

**STAFF REPORT:** 11-13-2019 MEETING  
**APPLICATION NUMBER:** 19-6534  
**ADDRESS:** 1554-1558 HUBBARD  
**HISTORIC DISTRICT:** HUBBARD FARMS  
**APPLICANT:** ROBERT HOCHSTADT  
**DATE OF COMPLETE APPLICATION:** 10-16-2019  
**DATE OF STAFF SITE VISIT:** 11/7/2019

**PREPARED BY:** J. ROSS

**SCOPE:** INSTALL SOLAR PANELS AT ROOFTOP

### **EXISTING CONDITIONS**

The building located at 1554-1558 Hubbard is a two-story, duplex that was erected ca. 1910. The resource is rectangular in plan and is clad with brick. The primary roof is hipped and is topped with a hipped-roof dormer. Asphalt shingles cover the roof. Windows are double-hung, leaded-glass, wood-sash units. A partial-width, flat-roof entry porch with Ionic wood columns/supports and masonry stoop shelters the home's primary entrance.



### **PROPOSAL**

With the current proposal, the applicant is seeking the Commission's approval to install solar panels at the

building's roof. Specifically, **as per the attached**, the applicant proposes to undertake the following work items:

### **Solar Array**

- Install a seventeen-panel, 22'-1" x 17'-4" x 47'-9" x 18'-9" array and associated flush-mounted rail system, at the south-facing roof surface

### **Solar Edge Inverter**

- Install equipment/solar edge inverter near the utility meter at the rear of the house (specific location is unclear/photos of specific location has not been submitted)

### **STAFF OBSERVATIONS AND RESEARCH**

- The solar array will be visible from the public right-of-way
- As per HDC resolution, HDC staff has the authority to approve new solar panel installations under the condition that they are not visible from the public right-of-way. Staff forwarded this application to the HDC for review because the solar array will be visible from the public right-of-way
- The application outlines the presence of two solar panel installations in the neighborhood (1551 Hubbard and 1520 Hubbard). The installation at 1551 Hubbard was approved by HDC staff on 10-1-2019 because the installation would not be visible from the public right-of-way. A review of the project files for 1520 Hubbard revealed that the Commission did not issue an approval for the installation of solar panels at 1520 Hubbard
- The Commission recently approved two applications for solar panel installations which are visible from the public right-of-way for the following reasons:
  - 4444 Second (Warren Prentis) - The building is industrial in nature, the prevailing character of the immediate environment is commercial in nature, and the panels were compatible with the diverse physical appearance of the adjacent architectural resources. The panels were **minimally-visible** from the right-of-way as they were pushed back 7'-0" from the roof edge, behind a 3'-0"-high parapet. Finally, a solar panel array which was installed at the building roof in 2010 (also visible from the public right-of-way) established a precedent for solar panels at the building.
  - 479 Prentis (Warren Prentis) – The building is located in a residential neighborhood, however, the array was set back 14'-9" from the house's front face, behind a chimney. The applicant's initial submittal did propose to install the array directly north of the chimney, in a location which would be highly visible from the public right-of-way. However, after discussion with HDC staff, the applicant repositioned the array to a less-visible location, behind the chimney/14'-9" from the house's front face. Also, the adjacent 4-story apartment building served to further minimize the visibility of the western roof slope and the proposed array. Staff therefore felt that that the installation would be **minimally visible/inconspicuous** and would not detract from the building's or districts historic character.
- It is staff's opinion that the solar array will be visible from the public right-of-way. See the National Park Service Bulletin entitled "*Interpreting the Secretary of the Interior's Standards for Rehabilitation, # 52 Subject: Incorporating Solar Panels in a Rehabilitation Project*":

<https://www.nps.gov/tps/standards/applying-rehabilitation/its-bulletins/ITS52-SolarPanels.pdf>

