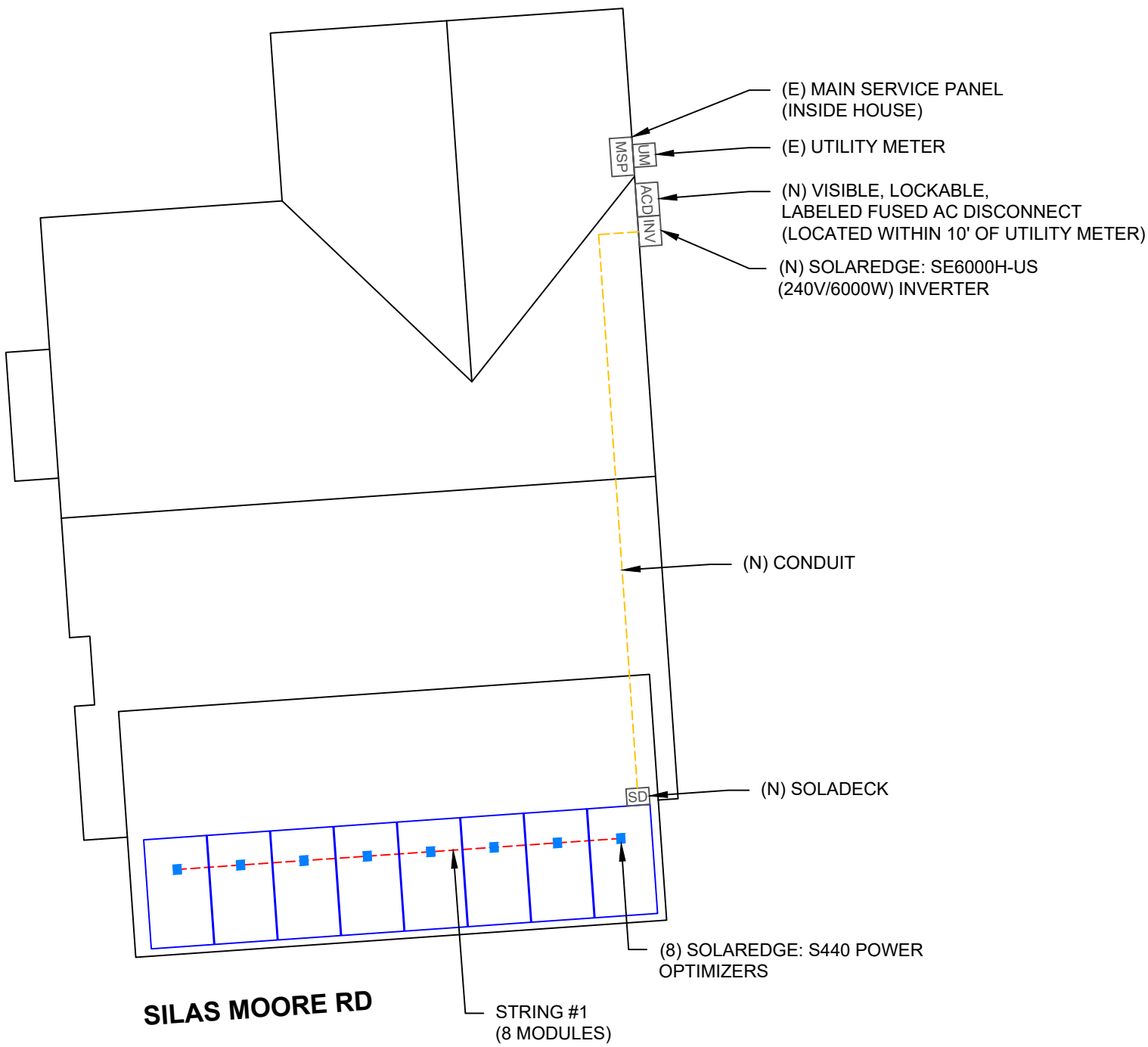
SHEET NAME  
**ROOF PLAN & MODULES**

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

SHEET NUMBER  
**PV-3**

DC SYSTEM SIZE: 3.160 kW DC  
 AC SYSTEM SIZE: 6.000 kW AC  
 (8) MISSION SOLAR: MSE395SX9R 395W MONO MODULES  
 WITH (8) SOLAREEDGE: S440 POWER OPTIMIZERS  
 LOCATED UNDER EACH PANEL AND  
 01 SOLAREEDGE: SE6000H-US (240V/6000W) INVERTER

**STRING LEGENDS**  
 - - - - - STRING #1



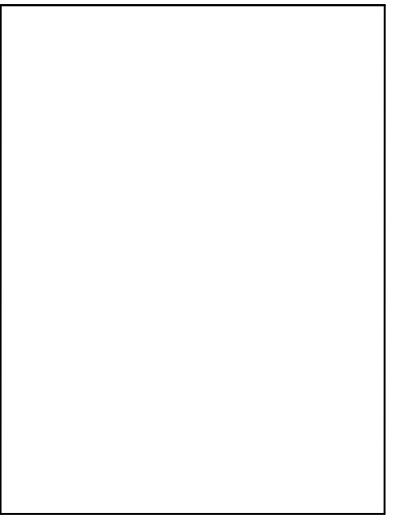
BILL OF MATERIALS	
EQUIPMENT DESCRIPTION	QTY
SOLAR PV MODULES: MISSION SOLAR: MSE395SX9R 395W MODULE	8
OPTIMIZERS: SOLAREEDGE: S440 POWER OPTIMIZERS	8
INVERTER: SOLAREEDGE: SE6000H-US (240V/6000W) INVERTER	01
SOLADECK	1
AC DISCONNECT: FUSED AC DISCONNECT, 60A FUSED, (2) 35A FUSES 240V NEMA 3R, UL LISTED	1
IRONRIDGE XR10 RAIL (RAIL 168" (14 FEET) BLACK) (XR-10-168B)	6
BONDED SPLICE, XR10 (XR10-BOSS-01-M1)	4
UNIVERSAL MODULE CLAMP, BLACK (UFO-CL-01-B1)	18
STOPPER SLEEVE, 40MM, BLACK (UFO-STP-40MM-B1)	4
GROUNDING LUG (XR-LUG-03-A1)	1
IRONRIDGE FLASHFOOT2 ATTACHMENTS OR IRONRIDGE HALO ULTRAGRIP ATTACHMENTS	17
SQUARE-BOLT BONDING HARDWARE (BHW-SQ-02-A1)	17

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 SOLAR SOLUTIONS

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SHEET NAME  
**ELECTRICAL PLAN**

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

SHEET NUMBER  
**PV-4**

**LEGEND**

<span style="border: 1px solid black; padding: 2px;">SD</span>	- SOLADECK
<span style="border: 1px solid black; padding: 2px;">INV</span>	- INVERTER
<span style="border: 1px solid black; padding: 2px;">ACD</span>	- AC DISCONNECT
<span style="border: 1px solid black; padding: 2px;">UM</span>	- UTILITY METER
<span style="border: 1px solid black; padding: 2px;">MSP</span>	- MAIN SERVICE PANEL
<span style="border: 1px solid black; border-radius: 50%; padding: 2px;"> </span>	- VENT, ATTIC FAN (ROOF OBSTRUCTION)
<span style="color: red;">●</span>	- ROOF ATTACHMENT
- - -	- RAFTER
- - - - -	- CONDUIT



