

## HISTORIC AND DESIGN REVIEW COMMISSION

June 19, 2019

**HDRC CASE NO:** 2019-326  
**ADDRESS:** 616 SHERMAN ST  
**LEGAL DESCRIPTION:** NCB 1300 BLK 1 LOT 7  
**ZONING:** R-5, H  
**CITY COUNCIL DIST.:** 2  
**DISTRICT:** Dignowity Hill Historic District  
**APPLICANT:** Ashley Smith/Standard Eco  
**OWNER:** Jiminez Gregorio  
**TYPE OF WORK:** Installation of solar panels  
**APPLICATION RECEIVED:** May 24, 2019  
**60-DAY REVIEW:** July 23, 2019  
**CASE MANAGER:** Edward Hall

### REQUEST:

The applicant is requesting a Certificate of Appropriateness for approval to install a solar photovoltaic system at 616 Sherman to feature forty-eight (48) panels.

### APPLICABLE CITATIONS:

*Historic Design Guidelines, Chapter 3, Guidelines for Additions*

#### 6. Designing for Energy Efficiency

##### C. SOLAR COLLECTORS

- i. Location*—Locate solar collectors on side or rear roof pitch of the primary historic structure to the maximum extent feasible to minimize visibility from the public right-of-way while maximizing solar access. Alternatively, locate solar collectors on a garage or outbuilding or consider a ground-mount system where solar access to the primary structure is limited.
- ii. Mounting (sloped roof surfaces)*—Mount solar collectors flush with the surface of a sloped roof. Select collectors that are similar in color to the roof surface to reduce visibility.
- iii. Mounting (flat roof surfaces)*—Mount solar collectors flush with the surface of a flat roof to the maximum extent feasible. Where solar access limitations preclude a flush mount, locate panels towards the rear of the roof where visibility from the public right-of-way will be minimized.

### FINDINGS:

- a. The historic structure at 616 Sherman was constructed circa 1910 and is found on the 1912 Sanborn Map. The structure features Folk Victorian elements and a unique footprint which is atypical of the style. The structure also features modifications and additions to its original design and form. This structure is contributing to the Dignowity Hill Historic District.
- b. LOCATION – The applicant has proposed to locate twenty-four (24) solar panels on each the east and west roof slopes of the primary roof slope. No panels will be located on the front façade or front facing roof slope. Per the Guidelines for Additions 6.C.i, solar collectors should be located on a side or rear roof pitch to the maximum extent possible to minimize the visibility from the public right-of-way. While panels on the structure may be visible from Sherman Street, staff finds the proposed location appropriate given their placement behind the forward-most massing and roof forms.
- c. PITCH – The applicant has noted that all panels will be installed flush with the roof pitch. Staff finds the proposal to be consistent with the Guidelines.

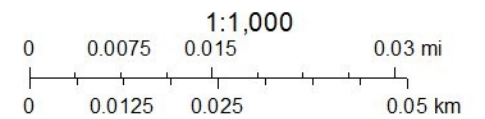
### RECOMMENDATION:

Staff recommends approval based on findings a through c with the stipulation that the applicant provide information to staff regarding the existing roof structure's ability to support the weight of the proposed system.

