

ANN ARBOR HISTORIC DISTRICT COMMISSION

Staff Report

ADDRESS: 313 S Seventh Street, Application Number HDC20-165

DISTRICT: Old West Side Historic District

REPORT DATE: November 12, 2020

REPORT PREPARED BY: Jill Thacher, Historic Preservation Coordinator

REVIEW COMMITTEE DATE: Monday, November 9, 2020

OWNER

Name: Scott Lancaster
Address: 313 S Seventh St
 Ann Arbor MI 48103
Phone: (734) 355-5112

APPLICANT

Nathan Houghteling
 2415 Burdette Ave
 Ferndale, MI 48220
 (734) 347-6103

BACKGROUND: This 1 ¾ story gable-fronter features a 1 ¾ story cross gable on the south side, a full-width wrap-around front porch with turned posts and spindle work, and the original house block has a stone foundation.

LOCATION: The property is located on the east side of South Seventh Street, south of W Washington and north of W. Liberty.

APPLICATION: The applicant seeks HDC approval to install a solar array of black-on-black panels on the south-facing roof of the house and on the garage.

APPLICABLE REGULATIONS:

From the Secretary of the Interior's Standards for Rehabilitation:

- (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.
- (9) New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
- (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.

From the Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings:

Roofs

Recommended: Identifying, retaining, and preserving roofs--and their functional and decorative features—that are important in defining the overall historic character of the building.

Not Recommended: Changing the configuration of a roof by adding new features such as dormer windows, vents, or skylights so that the historic character is diminished.

Energy Efficiency

Recommended: Placing a new addition that may be necessary to increase energy efficiency on non-character-defining elevations.

Not Recommended: Designing a new addition which obscures, damages, or destroys character-defining features.

Mechanical Equipment

Recommended: Providing adequate structural support for new mechanical equipment.

Not Recommended: Failing to consider the weight and design of new mechanical equipment so that, as a result, historic structural members or finished surfaces are weakened or cracked.

Installing a new mechanical system so that character-defining structural or interior features are radically changed, damaged, or destroyed.

From the Ann Arbor Historic District Design Guidelines (other Guidelines may apply):

Solar

Appropriate: Mounting solar panels at grade or on ground pole mountings. In the absence of an appropriate ground-based mounting location, panels should be mounted on side or rear facing roof surfaces.

Installing mechanical and service equipment on the roof related to the solar units and their related devices so that they are inconspicuous from the public right-of-way and do not damage or obscure character-defining features.

For sloped roof installations, mounting solar panels parallel to and within 8” of roof surface.

Not Appropriate: Mounting solar panels and their related devices on primary elevations or roofs that face the primary elevation or in planes that are highly visible from the street view. This location has the highest impact on the historic character of the historic building and all other options should be thoroughly explored.

Any other alteration or installation procedure that will cause irreversible changes to historic features or materials.

STAFF FINDINGS:

1. The application proposes to install an array of 32 solar panels. Eighteen are on the south face of the garage, eight on the east end of the house roof (behind the gable) and six on the west end of the roof. Only the six panels closest to the street should be visible from the street or sidewalk. Black modules with black framing are appropriately proposed. Because the panels are confined to the south face of the roof, are one consistent color, and cover the majority of the roof surface, staff believes the panels will not be a visual distraction from the historic structure. Distances from the roof edges are shown on the drawings. The roof material is dark brown asphalt, and the work is reversible.
2. Staff believes that the materials and design of the solar panels are compatible with the existing structure, neighboring buildings, and the surrounding historic district, and meet both the Secretary of the Interior's Standards and the *Ann Arbor Historic District Design Guidelines*.

POSSIBLE MOTIONS: (Note that the motion is only a suggestion. The Review Committee, consisting of staff and at least two Commissioners, will meet with the applicant on site and then make a recommendation at the meeting.)

I move that the Commission issue a certificate of appropriateness for the application at 313 South Seventh Street, a contributing property in the Old West Side Historic District, to install a black-on-black solar array on the south-facing roof, as proposed. The work is compatible in exterior design, arrangement, texture, material and relationship to the rest of the building and the surrounding area and meets *The Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings*, in particular standards 2, 9 and 10 and the guidelines for roofs, energy efficiency, and mechanical systems, as well as the *Ann Arbor Historic District Design Guidelines*, particularly as they pertain to solar installations.

MOTION WORKSHEET:

I move that the Commission issue a Certificate of Appropriateness for the work at 313 S Seventh Street in the Old West Side Historic District

_____ Provided the following condition(S) is (ARE) met: 1) STATE CONDITION(s)

The work is generally compatible with the size, scale, massing, and materials and meets the Secretary of the Interior's Standards for Rehabilitation, standard(S) number(S) (*circle all that apply*): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

ATTACHMENTS: application, photos, drawings, and technical information.