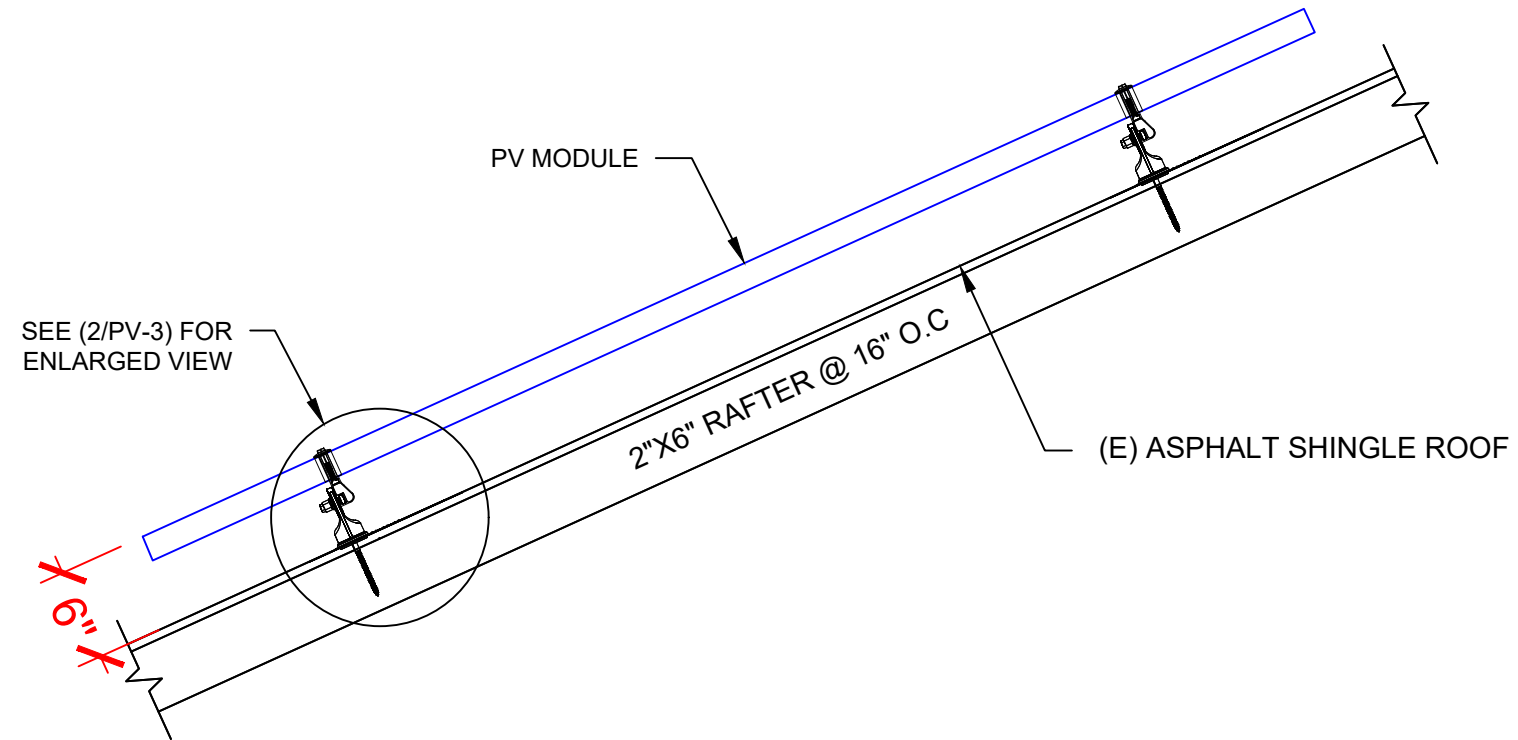
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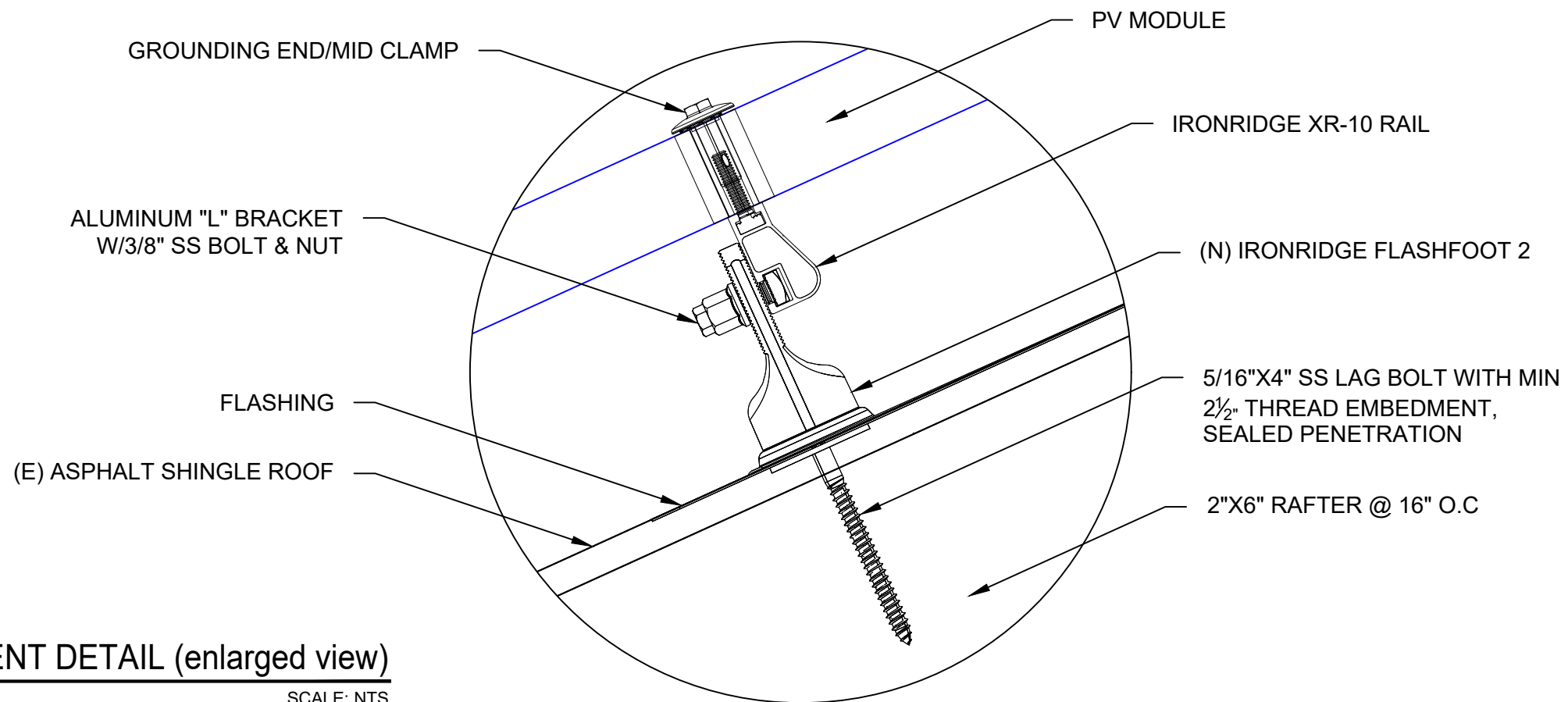


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**1** | **STRUCTURAL ATTACHMENT (Side view)**  
 PV-5 | SCALE: N.T.S



**2** | **ATTACHMENT DETAIL (enlarged view)**  
 PV-5 | SCALE: NTS

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SHEET NAME  
**STRUCTURAL DETAIL**

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

SHEET NUMBER  
**PV-5**



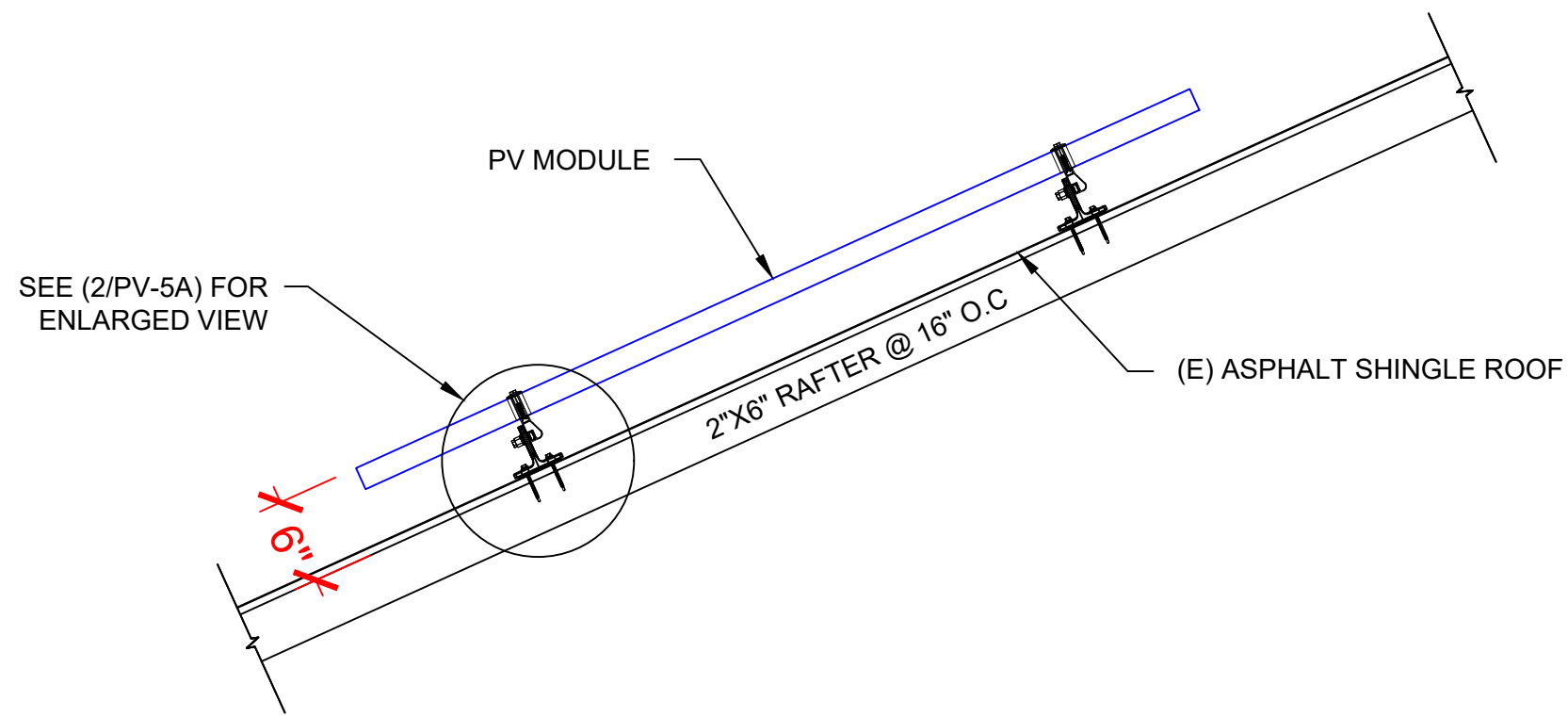
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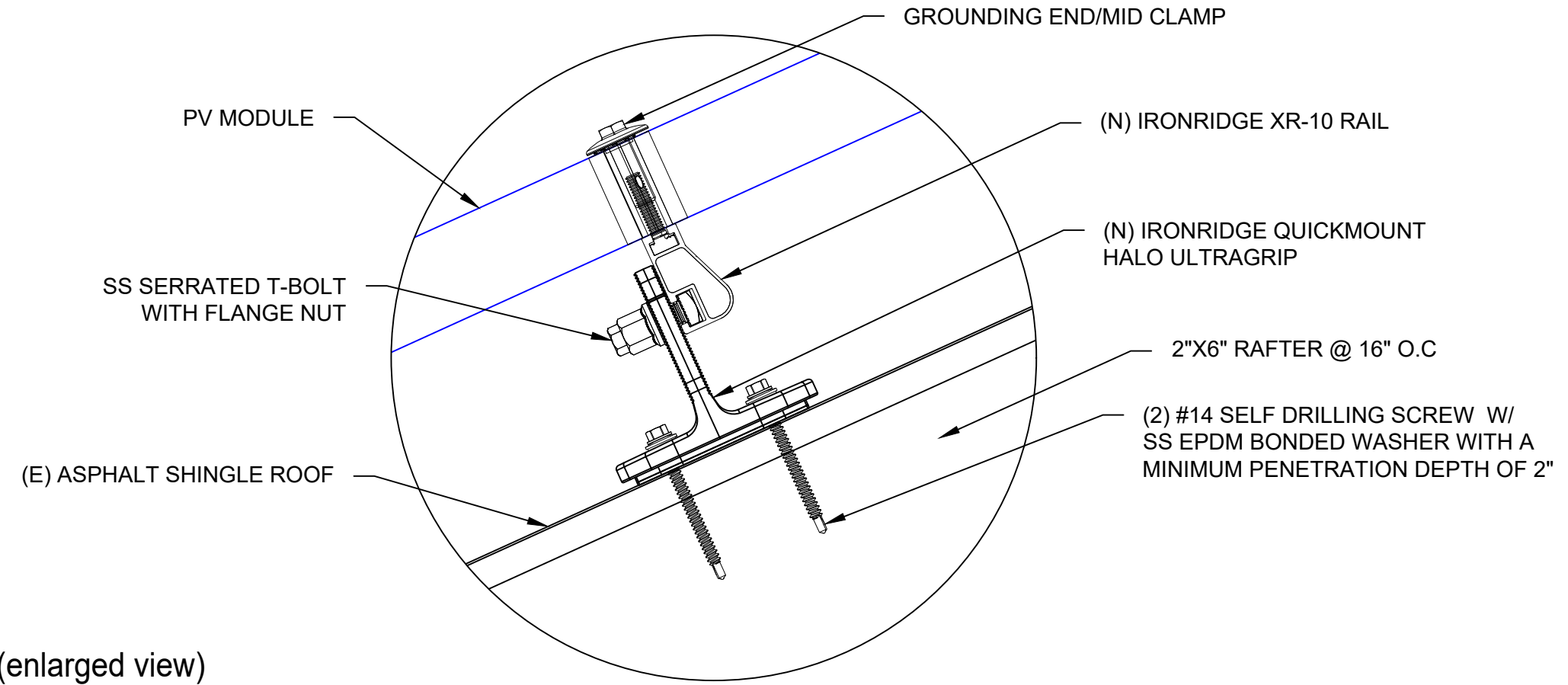


