

GENERAL NOTES

- 11.1 PROJECT NOTES:
- 11.2 THIS PHOTOVOLTAIC (PV) SYSTEM SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE (NEC) ARTICLE, ALL MANUFACTURERS LISTING AND INSTALLATION INSTRUCTIONS, AND THE RELEVANT CODES AS SPECIFIED BY THE AUTHORITY HAVING JURISDICTIONS (AHJ) APPLICABLE CODES.
- 11.3 THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION
- 11.4 GROUND FAULT DETECTION AND INTERRUPTION (GFDI) DEVICE IS INTEGRATED WITH THE MICROINVERTER IN ACCORDANCE WITH NEC 690.5(A)
- 11.5 ALL PV SYSTEM COMPONENTS, MODULES, UTILITY-INTERACTIVE INVERTERS, AND SOURCE CIRCUIT COMBINER BOXES ARE IDENTIFIED AND LISTED FOR USE IN PHOTOVOLTAIC SYSTEMS AS REQUIRED BY NEC 690.4 & NEC 690.60:
PV MODULES: UL1703, IEC61730, AND IEC61215, AND NFPA 70 CLASS C FIRE
INVERTERS: UL 1741 CERTIFIED, IEEE 1547, 929, 519
COMBINER BOXES: UL 1703 OR UL 1741 ACCESSORY
- 11.6 MAX DC VOLTAGE CALCULATED USING MANUFACTURER PROVIDED TEMP COEFFICIENT FOR VOC, IF UNAVAILABLE, MAX DC VOLTAGE CALCULATED ACCORDING TO NEC 690.7.
- 11.7 ALL INVERTERS, PHOTOVOLTAIC MODULES, PHOTOVOLTAIC PANELS, AND SOURCE CIRCUIT COMBINERS INTENDED FOR USE IN A PHOTOVOLTAIC POWER SYSTEM WILL BE IDENTIFIED AND LISTED FOR THE APPLICATION PER 690.4 (D). SHALL BE INSTALLED ACCORDING TO ANY INSTRUCTIONS FROM LISTING OR LABELING [NEC 110.3].
- 11.8 ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE. IF EXPOSED TO SUNLIGHT, IT SHALL BE UV RESISTANT. ALL PLAQUES AND SIGNAGE WILL BE INSTALLED AS REQUIRED BY THE NEC AND AHJ.
- 12.1 SCOPE OF WORK:
- 12.2 PRIME CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND SPECIFICATIONS OF THE GRID-TIED PHOTOVOLTAIC SYSTEM RETROFIT. PRIME CONTRACTOR WILL BE RESPONSIBLE FOR COLLECTING EXISTING ONSITE REQUIREMENTS TO DESIGN, SPECIFY, AND INSTALL THE EXTERIOR ROOF-MOUNTED PORTION OF THE PHOTOVOLTAIC SYSTEMS DETAILED IN THIS DOCUMENT.
- 13.1 WORK INCLUDES:
- 13.2 PV ROOF ATTACHMENTS - ECOLEBRUM ECOX
- 13.3 PV RACKING SYSTEM INSTALLATION - RAILLESS
- 13.4 PV MODULE AND INVERTER INSTALLATION - Helene 60M-320 / ENPHASE M250-60-2L-S22 (-ZC) (-NA) (240V)
- 13.5 PV EQUIPMENT GROUNDING
- 13.6 PV SYSTEM WIRING TO A ROOF-MOUNTED JUNCTION BOX
- 13.7 PV LOAD CENTERS (IF INCLUDED)
- 13.8 PV METERING/MONITORING (IF INCLUDED)
- 13.9 PV DISCONNECTS
- 13.10 PV GROUNDING ELECTRODE & BONDING TO (E) GEC
- 13.11 PV FINAL COMMISSIONING
- 13.12 (E) ELECTRICAL EQUIPMENT RETROFIT FOR PV
- 13.13 SIGNAGE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE

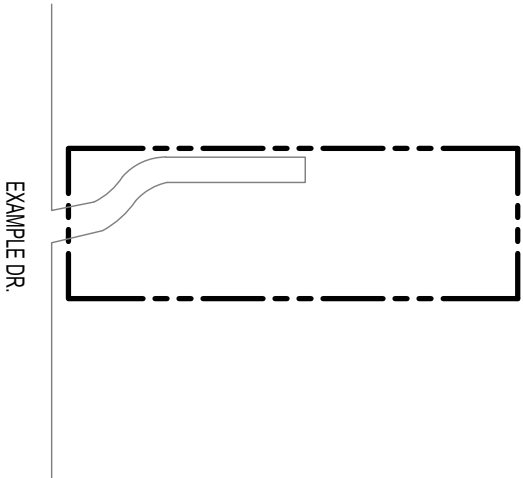
NEW PV SYSTEM: 7.84 kWp
EXAMPLE RESIDENCE

111 EXAMPLE DR.
DETROIT, MI 11111 ASSESSOR'S
#: 01010101010101



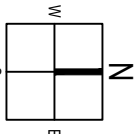
01
AERIAL PHOTO

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02
PLAT MAP

NOT TO SCALE



SHEET LIST TABLE

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R-003	RESOURCE DOCUMENT

PROJECT INFORMATION

OWNER

NAME: EXAMPLE RESIDENCE

PROJECT MANAGER

NAME: EXAMPLE MANAGER
PHONE: 123 456 7890

CONTRACTOR

NAME: EXAMPLE CONTRACTOR
PHONE: 123 456 7890

AUTHORTIES HAVING JURISDICTION

BUILDING: DETROIT
ZONING: DETROIT
UTILITY: DTE

DESIGN SPECIFICATIONS

OCCUPANCY: II
CONSTRUCTION: SINGLE-FAMILY
ZONING: RESIDENTIAL
GROUND SNOW LOAD: 25 PSF
WIND EXPOSURE: C
WIND SPEED: 115 MPH

APPLICABLE CODES & STANDARDS

BUILDING: IBC 2015 IRC 2015
ELECTRICAL: NEC 2014
FIRE: IFC 2015

CONTRACTOR

EXAMPLE CONTRACTOR

PHONE: 123-456-7890
ADDRESS: 111 EX DRIVE
DETROIT, MI 11111

LIC. NO.: 01010101010

HIC. NO.:

ELE. NO.:

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(SHEET 1)