313 S Seventh Street (July 2019, courtesy Google Streetview)





HISTORIC DISTRICT COMMISSION

PLANNING AND DEVELOPMENT SERVICES

City Hall: 301 E. Huron St. Ann Arbor, MI 48104-6120
 Mailing: P.O. Box 8647, Ann Arbor, MI 48107-8647
 Phone: 734.794.6265 ext. 42608 ithacher@a2gov.org
 Fax: 734.994.8460

APPLICATION MUST BE FILLED OUT COMPLETELY

OFFICE USE ONLY	
Permit Number	HDC# _____
	BLDG# _____
DATE STAMP	

PROPERTY LOCATION/OWNER INFORMATION

NAME OF PROPERTY OWNER Scott Lancaster		HISTORIC DISTRICT	
PROPERTY ADDRESS 313 South Seventh St.			CITY ANN ARBOR
ZIPCODE 48103	DAYTIME PHONE NUMBER (734) 355-5112	EMAIL ADDRESS s.e.lancaster@comcast.net	
PROPERTY OWNER'S ADDRESS (IF DIFFERENT FROM ABOVE)		CITY	STATE, ZIP

PROPERTY OWNER'S SIGNATURE

SIGN HERE	DocuSigned by: <i>Scott Lancaster & Laura Davis</i>	PRINT NAME	DATE
		Scott Lancaster & Laura Davis	10/15/2020

APPLICANT INFORMATION

NAME OF APPLICANT (IF DIFFERENT FROM ABOVE) Nathan Houghteling			
ADDRESS OF APPLICANT 2415 Burdette Ave			CITY Ferndale
STATE Michigan	ZIPCODE 48220	PHONE / CELL # (734) 347-6103	FAX No ()
EMAIL ADDRESS nathan@distributedpower.net			

APPLICANT'S SIGNATURE (if different from Property Owner)

SIGN HERE	DocuSigned by: <i>Nathan Houghteling</i>	PRINT NAME	DATE
		x Nathan Houghteling	10/15/2020

BUILDING USE – CHECK ALL THAT APPLY

<input checked="" type="checkbox"/> SINGLE FAMILY	<input type="checkbox"/> DUPLEX	<input type="checkbox"/> RENTAL	<input type="checkbox"/> MULTIPLE FAMILY	<input type="checkbox"/> COMMERCIAL	<input type="checkbox"/> INSTITUTIONAL
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PROPOSED WORK

Describe in detail each proposed exterior alteration, improvement and/or repair (use additional paper, if necessary).

9.92 kW Rooftop Solar Installation (32 panels). Site plans will be submitted with this application.

DESCRIBE CONDITIONS THAT JUSTIFY THE PROPOSED CHANGES:

Solar Panels with black cells and frames maximize aesthetics and reduce contrast with the rooftop.
 The majority of panels are not street-visible in this proposed design.

For Further Assistance With Required Attachments, please visit www.a2gov.org/hdc



HISTORIC DISTRICT COMMISSION APPLICATION

FEE CHART

DESCRIPTION	
STAFF REVIEW FEES	FEE
Application for Staff Approval	\$35.00
Work started without approvals	Additional \$50.00
HISTORIC DISTRICT COMMISSION FEES	
All other proposed work not listed below	\$100.00
Work started without approvals	Additional \$250.00
RESIDENTIAL – Single and 2-story Structure	
Addition: single story	\$300.00
Addition: taller than single story	\$550.00
New Structure - Accessory	\$100.00
New Structure – Principal	\$850.00
Replacement of single and 2-family window(s)	\$100 + \$25/window
COMMERCIAL – includes multi-family (3 or more unit) structures	
Additions	\$700.00
Replacement of multi-family and commercial window (s)	\$100 + \$50/window
Replacement of commercial storefront	\$250.00
DEMOLITION and RELOCATION	
Demolition of a contributing structure	\$1000.0
Demolition of a non-contributing structure	\$250.00
Relocation of a contributing structure	\$750.00
Relocation of a non-contributing structure	\$250.00

FOR COMMISSION REVIEWS:

- Application withdrawals made before public notice is published will qualify for a 50% refund of the application fee.
- Application withdrawals made after public notice is sent but before the public hearing will qualify for a 25% refund of the application fee.

INSTRUCTIONS FOR SUBMITTING APPLICATIONS

All HDC applications must be signed by the property owner and the applicant, if different, with the exception of staff approvals, which may be signed by only the applicant.

All completed HDC applications and their attachments may be submitted to Planning and Development Services by mail, in person (paper or digital), faxed, or via email to building@a2gov.org.

We accept CASH, CHECK, and all major credit cards. Checks should be made payable to “City of Ann Arbor”

HDC applications that are incomplete or not submitted with the required documentation or payment will not be processed or approved.

