STAFF REPORT: 11-13-2019 MEETING **PREPARED BY**: J. ROSS
APPLICATION NUMBER: 19-6533
ADDRESS: 1550 HUBBARD
HISTORIC DISTRICT: HUBBARD FARMS
APPLICANT: ROBERT HOCHSTADT
DATE OF COMPLETE APPLICATION: 10-16-2019
DATE OF STAFF SITE VISIT: 11/7/2019

SCOPE: INSTALL SOLAR PANELS AT ROOFTOP

EXISTING CONDITIONS
The building located at 1550 Hubbard is a two-story, single-family dwelling that was erected ca. 1910. The resource is rectangular in plan and is clad with brick. The primary roof is hipped with a front gabled wing and is topped with a front-gabled dormer. A lower, gabled-roof is located to the rear of the building. Asphalt shingles cover the roof. Windows are double-hung, 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 two solar panel

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

Solar Array # 1

- Install an eight-panel, 10'-10"x 17'-2"x 17'-3"x 34'-10" array and associated flush-mounted rail system, at the south-facing roof surface

Solar Array # 2

- Install a four-panel, 11'-3" x 12'-11" x 12'-10" x 12'-3" array and associated flush-mounted rail system, at the rear, lower gabled roof

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 smaller solar array (Solar Array # 2) will not be visible from the public right –of-way due to its placement at the building's rear wing
- The larger solar array (Solar Array # 1) 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 the y are not visible from the public right-of-way. Staff forwarded this application to the HDC for review because the larger 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.

- The solar array proposed for installation at the rear portion of the roof will not be visible from the public right-of-way. However, the eight-panel array will be ***visible***. 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 eight-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 eight-panel array will be ***conspicuous/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 work item 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.*

In re: to the proposed four-panel array, it is staff's opinion that the work will not result in the alteration of features and spaces that characterize a property as it will be located at the building's rear wing and will not be visible from the public right-of-way. Also, the work will not result in the removal of historic materials because the current roof surface is non-historic asphalt. Staff therefore recommends that the Commission issue a COA for the installation of the four-panel array because it meets 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. However, staff recommends that this COA be issued with the following condition:

- The applicant shall submit documentation to HDC staff which clearly indicates that location and the method of installation for the solar edge inverter for review and approval prior to the issuance of the COA.