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**1** STRUCTURAL ATTACHMENT (Side view)  
 PV-5A SCALE: N.T.S



**2** ATTACHMENT DETAIL (enlarged view)  
 PV-5A SCALE: NTS

PROJECT NAME & ADDRESS

TIMOTHY HUGGINS RESIDENCE  
 1013 SILAS MOORE RD,  
 BENSON, NC 27504

DRAWN BY  
 ESR

SHEET NAME  
 STRUCTURAL DETAIL

SHEET SIZE  
 ANSI B  
 11" X 17"

SHEET NUMBER  
 PV-5A

DC SYSTEM SIZE: 3.160 kW DC  
AC SYSTEM SIZE: 6.000 kW AC

(8) MISSION SOLAR: MSE395SX9R 395W MONO MODULES  
WITH (8) SOLAREDEGE: S440 POWER OPTIMIZERS  
LOCATED UNDER EACH PANEL (240V) AND  
(01) SOLAREDEGE: SE6000H-US (240V/6000W) INVERTER  
(1) STRING OF 8 MODULES ARE CONNECTED IN SERIES

**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:**

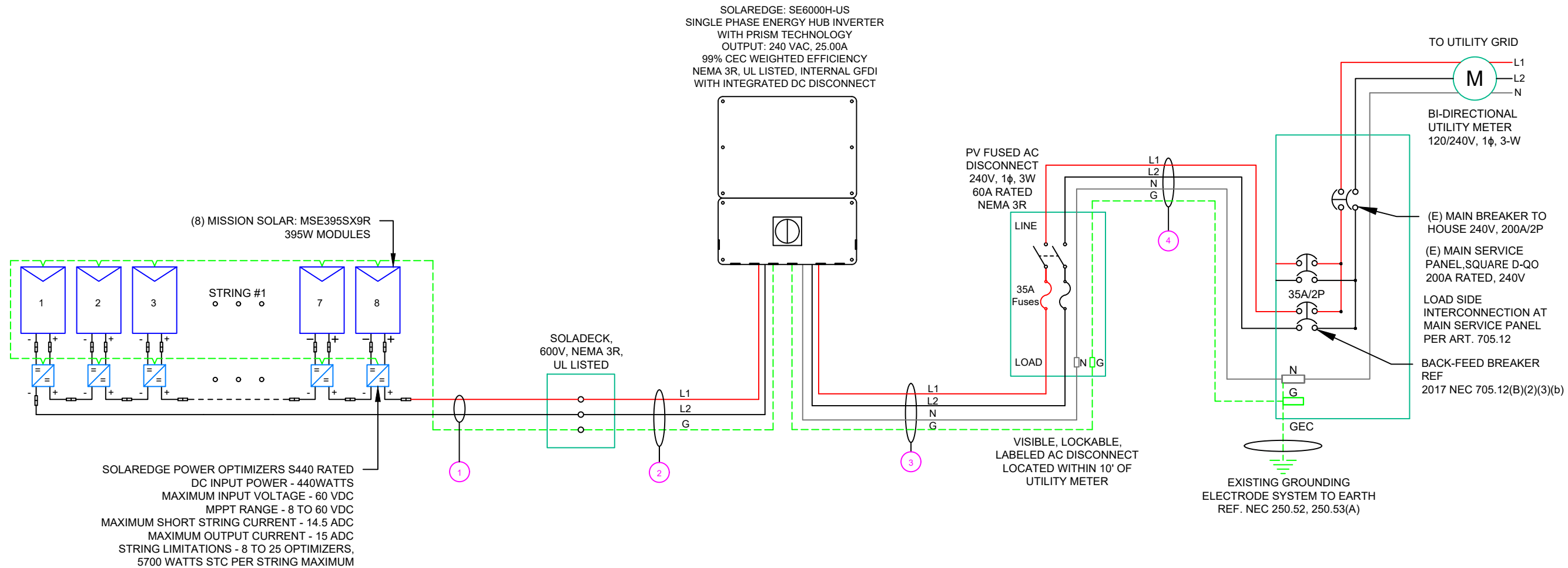
1. DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING LIVE ARE CONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS)
2. AC DISCONNECT MUST BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH
3. 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. SOLADECK QUANTITIES, AND PLACEMENT SUBJECT TO CHANGE IN THE FIELD - SOLADECK 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



SOLAREDEGE POWER OPTIMIZERS S440 RATED  
DC INPUT POWER - 440WATTS  
MAXIMUM INPUT VOLTAGE - 60 VDC  
MPPT RANGE - 8 TO 60 VDC  
MAXIMUM SHORT STRING CURRENT - 14.5 ADC  
MAXIMUM OUTPUT CURRENT - 15 ADC  
STRING LIMITATIONS - 8 TO 25 OPTIMIZERS,  
5700 WATTS STC PER STRING MAXIMUM

SOLAREDEGE: SE6000H-US  
SINGLE PHASE ENERGY HUB INVERTER  
WITH PRISM TECHNOLOGY  
OUTPUT: 240 VAC, 25.00A  
99% CEC WEIGHTED EFFICIENCY  
NEMA 3R, UL LISTED, INTERNAL GFDI  
WITH INTEGRATED DC DISCONNECT

SOLADECK,  
600V, NEMA 3R,  
UL LISTED

PV FUSED AC  
DISCONNECT  
240V, 1φ, 3W  
60A RATED  
NEMA 3R

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

EXISTING GROUNDING  
ELECTRODE SYSTEM TO EARTH  
REF. NEC 250.52, 250.53(A)

TO UTILITY GRID

L1  
L2  
N  
G

BI-DIRECTIONAL  
UTILITY METER  
120/240V, 1φ, 3-W

(E) MAIN BREAKER TO  
HOUSE 240V, 200A/2P

(E) MAIN SERVICE  
PANEL, SQUARE D-QO  
200A RATED, 240V

LOAD SIDE  
INTERCONNECTION AT  
MAIN SERVICE PANEL  
PER ART. 705.12

BACK-FEED BREAKER  
REF  
2017 NEC 705.12(B)(2)(3)(b)

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

QTY	CONDUCTOR INFORMATION		CONDUIT TYPE	CONDUIT SIZE
1	(2)	#10AWG - PV WIRE/USE-2	N/A	N/A
	(1)	#6AWG - BARE COPPER IN FREE AIR		
2	(2)	#10AWG - CU, THWN-2	EMT OR LFMC IN ATTIC	3/4"
	(1)	#10AWG - CU, THWN-2 GND		
3	(2)	#8AWG - CU, THWN-2	EMT, LFMC OR PVC	3/4"
	(1)	#8AWG - CU, THWN-2 N		
4	(1)	#10AWG - CU, THWN-2 GND	EMT, LFMC OR PVC	3/4"
	(2)	#8AWG - CU, THWN-2		
1	(1)	#8AWG - CU, THWN-2 N	EMT, LFMC OR PVC	3/4"
	(1)	#10AWG - CU, THWN-2 GND		

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SHEET NAME

ELECTRICAL LINE DIAGRAM

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-6

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)

INVERTER SPECIFICATIONS	
MANUFACTURER / MODEL #	SOLAREEDGE: SE6000H-US (240V/6000W) INVERTER
NOMINAL AC POWER	6.000 kW
NOMINAL OUTPUT VOLTAGE	240 VAC
NOMINAL OUTPUT CURRENT	25.00A

AMBIENT TEMPERATURE SPECS	
AMBIENT TEMP (HIGH TEMP 2%)	38°
RECORD LOW TEMPERATURE	-9°
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

AC FEEDER CALCULATIONS																						
CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FULL LOAD AMPS "FLA" (A)	FLA*1.25 (A)	OCPD 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 (%)
INVERTER 1	AC DISCONNECT	240	25	31.25	35	CU #8 AWG	CU #10 AWG	CU #8 AWG	50	PASS	38	2	55	0.91	1	50.05	PASS	5	0.778	0.081	3/4" EMT	24.5591
AC DISCONNECT	POI	240	25	31.25	35	CU #8 AWG	CU #10 AWG	CU #8 AWG	50	PASS	38	2	55	0.91	1	50.05	PASS	5	0.778	0.081	3/4" EMT	24.5591

CUMULATIVE VOLTAGE 0.162

DC FEEDER CALCULATIONS																					
CIRCUIT ORIGIN	CIRCUIT DESTINATION	VOLTAGE (V)	FULL LOAD AMPS "FLA" (A)	FLA*1.25 (A)	OCPD SIZE (A)	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 (%)
STRING 1	SOLADECK	380	15.00	18.75	20	BARE COPPER #6 AWG	CU #10 AWG	35	PASS	38	2	40	0.91	1	36.4	PASS	5	1.24	0.049	N/A	#N/A
SOLADECK	INVERTER	380	15.00	18.75	20	CU #10 AWG	CU #10 AWG	35	PASS	38	2	40	0.91	1	36.4	PASS	20	1.24	0.196	3/4" EMT	11.87617

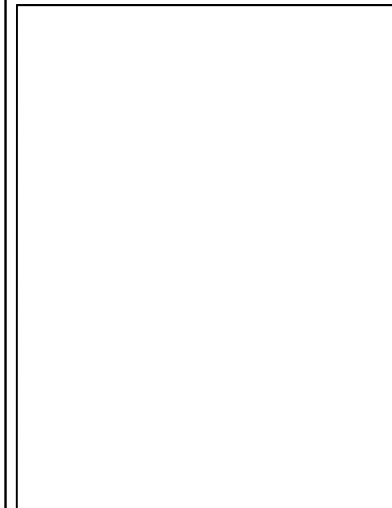
String 1 Voltage Drop 0.245



**TOP TIER SOLAR SOLUTIONS**

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

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	05/24/2023	



PROJECT NAME & ADDRESS

**TIMOTHY HUGGINS  
RESIDENCE**

1013 SILAS MOORE RD,  
BENSON, NC 27504

DRAWN BY  
**ESR**

SHEET NAME  
**WIRING CALCULATIONS**

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

SHEET NUMBER  
**PV-7**

ELECTRICAL NOTES

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



**PHOTOVOLTAIC POWER SOURCE**

EVERY 10' ON CONDUIT & ENCLOSURES

LABEL- 1:  
LABEL LOCATION:  
EMT/CONDUIT RACEWAY  
SOLADECK / JUNCTION BOX  
CODE REF: NEC 690.31 (D)(2)

**WARNING**

**ELECTRIC SHOCK HAZARD**

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

LABEL- 2:  
LABEL LOCATION:  
AC DISCONNECT  
CODE REF: NEC 690.13(B)