A		B		C		D		E		F		G		H																																							
1	2.1.1	SITE NOTES: A LADDER WILL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS. THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE AND THIS SYSTEM IS A UTILITY INTERACTIVE SYSTEM WITH NO STORAGE BATTERIES. THE SOLAR PV INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS. PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PER SECTION NEC 110.26. ROOF COVERINGS SHALL BE DESIGNED, INSTALLED, AND MAINTAINED IN ACCORDANCE WITH THIS CODE AND THE APPROVED MANUFACTURERS' INSTRUCTIONS SUCH THAT THE ROOF COVERING SERVES TO PROTECT THE BUILDING OR STRUCTURE.	4.5.1	GROUNDING NOTES: GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, AND GROUNDING DEVICES EXPOSED TO THE ELEMENTS SHALL BE RATED FOR SUCH USE. PV EQUIPMENT SHALL BE GROUNDED ACCORDING TO NEC 690.43 AND MINIMUM NEC TABLE 250.122. METAL PARTS OF MODULE FRAMES, MODULE RACKING, AND ENCLOSURES CONSIDERED GROUNDED IN ACCORD WITH 250.134 AND 250.136(A). EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC 690.45 AND MICROINVERTER MANUFACTURERS' INSTRUCTIONS. EACH MODULE WILL BE GROUNDED USING WEEB GROUNDING CLIPS AS SHOWN IN MANUFACTURER DOCUMENTATION AND APPROVED BY THE AHJ. IF WEEBS ARE NOT USED, MODULE GROUNDING LUGS MUST BE INSTALLED AT THE SPECIFIED GROUNDING LUG HOLES PER THE MANUFACTURERS' INSTALLATION REQUIREMENTS. THE GROUNDING CONNECTION TO A MODULE SHALL BE ARRANGED SUCH THAT THE REMOVAL OF A MODULE DOES NOT INTERRUPT A GROUNDING CONDUCTOR TO ANOTHER MODULE. GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLORED GREEN OR MARKED GREEN IF #4 AWG OR LARGER [NEC 250.119]. THE GROUNDING ELECTRODE SYSTEM COMPLIES WITH NEC 690.47 AND NEC 250.50 THROUGH 250.106. IF EXISTING SYSTEM IS INACCESSIBLE, OR INADEQUATE, A GROUNDING ELECTRODE SYSTEM PROVIDED ACCORDING TO NEC 250, NEC 690.47 AND AHJ. GROUND-FULT DETECTION SHALL COMPLY WITH NEC 690.5 IN GENERAL AND NEC 690.5 (A)(1) SPECIFICALLY.	2.5.2	DISCONNECTION AND OVER-CURRENT PROTECTION NOTES: DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING ENERGIZED ARE CONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS), BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH RAPID SHUTDOWN OF ENERGIZED CONDUCTORS BEYOND 10 FT OF PV ARRAY OR 5 FT INSIDE A BUILDING WITHIN 10 SECONDS. CONTROLLED CONDUCTORS ≤30V AND ≤240VA [NEC 690.12]. LOCATION OF LABEL ACCORDING TO AHJ. ALL OCPD RATINGS AND TYPES SPECIFIED ACCORDING TO NEC 690.8, 690.9, AND 240. MICROINVERTER BRANCHES CONNECTED TO A SINGLE BREAKER OR GROUPED FUSES IN ACCORDANCE WITH NEC 110.3(B). IF REQUIRED BY AHJ, SYSTEM WILL INCLUDE ARC-FULT CIRCUIT PROTECTION ACCORDING TO NEC 690.11 AND UL1699B.	2.5.3	INTERCONNECTION NOTES: LOAD-SIDE INTERCONNECTION SHALL BE IN ACCORDANCE WITH [NEC 690.64 (B)] THE SUM OF THE UTILITY OCPD AND INVERTER CONTINUOUS INPUT MAY NOT EXCEED 120% OF BUSBAR RATING [NEC 705.12(D)(2)(3)]. WHEN SUM OF THE PV SOURCES EQUALS >100% OF BUSBAR RATING, PV DEDICATED BACKFEED BREAKERS MUST BE LOCATED OPPOSITE END OF THE BUS FROM THE UTILITY SOURCE OCPD [NEC 705.12(D)(2)(3)]. AT MULTIPLE PV OUTPUT COMBINER PANEL, TOTAL RATING OF ALL OVERCURRENT DEVICES SHALL NOT EXCEED AMPACITY OF BUSBAR. HOWEVER, THE COMBINED OVERCURRENT DEVICE MAY BE EXCLUDED ACCORDING TO NEC 705.12 (D)(2)(3)(C). FEEDER TAP INTERCONNECTION (LOAD SIDE) ACCORDING TO NEC 705.12 (D)(2)(1) SUPPLY SIDE TAP INTERCONNECTION ACCORDING TO NEC 705.12 (A) WITH SERVICE ENTRANCE CONDUCTORS IN ACCORDANCE WITH NEC 230.42 BACKFEEDING BREAKER FOR UTILITY-INTERACTIVE INVERTER OUTPUT IS EXEMPT FROM ADDITIONAL FASTENING [NEC 705.12 (D)(5)].	2.5.4	STRUCTURAL NOTES: RACKING SYSTEM & PV ARRAY WILL BE INSTALLED ACCORDING TO CODE-COMPLIANT INSTALLATION MANUAL. TOP CLAMPS REQUIRE A DESIGNATED SPACE BETWEEN MODULES, AND RAILS MUST ALSO EXTEND A MINIMUM DISTANCE BEYOND EITHER EDGE OF THE ARRAY/SUBARRAY, ACCORDING TO RAI MANUFACTURERS' INSTRUCTIONS. JUNCTION BOX WILL BE INSTALLED PER MANUFACTURERS' SPECIFICATIONS. IF ROOF-PENETRATING TYPE, IT SHALL BE FLASHED & SEALED PER LOCAL REQUIREMENTS. ROOFTOP PENETRATIONS FOR PV RACEWAY WILL BE COMPLETED AND SEALED W/ APPROVED CHEMICAL SEALANT PER CODE BY A LICENSED CONTRACTOR. ALL PV RELATED ROOF ATTACHMENTS TO BE SPACED NO GREATER THAN THE SPAN DISTANCE SPECIFIED BY THE RACKING MANUFACTURER. WHEN POSSIBLE, ALL PV RELATED RACKING ATTACHMENTS WILL BE STAGGERED AMONGST THE ROOF FRAMING MEMBERS.	2.5.5	WIRING & CONDUIT NOTES: ALL CONDUIT AND WIRE WILL BE LISTED AND APPROVED FOR THEIR PURPOSE. CONDUIT AND WIRE SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING. CONDUCTORS SIZED ACCORDING TO NEC 690.8, NEC 690.7. VOLTAGE DROP LIMITED TO 1.5%. DC WIRING LIMITED TO MODULE FOOTPRINT. MICROINVERTER WIRING SYSTEMS SHALL BE LOCATED AND SECURED UNDER THE ARRAY W/ SUITABLE WIRING CLIPS. AC CONDUCTORS COLORED OR MARKED AS FOLLOWS: PHASE A OR L1- BLACK PHASE B OR L2- RED, OR OTHER CONVENTION IF THREE PHASE PHASE C OR L3- BLUE, YELLOW, ORANGE**, OR OTHER CONVENTION NEUTRAL- WHITE OR GREY IN 4-WIRE DELTA CONNECTED SYSTEMS THE PHASE WITH HIGHER VOLTAGE TO BE MARKED ORANGE [NEC 110.15].	2.5.6	EQUIPMENT LOCATIONS: ALL EQUIPMENT SHALL MEET MINIMUM SETBACKS AS REQUIRED BY NEC 110.26. WIRING SYSTEMS INSTALLED IN DIRECT SUNLIGHT MUST BE RATED FOR EXPECTED OPERATING TEMPERATURE AS SPECIFIED BY NEC 690.31 (A),(C) AND NEC TABLES 310.15 (B)(2)(A) AND 310.15 (B)(3)(C). JUNCTION AND PULL BOXES PERMITTED INSTALLED UNDER PV MODULES ACCORDING TO NEC 690.34. ADDITIONAL AC DISCONNECT(S) SHALL BE PROVIDED WHERE THE INVERTER IS NOT WITHIN SIGHT OF THE AC SERVICING DISCONNECT. ALL EQUIPMENT SHALL BE INSTALLED ACCESSIBLE TO QUALIFIED PERSONNEL ACCORDING TO NEC APPLICABLE CODES. ALL COMPONENTS ARE LISTED FOR THEIR PURPOSE AND RATED FOR OUTDOOR USAGE WHEN APPROPRIATE.	2.5.7	2	2.2.1	3	2.2.2	4	2.2.3	5	2.2.4	A	2.2.5	B	2.2.6	C	2.2.7	D	2.3.1	E	2.3.2	F	2.3.3	G	2.3.4	H	2.3.5	1	2.3.6	2	2.4.1	3	2.4.2	4	2.4.3	5	2.4.4	6	2.4.5	A	2.4.6
	2.1.2		2.5.2		2.5.3		2.5.4		2.5.5		2.5.6		2.5.7		2.2.1		2.2.2		2.2.3		2.2.4		2.2.5		2.2.6		2.2.7		2.3.1		2.3.2		2.3.3		2.3.4		2.3.5		2.3.6		2.4.1		2.4.2		2.4.3		2.4.4		2.4.5		2.4.6		
	2.1.3		2.5.3		2.5.4		2.5.5		2.5.6		2.5.7		2.2.1		2.2.2		2.2.3		2.2.4		2.2.5		2.2.6		2.2.7		2.3.1		2.3.2		2.3.3		2.3.4		2.3.5		2.3.6		2.4.1		2.4.2		2.4.3		2.4.4		2.4.5		2.4.6				
	2.1.4		2.5.3		2.5.4		2.5.5		2.5.6		2.5.7		2.2.1		2.2.2		2.2.3		2.2.4		2.2.5		2.2.6		2.2.7		2.3.1		2.3.2		2.3.3		2.3.4		2.3.5		2.3.6		2.4.1		2.4.2		2.4.3		2.4.4		2.4.5		2.4.6				
	2.1.5		2.5.4		2.5.5		2.5.6		2.5.7		2.2.1		2.2.2		2.2.3		2.2.4		2.2.5		2.2.6		2.2.7		2.3.1		2.3.2		2.3.3		2.3.4		2.3.5		2.3.6		2.4.1		2.4.2		2.4.3		2.4.4		2.4.5		2.4.6						
	2.1.6		2.5.6		2.5.7		2.2.1		2.2.2		2.2.3		2.2.4		2.2.5		2.2.6		2.2.7		2.3.1		2.3.2		2.3.3		2.3.4		2.3.5		2.3.6		2.4.1		2.4.2		2.4.3		2.4.4		2.4.5		2.4.6										