#1- 1550 Hubbard-Primary Right-of-Way Photos

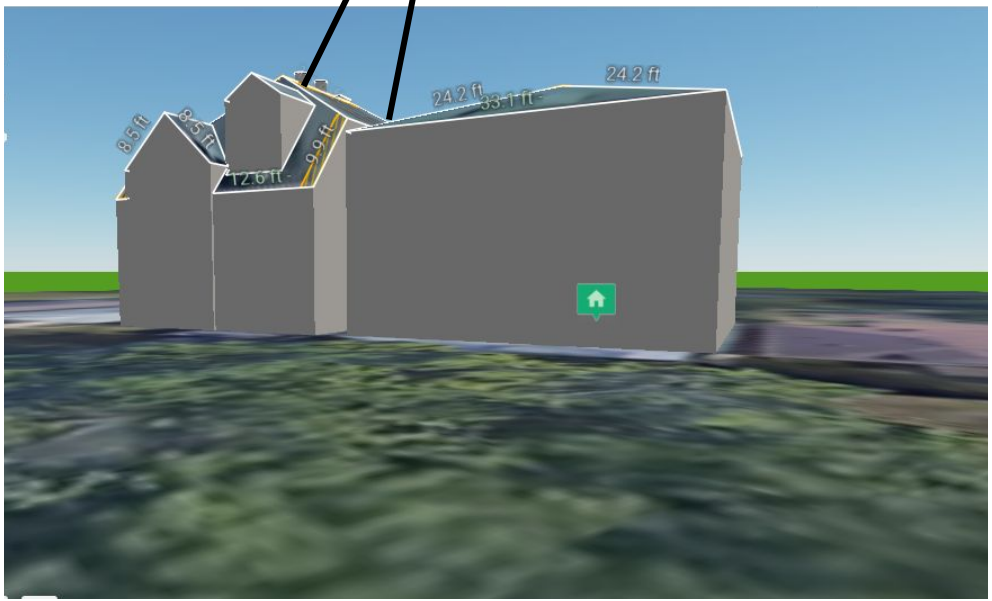
Solar Panels Placed

#1- 1550 Hubbard-Primary

All Sides of Property Photos

Solar Panels Mounted on
South East Facing Roof

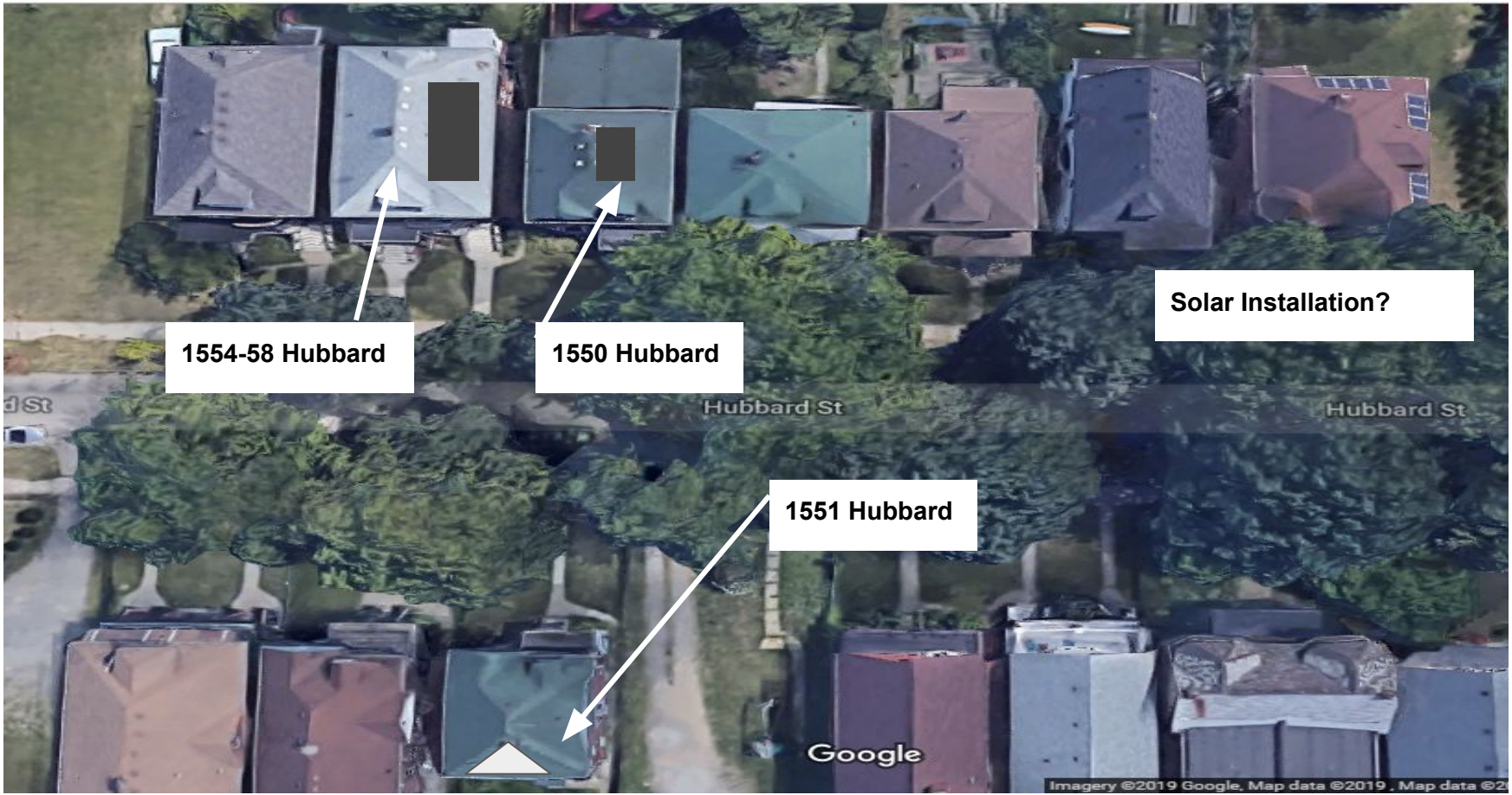
DISTRIBUTED POWER



#1- 1550 Hubbard-Primary

DISTRIBUTED POWER

It appears Solar has already been approved in the District.