**WARNING**

**DUAL POWER SUPPLY**

SOURCE: UTILITY GRID AND  
PV SOLAR ELECTRIC SYSTEM

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

**SOLAR PV BREAKER:**

**BREAKER IS BACKFED  
DO NOT RELOCATE**

LABEL-4:  
LABEL LOCATION:  
MAIN SERVICE PANEL  
CODE REF: NEC 705.12(C) & NEC 690.59

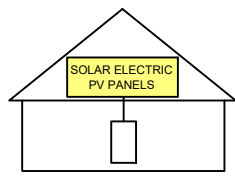
**WARNING**

POWER SOURCE OUTPUT  
CONNECTION. DO NOT  
RELOCATE THIS  
OVERCURRENT DEVICE

LABEL- 5:  
LABEL LOCATION:  
MAIN SERVICE PANEL (ONLY IF SOLAR IS BACK-FED)  
SUBPANEL (ONLY IF SOLAR IS BACK-FED)  
CODE REF: NEC 705.12(B)(3)(2)

**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- 6:  
LABEL LOCATION:  
AC DISCONNECT  
CODE REF: [NEC 690.56(C)(1)(A)]

**RAPID SHUTDOWN SWITCH  
FOR SOLAR PV SYSTEM**

LABEL- 7:  
LABEL LOCATION:  
AC DISCONNECT  
MAIN SERVICE PANEL  
CODE REF: NEC 690.56(C)(2)

**DC DISCONNECT**

LABEL- 8:  
LABEL LOCATION:  
INVERTER  
CODE REF: NEC 690.13(B)

MAXIMUM VOLTAGE	480 V
MAXIMUM CIRCUIT CURRENT	16.50 A
MAXIMUM RATED OUTPUT CURRENT OF THE CHARGE CONTROLLER OR DC-TO-DC CONVERTER (IF INSTALLED)	

LABEL- 9:  
LABEL LOCATION:  
INVERTER  
CODE REF: NEC 690.53

<b>AC DISCONNECT PHOTOVOLTAIC SYSTEM POWER SOURCE</b>	
NOMINAL OPERATING AC VOLATGE	240 V
RATED AC OUTPUT CURRENT	25.00 A

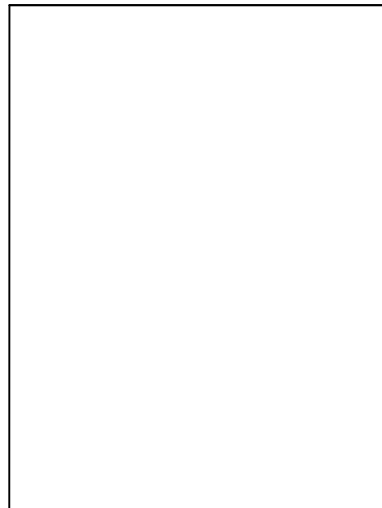
LABEL- 10:  
LABEL LOCATION:  
AC DISCONNECT  
CODE REF: NEC 690.54



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TIMOTHY HUGGINS  
RESIDENCE  
1013 SILAS MOORE RD,  
BENSON, NC 27504

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](http://www.missionsolar.com/warranty)

### CERTIFICATIONS

CEC

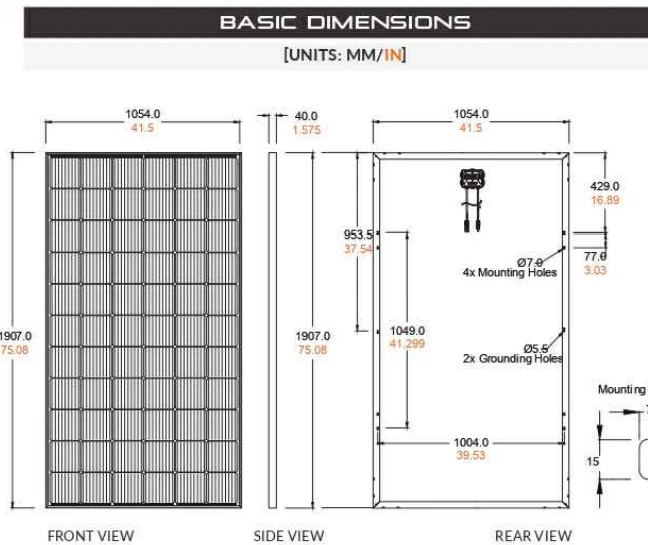


UL 61730 / IEC 61215 / IEC 61730 / IEC 61701

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



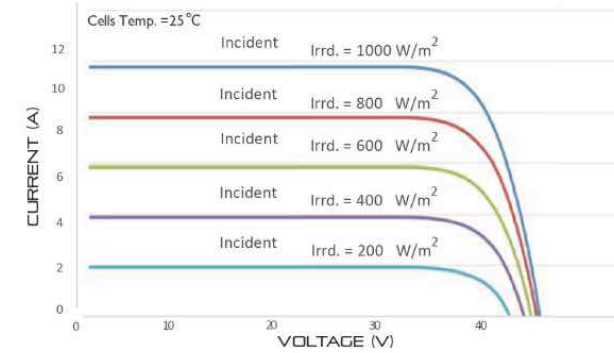
Class Leading  
**390-400W**



### 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](http://www.missionsolar.com) | [info@missionsolar.com](mailto:info@missionsolar.com)

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

[www.missionsolar.com](http://www.missionsolar.com) | [info@missionsolar.com](mailto:info@missionsolar.com)

# MSE PERC 66

ELECTRICAL SPECIFICATION					
PRODUCT TYPE	MSExxxSX9R (xxx = P <sub>max</sub> )				
Power Output	P <sub>max</sub>	W <sub>p</sub>	390	395	400
Module Efficiency	%		19.4	19.7	19.9
Tolerance	%		0/+3	0/+3	0/+3
Short Circuit Current	I <sub>sc</sub>	A	11.19	11.24	11.31
Open Circuit Voltage	V <sub>oc</sub>	V	45.04	45.18	45.33
Rated Current	I <sub>mp</sub>	A	10.63	10.68	10.79
Rated Voltage	V <sub>mp</sub>	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 <sub>max</sub>	-0.367%/°C
Temperature Coefficient of V <sub>oc</sub>	-0.259%/°C
Temperature Coefficient of I <sub>sc</sub>	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 4mm2 (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)	

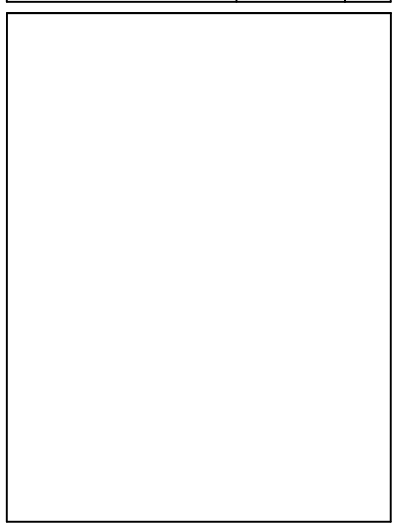
[www.missionsolar.com](http://www.missionsolar.com) | [info@missionsolar.com](mailto:info@missionsolar.com)

# TOP TIER SOLAR SOLUTIONS

## TOP TIER SOLAR SOLUTIONS

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

REVISIONS		
DESCRIPTION	DATE	REV
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### PROJECT NAME & ADDRESS

TIMOTHY HUGGINS  
RESIDENCE

1013 SILAS MOORE RD,  
BENSON, NC 27504

DRAWN BY  
**ESR**

SHEET NAME  
**EQUIPMENT SPECIFICATION**

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

SHEET NUMBER  
**PV-9**

# Power Optimizer For Residential Installations

S440, S500



POWER OPTIMIZER

## Enabling PV power optimization at the module level

- Specifically designed to work with SolarEdge residential inverters
- Mitigates all types of module mismatch loss, from manufacturing tolerance to partial shading
- Detects abnormal PV connector behavior, preventing potential safety issues\*
- Faster installations with simplified cable management and easy assembly using a single bolt
- Module-level voltage shutdown for installer and firefighter safety
- Flexible system design for maximum space utilization
- Superior efficiency (99.5%)
- Compatible with bifacial PV modules

\* Functionality subject to inverter model and firmware version

solaredge.com

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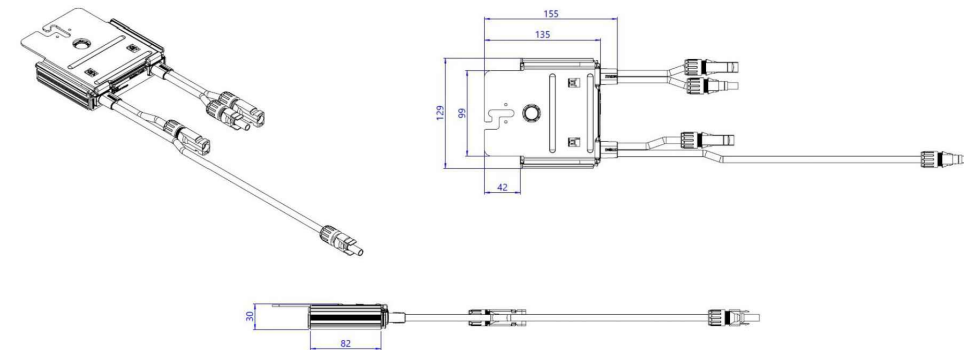
## Power Optimizer For Residential Installations S440, S500

	S440	S500	UNIT
Rated Input DC Power <sup>(1)</sup>	440	500	W
Absolute Maximum Input Voltage (Voc)		60	Vdc
MPPT Operating Range		8 - 60	Vdc
Maximum Short Circuit Current (Isc) of Connected PV Module	14.5	15	Adc
Maximum Efficiency		99.5	%
Weighted Efficiency		98.6	%
Overtoltage Category		II	
<b>OUTPUT DURING OPERATION</b>			
Maximum Output Current		15	Adc
Maximum Output Voltage		60	Vdc
<b>OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM INVERTER OR INVERTER OFF)</b>			
Safety Output Voltage per Power Optimizer		1	Vdc
<b>STANDARD COMPLIANCE</b>			
EMC	FCC Part 15 Class B, IEC61000-6-2, IEC61000-6-3, CISPR11, EN-55011		
Safety	IEC62109-1 (class II safety), UL1741		
Material	UL94 V-0, UV Resistant		
RoHS	Yes		
Fire Safety	VDE-AR-E 2100-712:2013-05		
<b>INSTALLATION SPECIFICATIONS</b>			
Maximum Allowed System Voltage		1000	Vdc
Dimensions (W x L x H)		129 x 155 x 30	mm
Weight (including cables)		655 / 1.5	gr / lb
Input Connector		MC4 <sup>(2)</sup>	
Input Wire Length		0.1	m
Output Connector		MC4	
Output Wire Length		(+) 2.3, (-) 0.10	m
Operating Temperature Range <sup>(3)</sup>		-40 to +85	°C
Protection Rating		IP68 / NEMA6P	
Relative Humidity		0 - 100	%