CONTRACTOR

EXAMPLE CONTRACTOR

PHONE: 123-456-7890
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DETROIT, MI 11111

LIC. NO.: 01010101010

HIC. NO.:

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NEW PV SYSTEM: 7.84 kWp

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ENGINEER OF RECORD

PAPER SIZE: 11" x 17" (ANSI B)

NOTES

DATE: 11.30.2016

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- 2. ITEMS BELOW MAY NOT BE ON THIS PAGE

----- PROPERTY LINE

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SITE PLAN

DATE: 11.30.2016

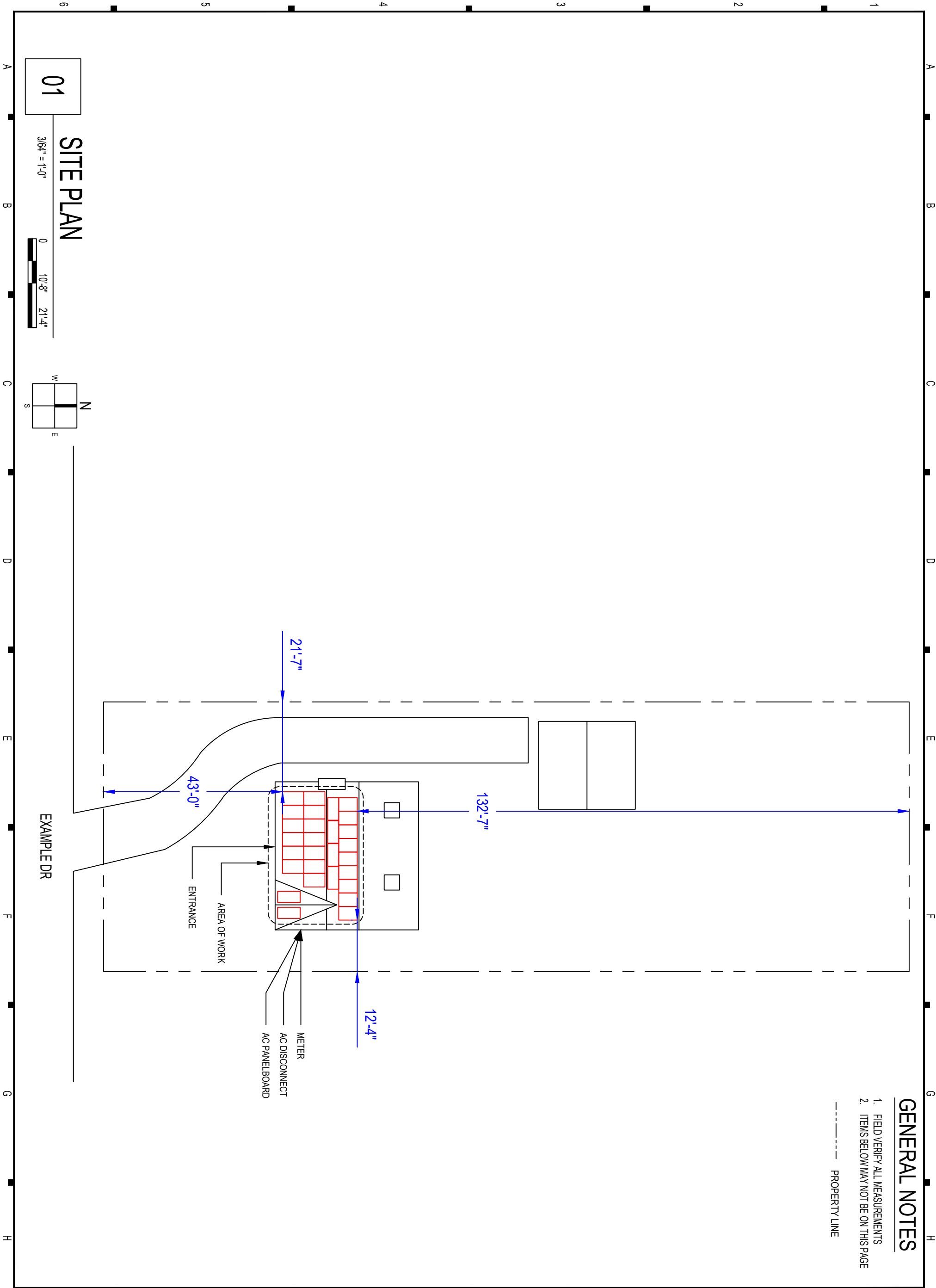
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H/C NO.:
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ELECTRICAL PLAN