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.

Description of Project/ Scope of Work

DISTRIBUTED POWER

- 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
- (12) 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.

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

DISTRIBUTED POWER

Materials Spec Sheets

Inverter

Optimizers

Solar Modules

Flush Mount Racking System

solaredge

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)

HD wave

www.solaredge.us

solaredge

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[1]							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	-	-	-	W
Transformer-less, Ungrounded	Yes							
Maximum Input Voltage	480							Vdc
Nominal DC Input Voltage	380					400		Vdc
Maximum Input Current 208V	-	9	-	13.5	-	-	-	Adc
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	600kΩ 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[2]							
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[3] (-40°F / -40°C option)[4]							°F / °C
Protection Rating	NEMA 3R (Inverter with Safety Switch)							

[1] For other regional settings please contact SolarEdge support
[2] Revenue grade inverter P/N: SExxxxH-US000NNC2
[3] For power de-rating information refer to: https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf
[4] -40 version P/N: SExxxxH-US000NNU4

RoHS

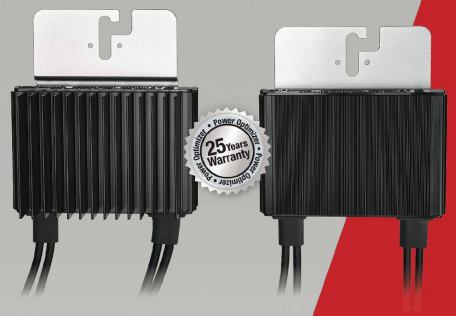
solaredge

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 shutdown for installer and firefighter safety

USA-CANADA-GERMANY-UK-ITALY-THE NETHERLANDS-JAPAN-CHINA-AUSTRALIA-ISRAEL-FRANCE-BELGIUM-TURKEY-INDIA-BULGARIA-ROMANIA-HUNGARY-SWEDEN-SOUTH AFRICA-POLAND-CZECH REPUBLIC

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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)	
INPUT						
Rated Input DC Power[1]	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	Adc
Maximum DC Input Current	13.75		12.63		17.5	Adc
Maximum Efficiency	99.5					%
Weighted Efficiency	98.8				98.6	%
Overvoltage Category	II					
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)						
Maximum Output Current	15					Adc
Maximum Output Voltage	60			85		Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR SOLAREDGE 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	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 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	MC4[2]					
Output Wire Type / Connector	Double Insulated; MC4					
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					%

[1] Rated STC power of the module. Module of up to +5% power tolerance allowed.
[2] For other connector types please contact SolarEdge

PV SYSTEM DESIGN USING A SOLAREDGE INVERTER[3][4]		SINGLE PHASE HD-WAVE	SINGLE PHASE	THREE PHASE 208V	THREE PHASE 480V	
Minimum String Length (Power Optimizers)	P320, P370, P400	8		10	18	
	P405 / P505	6		8	14	
Maximum String Length (Power Optimizers)		25		25	50[5]	
Maximum Power per String		5700 (6000 with SE7600H-US, SE10000H-US)	5250	6000	12750	W
Parallel Strings of Different Lengths or Orientations		Yes				

[3] For detailed string sizing information refer to: http://www.solaredge.com/sites/default/files/string_sizing_na.pdf.
[4] It is not allowed to mix P405/P505 with P320/P370/P400/P600/P700/P800 in one string.
[5] A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement

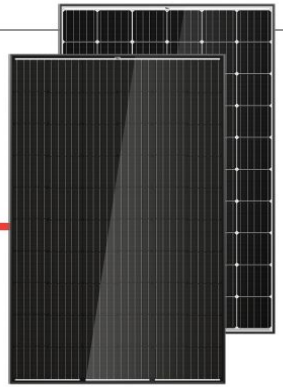
CE ETL

Mono Multi Solutions

THE

ALLMAX M PLUS+

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 collaboration with installers, developers, distributors and other partners.