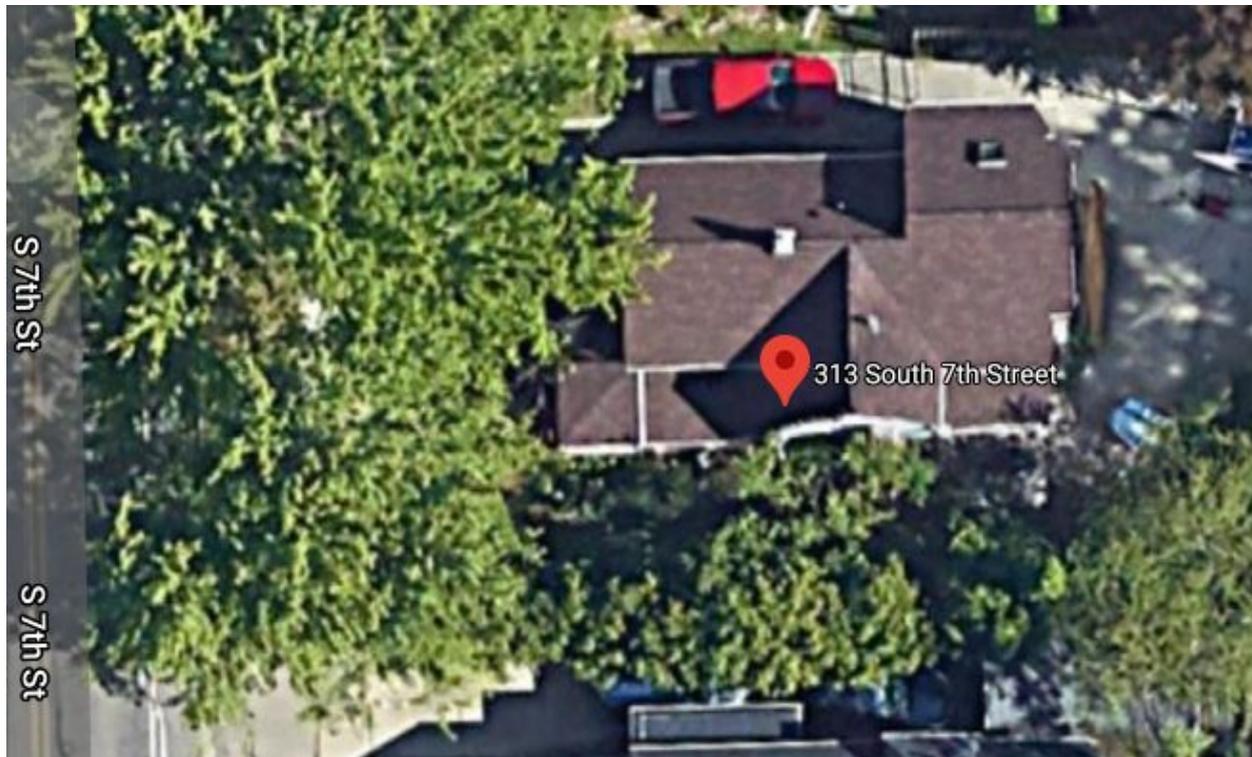
APPLICATION EXPIRATION

HDC applications expire three (3) years after the date of approval.

OFFICE USE ONLY

Date of Hearing:		
Action	<input type="checkbox"/> HDC COA	<input type="checkbox"/> HDC Denial
	<input type="checkbox"/> HDC NTP	<input type="checkbox"/> Staff COA
Staff Signature		
Comments		
Fee:	\$ _____	
Payment Type	<input type="checkbox"/> Check: # _____ <input type="checkbox"/> Cash <input type="checkbox"/> Credit Card	

Project: 9.92 kW Shingled Roof Solar Project
Home Owner: Scott Lancaster
Site Address: 313 S. Seventh St. Ann Arbor, MI 48103