DATE: 11.30.2016

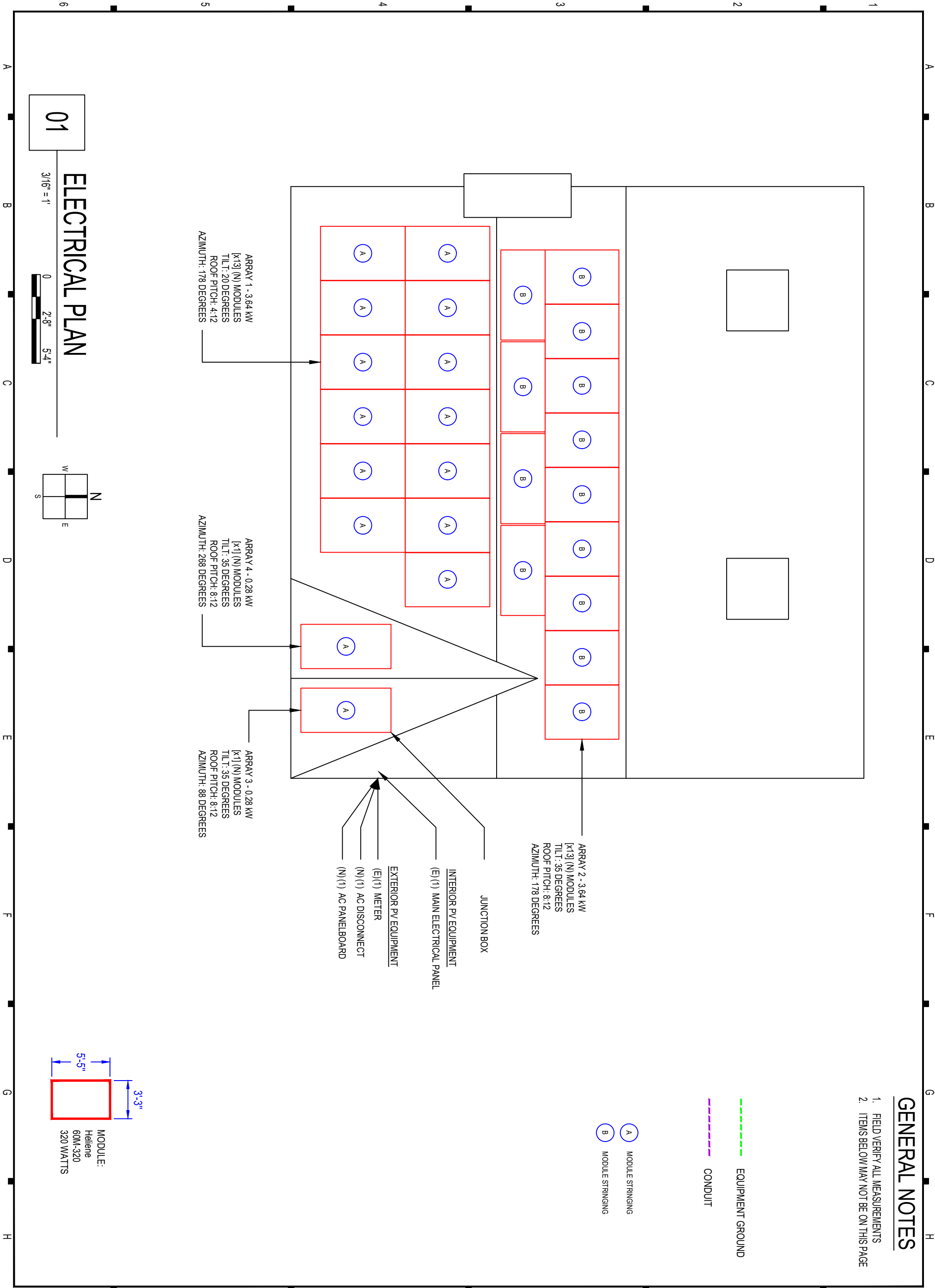
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--- ROOF RAFTERS

CONTRACTOR

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EXAMPLE

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SOLAR ATTACHMENT
PLAN

DATE: 11.30.2016

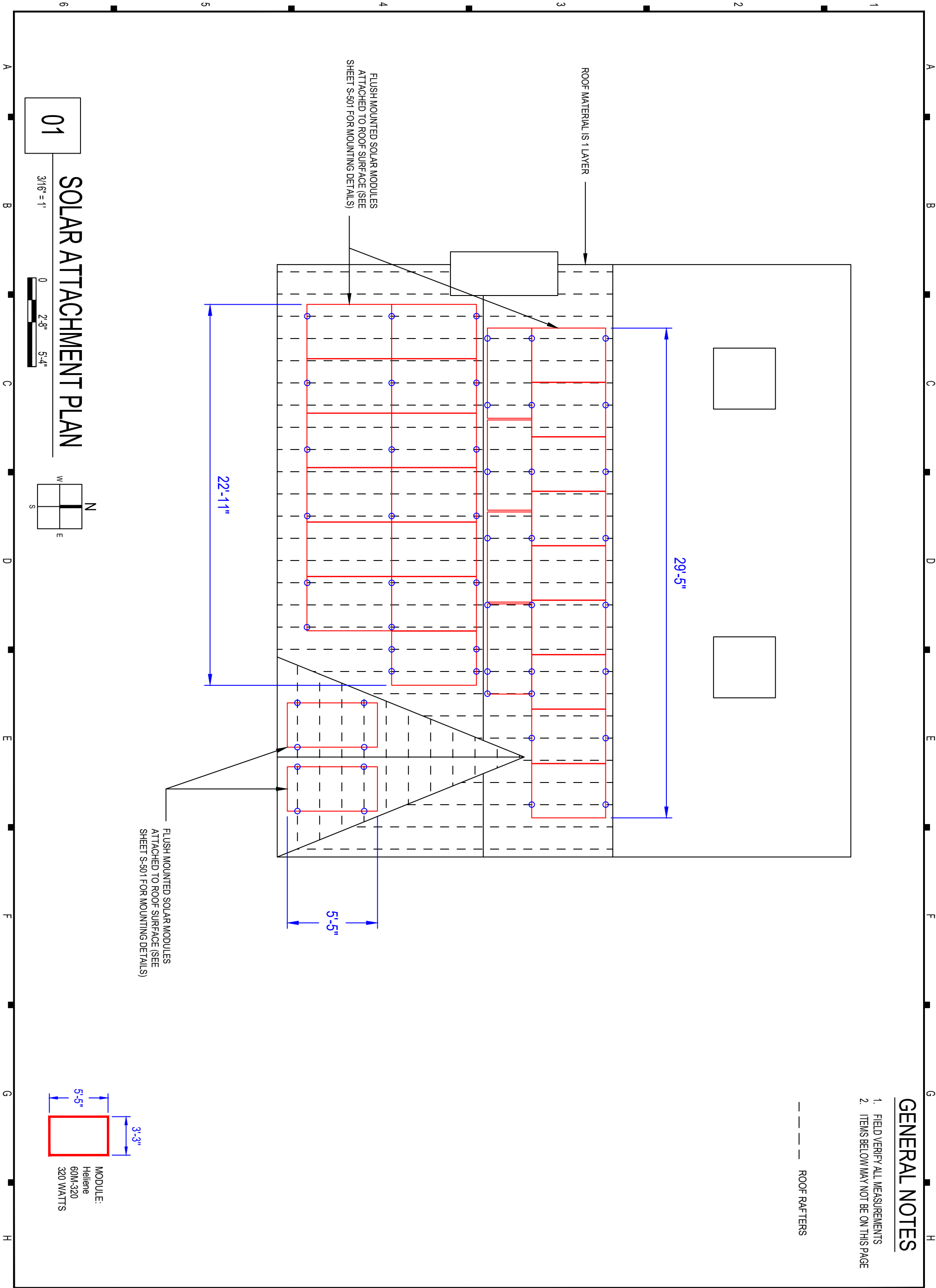
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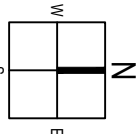
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SOLAR ATTACHMENT PLAN

3/16" = 1'



SYSTEM SUMMARY			
	BRANCH #1	BRANCH #2	
INVERTERS PER BRANCH	15	13	
MAX AC CURRENT	15A	13A	
MAX AC OUTPUT POWER	3,750W	3,250W	
ARRAY STC POWER	7,840W		
ARRAY PTC POWER	7,109W		
MAX AC CURRENT	28A		
MAX AC POWER	7,000W		
DERATED (CEC) AC POWER	6,860W		
DESIGN TEMPERATURES			
ASHRAE EXTREME LOW	-16°C (3°F), SOURCE: MCGUIRE AFB (KWMR) 40.02° , -74.6°		
ASHRAE 2% HIGH	33°C (91°F), SOURCE: MCGUIRE AFB (KWMR) 40.02° , -74.6°		

MODULES										
REF.	QTY.	MAKE AND MODEL	PMAX	PTC	ISC	IMP	VOC	VMP	TEMP. COEFF. OF VOC	FUSE RATING
PM1-28	28	Helione 60M-320	280W	254W	9.43A	8.89A	38.5V	31.5V	-0.119V/°C (-0.31%/°C)	15A
INVERTERS										
REF.	QTY	MAKE AND MODEL	AC VOLTAGE	GROUND	MAX OCPD RATING	RATED POWER	MAX OUTPUT CURRENT	MAX INPUT CURRENT	MAX INPUT VOLTAGE	CEC WEIGHTED EFFICIENCY
I1-28	28	ENPHASE M250-60-2LL-S22 (-ZC) (-NA) (240V)	240V	FLOATING	20A	250W	1.0A	9.8A	48V	96.5%
DISCONNECTS										
REF.	QTY.	MAKE AND MODEL	RATED CURRENT		MAX RATED VOLTAGE					
SW1	1	SQUARE D DU222RB OR EQUIV.	60A		240VAC					
OCPDS										
REF.	QTY.	RATED CURRENT		MAX VOLTAGE						
CB1-2	2	20A		240VAC						