Comprehensive Products And System Certificates

IEC61215/IEC61730/UL1703/IEC61701/IEC62716
ISO 9001: Quality Management System
ISO 14001: Environmental Management System
ISO14064: Greenhouse gases Emissions Verification
OHSAS 18001: Occupation Health and Safety Management System

Trinasolar

Maximize limited space with top-end efficiency

- Up to 192W/m² 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

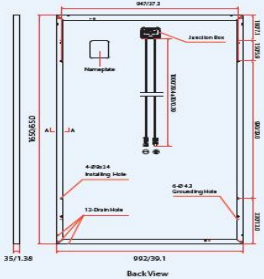
- 2400 Pa wind load
- 5400 Pa snow load
- 35 mm hail stones at 97 km/h

LINEAR PERFORMANCE WARRANTY

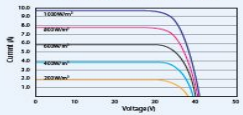
10 Year Product Warranty · 25 Year Linear Power Warranty

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

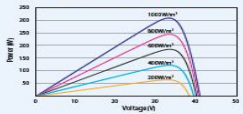
DIMENSIONS OF PV MODULE(mm/inches)



I-V CURVES OF PV MODULE(305W)



P-V CURVES OF PV MODULE(305W)



ELECTRICAL DATA (STC)

Peak Power Watts-P_{MAX} (Wp)*	275	280	285	290	295	300	305	310	315
Power Output Tolerance-P_{MAX} (W)	0 ~ +5								
Maximum Power Voltage-V_{MPP} (V)	31.4	31.7	31.8	32.2	32.5	32.6	32.9	33.1	33.3
Maximum Power Current-I_{MPP} (A)	8.76	8.84	8.97	9.01	9.08	9.19	9.28	9.37	9.46
Open Circuit Voltage-V_{OC} (V)	38.4	38.4	38.5	38.9	39.6	39.8	40.0	40.2	40.5
Short Circuit Current-I_{SC} (A)	9.24	9.42	9.51	9.66	9.68	9.77	9.85	9.94	10.0
Module Efficiency η_m (%)	16.8	17.1	17.4	17.7	18.0	18.3	18.6	18.9	19.2

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5.
*Measuring tolerance: ±3%.

ELECTRICAL DATA (NOCT)

Maximum Power-P_{MAX} (Wp)	205	209	212	216	220	223	227	231	235
Maximum Power Voltage-V_{MPP} (V)	29.1	29.4	29.5	29.9	30.1	30.2	30.5	30.7	30.9
Maximum Power Current-I_{MPP} (A)	7.04	7.10	7.21	7.24	7.30	7.38	7.46	7.53	7.60
Open Circuit Voltage-V_{OC} (V)	35.7	35.7	35.8	36.2	36.8	37.0	37.2	37.4	37.6
Short Circuit Current-I_{SC} (A)	7.46	7.61	7.68	7.80	7.82	7.89	7.95	8.03	8.10

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/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(II)]; Black [DD05A.05(II)]
Frame	Black Anodized Aluminium Alloy [DD05A.08(II), DD05A.05(II)]
J- Box	IP 67 or IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm² (0.006 inches²), 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_{MAX}	- 0.39%/°C
Temperature Coefficient of V_{OC}	- 0.29%/°C
Temperature Coefficient of I_{SC}	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 Fuse 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