Site Design

313 S. Seventh St, Ann Arbor, MI 48103



Utility Meter

Main Service Panel

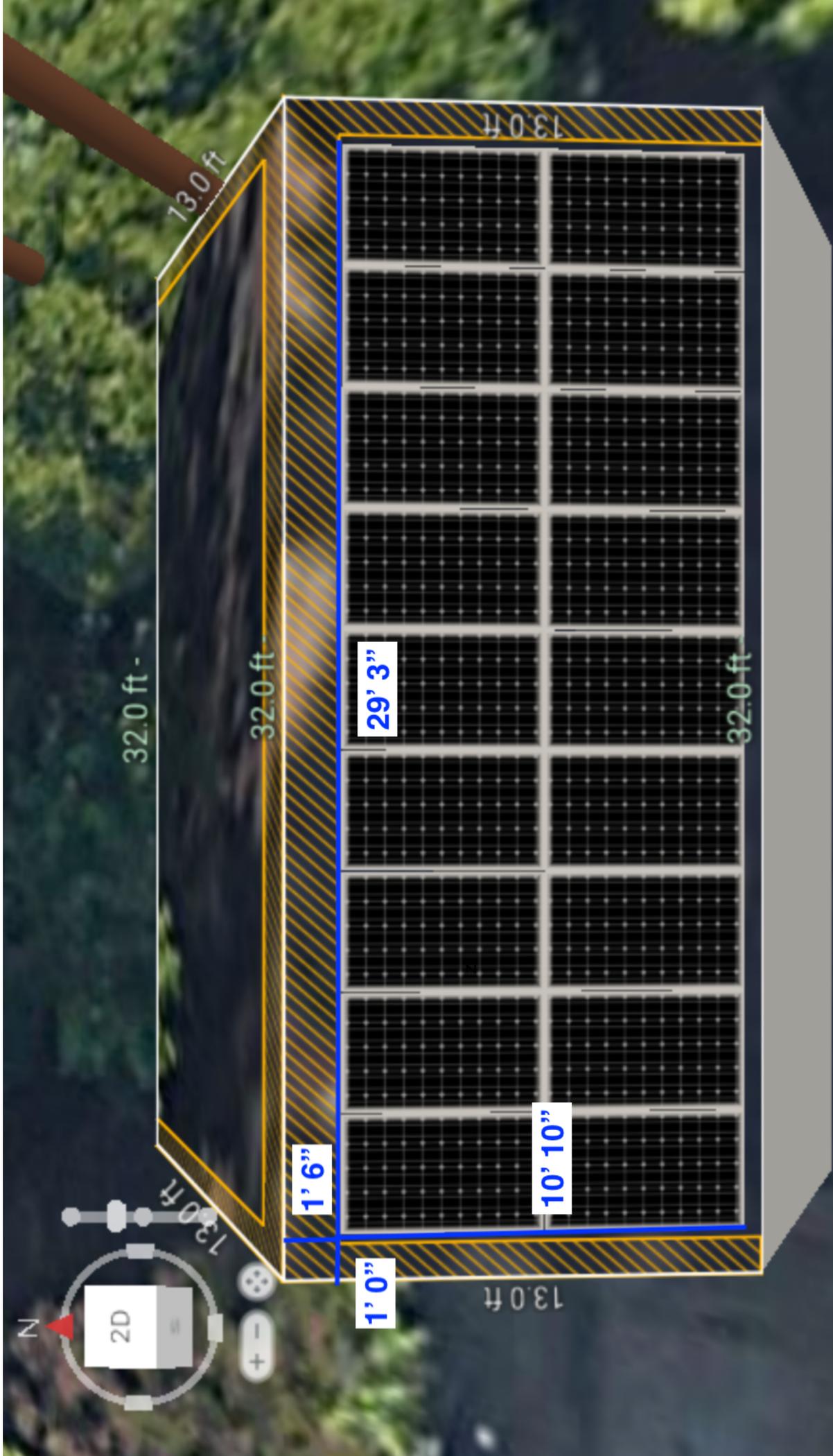
AC Disconnect

10 kW SolarEdge Inverter

32 x 310 Watt Solar Modules

Project: Lancaster 10 kW Solar Project





13.0 ft

13.0 ft

32.0 ft -

32.0 ft

29' 3"

32.0 ft

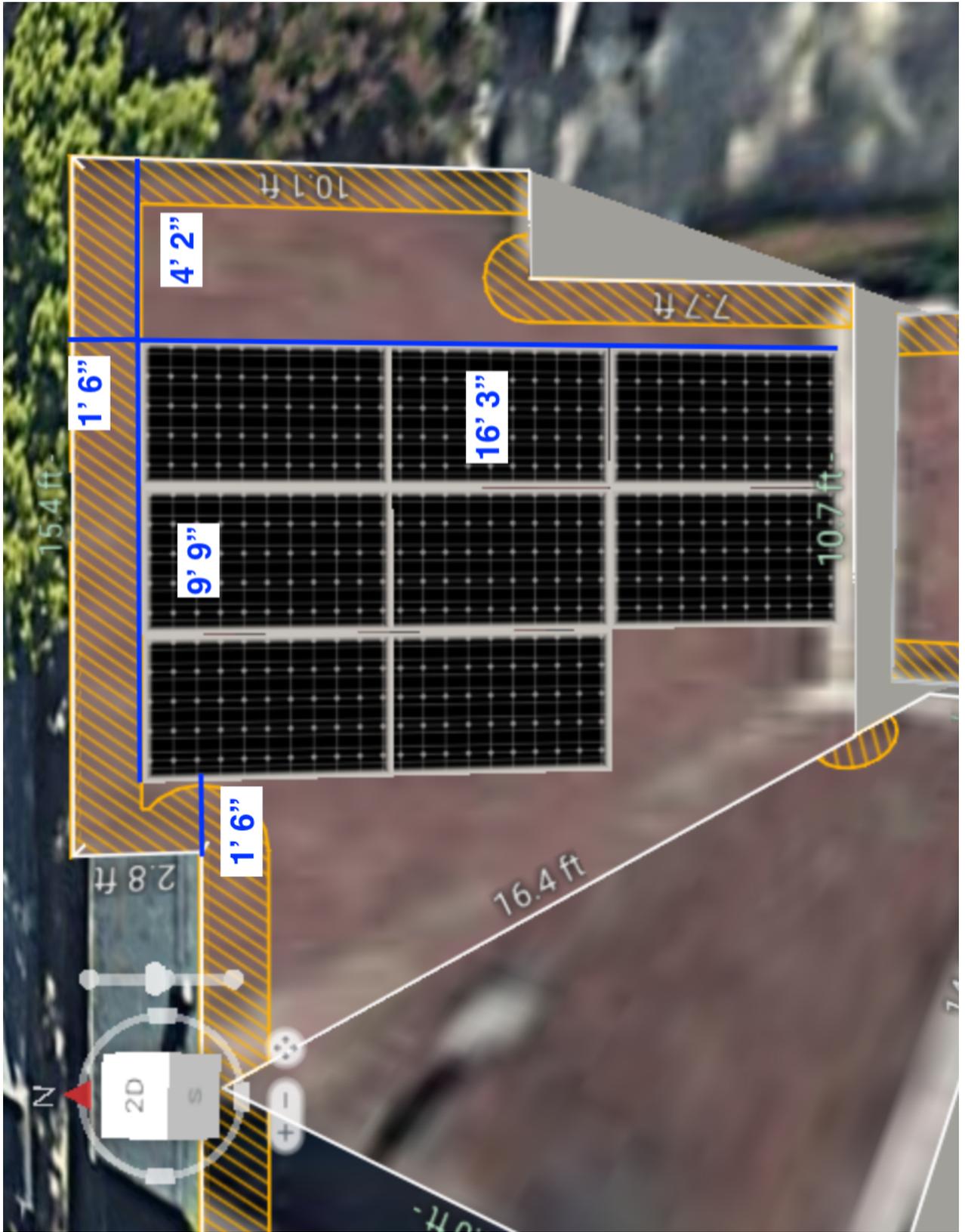
1' 6"