This bulletin notes that “properties with a hipped or gabled roof are **generally** not good candidates for a rooftop solar installation. Solar panels on historic buildings should not be visible from the public right of way such as nearby streets, sidewalks or other public spaces.” However, the below National Park Service publication entitled “*Illustrated Guidelines on Sustainability for Rehabilitating Historic Buildings*” does cite two examples of solar installations that are “...**visible but not conspicuous**...” and thus meet the standards:

<https://www.nps.gov/tps/sustainability/new-technology/solar-on-historic.htm>

- Finally See the below link to the National Park Service publication entitled “*Illustrated Guidelines on Sustainability for Rehabilitating Historic Buildings*” which outlines the “Recommended” and “Not Recommended” treatment re: the installation of new solar panel equipment at the exterior of historic buildings

<https://www.nps.gov/tps/standards/rehabilitation/guidelines/solar-technology.htm>

## ISSUES

- It is staff’s opinion that the proposed seventeen-panel array will be **conspicuous/visible** from the public right-of-way and is not appropriate within the building’s residential context/general environs
- When staff received the initial proposal, staff did counsel the applicant to seek an alternative location which might minimize the array’s appearance. It is unclear if the applicant undertook such analysis and exhausted all other options

## RECOMMENDATIONS

As noted above, it is staff’s opinion that the proposed solar array will be **conspicuously/visible** from the public right-of-way and is not appropriate within the building’s residential context/general environs. Staff therefore recommends that the Commission deny the issuance of a Certificate of Appropriateness (COA) for this project because the work does not meet the Secretary of the Interior’s Standards for Rehabilitation, standard # (2) *The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided* and standard # (10) *New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.*







# #5- 1554 Hubbard

## All Sides of Property Photos



Solar Panels



Solar Panel Array



**It appears Solar has already been approved in the District.**



**1554-58 Hubbard**

**1550 Hubbard**

**1551 Hubbard**

**Solar Installation?**

Google

Imagery ©2019 Google, Map data ©2019, Map data ©2019



# Examples of Black-Framed-on-Black-Backed Solar Panels on Black Racking Mounting System'





## **Description of Existing Conditions**

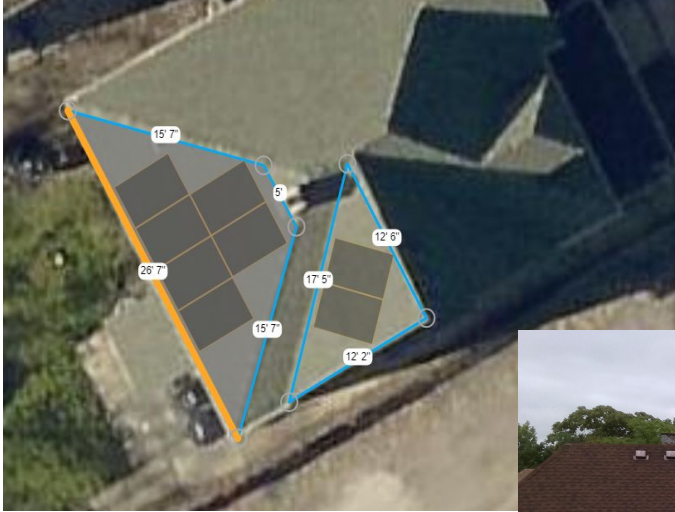
A two story Asphalt Shingle Roof on the home that faces Southwest, with the optimal placement for collecting sunlight and energy efficiency are the Southeast facing surfaces that are not visible from the right of way.



## **Description of Project/ Scope of Work**

- **Installation of Solar Panels for Green Alternative Energy source.**
- **Work to include**
- **Mounting of Flush Mounted Black Painted Rail System for Solar Panels (IronRidge)**
- **SolarEdge rail mounted Optimizers**
- **(8) 310W Black Framed and Black Backing Tier 1 Solar Modules**
- **Conduit connections**
- **SolarEdge Inverter Mounted Near the utility meter at the rear of the house**
- **AC Disconnect**
- **System monitoring including mapping solar panels and app set up for owners.**
- **Ensuring that the system is NEC compliant.**