# City of San Antonio One Stop



June 12, 2019





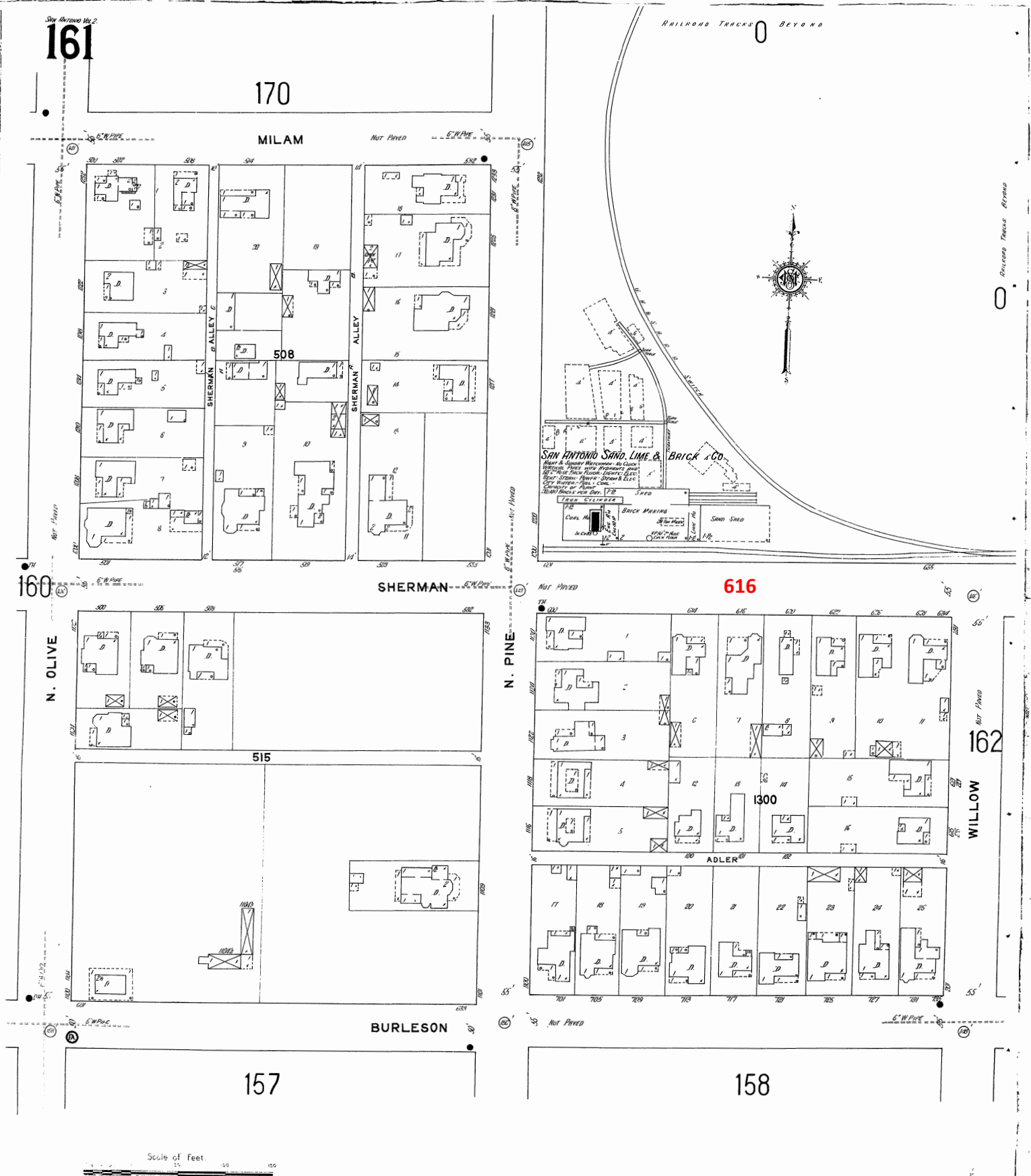


616 Sherman



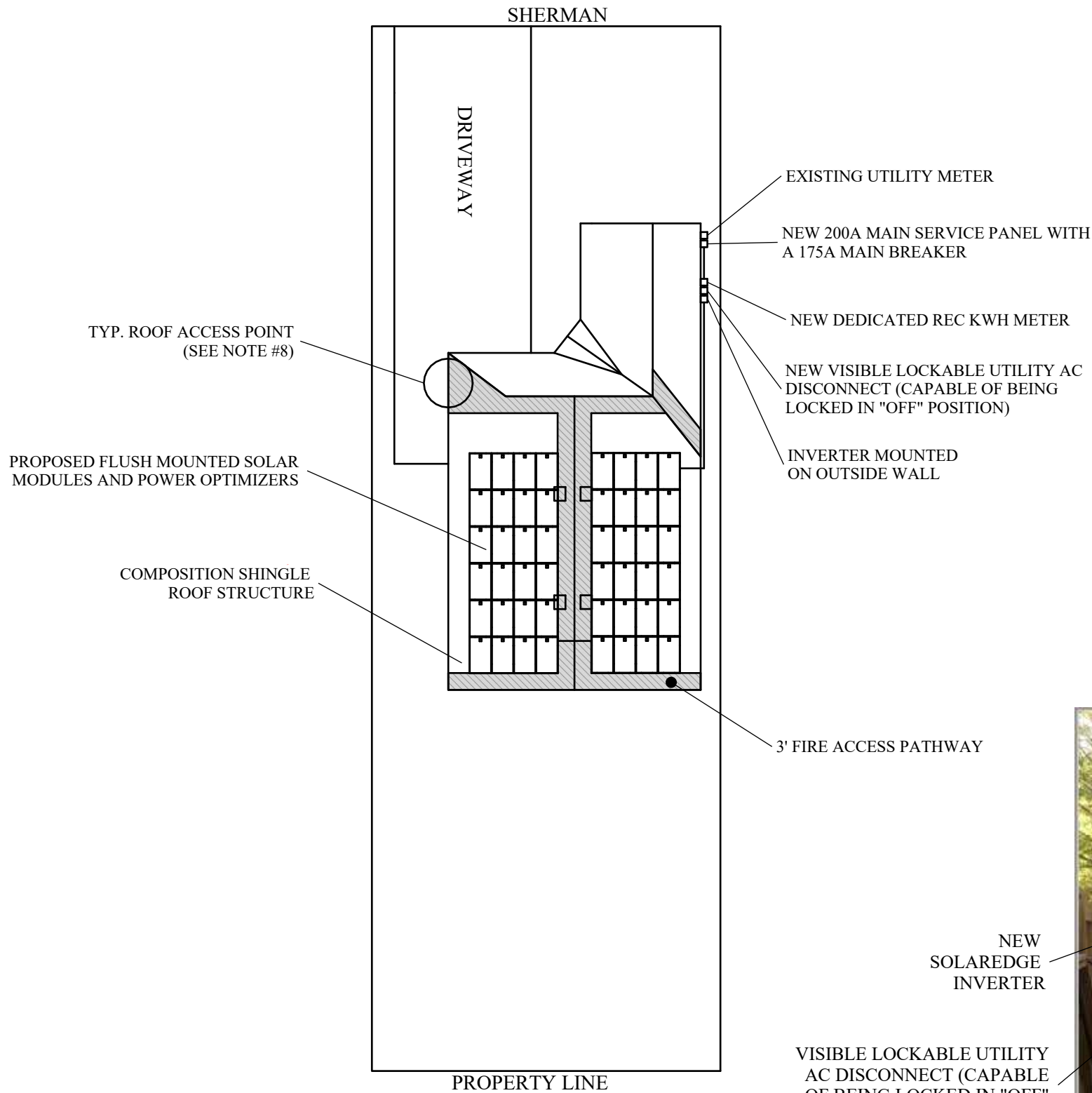








**SITE PLAN**  
SCALE: 1" = 20'-0"



**ELECTRICAL EQUIPMENT DETAIL**  
SCALE: NTS

**CONSTRUCTION NOTES:**

1. SOLAR PHOTOVOLTAIC SYSTEM TO BE INSTALLED ON RESIDENTIAL STRUCTURE.
2. THIS PROJECT HAS BEEN DESIGNED IN COMPLIANCE WITH THE IBC SECTION 1609 TO WITHSTAND A BASIC WIND SPEED OF 115 MPH (3 SECOND GUST).
3. THE HOUSE IS A SINGLE STORY STRUCTURE.
4. THE ROOF MEMBERS ARE 2x4 RAFTERS ON 24" CENTERS. CONNECTION TO STRUCTURE SHALL NOT BE WITHIN 6" OF NAILING PLATES.
5. ROOF PITCH IS: 45° (12:12 SLOPE)
6. THE SOLAR PHOTOVOLTAIC INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL OR BUILDING ROOF VENTS.
7. ALL CONDUCTORS AND CONDUITS MOUNTED ON ROOF SHALL BE MINIMUM 3 3/4" ABOVE ROOF SURFACE (INCLUDING CABLES UNDERNEATH MODULES AND RACKING).
8. ROOF ACCESS POINTS SHALL BE LOCATED IN AREAS WHERE GROUND LADDERS DO NOT COVER OPENINGS SUCH AS DOORS OR WINDOWS. LADDERS TO BE LOCATED AT STRONG POINTS OF BUILDING CONSTRUCTION IN LOCATIONS WHERE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS: TREE LIMBS, WIRES, OR SIGNS.

**PHOTOVOLTAIC  
SYSTEM SIZE:**

11.40 kW AC  
14.64 kW DC

SINGLE PHASE 120V/240V

**ARENAS Residence**  
616 SHERMAN, SAN ANTONIO, TX  
78202

**REVISIONS:**

**DRAWN BY:** ASD  
**DATE:** 04/13/2019

**SITE PLAN  
DRAWING**

**SHEET:**

**1**

**STANDARD ECO**

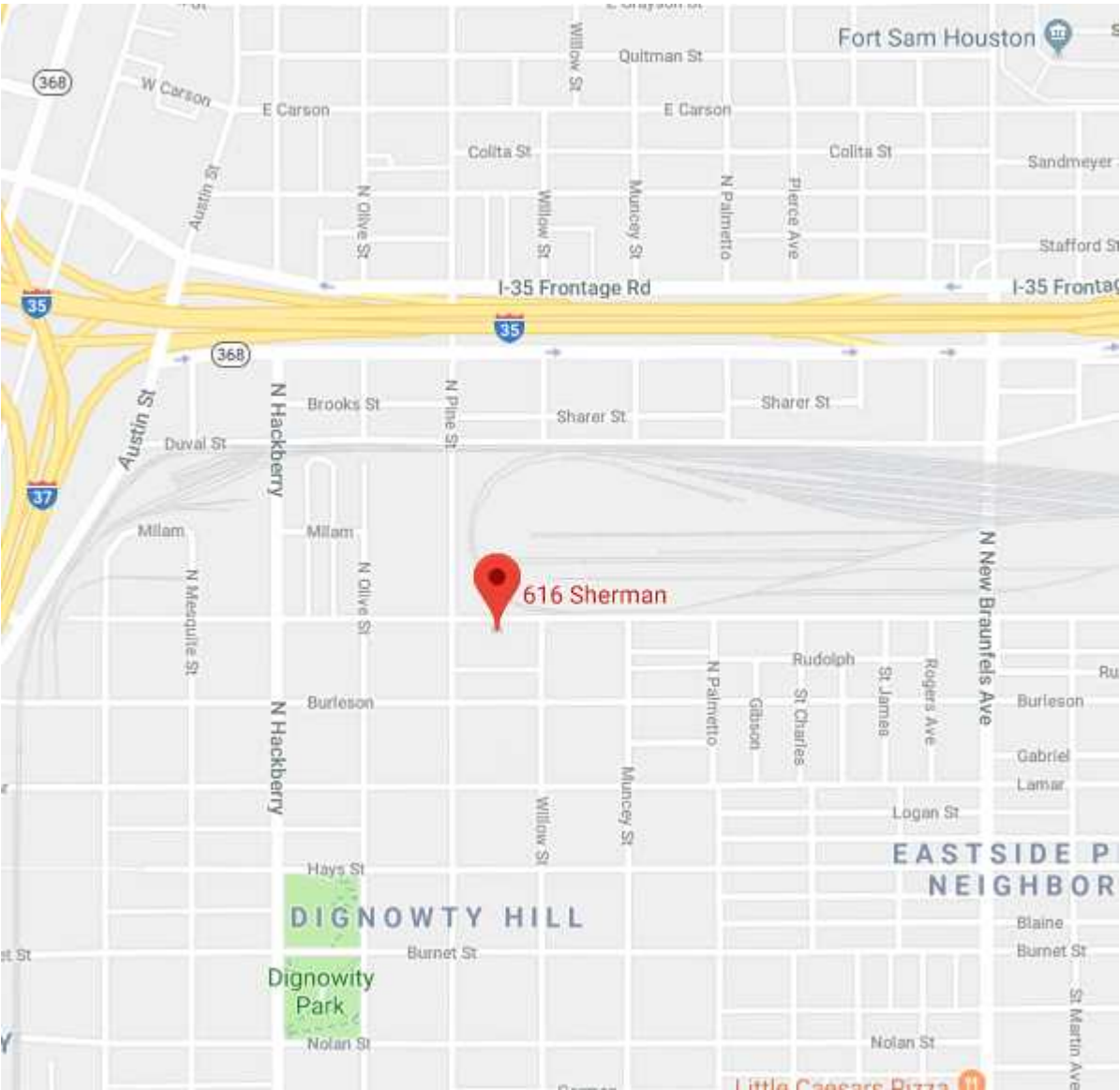
110 E. Houston St.,  
San Antonio, TX 78205  
TX License #:32439



STANDARD ECO

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VICINITY MAP



AERIAL IMAGE



SHEET INDEX

- 00- COVER SHEET AND PLOT MAP
- 1- SITE PLAN DRAWING
- 2- RACKING PLAN
- 3- ELECTRICAL NOTES
- 4- SINGLE LINE DIAGRAM
- 5- ARRAY MAP
- 5.1- THREE LINE DIAGRAM
- 6- PLACARDS
- - REFERENCE PAGE
- ATTACHED SPEC. SHEETS / ETC. -
- INVERTER SPECIFICATIONS
- MODULE SPECIFICATIONS

GENERAL NOTES

1. ALL CONSTRUCTION / INSTALLATION SHALL COMPLY WITH:  
  
2017 NATIONAL ELECTRIC CODE (NEC)  
2018 INTERNATIONAL FIRE CODE (IFC)  
2018 NTERNATIONAL BUILDING CODE  
2018 INTERNATIONAL RESIDENTIAL CODE  
2018 INTERNATIONAL MECHANICAL CODE  
2018 INTERNATIONAL PLUMBING CODE  
2018 INTERNATIONAL EXISTING BUILDING CODE  
2018 INTERNATIONAL FUEL GAS CODE  
2018 INTERNATIONAL ENERGY CONSERVATION CODE  
2012 CPS STANDARDS
2. ALL DIMENSIONS WITHIN THESE PLANS ARE APPROXIMATE.
3. ALL CONDUITS ON ROOF SHALL BE A MINIMUM OF 1/2" OFF ROOF.
4. CONSTRUCTION LIMITS: ALL IMPROVEMENTS AND ACCESS SHALL OCCUR WITHIN PLANT PROPERTY LINES.
5. PV EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH 2017 NEC 690 & POSTED WITH APPLICABLE WARNINGS, SIGNAGE AND PLAQUES PER 2017 NEC ARTICLE 705-10, 690-17, 690-64, AND 2018 IFC SECTION 605.11.
6. ALL PV ARRAYS AND ASSOCIATED EQUIPMENT, CONDUIT AND CONDUCTORS SHALL COMPLY WITH SECTION 605.11 OF THE 2018 IFC FOR MARKING DC CONDUCTORS, LOCATION OF DC CONDUCTORS, ROOF ACCESS, PATHWAYS AND SPACING. PLANS WILL SHOW COMPLIANCE WITH THE IFC.

SYSTEM EQUIPMENT

- (48x) MISSION SOLAR MSE305SQ5K
- (48x) POWER OPTIMIZERS P320
- (1x) SOLAREEDGE SE11400-US

ELECTRICAL NOTES		
1.	WHERE TWO SOURCES, ONE UTILITY AND THE OTHER AN INVERTER, ARE LOCATED AT OPPOSITE ENDS OF A BUSBAR THAT CONTAINS LOADS, THE SUM OF 125% OF THE INVERTER(S) OUTPUT CIRCUIT CURRENT AND THE RATING OF THE OVERCURRENT DEVICE PROTETICING THE BUSBAR SHALL NOT EXCEED 120% THE AMPACITY OF THE BUSBAR (NEC 2014 705.12(2)(b))	
2.	IDENTIFICATION AND GROUPING OF PHOTOVOLTAIC DC CIRCUITS SHALL COMPLY WITH NEC 690.4(B) AND SHALL BE SEPARATED FROM OTHER NON PV SYSTEM CONDUCTORS.	
3.	EXPOSED NON-CURRENT CARRYING METAL PARTS OF PHOTOVOLTAIC RACKING, EQUIPMENT, AND CONDUCTOR ENCLOSURES SHALL BE GROUNDED IN ACCORDANCE TO NEC 690.47 (C)(3), 250.64(C), 250.66, & 250.134 OR 250.136(A) AND SIZED PER 250.166 REGARDLESS OF VOLTAGE.	
4.	ALL CONDUIT ON ROOF NEEDS TO BE PLACED 1/2"-3 1/2" OFF THE ROOF'S SURFACE.	
5.	EACH MODULE (AND MICRO-INVERTER, IF APPLICABLE) SHALL BE GROUNDED PER THE MANUFACTURER'S INSTRUCTIONS USING THE BONDING MIDCLAMP / COMPONENTS, AND AT EACH ROW UTILIZING AMPHENOL HELIO LUGS (UL 2703). SPEC SHEETS CAN BE PROVIDED UPON REQUEST.	
5.	ELECTRICAL EQUIPMENT INSTALLED SHALL BE LISTED, LABELED, OR CERTIFIED FOR ITS USE BY A NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL).	
6.	ALL TERMINATIONS OF EQUIPMENT TO BE A MINIMUM 75 DEGREE CELCIUS PER NEC 110.14(C) & TABLE 310.15 (B)(16) 75 DEGREE COLUMN COPPER.	
7.	FOR SERVICE UPGRADES, IF THE EXISTING GROUNDING ELECTRODE SYSTEM CAN NOT BE VERIFIED, OR IS ONLY METALLIC WATER PIPING, OR IT HAS A RESISTANCE GREATER THAN 25 OHMS, IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSTALL A SUPPLEMENTAL GROUNDING ELECTRODE AT LEAST 6' FROM THE EXISTING GROUNDING ELECTRODE.	
9.	ALL BREAKERS AND SERVICE EQUIPMENT ARE RATED AT 22kAIC OR HIGHER	
10.	GROUND BUSHINGS TO BE USED ON ALL METALLIC RACEWAYS.	