BILL OF MATERIALS							DESCRIPTION		
CATEGORY	MAKE	MODEL NUMBER	REF	QTY	UNIT	QTY/UNIT			
MODULE	Helene	60M-320	PM1-28	28	PIECES	1	Helene 320, 60M-320, 320W, 60 CELLS, MONOCRYSTALLINE SILICON		
INVERTER	ENPHASE	M250-60-2LL-S22-IG	11-28	28	PIECES	1	ENPHASE M250-60-2LL-S22-IG 250W MICROINVERTER		
DISCONNECT	SQUARE D	DU222RB	SW1	1	PIECE	1	SQUARE D DU222RB DISCONNECT SWITCH, 2-POLE, 60A, 240VAC, OR EQUIVALENT		
MISC ELECTRICAL EQUIPMENT		GEN-AC-PANEL	EP1	1	PIECE	1	AC SUBPANEL		
MISC ELECTRICAL EQUIPMENT		GEN-CABLE-CLIP	HDWR6-145	140	PIECES	1	GENERIC CABLE CLIP		
WIRING	ENPHASE	ET17-240-40	EN1-2	2	PIECES	1	ENPHASE ENGAGE (TM) TRUNK CABLE FOR LANDSCAPE LAYOUT		
WIRING	ENPHASE	ET1TERM-10	EN3	1	BUNDLE	10	ENPHASE ENGAGE (TM) BRANCH TERMINATOR		
WIRING	ENPHASE	ET-SEAL-10	EN4	1	BUNDLE	10	ENPHASE ENGAGE (TM) WATERTIGHT SEALING CAP		
WIRING		GEN-8-AWG-THWN-2-CU-WH	WR1-3	110	FEET	1	8 AWG THWN-2, COPPER, WHITE (NEUTRAL)		
WIRING		GEN-8-AWG-THWN-2-CU-BLK	WR1-3	110	FEET	1	8 AWG THWN-2, COPPER, BLACK (LINE 1)		
WIRING		GEN-8-AWG-THWN-2-CU-BLK	WR1-3	110	FEET	1	8 AWG THWN-2, COPPER, RED (LINE 2)		
WIRING		GEN-6-AWG-THWN-2-CU-GR	WR1-3	110	FEET	1	6 AWG THWN-2, COPPER, GREEN (GROUND)		
WIREWAY	ENPHASE	ET-SPLK-05	EN5	1	BUNDLE	5	ENPHASE ENGAGE (TM) ENGAGE COUPLER		
WIREWAY		GEN-IBOX	JB1	1	PIECE	1	JUNCTION BOX		
WIREWAY		GEN-PVC-40-1DIA	WW1	45	FEET	1	PVC, 40 CONDUIT, 1 DIA.		
WIREWAY		GEN-PVC-40-0.75DIA	WW2-3	20	FEET	1	PVC, 40 CONDUIT, 0.75 DIA.		
OCPD	GENERIC MANUFACTURER	GEN-GB-20A-240VAC	CB1-2	2	PIECES	1	CIRCUIT BREAKER, 20A, 240VAC		
OCPD	GENERIC MANUFACTURER	GEN-GB-35A-240VAC	CB3	1	PIECE	1	CIRCUIT BREAKER, 35A, 240VAC		

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DESIGN TABLES

DATE: 11.30.2016

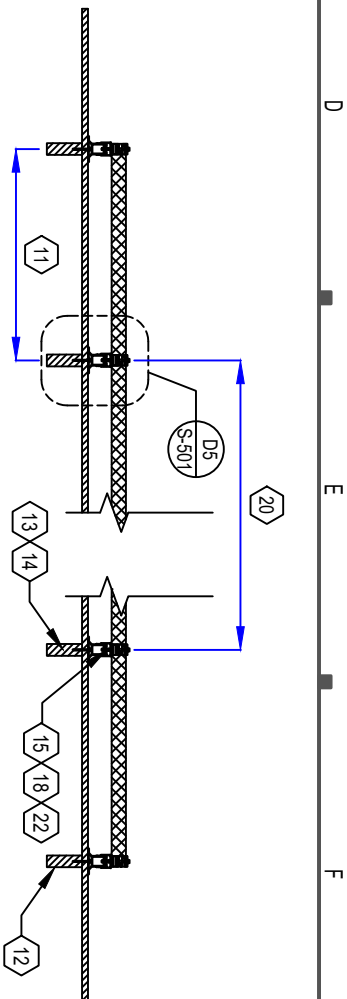
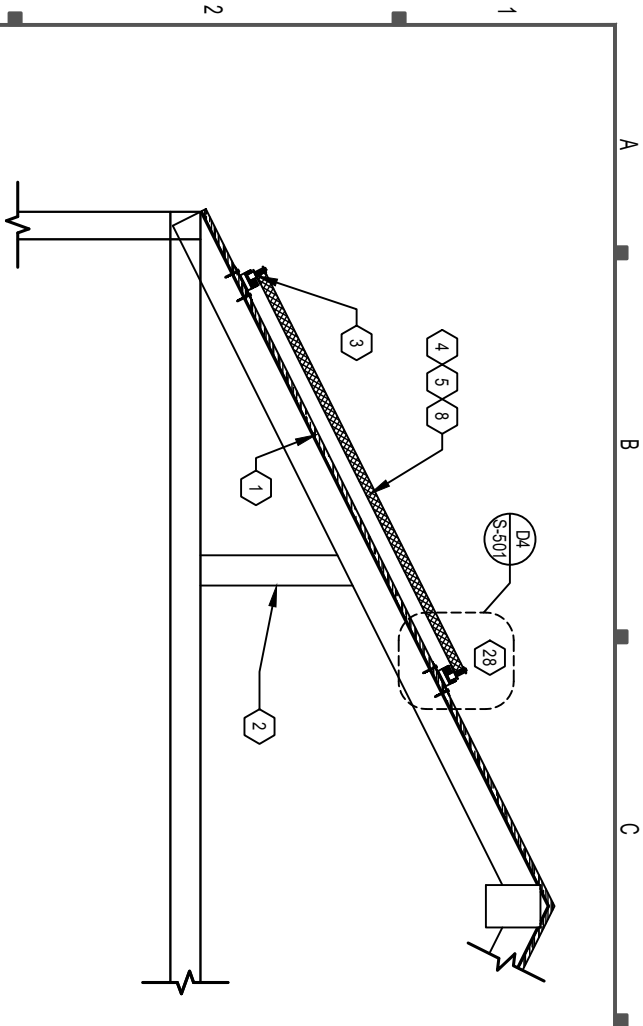
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(SHEET 7)