Trinasolar

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

Version number: TSM_EN_2018_C
www.trinasolar.com

Tech Brief

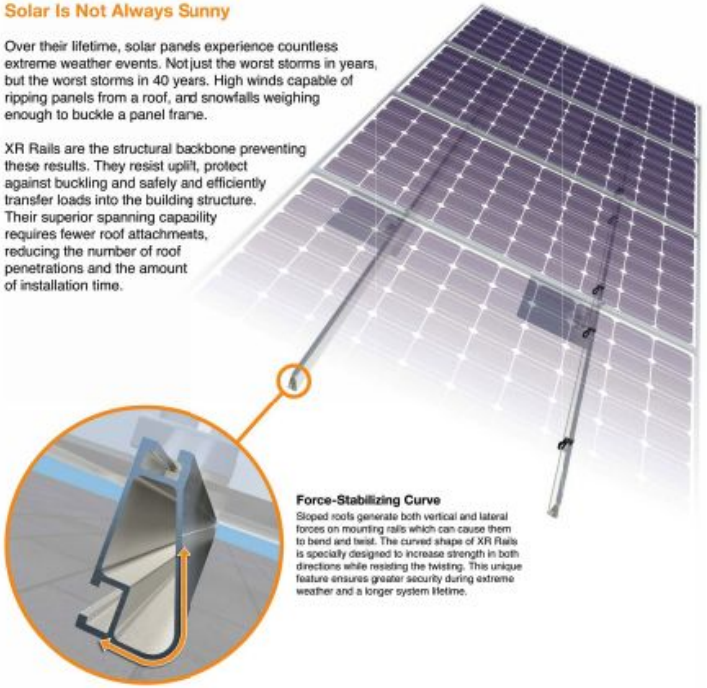
IRONRIDGE

XR Rail Family

Solar Is Not Always Sunny

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

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



Force-Stabilizing Curve

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

Compatible with Flat & Pitched Roofs

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

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

Corrosion-Resistant Materials

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

Tech Brief

XR Rail Family

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

XR10

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

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

XR100

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

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

XR1000

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

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

Rail Selection

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

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

DISTRIBUTED POWER

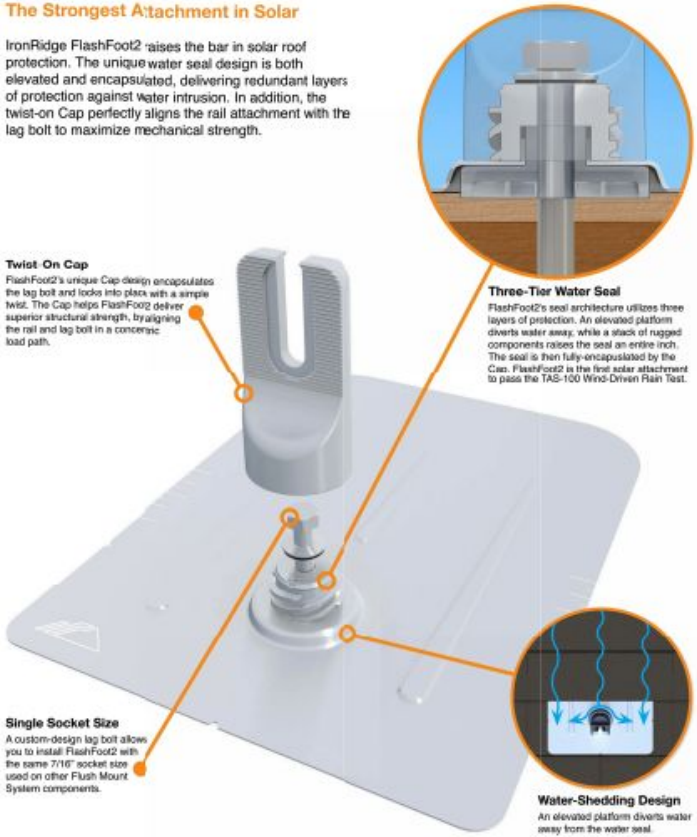
Tech Brief

IRONRIDGE

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.

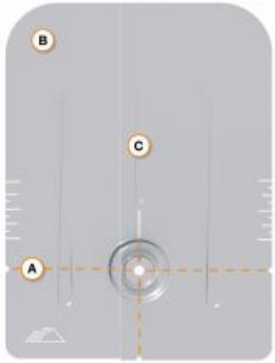
Three-Tier Water Seal
FlashFoot2's seal architecture utilizes three layers of protection. An elevated platform diverts water away, while a stack of rugged components raises the seal an entire inch. The seal is then fully-encapsulated by the Cap. FlashFoot2 is the first solar attachment to pass the TAS-100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

Tech Brief

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.

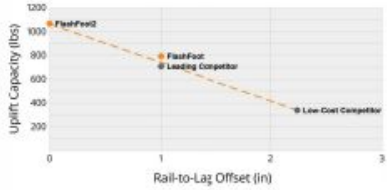
C Reinforcement Ribs

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.

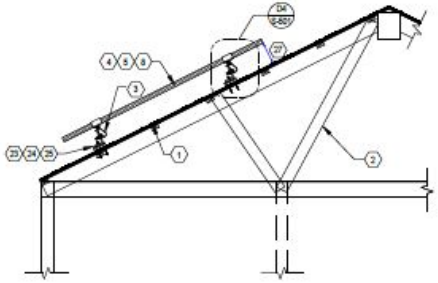
Water Seal Ratings

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.