STANDARD ECO

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SINGLE PHASE 120V/240V

ARENAS Residence  
616 SHERMAN, SAN ANTONIO, TX  
78202

REVISIONS:

DRAWN BY: ASD  
DATE: 04/13/2019

SINGLE LINE  
DIAGRAM

SHEET:

4

(6x) #10 AWG  
& (1x) #8 AWG GROUND  
(THWN-2/PV WIRE)  
(SEE NOTE #4)

(16x) MISSION SOLAR MSE305SQ5K  
WITH (16x) P320 POWER OPTIMIZERS  
(FOR GROUNDING SEE NOTE #5)

(16x) MISSION SOLAR MSE305SQ5K  
WITH (16x) P320 POWER OPTIMIZERS  
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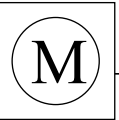
(16x) MISSION SOLAR MSE305SQ5K  
WITH (16x) P320 POWER OPTIMIZERS  
(FOR GROUNDING SEE NOTE #5)

INVERTER A  
SOLAREEDGE  
SE11400-US  
(W/ DC  
DISCONNECT  
INTEGRATED INTO  
INVERTER & DC  
AFCI COMPLIANT  
TO UL1699B)  
INTEGRATED RAPID  
SHUTDOWN

3/4" EMT  
(3x) #4 AWG  
& (1x) #8 AWG GROUND  
(THWN-2 WIRE)

60A VISIBLE  
LOCKABLE UTILITY  
AC DISCONNECT  
SWITCH  
EATON CUTLER  
HAMMER DG222URB  
240V - NON FUSED -  
SERVICE ENTRANCE  
RATED

DEDICATED PV  
SYSTEM kWh  
METER



MILBANK WATT HOUR  
METER, 240V 60HZ  
CLASS 200 FORM 2S  
AND U5929XL SOCKET

#8 CU BARE GROUNDING ELECTRODE  
CONDUCTOR (GEC). TO RUN INDEPENDENTLY  
OF OTHER CONDUCTORS AND TIE DIRECTLY  
INTO AC GROUNDING ELECTRODE

3/4" EMT  
(3x) #4 AWG  
& (1x) #8 AWG GROUND  
(THWN-2 WIRE)

NEW 200A  
PANEL & METER  
BI-DIRECTIONAL  
SINGLE PHASE  
UTILITY METER  
NEW 175A MAIN  
BREAKER  
(DERATED FROM  
200A)  
NEW 60A PV  
BREAKER  
(SEE NOTE #1 FOR  
LOCATION)



GROUNDING ELECTRODE  
(SEE ELECTRICAL NOTES #8)

MAX AVAILABLE BACKFEED FOR SES BUS SIZE:

200A BUS x 1.2 = 240A - 175A BREAKER =  
40A BACKFEED AVAILABLE

MAX BACKFED CURRENT FOR OCPD:

47.5A x 1.25 = 59.4A TOTAL



# MSE PERC 60

High Power PERC Rooftop Module



Class Leading Output:  
305W power



Advanced Technology:  
PERC and 4 busbars drive  
>18% module efficiency



Certified Reliability:  
3X IEC, salt mist, ammonia



Buy American Act

## Proudly assembled in the USA

Mission Solar Energy is headquartered in San Antonio, TX with module facilities onsite. Our hardworking team calls Texas home and is devoted to producing high quality solar products and services. Our supply chain includes local and domestic vendors increasing our impact to the U.S. economy.



Assembled  
in the USA

## CERTIFICATIONS

IEC 61215/ IEC 61730/ IEC 61701  
UL 1703: CSA



Independently Audited by

SOLARBUYER



PowerGuard  
SPECIALTY INSURANCE SERVICES

\*As there are different certification requirements in different markets, please contact your local Mission Solar Energy sales representative for the specific certificates applicable to the products in the region in which the products are to be used.



## Outstanding performance with PERC

Passivated Emitter Rear Contact (PERC) technology provides excellent power output through advanced cell structure.

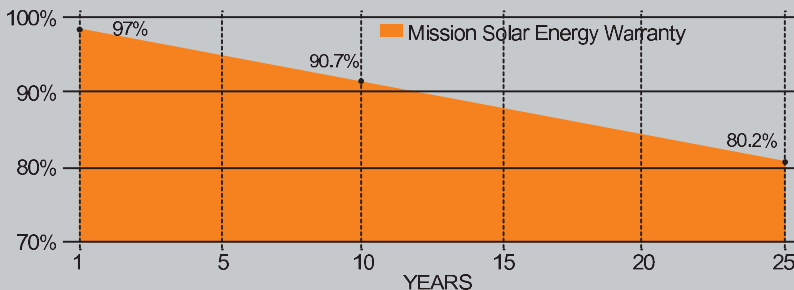
## Best in class quality

Mission Solar Energy production lines are fully automated and include multiple quality checks throughout the production process.

## Proven reliability and bankability

Mission Solar Energy panels have been tested by independent testing centers to meet and exceed IEC standards. Our panels are deployed in projects across North America.

## 25-YEAR LINEAR WARRANTY



## ELECTRICAL SPECIFICATIONS

Electrical parameters at Standard Test Condition (STC)

Module Type			MSE295SQ5K	MSE300SQ5K	MSE305SQ5K
Power Output	Pmax	Wp	295	300	305
Module Efficiency		%	17.82	18.06	18.36
Tolerance			0~+3%		
Short-Circuit Current	Isc	A	9.73	9.77	9.81
Open Circuit Voltage	Voc	V	39.38	39.72	39.95
Rated Current	Imp	A	9.20	9.27	9.36
Rated Voltage	Vmp	V	32.19	32.38	32.61

STC: Irradiance 1000 W/m<sup>2</sup>, Cell temperature of 25°C, AM 1.5

## TEMPERATURE COEFFICIENTS

Normal Operating Cell Temperature (NOCT)	44°C (±2°C)
Temperature Coefficient of Pmax	-0.427%/°C
Temperature Coefficient of Voc	-0.318%/°C
Temperature Coefficient of Isc	0.042%/°C

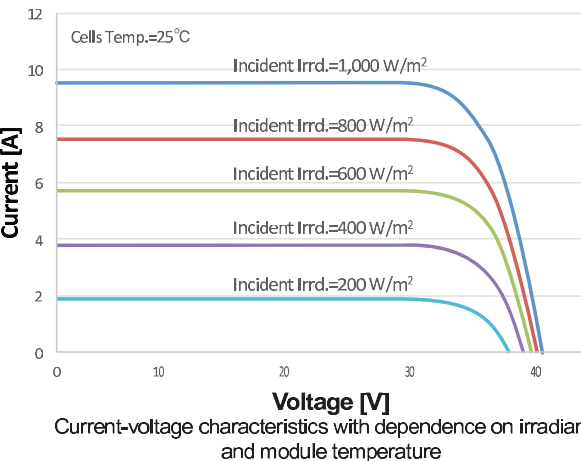
## OPERATING CONDITIONS

Maximum System Voltage	1,000VDC
Operating Temperature Range	-40°C (-40°F) to +90°C (194°F)
Maximum Series Fuse Rating	15A
Fire Safety Classification	Type 1, Class C
Static Load Wind/Snow	2400Pa/5400Pa
Hail Safety Impact Velocity	25mm at 23 m/s

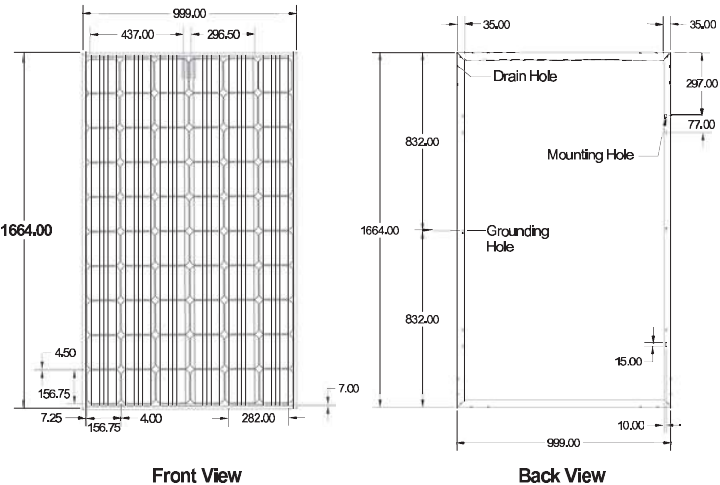
## MECHANICAL DATA

Solar Cells	P-type Mono-crystalline Silicon (156.75mm)
Cell orientation	60 cells (6x10), 4 busbar
Module dimension	1664mm x 999mm x 40mm (65.51 in. x 39.33 in. x 1.57 in.)
Weight	18.2 kg (40.1 lb)
Front Glass	3.2mm (0.126 in.) tempered, Low-iron, Anti-reflective coating
Frame	Anodized aluminum alloy
Encapsulant	Ethylene vinyl acetate (EVA)
J-Box	Protection class IP67 with 3 bypass-diodes
Cables	PV wire, 1m (39.37 in.), 4mm <sup>2</sup> / 12 AWG
Connector	MC4 or compatible

## MSE300SQ5K: 300WP, 60CELL SOLAR MODULE CURRENT-VOLTAGE CURVE



## BASIC DESIGN (UNITS: mm)



Mission Solar Energy reserves the right to make specification changes without notice.