GENERAL NOTES

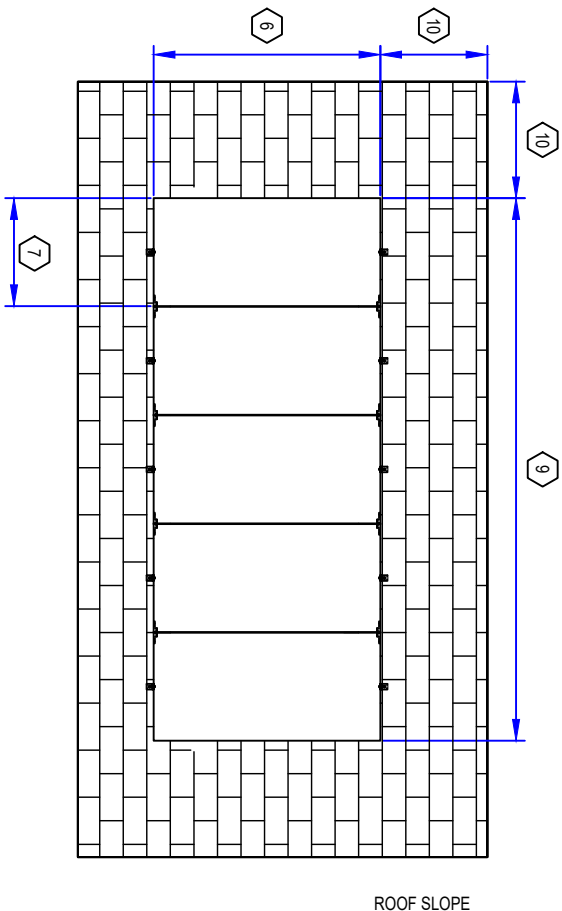
- FIELD VERIFY ALL MEASUREMENTS

SHEET KEYNOTES

- ROOF MATERIAL: ASPHALT SHINGLE
- ROOF STRUCTURE: KNEE WALL
- ATTACHMENT TYPE: ECOLIBRIUM ECOX
- MODULE MANUFACTURER: Helene
- MODULE MODEL: 60M-320
- MODULE LENGTH: 5'-5"
- MODULE WIDTH: 3'-3"
- MODULE WEIGHT: 40.1 LBS.
- SEE SHEET A-2 FOR DIMENSIONS(S)
- MIN. FIRE OFFSET: NO FIRE CODE ENFORCED
- RAFTER SPACING: 16 IN. O.C.
- RAFTER SIZE: 2X6 NOMINAL
- LAG BOLT DIAMETER: 3/8 IN.
- LAG BOLT EMBEDMENT: 4 IN.
- TOTAL # OF ATTACHMENTS: 53
- TOTAL AREA: 508.2 SQ. FT.
- TOTAL WEIGHT: 1122.8 LBS.
- WEIGHT PER ATTACHMENT: 21.18 LBS.
- DISTRIBUTED LOAD: 2.2 PSF.
- MAX. HORIZONTAL STANDOFF: 48 IN.
- MAX. VERTICAL STANDOFF: LANDSCAPE: 26 IN., PORTRAIT: 33 IN.
- STANDOFF STAGGERING: NO
- MAX. RAFTER SPAN: 13 FT.
- MODULE CLEARANCE: 3 IN. MIN., 6 IN. MAX.

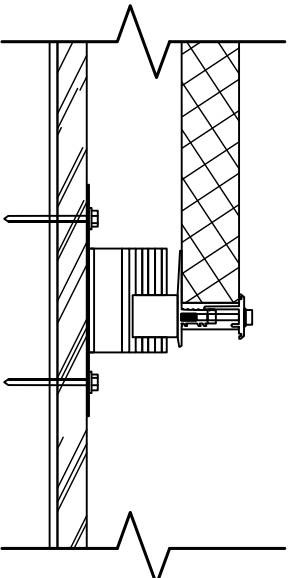
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NOT TO SCALE



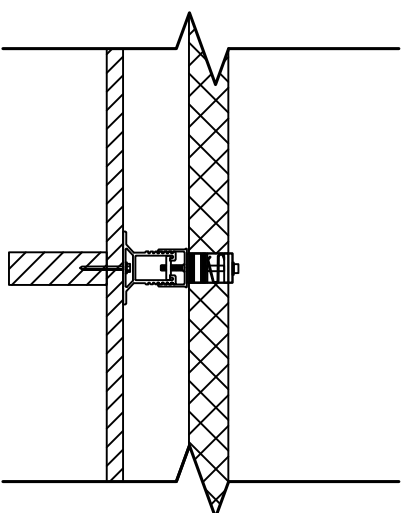
RACKING DETAIL (TOP)

NOT TO SCALE



DETAIL (TRANSVERSE)

NOT TO SCALE



DETAIL (LONGITUDINAL)

NOT TO SCALE

CONTRACTOR

EXAMPLE CONTRACTOR

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NEW PV SYSTEM: 7.84 kWp

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ENGINEER OF RECORD

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ASSEMBLY DETAILS

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(SHEET 9)

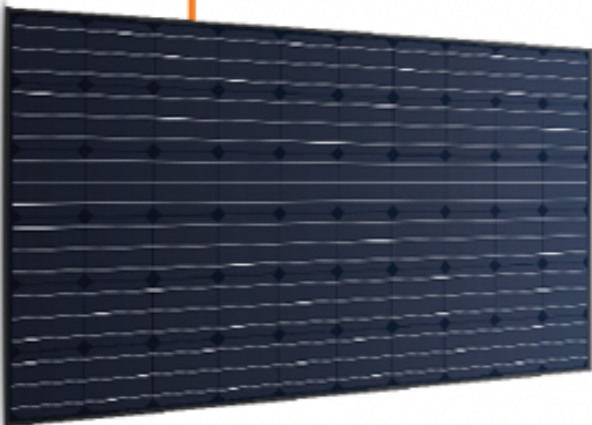
MONO POLY



60MBLKHOME PV

HELIENE

60-CELL MONOCRYSTALLINE HOME PV



320 Wp

MAX POWER OUPUT

19.21%

MAX EFFICIENCY

15 YEAR

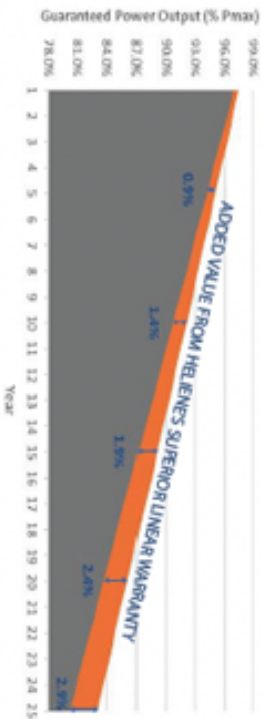
PRODUCT WARRANTY

25 YEAR

LINEAR PERFORMANCE GUARANTEE

HELIENE IS A PREMIER SOLAR MODULE MANUFACTURER, SERVICING THE GROWING SOLAR ENERGY MARKETS OF NORTH AMERICA. COMBINING PROVEN EUROPEAN TECHNOLOGY WITH NORTH AMERICAN INGENUITY ALLOWS HELIENE TO MAKE A REAL COMMITMENT IN PROVIDING SMARTER ENERGY CHOICES FOR THE FUTURE.

HELIENE
www.heliene.com



LINEAR PERFORMANCE GUARANTEE

15 YEAR WORKMANSHIP WARRANTY • 25 YEAR LINEAR PERFORMANCE GUARANTEE



AVAILABLE IN 1000V OR 1500V SYSTEM VOLTAGE RATING



MANUFACTURED FOLLOWING INTERNATIONAL QUALITY SYSTEM STANDARDS: ISO9001

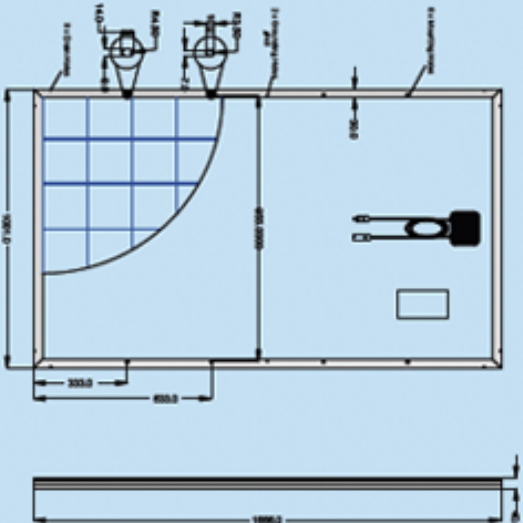


H-BLACK INTEGRATION - BLACK FRAME & BACKSHEET

60MBLKHOME PV

60-CELL MONOCRYSTALLINE HOME PV

DIMENSIONS FOR 60M HOME PV SERIES



ELECTRICAL DATA (STC)