# Solar Panel Installation





# **Materials Spec Sheets**

**Inverter**

**Optimizers**

**Solar Modules**

**Flush Mount Racking System**



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

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



### 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)



INVERTERS

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	
<b>OUTPUT</b>								
Rated AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400	VA
Max. AC Power Output	-	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
GFD Threshold	-	-	-	1	-	-	-	A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	-	-	-	Yes	-	-	-	
<b>INPUT</b>								
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 <sup>2)</sup> Sensitivity	-	-	-	
Maximum Inverter Efficiency	99	-	-	99.2	-	-	-	%
CEC Weighted Efficiency	-	-	-	99	-	-	-	%
Nighttime Power Consumption	-	-	-	<2.5	-	-	-	W
<b>ADDITIONAL FEATURES</b>								
Supported Communication Interfaces	-	-	-	RS485, Ethernet, ZigBee (optional), Cellular (optional)	-	-	-	
Revenue Grade Data, ANSI C12.20	-	-	-	Optional <sup>3)</sup>	-	-	-	
Rapid Shutdown - NEC 2014 and 2017 690.12	-	-	-	Automatic Rapid Shutdown upon AC Grid Disconnect	-	-	-	
<b>STANDARD COMPLIANCE</b>								
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 (H)	-	-	-	-	
Emissions	-	-	FCC Part 15 Class B	-	-	-	-	
<b>INSTALLATION SPECIFICATIONS</b>								
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	-	in / mm
Weight with Safety Switch	-	-	25.1 / 11.4	26.2 / 11.9	-	x 185	38.8 / 17.6	lb / kg
Noise	-	-	<25	-	-	<50	-	dB
Cooling	-	-	Natural Convection	-	-	Natural convection	-	°F / °C
Operating Temperature Range	-	-	-13 to +140 / -25 to +160 <sup>4)</sup> (-40°F / -40°C option <sup>5)</sup>	-	-	-	-	
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 (H): SE3000H-US0000NCC2

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

<sup>4)</sup> de version (H): SE3000H-US0000NCC2

<sup>5)</sup> For power de-rating information refer to: <https://www.solaredge.com/sites/default/files/ie-temperature-derating-note-na.pdf>

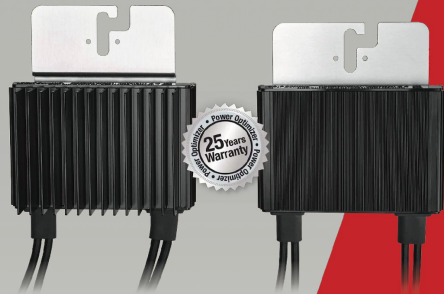


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## SolarEdge Power Optimizer Module Add-On For North America

P320 / P370 / P400 / P405 / 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
- Compliant with arc fault protection and rapid shutdown NEC requirements (when installed as part of the SolarEdge system)
- Module-level voltage protection for installer and firefighter safety



## SolarEdge Power Optimizer

Module Add-On for North America

P320 / P370 / P400 / P405 / P505

OPTIMIZER MODEL (typical module compatibility)	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)	P505 (for higher current modules)		
<b>INPUT</b>							
Rated Input DC Power <sup>(1)</sup>	320	370	400	405	505	W	
Absolute Maximum Input Voltage (Voc at lowest temperature)	48	60	80	125	83	Vdc	
MPPT Operating Range	8 - 48	8 - 60	8 - 80	12.5 - 105	12.5 - 83	Vdc	
Maximum Short Circuit Current (Isc)		11		10.1	14.5	Adc	
Maximum DC Input Current		13.75		12.63	17.5	Adc	
Maximum Efficiency			99.5			%	
Weighted Efficiency			99.8		98.6	%	
Overvoltage Category	II						
<b>OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREGE INVERTER)</b>							
Maximum Output Current						15	Adc
Maximum Output Voltage						60	Vdc
<b>OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREGE INVERTER OR SOLAREGE INVERTER OFF)</b>							
Safety Output Voltage per Power Optimizer	1 ± 0.1					Vdc	
<b>STANDARD COMPLIANCE</b>							
EMC	FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3						
Safety	IEC62109-1 (class II safety), UL1741						
RoHS	Yes						
<b>INSTALLATION SPECIFICATIONS</b>							
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 28 / 5 x 5.97 x 1.1	128 x 152 x 36 / 5 x 5.97 x 1.42	128 x 152 x 50 / 5 x 5.97 x 1.96	128 x 152 x 59 / 5 x 5.97 x 2.32		mm / in	
Weight (including cables)	630 / 1.4	750 / 1.7	845 / 1.9	1064 / 2.3		gr / lb	
Input Connector	MCA <sup>(2)</sup>						
Output Wire Type / Connector	Double Insulated; MCA						
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.