Rev. 7.03

8303 South New Braunfels Ave. | San Antonio | TX | 78235 | [missionsolar.com](http://missionsolar.com) | [info@missionsolar.com](mailto:info@missionsolar.com) | (210) 531-8600





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



Optimized installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking efficiency
- Fixed voltage inverter for longer strings
- Integrated arc fault protection and rapid shutdown for NEC 2014 and 2017, per article 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Extremely small
- High reliability without any electrolytic capacitors
- Built-in module-level monitoring
- Outdoor and indoor installation
- Optional: Revenue grade data, ANSI C12.20 Class 0.5 (0.5% accuracy)



www.solaredge.us



Single Phase Inverter  
with HD-Wave Technology for North America  
SE3000H-US / SE3800H-US / SE5000H-US /  
SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US

	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US		
OUTPUT									
Rated AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400	VA	
Max. AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400	VA	
AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229)	-	✓	-	✓	-	-	-	Vac	
AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac	
AC Frequency (Nominal)	59.3 - 60 - 60.5 <sup>(1)</sup>							Hz	
Maximum Continuous Output Current 208V	-	16	-	24	-	-	-	A	
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5	A	
GFDI Threshold	1							A	
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes								
INPUT									
Maximum DC Power @240V	4650	5900	7750	9300	11800	15500	17650	W	
Maximum DC Power @208V	-	5100	-	7750	-	-	-		
Transformer-less, Ungrounded	Yes								
Maximum Input Voltage	480							Vdc	
Nominal DC Input Voltage	380				400			Vdc	
Maximum Input Current 208V	-	9	-	13.5	-	-	-		
Maximum Input Current @240V	8.5	10.5	13.5	16.5	20	27	30.5	Adc	
Max. Input Short Circuit Current	45							Adc	
Reverse-Polarity Protection	Yes								
Ground-Fault Isolation Detection	600k $\Omega$ Sensitivity								
Maximum Inverter Efficiency	99	99.2						%	
CEC Weighted Efficiency	99							%	
Nighttime Power Consumption	< 2.5							W	
ADDITIONAL FEATURES									
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)								
Revenue Grade Data, ANSI C12.20	Optional <sup>(2)</sup>								
Rapid Shutdown - NEC 2014 and 2017 690.12	Automatic Rapid Shutdown upon AC Grid Disconnect								
STANDARD COMPLIANCE									
Safety	UL1741, UL1741 SA, UL1699B, CSA C22.2, Canadian AFCI according to T.I.L. M-07								
Grid Connection Standards	IEEE1547, Rule 21, Rule 14 (HI)								
Emissions	FCC Part 15 Class B								
INSTALLATION SPECIFICATIONS									
AC Output Conduit Size / AWG Range	3/4" minimum / 14-6 AWG					3/4" minimum /14-4 AWG			
DC Input Conduit Size / # of Strings / AWG Range	3/4" minimum / 1-2 strings / 14-6 AWG					3/4" minimum / 1-3 strings / 14-6 AWG			
Dimensions with Safety Switch (HxWxD)	17.7 x 14.6 x 6.8 / 450 x 370 x 174					21.3 x 14.6 x 7.3 / 540 x 370 x 185		in / mm	
Weight with Safety Switch	22 / 10	25.1 / 11.4	26.2 / 11.9	38.8 / 17.6				lb / kg	
Noise	< 25				<50			dBA	
Cooling	Natural Convection				Natural convection				
Operating Temperature Range	-13 to +140 / -25 to +60 <sup>(3)</sup> (-40°F / -40°C option) <sup>(4)</sup>							°F / °C	
Protection Rating	NEMA 3R (Inverter with Safety Switch)								

<sup>(1)</sup> For other regional settings please contact SolarEdge support

<sup>(2)</sup> Revenue grade inverter P/N: SExxxxH-US000NNC2

<sup>(3)</sup> For power de-rating information refer to: <https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf>

<sup>(4)</sup> -40 version P/N: SExxxxH-US000NNU4



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# SolarEdge Power Optimizer

## Module Add-On For North America

P300 / P320 / P370 / P400 / P405



POWER OPTIMIZER

### PV power optimization at the module-level

- 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
- Module-level voltage shutdown for installer and firefighter safety



# SolarEdge Power Optimizer

## Module Add-On for North America

P300 / P320 / P370 / P400 / P405

	P300 (for 60-cell mod- ules)	P320 (for high-power 60-cell modules)	P370 (for higher-power 60 and 72-cell modules)	P400 (for 72 & 96-cell modules)	P405 (for thin film modules)		
INPUT							
Rated Input DC Power <sup>(1)</sup>	300	320	370	400	405	W	
Absolute Maximum Input Voltage (Voc at lowest temperature)	48		60	80	125	Vdc	
MPPT Operating Range	8 - 48		8 - 60	8 - 80	12.5 - 105	Vdc	
Maximum Short Circuit Current (Isc)	10	11		10.1		Adc	
Maximum DC Input Current	12.5	13.75		12.63		Adc	
Maximum Efficiency			99.5			%	
Weighted Efficiency			98.8			%	
Overvoltage Category			II				
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREEDGE INVERTER)							
Maximum Output Current				15			Adc
Maximum Output Voltage	60			85		Vdc	
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREEDGE INVERTER OR SOLAREEDGE INVERTER OFF)							
Safety Output Voltage per Power Optimizer	1					Vdc	
STANDARD COMPLIANCE							
EMC	FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3						
Safety	IEC62109-1 (class II safety), UL1741						
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)	128 x 152 x 27.5 / 5 x 5.97 x 1.08			128 x 152 x 35 / 5 x 5.97 x 1.37	128 x 152 x 50 / 5 x 5.97 x 1.96	mm / in	
Weight (including cables)	630 / 1.4			750 / 1.7	845 / 1.9	gr / lb	
Input Connector	MC4 Compatible		MC4 / Amphenol AH4 Double Insulated;	MC4 Compatible			
Output Wire Type / Connector	Double Insulated; MC4 Compatible		MC4 / Amphenol AH4	Double Insulated; MC4 Compatible			
Output Wire Length	0.95 / 3.0			1.2 / 3.9		m / ft	
Operating Temperature Range	-40 - +85 / -40 - +185					°C / °F	
Protection Rating	IP68 / NEMA6P						
Relative Humidity	0 - 100					%	

<sup>(1)</sup> Rated STC power of the module. Module of up to +5% power tolerance allowed.

PV SYSTEM DESIGN USING A SOLAREEDGE INVERTER <sup>(2)(3)</sup>	SINGLE PHASE HD-WAVE	SINGLE PHASE	THREE PHASE 208V	THREE PHASE 480V	
Minimum String Length (Power Optimizers)	8		10	18	
Maximum String Length (Power Optimizers)	25		25	50	
Maximum Power per String	5700 (6000 with SE7600H-US)	5250	6000	12750	W
Parallel Strings of Different Lengths or Orientations	Yes				

<sup>(2)</sup> For detailed string sizing information refer to: [http://www.solaredge.com/sites/default/files/string\\_sizing\\_na.pdf](http://www.solaredge.com/sites/default/files/string_sizing_na.pdf).

<sup>(3)</sup> It is not allowed to mix P405 with P300/P370/P400/P600/P700 in one string.





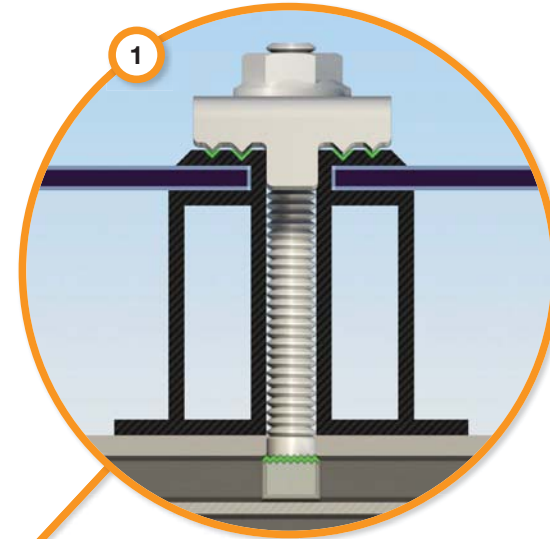
## Integrated Grounding System

### Simplified Grounding

#### For Greater Safety & Lower Cost

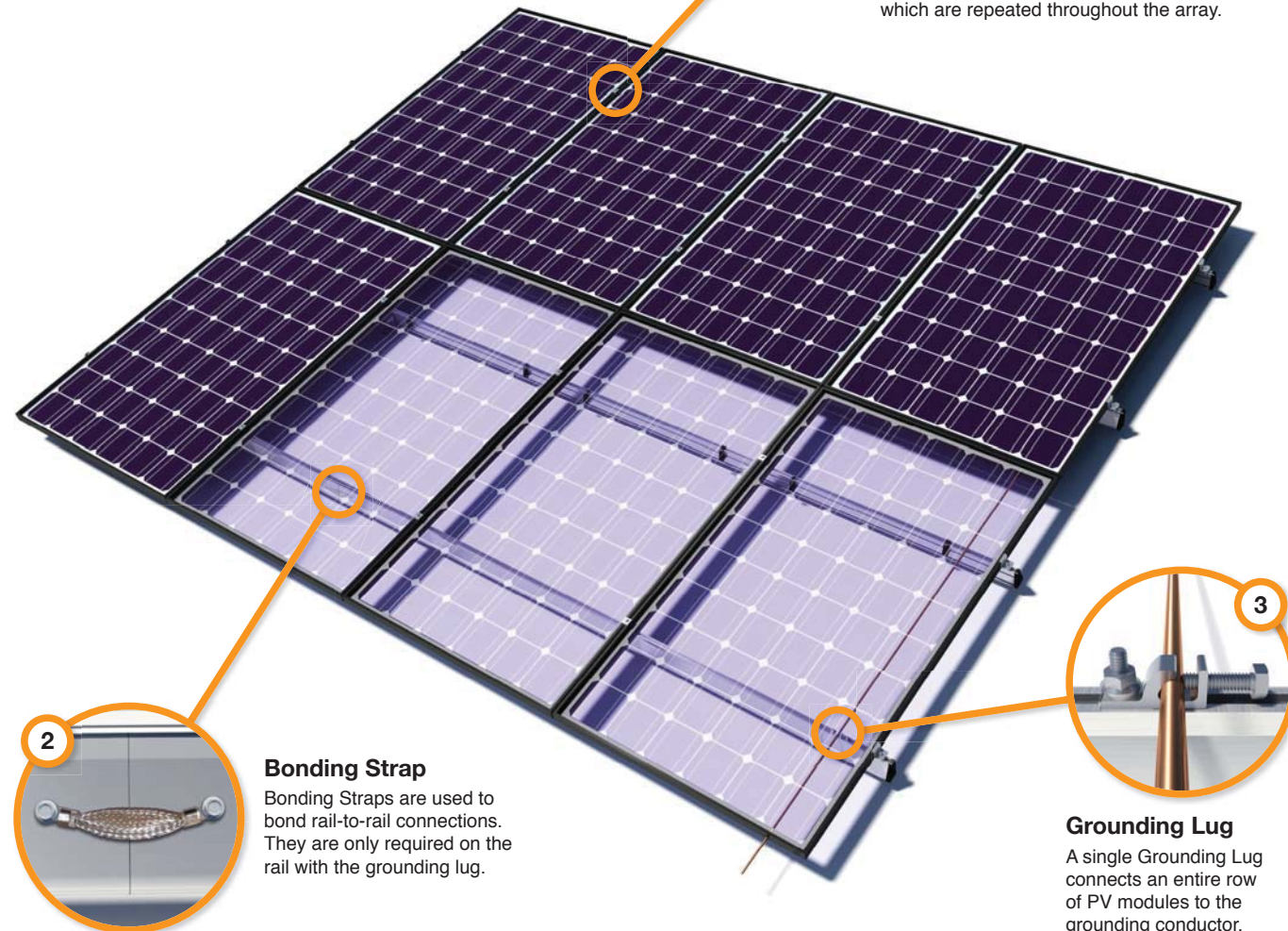
Traditionally, solar modules are grounded by attaching lugs, bolts or clips to the module frame, then connecting these to a copper conductor that runs throughout the array. This process adds time and cost to the installation, and often results in improper grounding, creating significant long-term safety risks.