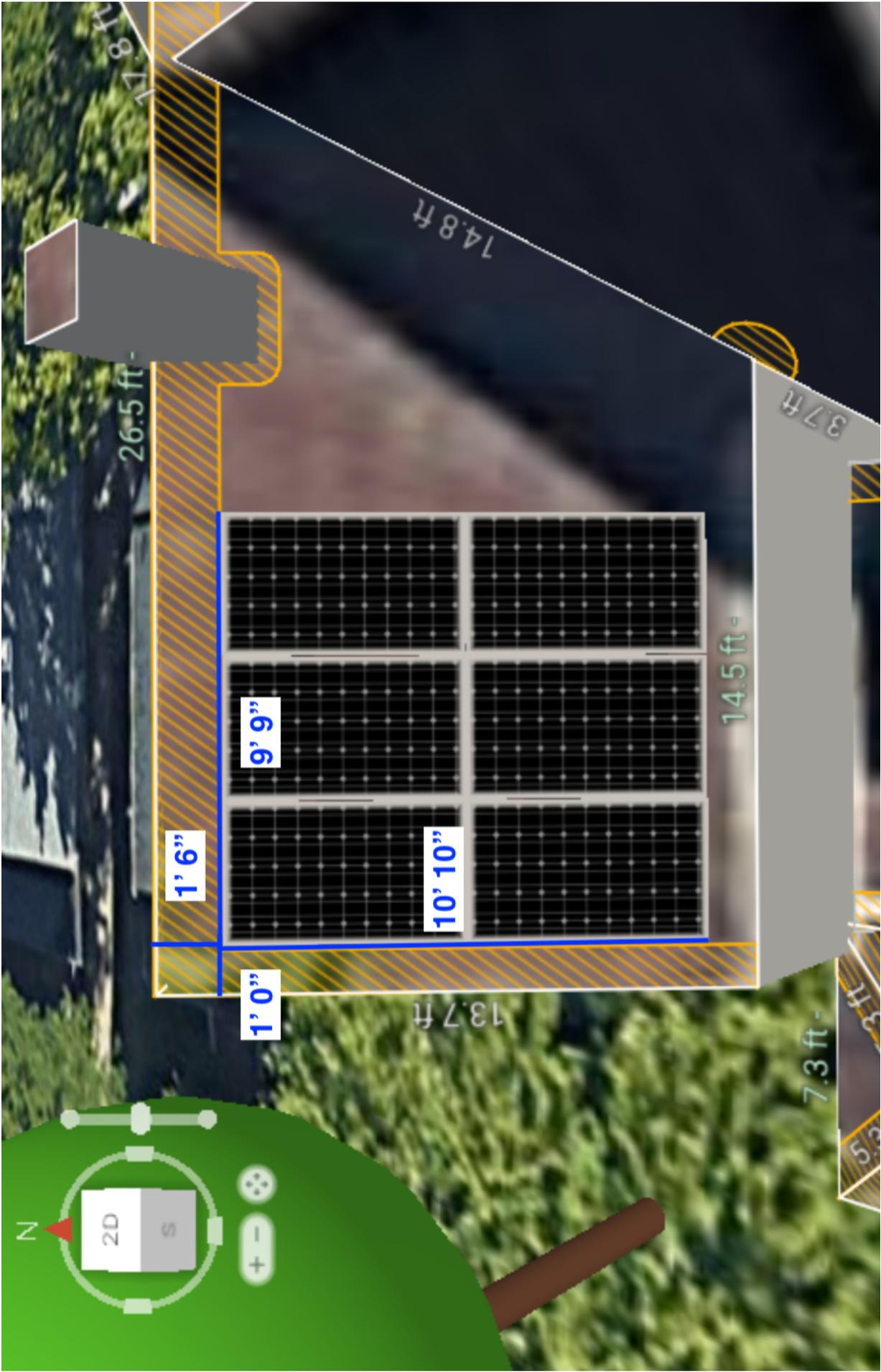
10' 10"