(1) Rated power of the module at STC will not exceed the Power Optimizer Rated Input DC Power. Modules with up to +5% power tolerance are allowed  
 (2) For other connector types please contact SolarEdge  
 (3) For ambient temperature above +70°C / +158°F power de-rating is applied. Refer to Power Optimizers Temperature De-Rating Technical Note for more details

PV System Design Using a SolarEdge Inverter	Single Phase HD-Wave	Three Phase	Three Phase for 277/480V Grid	
Minimum String Length (Power Optimizers)	S440, S500	8	16	18
Maximum String Length (Power Optimizers)		25	50	
Maximum Nominal Power per String <sup>(4)</sup>		5700	11250 <sup>(5)</sup>	12750 <sup>(6)</sup>
Parallel Strings of Different Lengths or Orientations			Yes	

(4) If the inverters rated AC power ≤ maximum nominal power per string, then the maximum power per string will be able to reach up to the inverters maximum input DC power. Refer to: <https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf>  
 (5) For the 230/400V grid: it is allowed to install up to 13,500W per string when the maximum power difference between each string is 2,000W  
 (6) For the 277/480V grid: it is allowed to install up to 15,000W per string when the maximum power difference between each string is 2,000W  
 (7) It is not allowed to mix S-series and P-series Power Optimizers in new installations



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CE RoHS

**TOP TIER**  
SOLAR SOLUTIONS

TOP TIER SOLAR SOLUTIONS

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RESIDENCE

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DRAWN BY

ESR

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-10

# Single Phase Energy Hub Inverter with Prism Technology

For North America

SE3000H-US / SE3800H-US / **SE6000H-US** / SE7600H-US / SE10000H-US / SE11400H-US<sup>(1)</sup>



**12-25**  
YEAR  
WARRANTY

**HOME BACKUP**

## Optimized battery storage with HD-Wave technology

- Record-breaking 99% weighted efficiency with 200% DC oversizing
- Multi-inverter, scalable storage solution
  - With enhanced battery power up to 10kW
- Small, lightweight, and easy to install
- Integrated arc fault protection and rapid shutdown for NEC 2014, NEC 2017 and NEC 2020, per article 690.11 and 690.12
- Modular design, future ready with optional upgrades to:
  - DC-coupled storage for full or partial home backup
  - Built-in consumption monitoring
  - Direct connection to the SolarEdge smart EV charger
- Embedded revenue grade production data, ANSI C12.20 Class 0.5

solaredge.com



## Single Phase Energy Hub Inverter with Prism Technology

For North America

SE3000H-US / SE3800H-US / **SE6000H-US** / SE7600H-US / SE10000H-US / SE11400H-US<sup>(1)</sup>

	SE3000H-US	SE3800H-US	<b>SE6000H-US</b>	SE7600H-US	SE10000H-US	SE11400H-US	UNITS
<b>OUTPUT - AC ON GRID</b>							
Rated AC Power	3000	3800 @ 240V 3300 @ 208V	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	W
Maximum AC Power Output	3000	3800 @ 240V 3300 @ 208V	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	W
AC Frequency Range (min - nom - max)	59.3 - 60 - 60.5 <sup>(2)</sup>						Hz
Maximum Continuous Output Current @ 240V	12.5	16	25	32	42	47.5	A
Maximum Continuous Output Current @ 208V	-	16	24	-	-	48.5	A
GFDI Threshold	1						A
Total Harmonic Distortion (THD)	<3						%
Power Factor	1, adjustable -0.85 to 0.85						
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes						
Charge Battery from AC (if allowed)	Yes						
Typical Nighttime Power Consumption	<2.5						W
<b>OUTPUT - AC BACKUP<sup>(3)</sup></b>							
Rated AC Power in Backup Operation <sup>(4)</sup>	3000	3800 7600*	6000	7600 10300*	10000	10300	W
AC L-L Output Voltage Range in Backup	211 - 264						Vac
AC L-N Output Voltage Range in Backup	105 - 132						Vac
AC Frequency Range in Backup (min - nom - max)	55 - 60 - 65						Hz
Maximum Continuous Output Current in Backup Operation	12.5	16 32*	25	32 43*	42	43	A
GFDI	1						A
THD	<5						%
<b>OUTPUT - SMART EV CHARGER AC</b>							
Rated AC Power	9600						W
AC Output Voltage Range	211 - 264						Vac
On-Grid AC Frequency Range (min - nom - max)	59.3 - 60 - 60.5						Hz
Maximum Continuous Output Current @ 240V (grid, PV and battery)	40						Aac
<b>INPUT - DC (PV AND BATTERY)</b>							
Transformer-less, Ungrounded	Yes						
Max Input Voltage	480						Vdc
Nom DC Input Voltage	380						Vdc
Reverse-Polarity Protection	Yes						
Ground-Fault Isolation Detection	600kΩ Sensitivity						
<b>INPUT - DC (PV)</b>							
Maximum DC Power @ 240V	6000	7600 15200*	12000	15200 22800*	22000	22800	W
Maximum DC Power @ 208V	-	6600	10000	-	-	20000	W
Maximum Input Current <sup>(5)</sup> @ 240V	8.5	10.5 20*	16.5	20 31*	27	31	Adc
Maximum Input Current <sup>(5)</sup> @ 208V	-	9	13.5	-	-	27	Adc
Max. Input Short Circuit Current	45						Adc
Maximum Inverter Efficiency	99	99.2					%
CEC Weighted Efficiency	99					99 @ 240V 98.5 @ 208V	%
2-pole Disconnection	Yes						

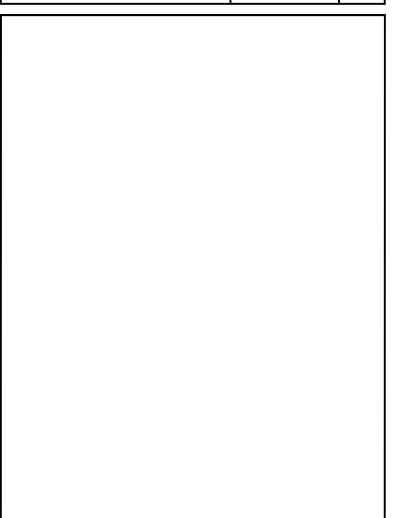
\* Supported with PN SExxxxH-USMxxxxxx or SExxxxH-USMxxxxxx  
 (1) These specifications apply to inverters with part numbers SExxxxH-USMxxxxxx or SExxxxH-USMxxxxxx and connection unit model number DCD-1PH-US-PxH-F-x  
 (2) For other regional settings please contact SolarEdge support.  
 (3) Not designed for standalone applications and requires AC for commissioning. Backup functionality is only supported for 240V grid  
 (4) Rated AC power in Backup Operation are valid for installations with multiple inverters. For a single backup inverter operation, rated AC power in Backup is 90% of the value stated.  
 (5) A higher current source may be used; the inverter will limit its input current to the values stated.

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**PV-11**

# / Single Phase Energy Hub Inverter with Prism Technology For North America

SE3000H-US / SE3800H-US / **SE6000H-US** / SE7600H-US / SE10000H-US / SE11400H-US<sup>(1)</sup>

	SE3000H-US	SE3800H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	UNITS
<b>INPUT - DC (BATTERY)</b>							
Supported Battery Types	SolarEdge Energy Bank, LG RESU Prime <sup>(6)</sup>						
Number of Batteries per Inverter	Up to 3 SolarEdge Energy Bank, up to 2 LG RESU Prime						
Continuous Power <sup>(7)</sup>	6000	7600		10000			W
Peak Power <sup>(7)</sup>	6000	7600		10000			W
Max Input Current	16	20		26.5			Adc
2-pole Disconnection	Yes						
<b>SMART ENERGY CAPABILITIES</b>							
Consumption Metering	Built - in <sup>(8)</sup>						
Backup & Battery Storage	With Backup Interface (purchased separately) for service up to 200A; Up to 3 inverters						
EV Charging	Direct connection to Smart EV charger						
<b>ADDITIONAL FEATURES</b>							
Supported Communication Interfaces	RS485, Ethernet, Cellular <sup>(9)</sup> , Wi-Fi (optional), SolarEdge Energy Net (optional)						
Revenue Grade Metering, ANSI C12.20	Built - in <sup>(8)</sup>						
Integrated AC, DC and Communication Connection Unit	Yes						
Inverter Commissioning	With the SetApp mobile application using built-in Wi-Fi Access Point for local connection						
DC Voltage Rapid Shutdown (PV and Battery)	Yes, according to NEC 2014, NEC 2017 and NEC 2020 690.12						
<b>STANDARD COMPLIANCE</b>							
Safety	UL1741, UL1741 SA, UL1741 PCS, UL1699B, UL1998, UL9540, CSA 22.2						
Grid Connection Standards	IEEE1547, Rule 21, Rule 14H						
Emissions	FCC part 15 class B						
<b>INSTALLATION SPECIFICATIONS</b>							
AC Output and EV AC Output Conduit Size / AWG Range	1" maximum / 14-4 AWG						
DC Input (PV and Battery) Conduit Size / AWG Range	1" maximum / 14-6 AWG						
Dimensions with Connection Unit (H x W x D)	17.7 x 14.6 x 6.8 / 450 x 370 x 174		17.7 x 14.6 x 6.8 / 450 x 370 x 174	17.7 x 14.6 x 6.8 / 450 x 370 x 174		in / mm	
Weight with Connection Unit	26 / 11.8		26 / 11.8	41.7 / 18.9		lb / kg	
Noise	< 25	< 25 < 50*	< 25	< 50		dBA	
Cooling	Natural Convection						
Operating Temperature Range	-40 to +140 / -40 to +60 <sup>(10)</sup>						
Protection Rating	NEMA 4						

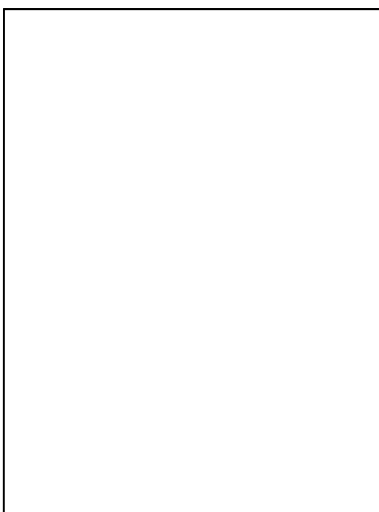
(6) The part numbers SExxxxH-USxMxxxx only support the SolarEdge Energy Bank. The part numbers SExxxxH-USxNxxxx support both SolarEdge Energy Bank and LG RESU Prime batteries. Requires supporting Inverter firmware.  
 (7) Discharge power is limited up to the inverter rated AC power for on-grid and backup applications.  
 (8) For consumption metering current transformers should be ordered separately: SECT-SPL-225A-T-20 or SEACT0750-400NA-20 units per box. Revenue grade metering is only for production metering.  
 (9) Information concerning the Data Plan's terms & conditions is available in the following link: <https://www.solaredge.com/sites/default/files/se-communication-plan-terms-and-conditions-eng.pdf>  
 (10) Full power up to at least 50°C / 122°F; for power de-rating information refer to: <https://www.solaredge.com/sites/default/files/se-temperature-derating-nc-e-na.pdf>