The IronRidge Integrated Grounding System solves these challenges by bonding modules directly to the mounting rails. This approach eliminates separate module grounding hardware, and it creates many parallel grounding paths throughout the array, providing greater safety for system owners.



#### Grounding Mid Clamp

Each Grounding Mid Clamp pierces through the anodized coatings of both the module frame and the mounting rail to form secure electrical bonds, which are repeated throughout the array.



2

#### Bonding Strap

Bonding Straps are used to bond rail-to-rail connections. They are only required on the rail with the grounding lug.

3

#### Grounding Lug

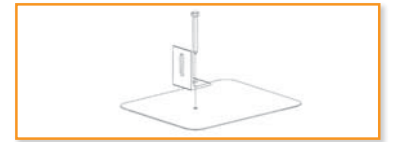
A single Grounding Lug connects an entire row of PV modules to the grounding conductor.

## Installation Overview

1

### Install Roof Attachments

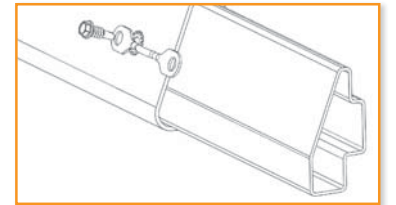
- Install appropriate roof flashing and/or standoff for roof type.
- Attach L-Feet to flashing or standoff.



2

### Prepare Rail Connections

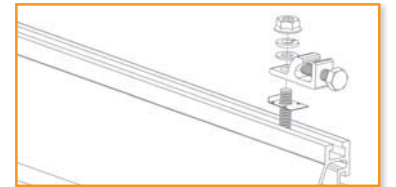
- Insert splice into first rail, then secure with Bonding Strap and self-drilling screw.
- Slide second rail over splice, then secure with opposite end of Grounding Strap and self-drilling screw.



3

### Mount & Ground Rails

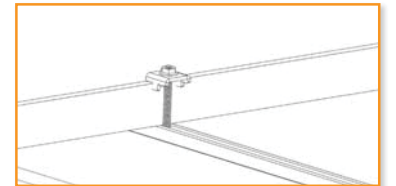
- Attach rails to L-Feet and level rails.
- Install one Grounding Lug per row of modules.
- Connect Grounding Lug to grounding conductor.



4

### Install Modules & Clamps

- Install first module using End Clamps and Grounding Mid Clamps.
- Install additional modules using Grounding Mid Clamps.
- Finish row with a second pair of End Clamps.



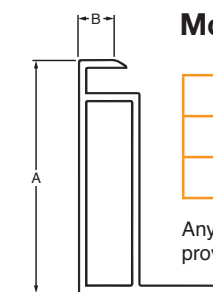
## Testing & Certification

The IronRidge Integrated Grounding System has been tested and certified to UL 2703 by Intertek Group plc.

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

The testing process closely mirrors that of UL 1703, the solar module testing standard, including temperature and humidity cycling, electrical and mechanical load testing, and manufacturing quality reviews.

### Module Frame Compatibility



Dimension	Range
A	31.0mm - 51.0mm
B	5.08mm (minimum)

Any module frames whose parameters are not listed in the provided table have not been tested for compatibility.

The Grounding Mid Clamp has proven robust in grounding solar modules with a box frame construction, a range of anodization thicknesses and nominal lengths of 78.5" or less.

All solar modules listed to UL 1703 and with frame construction within the parameters stated above are compatible with the IronRidge Integrated Grounding System.

 [Go to ironridge.com/ig](https://www.ironridge.com/ig)



## 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.

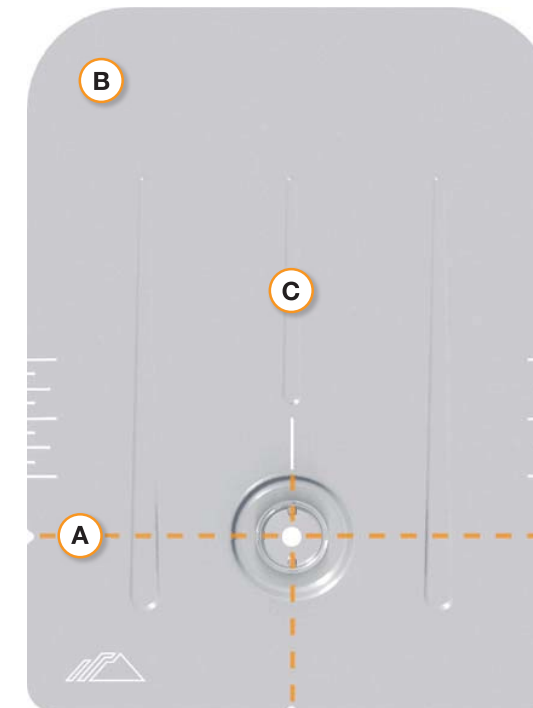
## Single Socket Size

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.

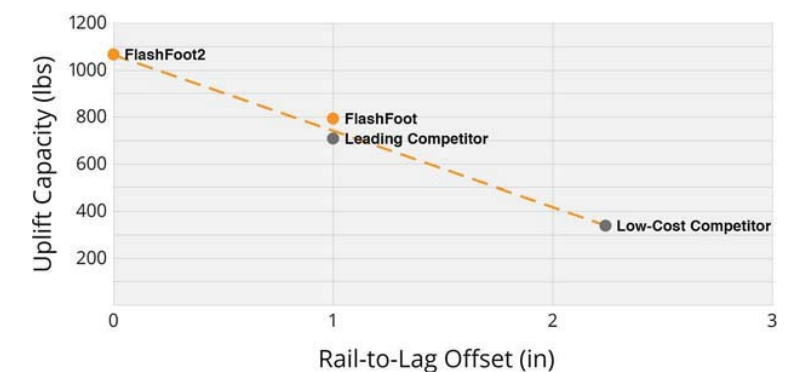
## C Reinforcement Ribs

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 &amp; 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.





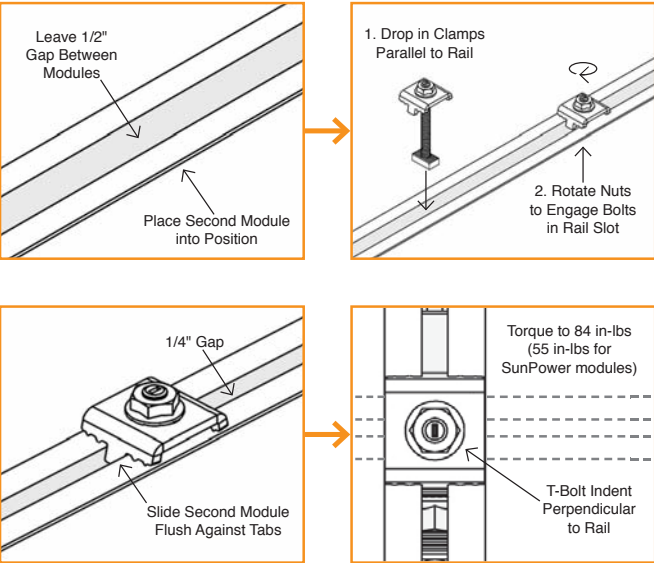
# Grounding Mid Clamp

## Installation

Once the end module is set into position, place second module into position, leaving a 1/2" gap between it and the previous module. While holding module in place, drop Grounding Mid Clamps into rail slots and rotate nuts to engage T-bolts.

Slide second module flush against clamp tabs. Once clamp teeth are in contact with both module frames and the bolts are properly aligned in slots, torque to 84 in-lbs (55 in-lbs for SunPower modules). Repeat procedure for each following module.

- ▶ **Make sure indent at top of T-bolt is perpendicular to rail slot to ensure T-bolts are properly seated.**
- ▶ **If grounding mid clamps need to be reinstalled, slightly move the modules so that clamp teeth are in contact with a new section of the module frame.**

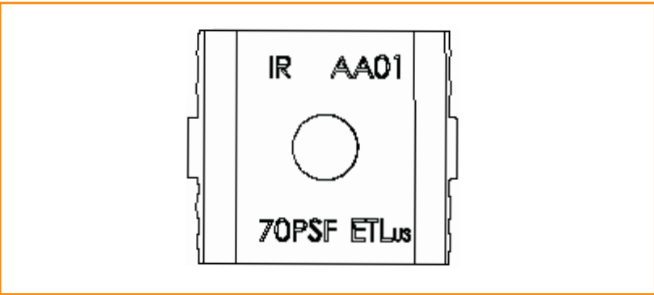


## Markings

Markings are located on the top surface of the Grounding Mid Clamp and being with the manufacturing and model number followed by the revision and manufacturing date.

Manufacturer and model number: IR

Revision and manufacturing date:  
First digit (revision code): A = Rev A, B = Rev B, etc.  
Second digit (month produced): A = Jan, B = Feb, etc.  
Third & fourth digits (year produced): 15 = 2015, etc.

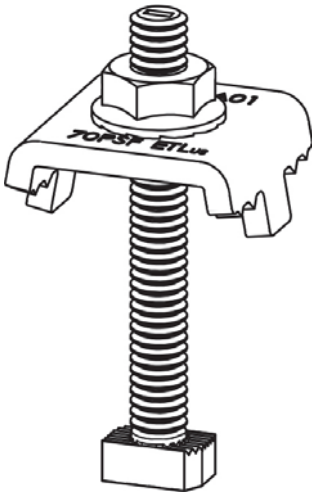


## Ratings

Max Overcurrent Protective Device (OCPD) Rating: 25A

Installer is responsible for and shall provide an appropriate method of direct-to-earth grounding according to the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, and NEC 690: Solar Photovoltaic Systems.

If loose components, loose fasteners or corrosion are found during periodic inspection, replace affected components immediately.



## Module Compatibility

The Grounding Mid Clamp may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions. Unless otherwise noted, “xxx” refers to the module power rating and both black and silver frames are included in the certification.