1' 0"

13.0 ft

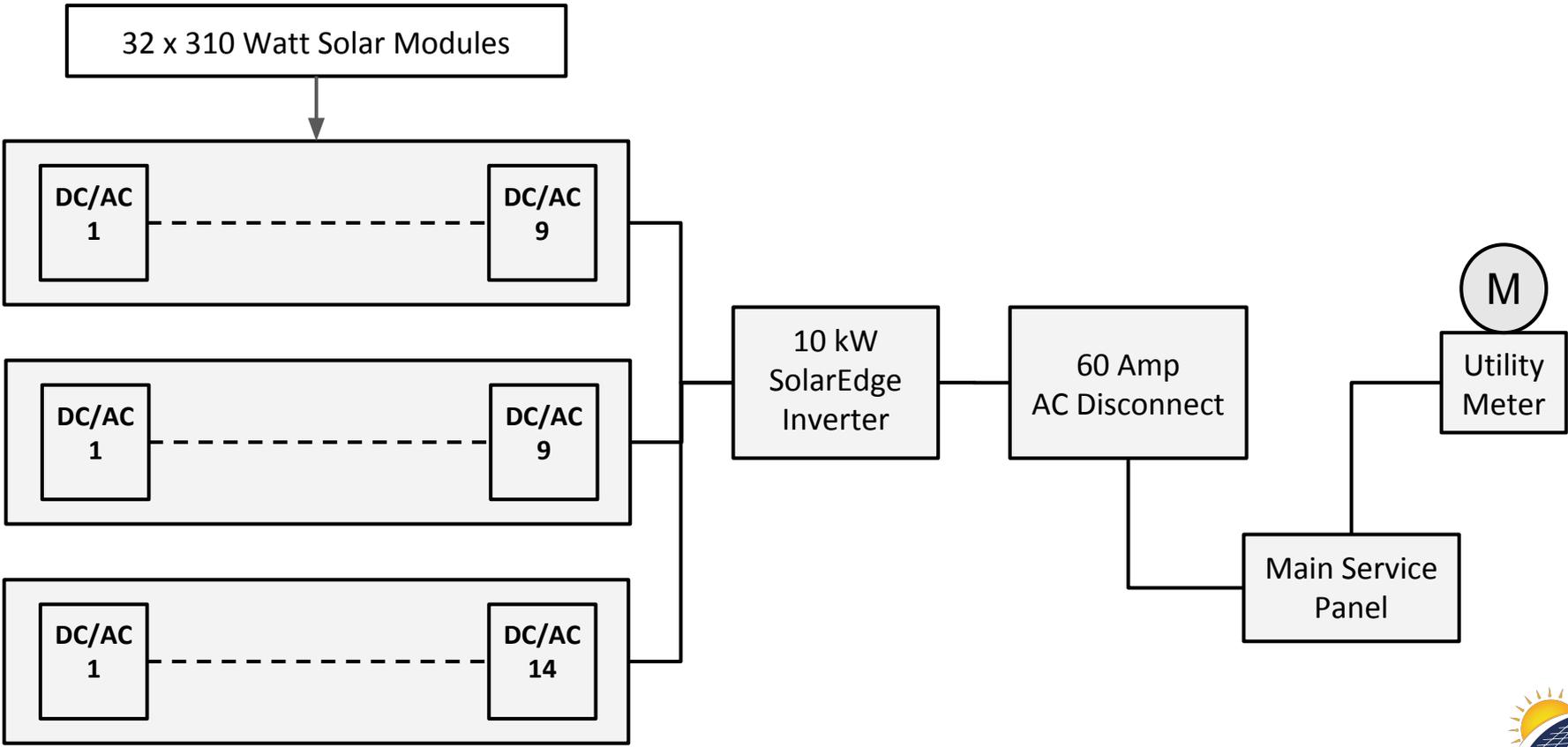






Electrical Diagram

313 S. Seventh St, Ann Arbor, MI 48103



Project: Lancaster 10 kW Solar Project



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
- Built-in module-level monitoring
- Outdoor and indoor installation
- Optional: Revenue grade data, ANSI C12.20 Class 0.5 (0.5% accuracy)