Peak Rated Power	P _{max} (W)	320	315	310	310	305
Maximum Power Voltage	V _{mp} (V)	34.10	33.70	33.54	33.54	33.60
Maximum Power Current	I _{mp} (A)	9.37	9.33	9.27	9.27	9.07
Maximum Power Current	I _{mp} (A)	9.37	9.33	9.27	9.27	9.07
Open Circuit Voltage	V _{oc} (V)	40.50	40.32	40.13	40.13	39.98
Short Circuit Current	I _{sc} (A)	10.20	10.16	10.22	10.22	9.67
Module Efficiency *	Eff (%)	19.21	18.92	18.78	18.78	18.28
Maximum Series Fuse Rating	MF (A)	20	20	20	20	20
Power Output Tolerance		[-3, +3] %				

STC - Standard Test Conditions: Irradiation 1000 W/m² - Air mass AM 1.5 - Cell Temperature 25 °C
* Calculated using maximum power based on full positive output tolerance [-3, +3] %

MECHANICAL DATA

Dimensions (L x W x D)	1666 x 1001 x 40 mm (65.5 x 39.4 x 1.6 inch)
Weight*	19 kg (41.9 lbs)
Output Cables	1.2 m (47.24 inch) symmetrical cables with Multi-Contact (Saubli) MC4 connectors
Junction Box	IP-67 rated with bypass diodes
Frame	Double webbed 15 micron anodized aluminum alloy
Front Glass	Low-iron content, high-transmission PV solar glass
Solar Cells	60 Monocrystalline cells (158.75 x 158.75 mm)

CERTIFICATIONS

UL Certification	ULC/OBDC1703-1, UL1703
IEC Certification	Optional

All Heliene modules are certified under the California Energy Commission (CEC) Listing Report

TEMPERATURE RATINGS

Nominal Operating Cell Temperature (NOCT) (±2°C)	+45°C	PACKAGING CONFIGURATION	
Temperature Coefficient of P _{max}	-0.36%/°C	Modules per box:	26 pieces
Temperature Coefficient of V _{oc}	-0.30%/°C	Modules per 53 trailer:	936 pieces
Temperature Coefficient of I _{sc}	0.04%/°C		

MAXIMUM RATINGS

Operational Temperature	-40°C - +85°C
Max System Voltage	1000V (†1500V) *Optional

CERTIFICATIONS



WARRANTY

15 Year Manufacturer's Workmanship Warranty
25 Year Linear Power Guarantee

(Refer to product warranty page for details)

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT. Specifications included in this datasheet are subject to change without notice.

HELIENE60MBLK_HOME PV-Rev.01

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Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US



INVERTERS

- Specifically designed to work with power optimizers

Record-breaking 99% weighted efficiency

Quick and easy inverter commissioning directly from a smartphone using the SolarEdge SetApp

Fixed voltage inverter for longer strings

Integrated arc fault protection and rapid shutdown for NEC 2014, NEC 2017 and NEC 2020 per article 690.11 and 690.12

UL1741 SA certified, for CPUC Rule 21 grid compliance

Small, lightweight, and easy to install both outdoors or indoors

Built-in module-level monitoring

Optional: Faster installations with built-in consumption metering (1% accuracy) and production revenue grade metering (0.5% accuracy, ANSI C12.20)

solaredge.com



/ Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US/
SE7600H-US / SE10000H-US / SE11400H-US

MODEL NUMBER	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US
APPLICABLE TO INVERTERS WITH PART NUMBER	SEXXXXH-XXXX3XX4						
OUTPUT							
Rated AC Power Output	3000	3600 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V
Maximum AC Power Output	3000	3600 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V
AC Output Voltage Min. Nom. Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓
AC Output Voltage Min. Nom. Max. (183 - 208 - 229)	-	✓	-	✓	-	-	✓
AC Frequency (Nominal)				59.3 - 60 - 60.5 ¹⁾			
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5
Maximum Continuous Output Current @208V	-	16	-	24	-	-	48.5
Power Factor	1. Adjustable - 0.85 to 0.85						
GFDI Threshold	1						
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes						
INPUT							
Maximum DC Power @240V	4650	5900	7750	9300	11800	15500	17650
Maximum DC Power @208V	-	5100	-	7750	-	-	15500
Transformerless, Ungrounded	Yes						
Maximum Input Voltage	480						
Nominal DC Input Voltage	380						
Maximum Input Current @240V ¹⁾	8.5	10.5	13.5	16.5	20	27	30.5
Maximum Input Current @208V ¹⁾	-	9	-	13.5	-	-	27
Max. Input Short Circuit Current	45						
Reverse-Polarity Protection	Yes						
Ground-Fault Isolation Detection	600k Ω Sensitivity						
Maximum Inverter Efficiency	99			99.2			99 @ 240V 98.5 @ 208V
CEC Weighted Efficiency	99						
Nighttime Power Consumption	< 2.5						
	W						W

(1) For other regional settings please contact SolarEdge support
(2) A higher current source may be used, the inverter will limit its input current to the values stated

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Power Optimizer

For North America

P320 / P340 / P370 / P400 / P401 / P405 / P485 / P505



POWER OPTIMIZER

PV power optimization at the module-level

- Specifically designed to work with SolarEdge inverters
- Up to 25% more energy
- Superior efficiency (99.5%)
- Mitigates all types of module mismatch losses, from manufacturing tolerance to partial shading
- Flexible system design for maximum space utilization
- Fast installation with a single bolt
- Next generation maintenance with module-level monitoring
- Meets NEC requirements for arc fault protection (AFCD) and Photovoltaic Rapid Shutdown System (PVRSS)
- Module-level voltage shutdown for installer and firefighter safety

solaredge.com



Power Optimizer

For North America

P320 / P340 / P370 / P400 / P401 / P405 / P485 / P505

Optimizer model (typical module compatibility)	P320 (for 60-cell modules)	P340 (for high- power 60-cell modules)	P370 (for higher- power 60 and 72- cell modules)	P400 (for 72 & 96-cell modules)	P401 (for high power 60 and 72 cell modules)	P405 (for high- voltage modules)	P485 (for high- voltage modules)	P505 (for higher current modules)		
INPUT										
Rated Input DC Power ⁽¹⁾	320	340	370	400	405	485	505		W	
Absolute Maximum Input Voltage (Voc at lowest temperature)	48		60	80	60		125 ⁽⁶⁾	83 ⁽⁶⁾	Vdc	
MPPT Operating Range	8 - 48		8 - 60	8 - 80	8-60	12.5 - 105		12.5 - 83	Vdc	
Maximum Short Circuit Current (Isc)		11		10.1	11.75		11	14	Adc	
Maximum Efficiency				99.5					%	
Weighted Efficiency			98.8	II				98.6	%	
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREEDGE INVERTER)										
Maximum Output Current				15			85		Adc	
Maximum Output Voltage			60						Vdc	
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREEDGE INVERTER OR SOLAREEDGE INVERTER OFF)										
Safety Output Voltage per Power Optimizer			1 ± 0.1						Vdc	
STANDARD COMPLIANCE										
EMC			FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3							
Safety			IEC61009-1 (class II safety), UL1741							
Material			UL94 V-0, UV Resistant							
RoHS			Yes							
INSTALLATION SPECIFICATIONS										
Maximum Allowed System Voltage			1000						Vdc	
Compatible Inverters			All SolarEdge Single Phase and Three Phase Inverters							
Dimensions (W x L x H)		129 x 153 x 27.5 / 5.1 x 6 x 1.1	129 x 153 x 33.5 / 5.1 x 6 x 1.3	129 x 153 x 29.5 / 5.1 x 6 x 1.16	129 x 159 x 49.5 / 5.1 x 6.3 x 1.9	129 x 162 x 59 / 5.1 x 6.4 x 2.3			mm / in	
Weight (including cables)		630 / 14		750 / 17	655 / 15	845 / 19	1064 / 23		gr / lb	
Input Connector			MC4 ⁽⁸⁾							
						Single or dual MC4 ⁽⁸⁾⁽⁹⁾	MC4 ⁽⁸⁾			
Input Wire Length			0.16 / 0.52							m / ft
Output Wire Type / Connector			Double Insulated / MC4							
Output Wire Length		0.9 / 2.95				1.2 / 3.9			m / ft	
Operating Temperature Range ⁽⁸⁾			-40 - -85 / -40 - -185							°C / °F
Protection Rating			IP68 / NEMA6P							
Relative Humidity			0 - 100							%