MANUFACTURER	MODELS
AstroEnergy Solar	Modules with 35, 40, and 45mm frames and model identifier aaSM66yyPzz-xxx; where "aa" can be CH or A; "yy" can be either 10 or 12; "zz" can be blank or (BL).
Canadian Solar	Modules with 40mm frames and model identifier CS6Y-xxxZ; where "Y" can be K, P, V, or X; and ""Z"" can be M, P, PX, or P-SD.
ET Solar	Modules with 35, 40, and 50mm frames and model identifier ET-Y6ZZxxxAA; where "Y" can be P, L, or M; "ZZ" can be 60 or 72; and "AA" can be WB, WW, BB, WBG, WWG, WBAC, WBCO, WWCO, WWBCO or BBAC.
GigaWatt Solar	Modules with 40mm frames and model identifier GWxxxYY; where "YY" can be either PB or MB.
Hanwha Solar	Modules with 40, 45, and 50mm frames and model identifier HSLaaP6-YY-1-xxxZ; where "aa" can be either 60 or 72; "YY" can be PA or PB; and "Z" can be blank or B.
Hanwha Q CELLS	Modules with 32, 35, 40, and 42mm frames and model identifier Q.YY-ZZ-xxx; where "YY" can be PLUS, PRO, or PEAK; and "ZZ" can be G3, G4, L-G2, L-G3y, L-G4y, BFR-G3, BLK-G3, BFR-G4, BFR-G4.1, or G4.1/SC.
Hyundai	Modules with 35 and 50mm frames and model identifier HiS-YxxxZZ; where "Y" can be M or S; and "ZZ" can be MI, MF, MG, SG, RI, RG, TI, or TG.
JA Solar	Modules with 40 and 45mm frames and model identifier JAyyzz-bb-xxx/aa; where "yy" can be M6 or P6; "zz" can be blank, (K), (L), (R), (V), (BK), (FA), (TG), (FA)(R), (L)(BK), (L)(TG), (R)(BK), (R)(TG), (V)(BK), (BK)(TG), or (L)(BK)(TG); "bb" can be 48, 60, or 72; and "aa" can be MP, SI, PR, 3BB, 4BB, 4BB/RE.
Jinko	Modules with 35 and 40mm frames and model identifier JKMYxxxZZ; where "Y" can either be blank or S; and "ZZ" can be M, P, PP, P-B, or P-V.
Kyocera	Modules with 46mm frames and model identifier KYxxxZZ-AA; where "Y" can be D or U; "ZZ" can be blank, GX, or SX; and "AA" can be LPu, LFU, UPU, LPS, LPB, ,LFB, LFBS, LFB2, LPB2, 3AC, 3BC, 3FC, 4AC, 4BC, 4FC, 4UC, 5AC, 5BC, 5FC, 5UC, 6BC, 6FC, or 8BC.
LG	Modules with 35, 40, and 46mm frames and model identifier LGxxxy1z-bb; where "y" can be A, N, or S; "z" can be C or K; and "bb" can be A3, B3, G3, C4 or K4.
Mistubishi	Modules with 46mm frames and model identifier PV-MYYxxxZZ; where "YY" can be LE or JE; and "ZZ" can be either HD, HD2, or FB.
Motech	IM and XS series modules with 40, 45, and 50mm frames.
Panasonic	Modules with 35mm frames and model identifier VBHNxxxSAyy; where "yy" can be either 06, 06B, 11, 11B, 15, 15B, 16 or 16B.
Phono Solar	Modules with 35, 40, and 45mm frames and model identifier PSxxxY-ZZ/A; where "Y" can be M or P; "ZZ" can be 20 or 24; and "A" can be F, T or U.
REC Solar	Modules with 38 and 45mm frames and model identifier RECxxxYYZZ; where "YY" can be M, PE or TP; and "ZZ" can be blank, BLK, SLV, or 72.
Renesola	Modules with 35, 40 and 50mm frames and model identifier JCxxxY-ZZ; where "Y" can be F, M or S; and "ZZ" can be Ab, Ab-b, Abh, Abh-b, Abv, Abv-b, Bb, Bb-b, Bbh, Bbh-b, Bbv, Bbv-b, Db, or Db-b.
SolarWorld	Sunmodule Plus, Protect or XL mono or poly modules with 31, 33 or 46mm frames and model identifier SW-xxx.
Stion	Thin film modules with 35mm frames and model identifier STO-xxx.
SunEdison	Modules with 35, 40, and 50mm frames and model identifier SE-YxxxZABCDE; where "Y" can be B, F, H, P, R, or Z; "Z" can be 0 or 4; "A" can be B, C, D, E, H, I, J, K, L, M, or N; "B" can be B or W; "C" can be A or C; "D" can be 3, 7, 8, or 9; and "E" can be 0, 1 or 2.
Suniva	Modules with 35, 38, 40, 46, and 50mm frames and model identifiers OPTxxx-AA-B-YYY-Z or MVXxxx-AA-B-YYY-Z; where "AA" is either 60 or 72; "B" is either 4 or 5; "YYY" is either 100,101,700,1B0, or 1B1; and "Z" is blank or B.
Sunpower	SPR-A-xx series with standard (G3) or InvisiMount (G5) 46mm frames; where "A" is either E or X; and "xx" is the series number.
Suntech	Vd, Vem, Wdb, Wde, and Wd series modules with 35, 40, and 50mm frames.
Trina	Modules with 35, 40 and 46mm frames and model identifier TSM-xxxYYZZ; where "YY" can be PA05, PC05, PD05, PA14, PC14, or PD14; and "ZZ" can be blank or A or A.05 or A.08.
Winaico	Modules with 35 and 40mm frames and model identifier Wsy-xxxz6; where "y" can be either P or T; and ""z"" can be either M or P.
Yingli	Panda, YGE, and YGE-U series modules with 35, 40, and 50 mm frames.


This authorizes the application of the Certification Mark(s) shown below to the models described in the Product(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to multiple listee model(s) identified on the correlation page of the Listing Report.

This document is the property of Intertek Testing Services and is not transferable. The certification mark(s) may be applied only at the location of the Party Authorized To Apply Mark.

**Applicant:** IronRidge, Inc.  
**Address:** 1495 Zephyr Ave  
Hayward, CA 94544  
**Country:** USA  
**Contact:** Yann Schwarz  
**Phone:** (800) 227-9523  
**FAX:** (707) 459-1833  
**Email:** yschwarz@ironridge.com

**Manufacturer:** Precision Die & Stamping, Inc.  
**Address:** 1704 W. 10th Street  
Tempe, AZ 85281  
**Country:** USA  
**Contact:** Andy Frola  
**Phone:** (480) 967-2038  
**FAX:** (480) 829-0838  
**Email:** andy@precisiondie.com

**Party Authorized To Apply Mark:** Same as Manufacturer  
**Report Issuing Office:** Lake Forest, CA

**Control Number:** 4008083  
**Authorized by:**   
for Thomas J. Patterson, Certification Manager



This document supersedes all previous Authorizations to Mark for the noted Report Number.

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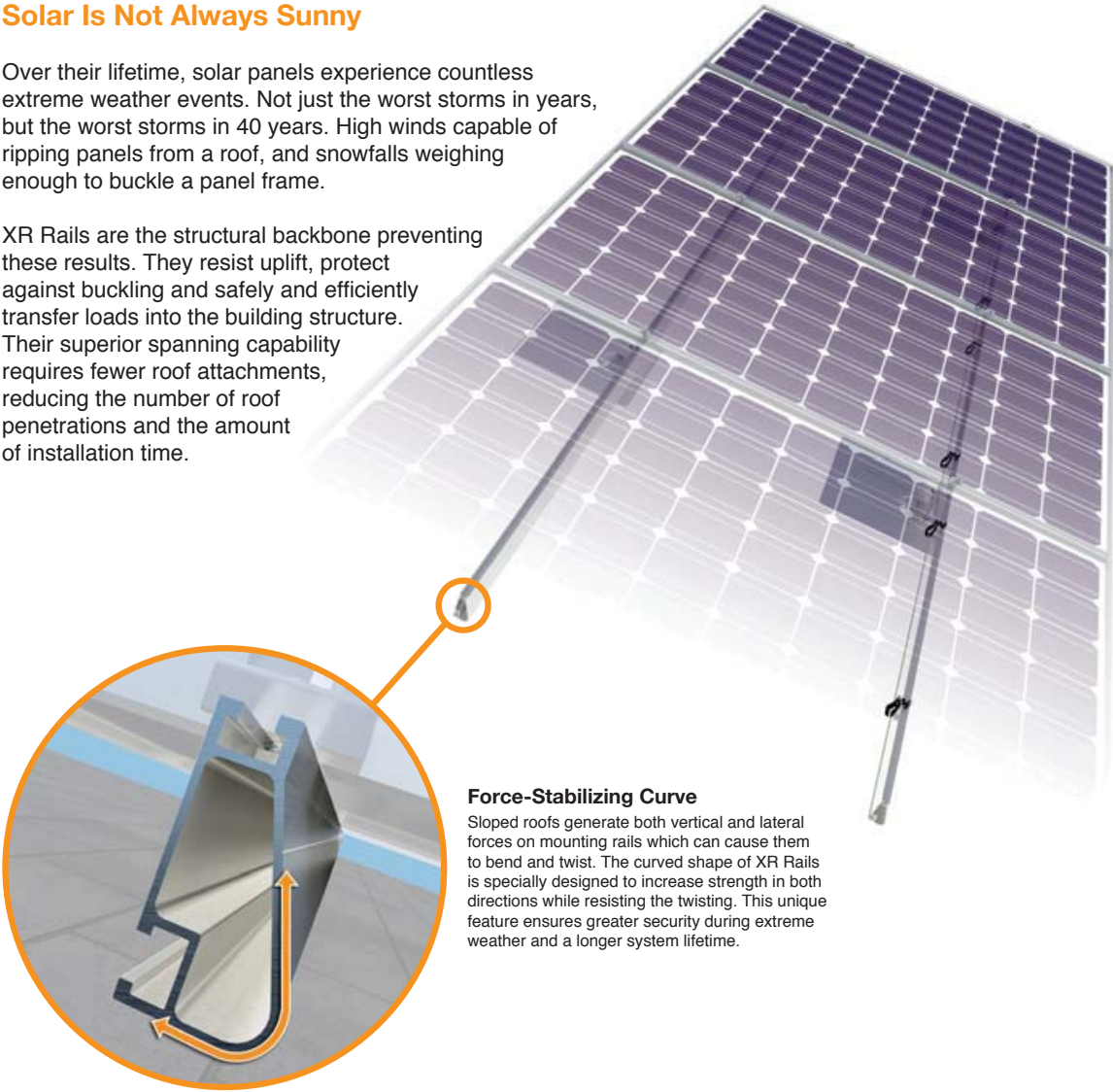
Intertek Testing Services NA Inc.  
545 East Algonquin Road, Arlington Heights, IL 60005  
Telephone 800-345-3851 or 847-439-5667 Fax 312-283-1672

Standard(s):	UL Subject 2703 Outline of Investigation for Rack Mounting Systems and Clamping Devices for Flat-Plate Photovoltaic Modules and Panels, Issue Number: 1, October 4, 2010
Product:	XR Rails with Integrated Grounding.
Brand Name:	IronRidge Roof Mount
Models:	IR XR followed by 4 Alphanumeric Characters

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.