<sup>(2)</sup> For other connector types please contact SolarEdge

PV SYSTEM DESIGN USING A SOLAREGE INVERTER <sup>(1)(2)</sup>	SINGLE PHASE HD-WAVE	SINGLE PHASE	THREE PHASE 208V	THREE PHASE 480V	
Minimum String Length (Power Optimizers)	P320, P370, P400 P405 / P505	8	10	18	
Maximum String Length (Power Optimizers)		6	8	14	
		25	25	50 <sup>(3)</sup>	
Maximum Power per String	5700 (6000 with SE7600H-US, SE10000H-US)	5250	6000	12750	W
Parallel Strings of Different Lengths or Orientations	Yes				

<sup>(1)</sup> For detailed string sizing information refer to: [http://www.solarege.com/sites/default/files/string\\_sizing\\_na.pdf](http://www.solarege.com/sites/default/files/string_sizing_na.pdf)

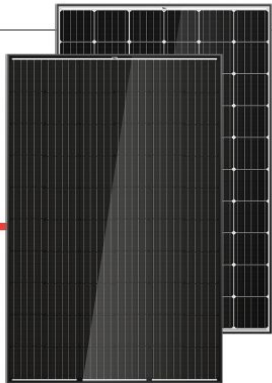
<sup>(2)</sup> It is not allowed to mix P405/P505 with P320/P370/P400/P405/P505 in one string.

<sup>(3)</sup> A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement



# THE ALLMAX<sup>M</sup> plus<sup>+</sup>

## FRAMED 60-CELL MODULE



**60 CELL**  
MONOCRYSTALLINE MODULE

**275-315W**  
POWER OUTPUT RANGE

**19.2%**  
MAXIMUM EFFICIENCY

**0~+5W**  
POSITIVE POWER TOLERANCE

Founded in 1997, Trina Solar is the world's leading comprehensive solutions provider for solar energy. We believe close cooperation with our partners is critical to success. Trina Solar now distributes its PV products to over 60 countries all over the world. Trina is able to provide exceptional service to each customer in each market and supplement our innovative, reliable products with the backing of Trina as a strong, bankable partner. We are committed to building strategic, mutually beneficial collaborations with installers, developers, distributors and other partners.

### Comprehensive Products And System Certificates

IEC61215/IEC61739/UL1709/IEC61703/IEC62716  
ISO 9001: Quality Management System  
ISO 14001: Environmental Management System  
ISO 14064: Greenhouse gases Emissions Verification  
OHSAS 18001: Occupation Health and Safety Management System



### Maximize limited space with top-end efficiency

- Up to 192W/m<sup>2</sup> power density
- Low thermal coefficients for greater energy production at high operating temperatures



### Highly reliable due to stringent quality control

- Over 30 In-house tests (UV, TC, HF, and many more)
- In-house testing goes well beyond certification requirements
- PID resistant
- 100% EL double inspection
- Selective emitter, advanced surface texturing