(1) Rated power of the module at STC will not exceed the optimizer "Rated Input DC Power". Modules with up to 5% power tolerance are allowed.
(2) NEC 2017 requires max input voltage be not more than 80V.
(3) For other connector types, please contact SolarEdge.
(4) For dual version for parallel connection of two modules use P485-4N-MC4-MV, in the case of an odd number of PV modules in one string, installing one P485 dual version power optimizer connected to one PV module. When connecting a single module, seal the unused input connectors with the supplied part of seals.
(5) For ambient temperature above 185°C / 1,85°F power derating is applied. Refer to Power Optimizers Temperature Derating Technical Note for more details.

PV System Design Using a SolarEdge Inverter ⁽¹⁾		Single Phase HD-Wave	Single phase	Three Phase for 208V grid	Three Phase for 277/480V grid
Minimum String Length (Power Optimizers)	P320, P340, P370, P400, P401, P405, P485, P505	8		10	18
		6	25	8	14
Maximum String Length (Power Optimizers)		5700 (6000 with SE7600-US - SE1400-US)	5250	6000 ⁽⁶⁾	12750 ⁽⁶⁾
Maximum Power per String					W
Parallel Strings of Different Lengths or Orientations		Yes			

(6) For detailed string sizing information, refer to https://www.solaredge.com/sites/default/files/string_sizing.pdf.
(7) It is not allowed to mix P485/P485-P505 with P320/P340/P370/P400/P401 in one string.
(8) A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement.
(9) For 208V grid, it is allowed to install up to 7,200V per string when the maximum power difference between each string is 1,000V.
(10) For 277/480V grid, it is allowed to install up to 5,000V per string when the maximum power difference between each string is 2,000V.

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RESIDENCE

111 EXAMPLE DR

DETROIT, MI 11111 APN:

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ENGINEER OF RECORD

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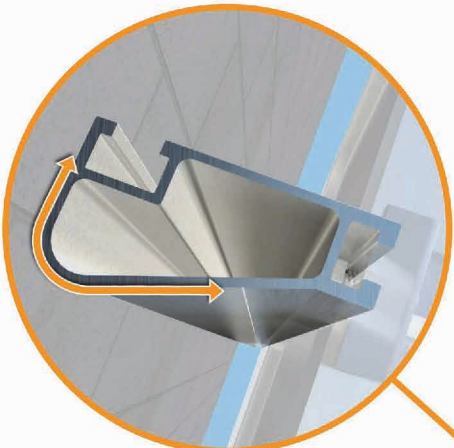
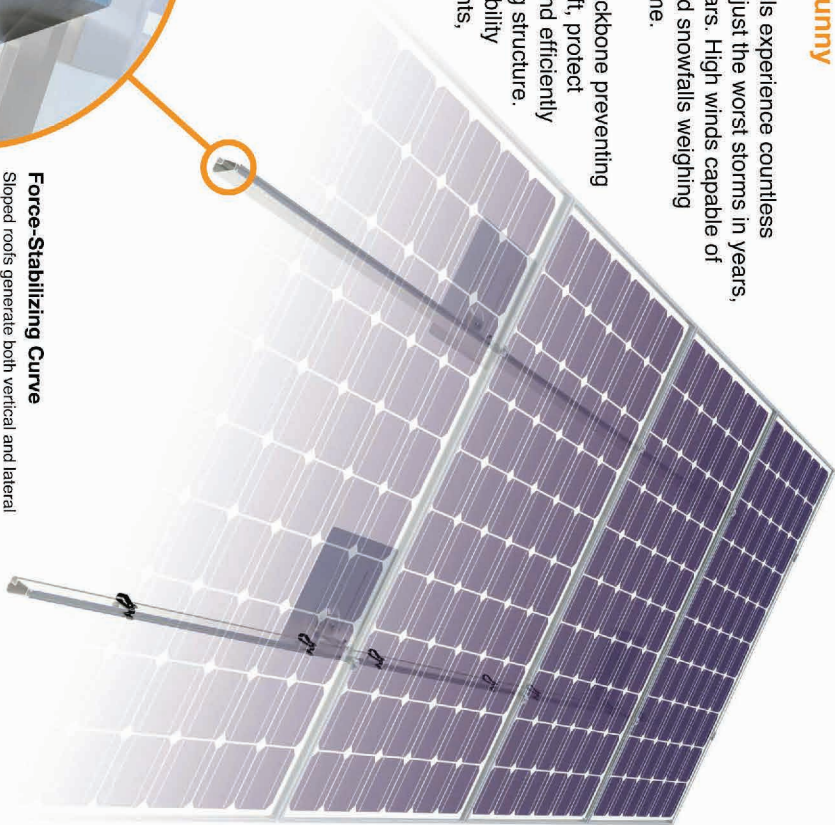
XR Rail Family

Tech Brief

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 Flash-Foot 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

Tech Brief

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 load 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	XR10					
	120						
	140						
10-20	160	XR100					
	100						
	120						
30	140	XR1000					
	160						
	100						
40	160						
	100						
	120						
50-70	160						
	100						
	120						
80-90	160						
	100						
	120						

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FlashFoot2

Tech Brief

Installation Features

Tech Brief

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

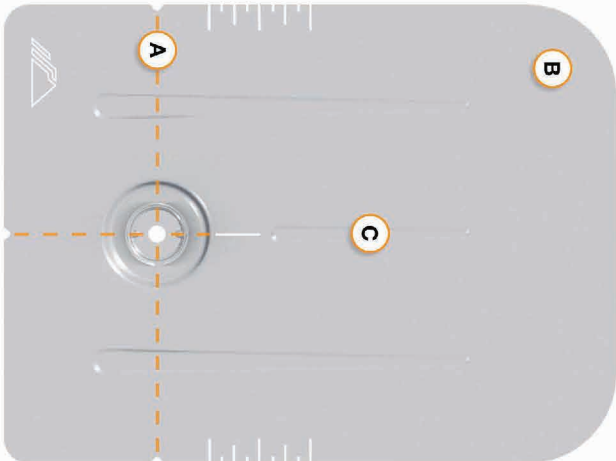
FlashFoot2's seal architecture utilizes three layers of protection. An elevated platform diverts water away, while a stack of rugged components raises the seal an entire inch. The seal is then fully-encapsulated by the Cap. FlashFoot2 is the first solar attachment to pass the TAS-100 Wind-Driven Rain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



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.

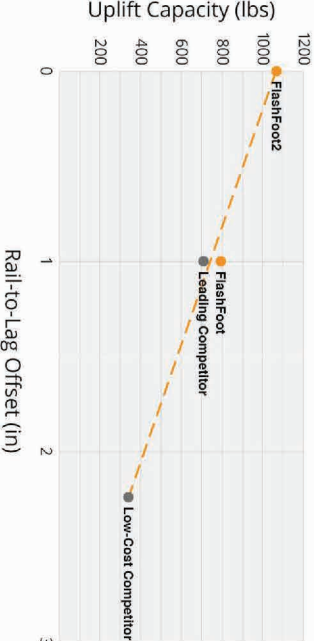
C Reinforcement Ribs

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.

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