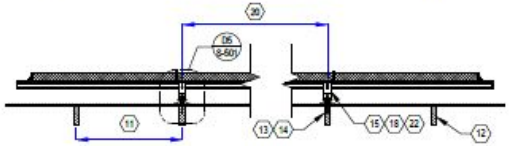
UL 2703

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

DISTRIBUTED POWER



D1 RACKING DETAIL (TRANSVERSE)
NOT TO SCALE



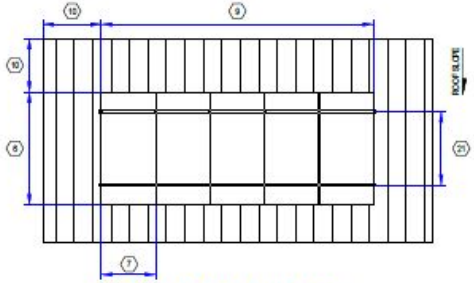
D2 RACKING DETAIL (LONGITUDINAL)
NOT TO SCALE

GENERAL NOTES

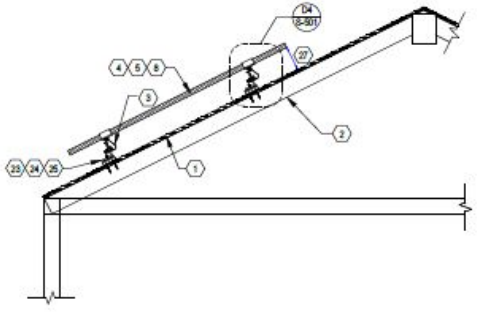
1. FIELD VERIFY ALL MEASUREMENTS

SHEET KEYNOTES

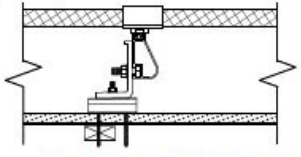
1. ROOF MATERIAL: STANDING SEAM METAL
2. ROOF STRUCTURE: TRUSS, PURLINS.
3. ATTACHMENT TYPE: ROOF TECH RT-MINI WITH L-FOOT
4. MODULE MANUFACTURER: TSM-375DEG14(II)
5. MODULE MODEL: TSM-375DEG14(II)
6. MODULE LENGTH: 77.9"
7. MODULE WIDTH: 39.1"
8. MODULE WEIGHT: 51.7 LBS.
9. SEE SHEET A-103 FOR DIMENSION(S)
10. MIN. FIRE OFFSET: NO FIRE CODE ENFORCED
11. TRUSS SPACING: 24 IN. O.C.
12. TRUSS SIZE: 2X6 NOMINAL
13. LAG BOLT DIAMETER: BOLT/SCREW SUPPLIED WITH RACKING
14. LAG BOLT EMBEDMENT: PER RACKING MFG SPECIFICATIONS
15. TOTAL # OF ATTACHMENTS: 32
16. TOTAL AREA: 465.34 SQ. FT.
17. TOTAL WEIGHT: 1652.25 LBS.
18. WEIGHT PER ATTACHMENT: 46.63 LBS.
19. DISTRIBUTED LOAD: 3.21 PSF
20. MAX. HORIZONTAL STANDOFF: 60 IN.
21. MAX. VERTICAL STANDOFF: LANDSCAPE: 26 IN., PORTRAIT: 33 IN.
22. STANDOFF STAGGERING: YES
23. RAIL MANUFACTURER (OR EQUIV.): IRONRIDGE
24. RAIL MODEL (OR EQUIVALENT): XR100
25. RAIL WEIGHT: 0.68 PLF.
26. MAX. TRUSS SPAN: 8 FT.
27. MODULE CLEARANCE: 3 IN. MIN., 6 IN. MAX.



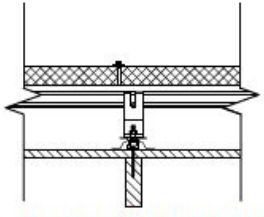
D3 RACKING DETAIL (TOP)
NOT TO SCALE



D6 RACKING DETAIL (TRANSVERSE)
NOT TO SCALE



D4 DETAIL (TRANSVERSE)
NOT TO SCALE



D5 DETAIL (LONGITUDINAL)
NOT TO SCALE

DISTRIBUTED POWER