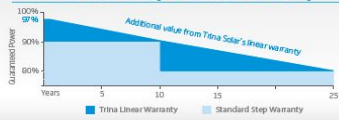


### Certified to withstand the most challenging environmental conditions

- 2400 Pa wind load
- 5400 Pa snow load
- 35 mm hail stones at 97 km/h

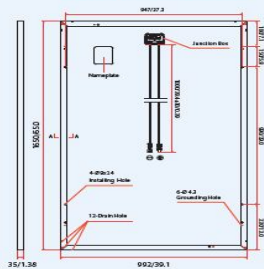
### LINEAR PERFORMANCE WARRANTY

10 Year Product Warranty • 25 Year Linear Power Warranty

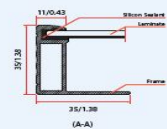


PRODUCTS	POWER RANGE
TSM-DD05A.08(I)	280-315W
TSM-DD05A.05(I)	275-310W

### DIMENSIONS OF PV MODULE(mm/Inches)

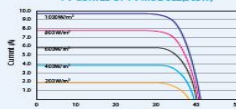


Back View

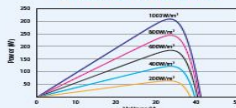


(A-A)

### I-V CURVES OF PV MODULE(305W)



### P-V CURVES OF PV MODULE(305W)



### ELECTRICAL DATA (STC)

Peak Power Watts-P <sub>max</sub> (Wp)*	275	280	285	290	295	300	305	310	315
Power Output Tolerance-P <sub>max</sub> (W)	0 ~ +5								
Maximum Power Voltage-V <sub>mp</sub> (V)	31.4	31.7	31.8	32.2	32.5	32.6	32.9	33.1	33.3
Maximum Power Current-I <sub>mp</sub> (A)	8.76	8.84	8.97	9.01	9.08	9.19	9.28	9.37	9.46
Open Circuit Voltage-V <sub>oc</sub> (V)	38.4	38.4	38.5	38.9	39.6	39.8	40.0	40.2	40.5
Short Circuit Current-I <sub>sc</sub> (A)	9.24	9.42	9.51	9.66	9.68	9.77	9.85	9.94	10.0
Module Efficiency η <sub>m</sub> (%)	16.8	17.1	17.4	17.7	18.0	18.3	18.6	18.9	19.2

STC: Irradiance 1000W/m<sup>2</sup>, Cell Temperature 25°C, Air Mass AM1.5  
\*Measuring tolerance: ±3%

### ELECTRICAL DATA (NOCT)

Maximum Power-P <sub>max</sub> (Wp)	205	209	212	216	220	223	227	231	235
Maximum Power Voltage-V <sub>mp</sub> (V)	29.1	29.4	29.5	29.9	30.1	30.2	30.5	30.7	30.9
Maximum Power Current-I <sub>mp</sub> (A)	7.04	7.10	7.21	7.24	7.30	7.38	7.46	7.53	7.60
Open Circuit Voltage-V <sub>oc</sub> (V)	35.7	35.7	35.8	36.2	36.8	37.0	37.2	37.4	37.6
Short Circuit Current-I <sub>sc</sub> (A)	7.46	7.61	7.68	7.80	7.82	7.89	7.95	8.03	8.10

NOCT: Irradiance at 800W/m<sup>2</sup>, Ambient Temperature 20°C, Wind Speed 3m/s

### MECHANICAL DATA

Solar Cells	Monocrystalline 156.75 × 156.75 mm (6 inches)
Cell Orientation	60 cells (6 × 10)
Module Dimensions	1650 × 992 × 35 mm (65.0 × 39.1 × 1.38 inches)
Weight	18.6 kg (41.0 lb)
Glass	3.2 mm (0.13 inches), High Transmission, AR Coated Tempered Glass
Backsheet	White [DD05A.08(I)]; Black [DD05A.05(I)]
Frame	Black Anodized Aluminium Alloy [DD05A.08(I), DD05A.05(I)]
J-Box	IP 67 or IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm <sup>2</sup> (0.006 inches <sup>2</sup> ), 1000 mm (39.4 inches)
Connector	MC4
Fire Type	Type 1 or Type 2

### TEMPERATURE RATINGS

NOCT(Nominal Operating Cell Temperature)	44°C (±2°C)
Temperature Coefficient of P <sub>max</sub>	-0.39%/°C
Temperature Coefficient of V <sub>oc</sub>	-0.29%/°C
Temperature Coefficient of I <sub>sc</sub>	0.05%/°C