**TOP TIER SOLAR SOLUTIONS**

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

REVISIONS		
DESCRIPTION	DATE	REV
INITIAL DESIGN	05/24/2023	



PROJECT NAME & ADDRESS

**TIMOTHY HUGGINS  
RESIDENCE**

**1013 SILAS MOORE RD,  
BENSON, NC 27504**

DRAWN BY  
**ESR**

SHEET NAME  
**EQUIPMENT  
SPECIFICATION**

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

SHEET NUMBER  
**PV-12**



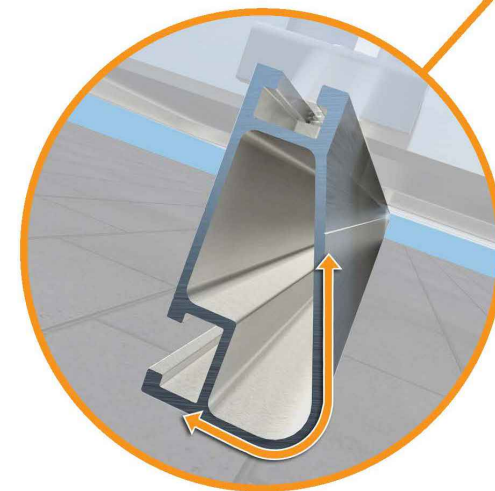
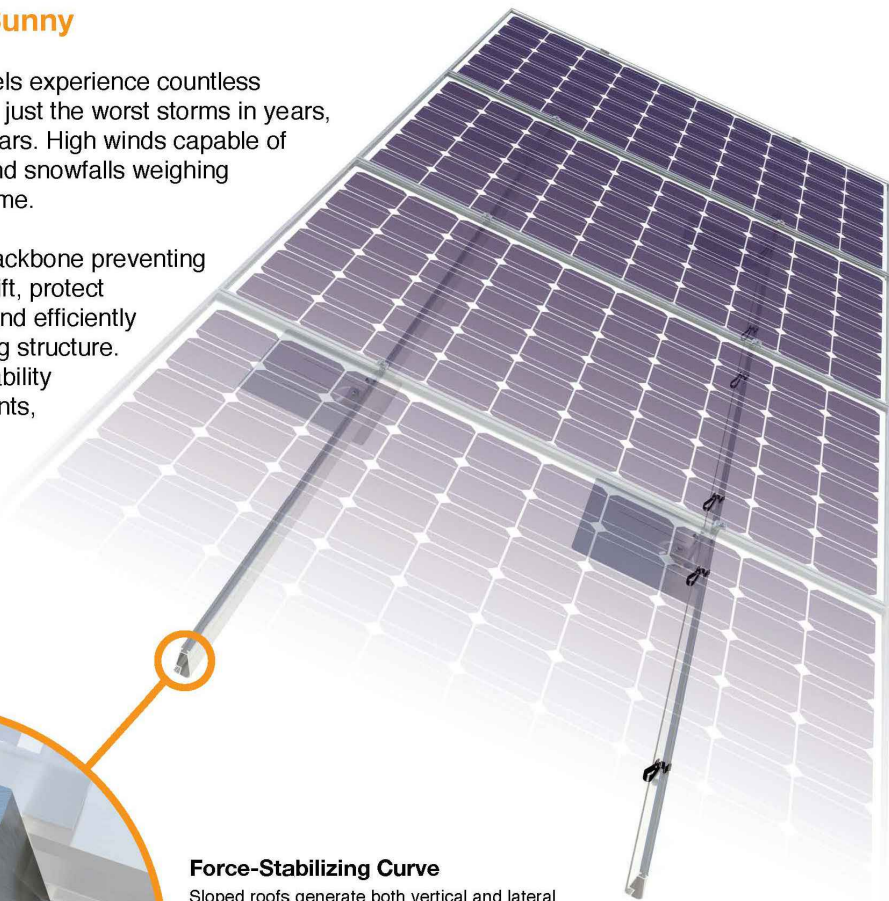
Tech Brief

## 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.



Tech Brief

## 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](http://IronRidge.com) for detailed span tables and certifications.

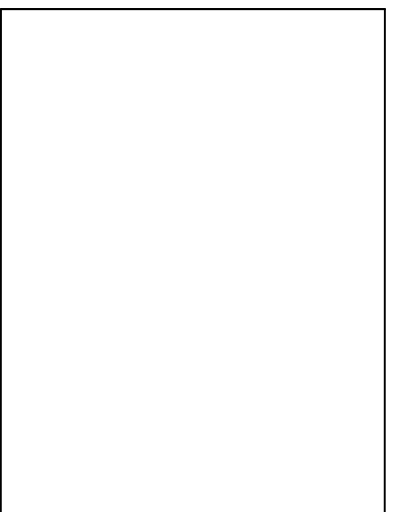
Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	100						
	120						
	140	XR10		XR100		XR1000	
	160						
10-20	100						
	120						
	140						
	160						
30	100						
	160						
40	100						
	160						
50-70	160						
80-90	160						



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ESR

SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-13

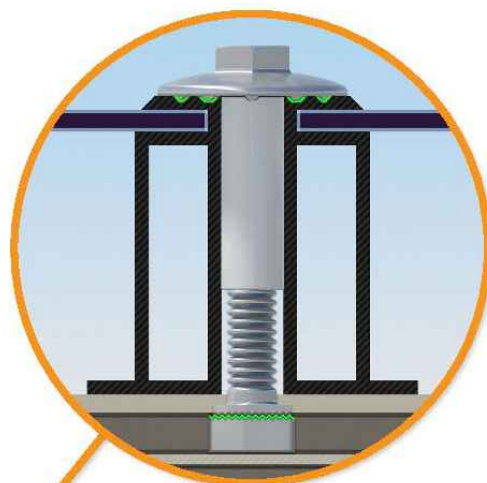


## UFO Family of Components

### 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

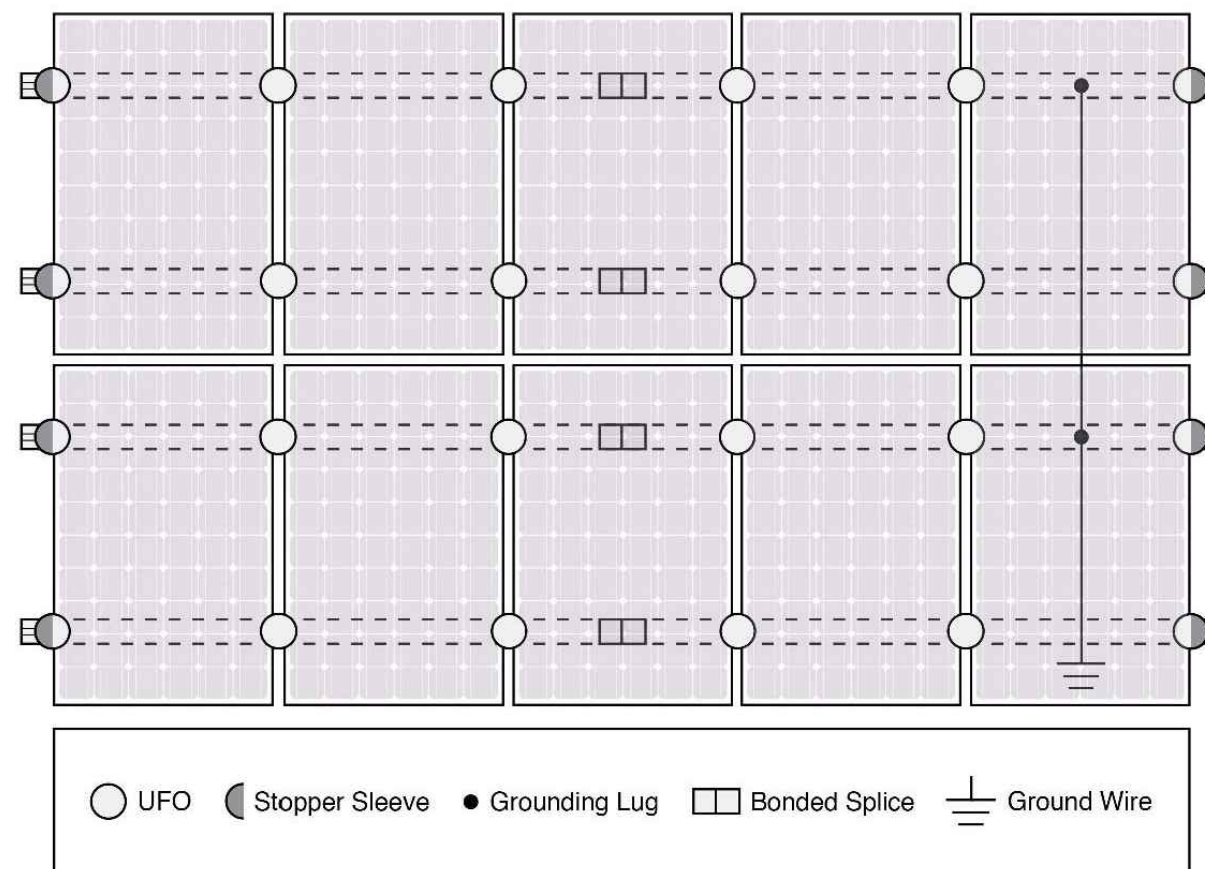
A single Grounding Lug connects an entire row of PV modules to the grounding conductor.