solaredge.com



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

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

	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 @ 240V 10000 @ 208V	VA	
Maximum AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA	
AC Output Voltage Min-Nom-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac	
AC Output Voltage Min-Nom-Max. (183 - 208 - 229)	-	✓	-	✓	-	-	✓	Vac	
AC Frequency (Nominal)	59.3 - 60 - 60.5 ¹⁾								
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5	A	
Maximum Continuous Output Current @208V	-	16	-	24	-	-	48.5	A	
GFDI Threshold	1								
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	-	-	15500	W	
Transformer-less, Ungrounded	Yes								
Maximum Input Voltage	480								
Nominal DC Input Voltage	380								
Maximum Input Current @240V ²⁾	8.5	10.5	13.5	16.5	20	27	30.5	Adc	
Maximum Input Current @208V ³⁾	-	9	-	13.5	-	-	27	Adc	
Max. Input Short Circuit Current	45								
Reverse-Polarity Protection	Yes								
Ground-Fault Isolation Detection	600µs Sensitivity								
Maximum Inverter Efficiency	99			99.2				%	
CEC Weighted Efficiency							99 @ 240V 98.5 @ 208V	%	
Nighttime Power Consumption	< 2.5								
ADDITIONAL FEATURES									
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)								
Revenue Grade Data, ANSI C12.20	Optional ⁴⁾								
Rapid Shutdown - NEC 2014 and 2017 690.12	Automatic Rapid Shutdown upon AC Grid Disconnect								
STANDARD COMPLIANCE									
Safety	UL1741, UL1741 SA, UL16998, CSA C22.2, Canadian AFCI according to TLL M-07								
Grid Connection Standards	IEEE1547, Rule 21, Rule 14 (H)								
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 (95WxD)	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								
Operating Temperature Range	-40 to +140 / -25 to +60 ⁵⁾ (-40T / -40C option) ⁶⁾								
Protection Rating	NEMA 4X (Inverter with Safety Switch)								

¹⁾ For other regional settings please contact SolarEdge support
²⁾ A higher current source may be used; the inverter will limit its input current to the values stated
³⁾ Revenue grade inverter P/N: SE3000H-US000N2C
⁴⁾ For power derating information refer to: <https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf>
⁵⁾ -40 version P/N: SE3000H-US000N2U4

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RoHS



DISTRIBUTED POWER

Project: Lancaster 10 kW Solar Project



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



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	9-60	9-80	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 SOLAREGE INVERTER)							
Maximum Output Current	15						
Maximum Output Voltage	60						
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREGE INVERTER OR SOLAREGE INVERTER OFF)							
Safety Output Voltage per Power Optimizer	1 ± 0.1						
Optimize							
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						
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 ⁽²⁾						
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						
Protection Rating	IP68 / NEMAGP						
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 SOLAREGE INVERTER ⁽¹⁾⁽²⁾	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	
Maximum Power per String		25	25	50 ⁽³⁾	W
Parallel Strings of Different Lengths or Orientations	5700 (6000 with SE7600H-US, SE10000H-US)	5250	6000	12750	
			Yes		

⁽¹⁾ For detailed string sizing information refer to: http://www.solaredge.com/sites/default/files/string_sizing_na.pdf.

⁽²⁾ It is not allowed to mix P405/P505 with P320/P370/P400/P600/P700/P800 in one string.

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





SLA-M 310 Wp



60 Cell Monocrystalline PV Module

INDUSTRY LEADING WARRANTY
All our products include an industry leading 25-year product workmanship and 30-year performance warranty.

35+ YEARS OF SOLAR INNOVATION
Leveraging over 35+ years of worldwide experience in the solar industry, Silfab is dedicated to superior manufacturing processes and innovations such as Bifacial and Back Contact technologies, to ensure our partners have the latest in solar innovation.

NORTH AMERICAN QUALITY
Silfab is the largest and most automated solar manufacturer in North America. Utilizing premium quality materials and strict quality control management to deliver the highest efficiency, premium quality PV modules 100% made in North America.



CHUBB
* Chubb provides fire and theft insurance to Silfab Solar Inc.

BAA / ARRA COMPLIANT
Silfab panels are designed and manufactured to meet Buy American Act Compliance. The US State Department, US Military and FAA have all entrusted Silfab panels in their solar installations.

LIGHT AND DURABLE
Engineered to accommodate low load bearing structures up to 5400Pa. The light-weight frame is exclusively designed for wide-ranging racking compatibility and durability.

LOWEST DEFECT RATE
Total automation ensures strict quality controls during the entire manufacturing process at our ISO certified facilities. 48.18 ppm as per December 2018.

DOMESTIC PRODUCTION
Silfab is 100% North American which means our customer service is direct, efficient and local. Your solar panels can be delivered anywhere in the Continental USA within days.

AESTHETICALLY PLEASING
All black sleek design doesn't compromise on quality.

PID RESISTANT
PID Resistant due to advanced cell technology and material selection. In accordance to IEC 62804-1



Silfab Solar Inc.
240 Courtneypark Drive East
Mississauga, ON L5T 2Y3 Canada
Tel +1 905-255-2501 | Fax +1 905-696-0267
info@silfabsolar.com | www.silfabsolar.com