### MAXIMUM RATINGS

Operational Temperature	-40~ +85°C
Maximum System Voltage	1000V DC (IEC) 1000V DC (UL)
Max Series Fuse Rating	15A (Power ≤285W) 20A (Power ≤290W)

(DO NOT connect fuses in Combiner Box with two or more strings in parallel connection)

### WARRANTY

- 10 year Product Workmanship Warranty
  - 25 year Linear Power Warranty
- (Please refer to product warranty for details)

### PACKAGING CONFIGURATION

- Modules per box: 30 pieces
- Modules per 40' container: 840 pieces

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

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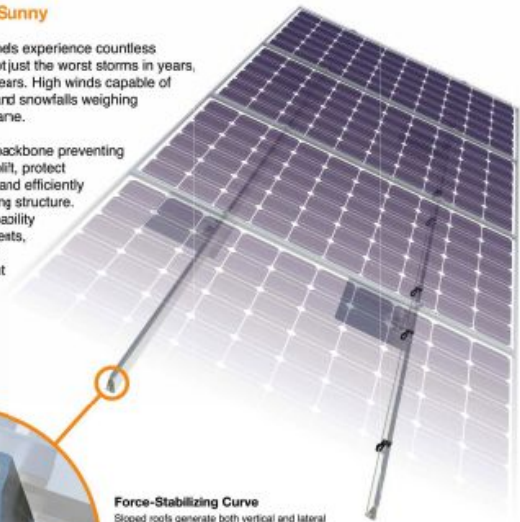


## XR Rail Family

### Solar Is Not Always Sunny

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

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



#### Force-Stabilizing Curve

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

#### Compatible with Flat & Pitched Roofs



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



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

#### Corrosion-Resistant Materials

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



## XR Rail Family

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



#### XR10

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

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



#### XR100

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

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



#### XR1000

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

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

## Rail Selection

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

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

## FlashFoot2

### The Strongest Attachment in Solar

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

#### Twist On Cap

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



#### Three-Tier Water Seal

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

#### Single Socket Size

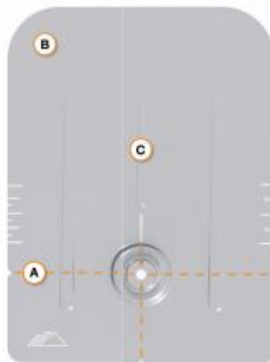
A custom-design lag bolt allows you to install FlashFoot2 with the same 7/16" socket size used on other Flush Mount System components.



#### Water-Shedding Design

An elevated platform diverts water away from the water seal.

### Installation Features



#### A Alignment Markers

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

#### B Rounded Corners

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

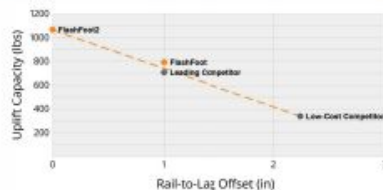
#### C Reinforcement Ribs

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

### Benefits of Concentric Loading

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

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



### Testing & Certification

#### Structural Certification

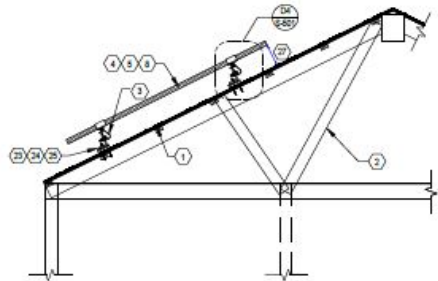
Designed and Certified for Compliance with the International Building Code & ASCE/SEI-7.