CLASSIFICATION  
Constructional Data Report (CDR)

1.0 Reference and Address			
Report Number	101541132LAX-002	Original 22-May-2014	Revised: 15-Jan-2016
Standard(s)	UL Subject 2703 Outline of Investigation for Rack Mounting Systems and Clamping Devices for Flat-Plate Photovoltaic Modules and Panels, Issue Number: 1, October 4, 2010		
Applicant	IronRidge, Inc.	Manufacturer 1	IronRidge, Inc.
Address	1495 Zephyr Ave Hayward, CA 94544	Address	1495 Zephyr Ave Hayward, CA 94544
Country	USA	Country	USA
Contact	Yann Schwarz	Contact	Jim Norsworthy Or Dave Taggart
Phone	(800) 227-9523 (510) 225-0973	Phone	(707) 363-3025 (800) 227-9523
FAX	(707) 459-1833	FAX	(510) 225-0975
Email	<a href="mailto:yschwarz@ironridge.com">yschwarz@ironridge.com</a>	Email	<a href="mailto:jnorsworthy@ironridge.com">jnorsworthy@ironridge.com</a> <a href="mailto:dtaggart@ironridge.com">dtaggart@ironridge.com</a>
Manufacturer 2	Precision Die & Stamping, Inc.		
Address	1704 W. 10th Street Tempe, AZ 85281		
Country	USA		
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Phone	(480) 967-2038		
FAX	(480) 829-0838		
Email	<a href="mailto:andy@precisiondie.com">andy@precisiondie.com</a>		

2.0 Product Description	
Product	XR Rails with Integrated Grounding.
Brand name	IronRidge Roof Mount
Description	<p>The product covered by this report is the IronRidge Rails with Integrated Grounding solar roof mounting system. This system is designed to provide bonding and grounding to photovoltaic modules. The mounting system employs anodized aluminum rails that are roof mounted using aluminum Extruded L Foot brackets. The mounting rails in this report are XRL, XR10, XR100 and XR1000 Rail. All rails have an optional aluminum splice which ties the rails together to extend their length.</p> <p>A grounding strap and stainless steel hardware are required for penetrating the anodized coating of the rails, creating a bonded connection from rail to rail. 304 stainless steel Grounding Mid Clamp and aluminum End Clamps are used to attach and support framed photovoltaic modules to the system. The End Clamps are not used as a grounding means.</p> <p>The Grounding Mid Clamps are installed onto the module frame by using a 18-8 stainless steel serrated T-Bolt and a 18-8 stainless steel Flange Hex Nut that gets screwed onto the rails to a specified torque. The retention teeth of the clamp and bolt penetrate the anodized coating of the photovoltaic modules frame and rail to contact the metal, creating a bonded connection from module to module and module to rail.</p> <p>The grounding of the entire system is intended to be in accordance with the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, and NEC 690: Solar Photovoltaic Systems. Any local electrical codes must be adhered in addition to the national electrical codes. An entire array, regardless of size, is grounded via one grounding lug. The WEEB Grounding Lug is secured to XRL, XR10, XR100 or XR1000 Rail's top slot using stainless steel hex bolt or T-Bolt, flat washer, split lock washer, and nut, tightened to manufacture's specified torque. The WEEB Grounding Lug is intended for use with one solid or stranded copper wire, conductor size 14 AWG though 6 AWG. The Titan Grounding Lug is secured to XRL, XR10, XR100 or XR1000 Rail's side center cavity of rails using stainless steel T-bolt, k-lock nut, star washer, and machine screw. The Titan Grounding Lug is intended for use with one solid or stranded copper wire, conductor size 14 AWG though 4 AWG.</p>
Models	IR XR followed by 4 Alphanumeric Characters
Model Similarity	N/A
Ratings	<p><b>Fuse Rating:</b> 20 A</p> <p><b>Fire Class Resistance Rating:</b></p> <ul style="list-style-type: none"><li>- Class A for Steep Slope Flush-Mount (Symmetrical) Applications when using Type 1, Type 2 and Type 3, Listed Photovoltaic Module.</li><li>- Class A for Low Slope Flush-Mount (Symmetrical) Applications when using Type 1, Type 2 and Type 3, Listed Photovoltaic Module.</li><li>- Class A for Steep Slope Tilt-Mount ( Asymmetrical) Applications when using Type 1 and Type 2, Listed Photovoltaic Module.</li><li>- Class A for Low Slope Tilt-Mount ( Asymmetrical) Applications when using Type 1, Type 2 and Type 3, Listed Photovoltaic Module.</li></ul>

2.0 Product Description	
	<p>These systems were evaluated or tested for bonding and grounding with the following PV-Module frames:</p> <p><b>Motech - Black or Silver Frames</b> <b>Models:</b> IM and XS series, 60 and 72 cell modules with 40 mm frame height. IM and XS series, 60 and 72 cell modules with 45 mm frame height. IM and XS series, 60 and 72 cell modules with 50 mm frame height.</p> <p><b>Suntech - Black or Silver Frames</b> <b>Models:</b> Wdb, Wde, and Wd series, 60 and 72 cell modules with 35 mm frame height. Vd series, 60 and 72 cell modules with 50 mm frame height.</p> <p><b>ET Solar - Black or Silver Frames</b> <b>Models:</b> ET Solar 60 cell modules with 35 and 40 mm frames ET-Y660xxxZZ Where "Y" can be P, L, or M; "xxx" refers to the module power rating; "ZZ" can be WB, WW, BB, WBAC, or BBAC</p> <p>ET Solar 72 cell modules with 40 and 50 mm frames ET-Y672xxxZZ Where "Y" can be P, L, or M; "xxx" refers to the module power rating; "ZZ" can be WB, WW, BB, or WBG</p> <p><b>Hyundai - Black or Silver Frames</b> <b>Models:</b> SG, MG, RG and TG Series, 60 cell modules with 35 mm frame height. MI, RI and TI Series, 72 cell modules with 50 mm frame height.</p> <p><b>Yingli - Black or Silver Frames</b> <b>Models:</b> Panda and YGE models, 60 cell modules with 40 mm or 35 mm frame height. YGE models, 72 cell modules with 50 mm or 40 mm frame height.</p> <p><b>Kyocera -</b> <b>Models:</b> KD(xxx)GX-LPU, KD(xxx)GX-LFU, KD135SX-UPU, KD(xxx)GX-LFBS, KD(xxx)GX-LPB KD(xxx)GX-LFB, KD(xxx)GX-LFB2, KD(xxx)GX-LPB2 KD135GX-LPS, KD140GX-LPS, KD140SX-UPU KU(xxx)-3AC, KU(xxx)-4AC, KU(xxx)-5AC, KU(xxx)-3BC, KU(xxx)-4BC KU(xxx)-5BC, KU(xxx)-6BC, KU(xxx)-8BC, KU(xxx)-3FC, KU(xxx)-4FC KU(xxx)-5FC, KU(xxx)-6FC, KU(xxx)-4UC, KU(xxx)-5UC. Where xxx refers to the module power rating</p> <p><b>Canadian Solar - Black or Silver Frames</b> <b>Models:</b> CS6P-M 60 Cell Modules with a 40mm frame height. CS6P-P 60 Cell Modules with a 40mm frame height. CS6X-M 72 cell modules with a 40mm frame height. CS6X-P 72 cell modules with a 40mm frame height.</p>

2.0 Product Description	
	<p><b>LG Modules - Black or Silver Frames</b> <b>Models:</b> LG 60 cell modules with 35 mm frames: LGxxx1z-b3 Where xxx is the module power rating, "y" can be A,N or S, "z" can be C or K, and "b" can be A, B, or G.</p> <p>LG 60 cell Modules with 40mm frames: LGxxx1z-G4 Where "xxx" is the module power rating, "y" can be N or S, and "z" can be C or K</p> <p>LG 72 Cell Modules with 46mm frames: LGxxx2z-b3 Where "xxx" is the module power rating, "y" can be N or S, "z" can be C or K, and "b" can be A, B, or G</p> <p><b>Suniva Modules - Black or Silver Frames</b> <b>Models:</b> 60 Cell Modules with 35 and 40mm frames: OPTxxx-60-A-YYY-Z MVXxxx-60-A-YYY-Z Where "xxx" is the module power rating, "A" is either 4 or 5, "YYY" is either 100,101,700,1B0, or 1B1, and "z" is blank or B.</p> <p>72 Cell Modules with 38, 46, and 50mm frames: OPTxxx-72-A-YYY-Z MVXxxx-72-A-YYY-Z Where "xxx" is the module power rating, "A" is either 4 or 5, "YYY" is either 100,101,700,1B0, or 1B1, and "Z" is either blank or B</p> <p><b>Hanwha Modules - Black or Silver Frames</b> <b>Models:</b> HSL72P6-PA-1-xxx(50mm frame) HSL72P6-PB-1-xxx(45mm frame) HSL60P6-PB-1-xxx(40mm frame) HSL60P6-PA-1-xxx(45mm frame) The model number can be followed with a "B" Where xxx is the module power rating</p> <p><b>Trina Solar Modules - Black or Silver Frames</b> <b>Models:</b> TSM-xxxPA05 (35mm frame height) TSM-xxxPC05 (35mm frame height) TSM-xxxPD05 (35mm frame height) TSM-xxxPA05 (40mm frame height) TSM-xxxPA14 (46mm frame height) TSM-xxxPD14 (40mm frame height) TSM-xxxPC14 (40mm frame height) The model number can be followed by A and .05 or .08 Where xxx refers to module power rating</p>
Other Ratings	