#### 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://Go to IronRidge.com/UFO)

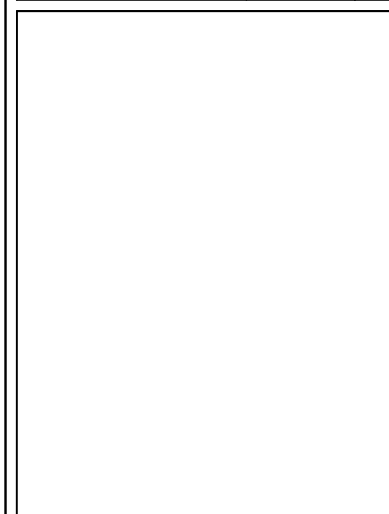
Cross-System Compatibility			
Feature	Flush Mount	Tilt Mount	Ground Mount
XR Rails	✓	✓	XR1000 Only
UFO/Stopper	✓	✓	✓
Bonded Splice	✓	✓	N/A
Grounding Lugs	1 per Row	1 per Row	1 per Array
Microinverters & Power Optimizers	Enphase - M250-72, M250-60, M215-60, C250-72 Darfon - MIG240, MIG300, G320, G640 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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1013 SILAS MOORE RD,  
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SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-14



Tech Brief

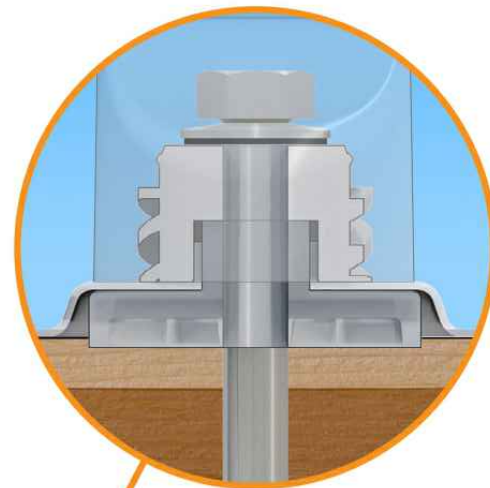
## FlashFoot2

### The Strongest Attachment in Solar

IronRidge FlashFoot2 raises the bar in solar roof protection. The unique water seal design is both elevated and encapsulated, delivering redundant layers of protection against water intrusion. In addition, the twist-on Cap perfectly aligns the rail attachment with the lag bolt to maximize mechanical strength.

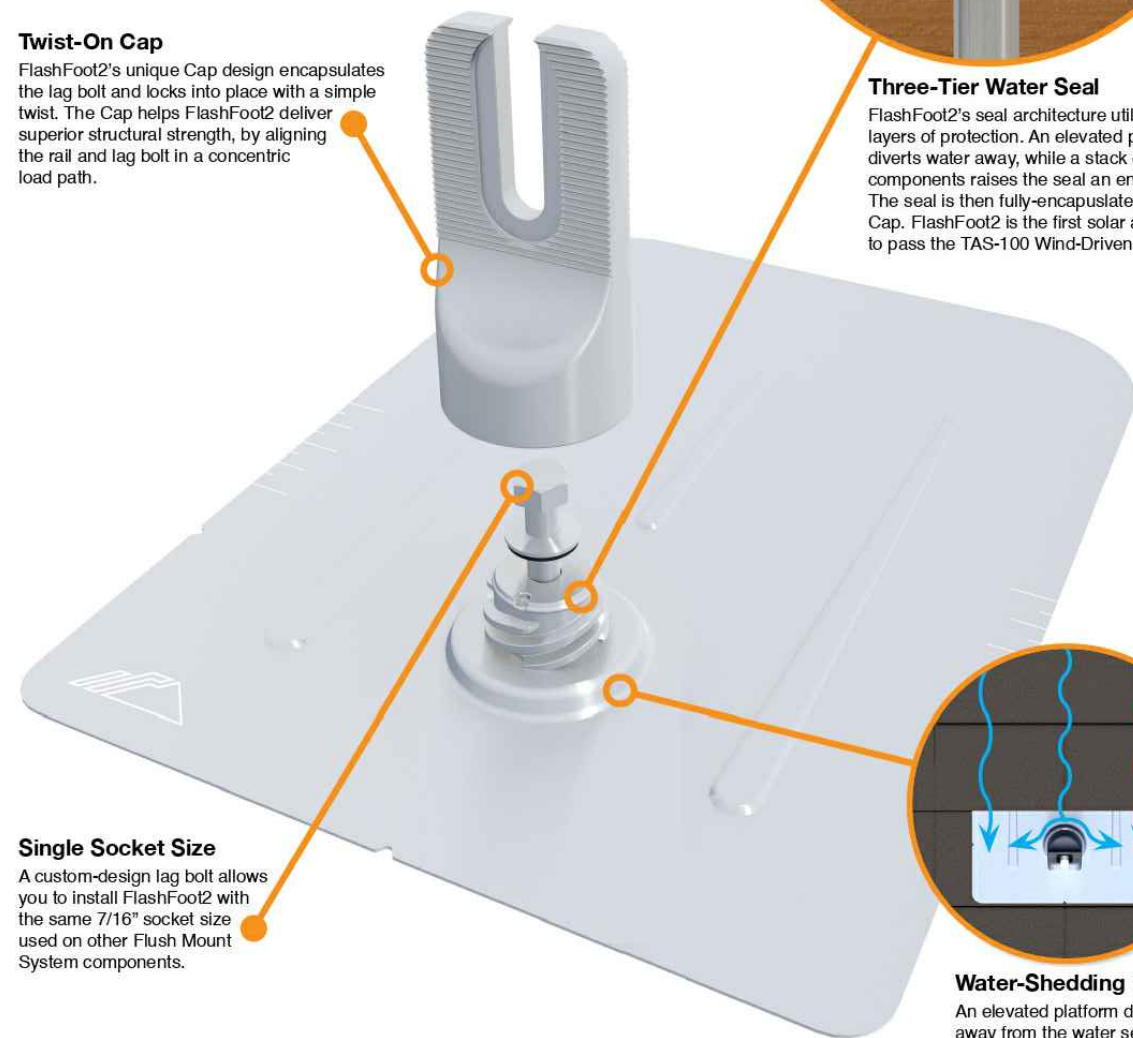
#### Twist-On Cap

FlashFoot2's unique Cap design encapsulates the lag bolt and locks into place with a simple twist. The Cap helps FlashFoot2 deliver superior structural strength, by aligning the rail and lag bolt in a concentric load path.



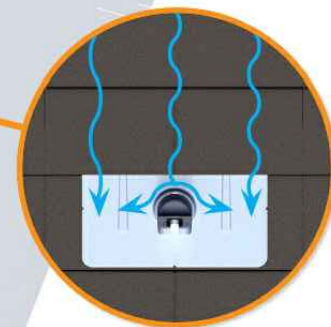
#### Three-Tier Water Seal

FlashFoot2's seal architecture utilizes three layers of protection. An elevated platform diverts water away, while a stack of rugged components raises the seal an entire inch. The seal is then fully-encapsulated by the Cap. FlashFoot2 is the first solar attachment to pass the TAS-100 Wind-Driven Rain Test.



#### Single Socket Size

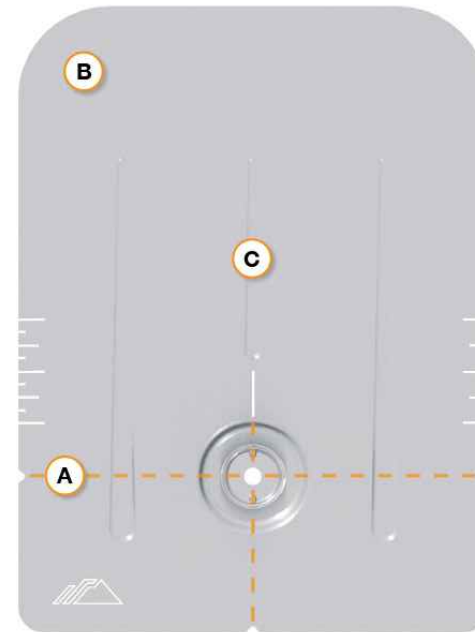
A custom-design lag bolt allows you to install FlashFoot2 with the same 7/16" socket size used on other Flush Mount System components.



#### Water-Shedding Design

An elevated platform diverts water away from the water seal.

### Installation Features



#### A Alignment Markers

Quickly align the flashing with chalk lines to find pilot holes.

#### B Rounded Corners

Makes it easier to handle and insert under the roof shingles.

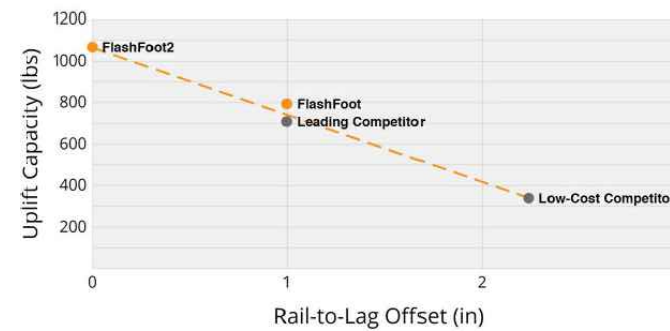
#### C Reinforcement Ribs

Help to stiffen the flashing and prevent any bending or crinkling during installation.

### Benefits of Concentric Loading

Traditional solar attachments have a horizontal offset between the rail and lag bolt, which introduces leverage on the lag bolt and decreases uplift capacity.

FlashFoot2 is the only product to align the rail and lag bolt. This concentric loading design results in a stronger attachment for the system.



### Testing & Certification

#### Structural Certification

Designed and Certified for Compliance with the International Building Code & ASCE/SEI-7.

#### Water Seal Ratings

Water Sealing Tested to UL 441 Section 27 "Rain Test" and TAS 100-95 "Wind Driven Rain Test" by Intertek. Ratings applicable for composition shingle roofs having slopes between 2:12 and 12:12.

#### UL 2703

Conforms to UL 2703 Mechanical and Bonding Requirements. See Flush Mount Install Manual for full ratings.