#### Water Seal Ratings

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

#### UL 2703

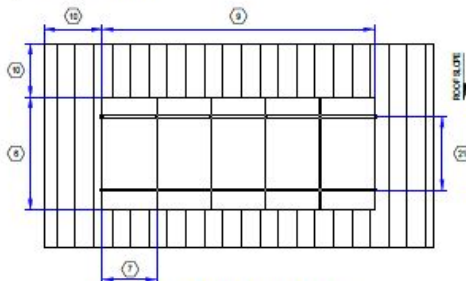
Conforms to UL 2703 Mechanical and Bonding Requirements. See Flush Mount Install Manual for full ratings.



D1

**RACKING DETAIL (TRANSVERSE)**

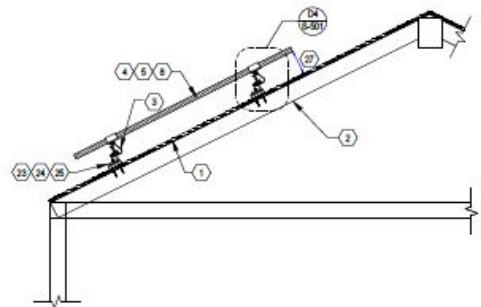
NOT TO SCALE



D2

**RACKING DETAIL (LONGITUDINAL)**

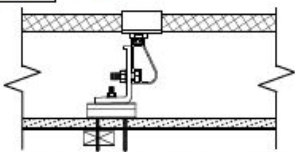
NOT TO SCALE



D3

**RACKING DETAIL (TOP)**

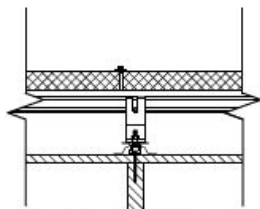
NOT TO SCALE



D4

**DETAIL (TRANSVERSE)**

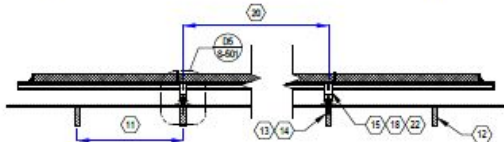
NOT TO SCALE



D5

**DETAIL (LONGITUDINAL)**

NOT TO SCALE



D6

**RACKING DETAIL (TRANSVERSE)**

NOT TO SCALE

**GENERAL NOTES**

1. FIELD VERIFY ALL MEASUREMENTS

**SHEET KEYNOTES**

1. ROOF MATERIAL: STANDING SEAM METAL
2. ROOF STRUCTURE: TRUSS, PURLING
3. ATTACHMENT TYPE: ROOF TECH RT4MINI WITH L-FOOT
4. MODULE MANUFACTURER: TSM-375DEG1401
5. MODULE MODEL: TSM-375DEG1401
6. MODULE LENGTH: 77.3"
7. MODULE WIDTH: 39.1"
8. MODULE WEIGHT: 61.7 LBS
9. SEE SHEET A-103 FOR DIMENSION(S)
10. MIN. FIRE OFFSET: NO FIRE CODE ENFORCED
11. TRUSS SPACING: 24 IN. O.C.
12. TRUSS SIZE: 2X6 NOMINAL
13. LAG BOLT DIMETER: BOLT/SCREW SUPPLIED WITH RACKING
14. LAG BOLT EMBEDMENT: PER RACKING MFG SPECIFICATIONS
15. TOTAL # OF ATTACHMENTS: 32
16. TOTAL AREA: 495.34 SQ. FT.
17. TOTAL WEIGHT: 1492.25 LBS.
18. WEIGHT PER ATTACHMENT: 46.63 LBS.
19. DISTRIBUTED LOAD: 3.21 POF
20. MAX. HORIZONTAL STANDOFF: 60 IN.
21. MAX. VERTICAL STANDOFF: LANDSCAPE: 25 IN., PORTRAIT: 33 IN.
22. STANDOFF STAGGERING: YES
23. RAIL MANUFACTURER (OR EQUIV.): IRONRIDGE
24. RAIL MODEL (OR EQUIVALENT): XR100
25. RAIL WEIGHT: 9.69 PLF.
26. MAX. TRUSS SPAN: 9 FT.
27. MODULE CLEARANCE: 3 IN. MIN., 6 IN. MAX.