2.0 Product Description	
	<p><b>SolarWorld Modules - Black or Silver Frames</b> <b>Models:</b> Sunmodule Plus SW-xxx, Sunmodule Protect SW-xxx, Sunmodule XL SW-xxx Mono or Poly with 31, 33, or 46 mm frame height. Where xxx refers to the module power rating</p> <p><b>Phono Solar Modules - Black or Silver Frames</b> <b>Models:</b> PSxxxP-20/U, PSxxxM-20/U, PSxxxP-24/T, PSxxxM-24/T with 40mm frame height Where xxx refers to module power rating</p> <p><b>SunEdison modules - Black or Silver Frames</b> <b>Models:</b> SE-QxxxBCC-3Y, SE-MxxxBCC-3Y, SE-FxxxBCC-3Y, SE-PxxxBCC-3Y, SE-QxxxBMC-3Y SE-MxxxBMC-3Y, SE-FxxxBMC-3Y, SE-DxxxBMC-3Y, SE-PxxxBMC-3Y with 50mm frame height. Where xxx refers to module power rating</p> <p><b>Hanwha Q CELLS modules - Black or Silver Frames</b> <b>Models:</b> Hanwha QCells 60 cell modules with 32 mm frames Q.PLUS-G4-xxx Q.PRO BFR-G4-xxx where xxx refers to module power rating</p> <p>Hanwha QCells 60 cell modules with 35 mm frames: Q.PRO-G3-xxx Q.PRO-BFR-G3-xxx Q.PEAK BLK G3-xxx Q.PLUS G3-xxx where xxx refers to module power rating</p> <p>Hanwha QCells 72 cell modules with 35 mm frames: Q.PRO L-G4y-xxx Q.PLUS L-G4y-xxx where "y" can be blank, 1 or 2 and "xxx" refers to module power rating</p> <p>Hanwha QCell 72 cell modules with 40 mm frames: Q.PRO L-G2xxx Q.PRO L-G3y-xxx where "y" can be blank or 1 and "xxx" refers to module power rating</p> <p>Hanwha QCell 72 cell modules with 42 mm frames: Q.PRO L-G2-xxx where "xxx" refers to module power rating</p>

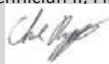
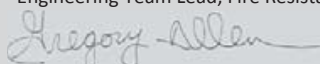
2.0 Product Description	
	<p><b>Renesola Modules - Black or Silver Frames</b> <b>Models:</b> Mono and Virtus II Modules: JCxxxM-24/Abh, JCxxxS-24/Abh, JCxxxF-24/Abh, JCxxxM-24/Abh-b, JCxxxS-24/Abh-b JCxxxF-24/Abh-b, JCxxxM-24/Ab, JCxxxM-24/Abv, JCxxxS-24/Ab, JCxxxF-24/Ab JCxxxM-24/Ab-b, JCxxxM-24/Abv-b, JCxxxS-24/Ab-b, JCxxxF-24/Ab-b with 50mm frame height. JCxxxM-24/Bb, JCxxxM-24/Bbv, JCxxxS-24/Bb, JCxxxF-24/Bb, JCxxxM-24/Bb-b JCxxxM-24/Bbv-b, JCxxxS-24/Bb-b, JCxxxF-24/Bb-b, JCxxxM-24/Bbh, JCxxxS-24/Bbh JCxxxF-24/Bbh, JCxxxM-24/Bbh-b, JCxxxS-24/Bbh-b, JCxxxF-24/Bbh-b with 40mm frame height. JCxxxS-24/Db, JCxxxF-24/Db, JCxxxS-24/Db-b, JCxxxF-24/Db-b with 35mm frame height. Where xxx refers to the module power rating.</p> <p><b>Sunpower Modules- Black or Silver Frames</b> <b>Models:</b> SPR-E-xx series with standard (G3) or InvisiMount (G5) 46 mm frame SPR-X-xx series with standard (G3) or InvisiMount (G5) 46 mm frame. where xx is the series number</p> <p><b>Panasonic Modules – Black or Sliver Frames</b> <b>Models:</b> VBHNxxxSA06, VBHNxxxSA06B, VBHNxxxSA11, VBHNxxxSA11B with 35 mm frame height. Where xxx refers to the module power rating</p> <p><b>Winaico Modules - Black or Silver Frames</b> <b>Models:</b> Winaico 60 Cell modules with 35 and 40 mm frames Wsy-xxxz6 Where "y" can be either P or T, "xxx" is the module power rating, and "z" can be either M or P</p> <p><b>Mitsubishi Modules - Black or Silver Frames</b> <b>Models:</b> PV-MYYxxxZZ Where YY can be LE or JE, xxx is the module power rating, and ZZ can be either HD, HD2, or FB</p> <p><b>Jinko Solar Modules - Silver Frames</b> <b>Models:</b> JKMxxxP-60: Where xxx is the module power rating between 250-270 in increments of 5. JKMSxxxP: Where xxx is the module power rating between 255-270 in increments of 5. JKMxxxPP-60: Where xxx is the module power rating between 255-270 in increments of 5.</p>



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## Test Verification of Conformity

In the basis of the tests undertaken, the sample(s) of the below product have been found to comply with the requirements of the referenced specifications at the time the tests were carried out.

Applicant Name & Address:	IronRidge, Inc. 1495 Zephyr Ave. Hayward, CA 94544 USA		
Product Description:	XR Rails with Integrated Grounding.		
Ratings & Principle Characteristics:	<u>Fire Class Resistance Rating:</u> -Flush Mount (Symmetrical). Class A Fire Rated for Low Slope applications when using Type 1, 2 and 3, listed photovoltaic modules. Class A Fire Rated for Steep Slope applications with Type1, 2 and 3, listed photovoltaic modules. Tested with a 5" gap (distance between the bottom the module frame and the roof covering), per the standard this system can be installed at any gap allowed by the manufacturers installation instructions. No perimeter guarding is required.		
Models:	51-61GD-005, 51-61GD-005B, 51-5000-001 and 51-65-001		
Brand Name:	IronRidge Roof Mount		
Relevant Standards:	UL 2703 (Section 15.2 and 15.3) Standard for Safety Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels, First Edition dated Jan. 28, 2015 <b>Referencing</b> UL1703 Third Edition dated Nov. 18, 2014, (Section 31.2) Standard for Safety for Flat-Plate Photovoltaic Modules and Panels.		
Verification Issuing Office:	Intertek Testing Services NA, Inc. 8431 Murphy Drive Middleton, WI 53562		
Date of Tests:	08/27/2014 to 03/17/2015		
Test Report Number(s):	101769343MID-001r1, 101769343MID-001a, 101915978MID-001 & 101999492MID-001ar1-cr1.		
This verification is part of the full test report(s) and should be read in conjunction with them. This report does not automatically imply product certification.			
Completed by:	Chad Naggs	Reviewed by:	Gregory Allen
Title:	Technician II, Fire Resistance	Title:	Engineering Team Lead, Fire Resistance
Signature:		Signature:	
Date:	03/30/2015	Date:	03/30/2015

*This Verification is for the exclusive use of Intertek's client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this Verification. Only the Client is authorized to permit copying or distribution of this Verification. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test/inspection results referenced in this Verification are relevant only to the sample tested/inspected. This Verification by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.*

GFT-OP-11a (24-MAR-2014)



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IronRidge  
1495 Zephyr Ave  
Hayward, CA 94544

December 18, 2014  
page 1 of 11

Attn: Mr. David F. Taggart, Vice President Products

Subject: IronRidge FlashFoot

Dear Sir:

This letter is a supplement to the standard letter for the IronRidge Roof Flush Mounting System to address the requirements for use with the IronRidge FlashFoot.

The IronRidge FlashFoot comprises an aluminum block and flashing plate. An L-Foot base is attached using a 5/16” lag screw with a 3 inch minimum embedment into a wood substrate. The wood substrate for the tests consisted of 1/2” CDX plywood over a 2x6 SPF #2 rafter with a specific gravity of 0.42. A full detail can be seen on the attached drawings.

The testing data provided shows that the critical failure occurs in one of two ways, pullout of the lag screw from the base material or the shear failure of the L-Foot. Maximum allowable values for these failure conditions were derived using a safety factor of 3.0 on the lowest ultimate load provided by the testing. The maximum allowable uplift reaction of 717 lbs and the maximum allowable downslope (lateral) reaction of 341 lbs are based on the tested criteria.

The allowable loads used to develop the tables below have been increased from the tested values above to reflect installation into a wood substrate with specific gravity of 0.50. The increase was determined using the ANSI/AF&PA NDS-2010 National Design Specification (NDS) for Wood Construction adjustment factor of 1 / 1-(0.50-G) where G is the tested specific gravity. Therefore, the maximum allowable uplift reaction is 779 lbs and the maximum allowable downslope (lateral) reaction is 370 lbs. The maximum allowable spacing of the FlashFoot for common load cases due to wind and snow are shown in Tables 1-9 below.

Starling Madison Lofquist, Inc.

Consulting Structural and Forensic Engineers



IronRidge  
Mr.David F. Taggart  
IronRidge Flashing

December 18, 2014  
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Notes – Tabulated values are based on the following criteria:

- 1. Building mean roof height = 30 ft
- 2. Risk Category = I
- 3. Roof Slope = 7 to 27 degrees
- 4. Solar panel long dimension = 78.5 in
- 5. Minimum specific gravity of wood rafter = 0.50
- 6. ASCE 7-10

Our analysis assumes that the connections and associated hardware are installed in a workmanlike manner in accordance with the “IronRidge Roof Mount Installation Manual” by IronRidge and generally accepted standards of construction practice. It is the responsibility of the contractor to verify that the quality of the roof framing meets the minimum properties used in the tests. Additional information is available at the IronRidge web site, IronRidge.com.

Please feel free to contact me at your convenience if you have any questions.

Respectfully yours,

Tres J. Warner, P.E.  
Design Division Manager



Starling Madison Lofquist, Inc.

Consulting Structural and Forensic Engineers




AUTHORIZATION TO MARK

This authorizes the application of the Certification Mark(s) shown below to the models described in the Product(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to multiple listee model(s) identified on the correlation page of the Listing Report.

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<b>Applicant:</b>	IronRidge, Inc.	<b>Manufacturer:</b>	IronRidge, Inc.
<b>Address:</b>	1495 Zephyr Ave Hayward, CA 94544	<b>Address:</b>	1495 Zephyr Ave Hayward, CA 94544
<b>Country:</b>	USA	<b>Country:</b>	USA
<b>Contact:</b>	Yann Schwarz	<b>Contact:</b>	Jim Norsworthy Or
<b>Phone:</b>	(800) 227-9523	<b>Phone:</b>	(707) 363-3025
<b>FAX:</b>	(707) 459-1833	<b>FAX:</b>	(510) 225-0975
<b>Email:</b>	yschwarz@ironridge.com	<b>Email:</b>	jnorsworthy@ironridge.com

**Party Authorized To Apply Mark:** Same as Manufacturer  
**Report Issuing Office:** Lake Forest, CA

**Control Number:** 4008377 **Authorized by:**   
for Thomas J. Patterson, Certification Manager



This document supersedes all previous Authorizations to Mark for the noted Report Number.

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Intertek Testing Services NA Inc.  
545 East Algonquin Road, Arlington Heights, IL 60005  
Telephone 800-345-3851 or 847-439-5667 Fax 312-283-1672

<b>Standard(s):</b>	UL Subject 2703 Outline of Investigation for Rack Mounting Systems and Clamping Devices for Flat-Plate Photovoltaic Modules and Panels, Issue Number: 1, October 4, 2010
<b>Product:</b>	XR Rails with Integrated Grounding.
<b>Brand Name:</b>	IronRidge Roof Mount
<b>Models:</b>	IR XR followed by 4 Alphanumeric Characters