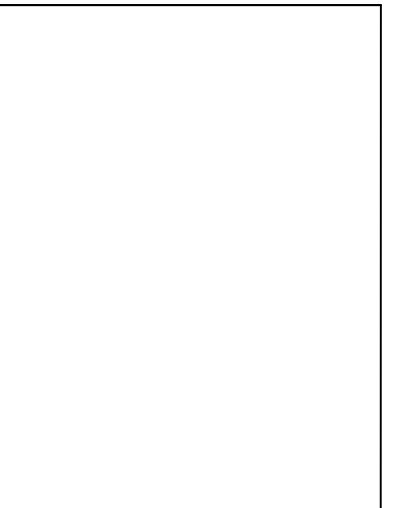
Tech Brief



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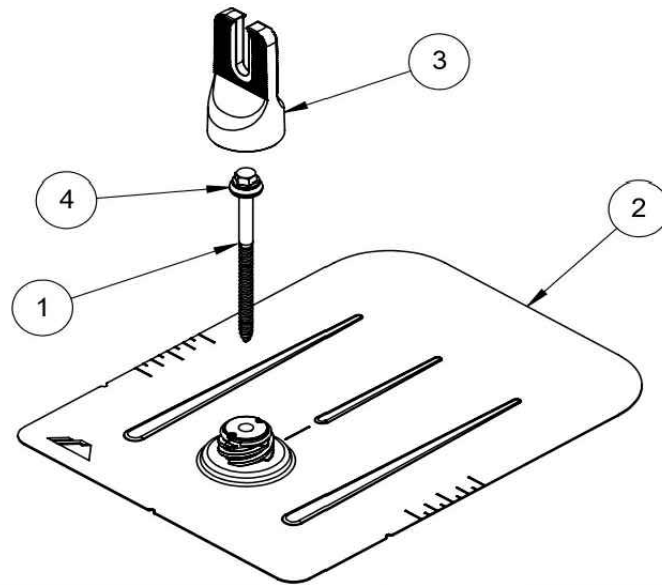
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SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE  
ANSI B  
11" X 17"

SHEET NUMBER  
PV-15



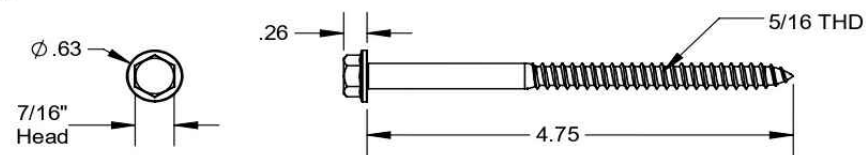


ITEM NO.	DESCRIPTION	Qty in Kit
1	BOLT LAG 5/16 X 4.75"	1
2	ASSY, FLASHING	1
3	ASSY, CAP	1
4	WASHER, EPDM BACKED	1

FLASHFOOT 2

Part Number	Description
FF2-02-M2	FlashFoot2® (Mill)
FF2-02-B2	FlashFoot2® (Black)

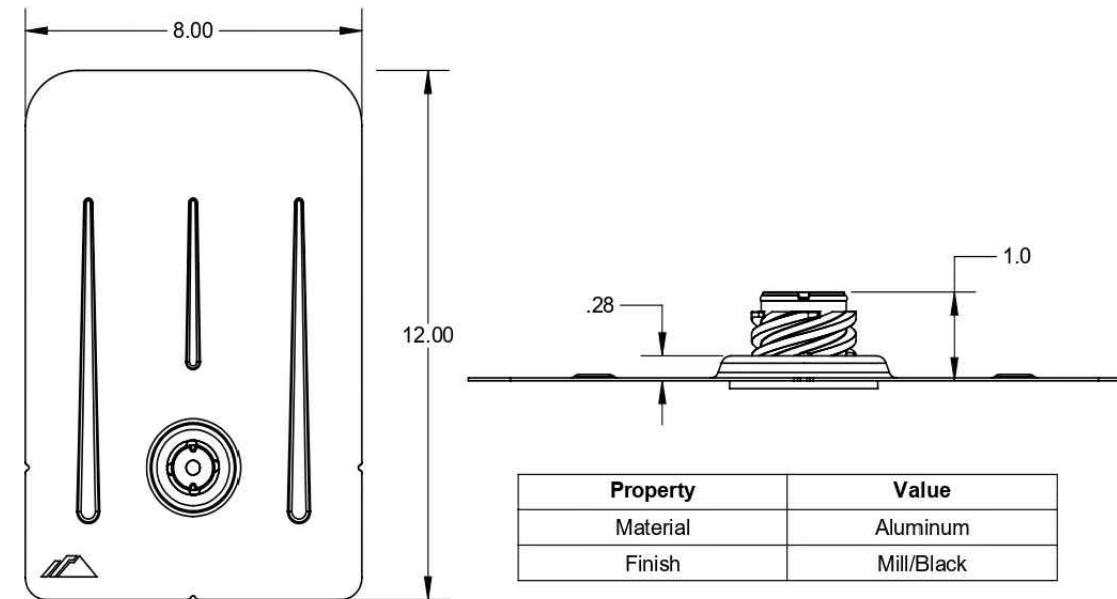
1) Bolt, Lag 5/16 x 4.75



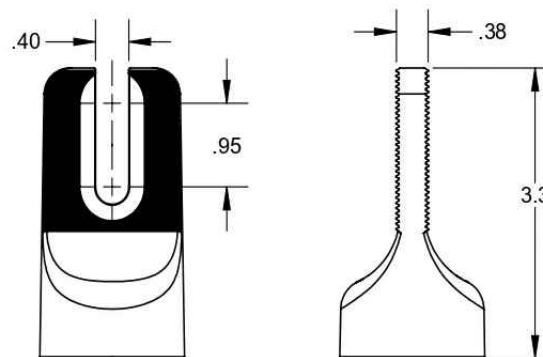
Property	Value
Material	300 Series Stainless Steel
Finish	Clear

v2.0

2) Assy, Flashing

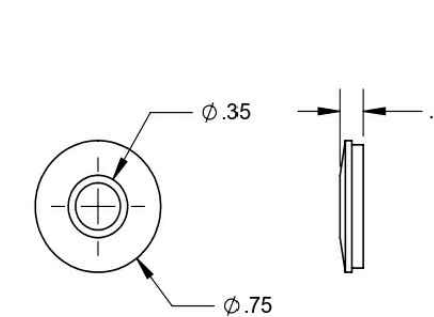


3) Assy, Cap



Property	Value
Material	Aluminum
Finish	Mill/Black

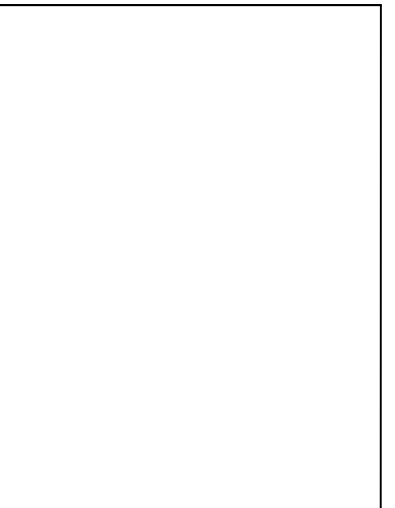
4) Washer, EPDM Backed



Property	Value
Material	300 Series Stainless Steel
Finish	Clear

v2.0

REVISIONS		
DESCRIPTION	DATE	REV
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SHEET NAME  
EQUIPMENT  
SPECIFICATION

SHEET SIZE

ANSI B  
11" X 17"

SHEET NUMBER

PV-16

RD STRUCTURAL SCREW PN RD-1430-01-M1  
SOLD SEPARATELY  
SHOWN FOR REFERENCE

Release Liner  
shown for reference

ITEM NO	DESCRIPTION	QTY IN KIT
1	QM Halo UltraGrip(Mill or Black)	1

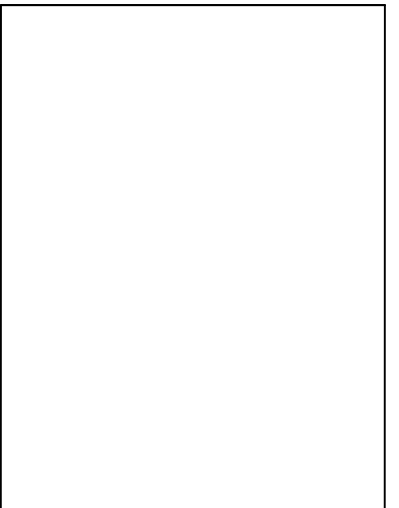
PART NUMBER	DESCRIPTION
QM-HUG-01-M1	Halo UltraGrip - Mill
QM-HUG-01-B1	Halo UltraGrip - Black

1. Halo UltraGrip

Dimensions: .38, 3.35, 3.83, .40, 1.63, .34, 2.99, 1.56,  $\phi .26$

Property	Value
Material	3000 Series Aluminium
Finish	Mill or Black

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SHEET NUMBER  
PV-17



# QuickMount® RD Structural Screw



**TOP TIER SOLAR SOLUTIONS**

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ITEM NO	DESCRIPTION	QTY IN KIT
1	Self Drilling Screw, #14, Wood Tip	1
2	Washer, EPDM Backed	1

PART NUMBER	DESCRIPTION
RD-1430-01-M1	RD Structural Screw

1. Self Drilling Screw, #14, Wood Tip

5/16" Head  
Ø .43

.22  
#14 DIA  
3.22

Property	Value
Material	300 Series Stainless Steel
Finish	Clear

2. Washer, EPDM Backed

Ø .26    Ø .57

.13

Property	Value
Material	300 Series Stainless Steel
Finish	Clear

PROJECT NAME & ADDRESS

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**ESR**

SHEET NAME  
**EQUIPMENT SPECIFICATION**

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

SHEET NUMBER  
**PV-18**

# SolaDeck

FLASHED PV ROOF-MOUNT COMBINER/ENCLOSURE

## Basic Features

- Stamped Seamless Construction
- 18 Gauge Galvanized Steel
- Powder Coated Surfaces
- Flashes into the roof deck
- 3 Roof deck knockouts .5", .75", 1"
- 5 Centering dimples for entry/exit fittings or conduit
- 2 Position Ground lug installed
- Mounting Hardware Included



SolaDeck Model SD 0783



## SolaDeck UL50 Type 3R Enclosures

Available Models:  
 Model SD 0783 - (3" fixed Din Rail)  
 Model SD 0786 - (6" slotted Din Rail)



## SolaDeck UL 1741 Combiner/Enclosures

Models SD 0783-41 and SD 0786-41 are labeled and ETL listed UL STD 1741 according to the UL STD 1741 for photovoltaic combiner enclosures.  
 Max Rated - 600VDC, 120AMPS

**Model SD 0783-41** 3" Fixed Din Rail fastened using Norlock System

### \*\*Typical System Configuration

- 4- Din Rail Mounted Fuse Holders 600VDC 30 AMP
- 1- Power Distribution Block 600VDC 175AMP
- 1- Bus Bar with UL lug

**Model SD 0786-41** 6" Slotted Din Rail fastened using steel studs

### \*\*Typical System Configuration

- 4- Din Rail Mounted Fuse Holders 600VDC 30 AMP
- 4- Din Rail Mounted Terminal Blocks
- Bus Bars with UL lug

\*\*Fuse holders and terminal blocks added in the field must be UL listed or recognized and meet 600 VDC 30 AMP 110C for fuse holders, 600V 50 AMP 90C for rail mounted terminal blocks and 600 V 175 AMP 90C for Power Distribution Blocks. Use Copper Wire Conductors.



Cover is trimmed to allow conduit or fittings, base is center dimpled for fitting locations.



Model SD 0783-41, wired with Din Rail mounted fuse holders, bus bar and power distribution block.



Model SD 0786-41, wired with Din Rail mounted fuse holders, terminal blocks and bus bars.

RSTC Enterprises, Inc • 2219 Heimstead Road • Eau Claire, WI 54703  
 For product information call 1(866) 367-7782

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SHEET NAME  
**EQUIPMENT  
 SPECIFICATION**

### SHEET SIZE

ANSI B  
 11" X 17"

### SHEET NUMBER

PV-19