Silfab Solar Inc.
800 Cornwall Ave
Bellingham WA 98225 USA
Tel +1 360-569-4733

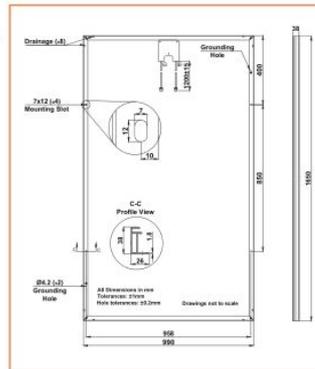
Electrical Specifications		SILFAB SLA Monocrystalline	
Test Conditions		STC	NOCT
Module Power (Pmax)	Wp	310	234
Maximum power voltage (Vpmax)	V	33.05	29.7
Maximum power current (Ipmax)	A	9.38	7.88
Open circuit voltage (Voc)	V	40.25	37.2
Short circuit current (Isc)	A	9.93	8.14
Module efficiency	%	19.0	17.9
Maximum system voltage (VDC)	V		1000
Series fuse rating	A		20
Power Tolerance	Wp		-0/+5
Measurement conditions: STC 1000 W/m ² • AM 1.5 • Temperature 25 °C • NOCT 800 W/m ² • AM 1.5 • Measurement uncertainty ± 3% * Sun simulator calibration reference modules from Fraunhofer Institute. Electrical characteristics may vary by ±5% and power by -0/+5W.			
Temperature Ratings		SILFAB SLA Monocrystalline	
Temperature Coefficient Isc	%/K		0.03
Temperature Coefficient Voc	%/K		-0.30
Temperature Coefficient Pmax	%/K		-0.38
NOCT (± 2°C)	°C		45
Operating temperature	°C		-40/+85
Mechanical Properties and Components		SILFAB SLA Monocrystalline	
Module weight (± 1 kg)	kg		19
Dimensions (H x L x D; ± 1mm)	mm		1650 x 990 x 38
Maximum surface load (wind/snow)*	N/m ²		2400 Pa upward / 5400 Pa downward
Hail impact resistance			± 25 mm at 83 km/h
Cells			60 - Si monocrystalline - 4 or 5 busbar - 156.75 x 156.75 mm
Glass			3.2 mm high transmittance, tempered, antireflective coating
Backsheet			Multilayer polyester-based
Frame			Anodized Al (Black)
Bypass diodes			3 diodes-45V/12A, IP67/IP68
Cables and connectors (See installation manual)			1200 mm ø 5.7 mm (4 mm ²), MC4 compatible
Warranties		SILFAB SLA Monocrystalline	
Module product workmanship warranty			25 years
Linear power performance guarantee			30 years
Certifications		SILFAB SLA Monocrystalline	
Product		ULC ORD C1703, UL 1703, IEC 61215, IEC 61730-1 and IEC 61730-2 Certified. FSEC and CECC listed. IEC 62716 Ammonia Corrosion, IEC 61701:2011 Salt Mist Corrosion Certified	
Factory		UL Fire Rating: Type 2 (Type 1 on request) ISO9001:2015	

*Please refer to the Safety and Installation Manual for mounting specifications.
▲ Warning: Read the installation and User Manual before handling, installing and operating modules.

Third-party generated pan files from Fraunhofer-Institute for Solar Energy Systems ISE are available for download at: www.silfabsolar.com/downloads



Modules Per Pallet: 26
Pallets Per Truck: 36
Modules Per Truck: 936



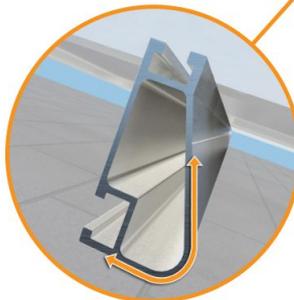
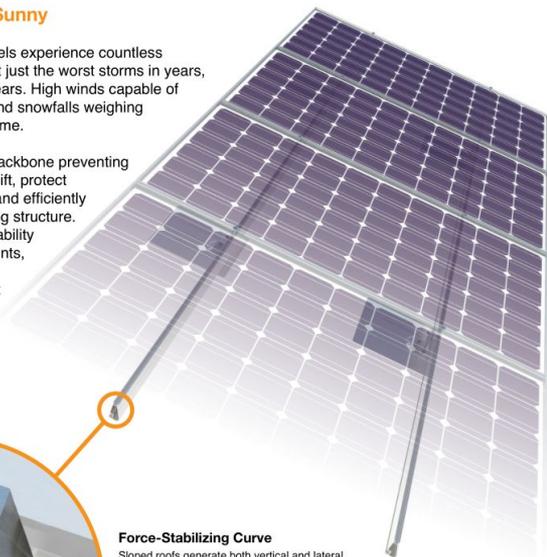
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Solar Is Not Always Sunny

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 6000-series 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 & black 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 up to 12 feet 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' 5"	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						



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.

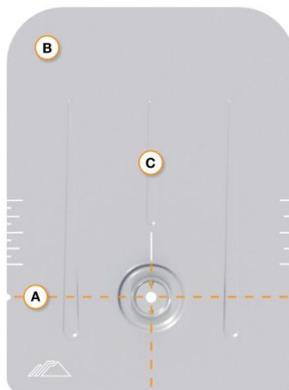
Single Socket Size

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.

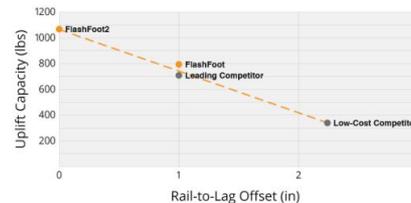
C Reinforcement Ribs

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

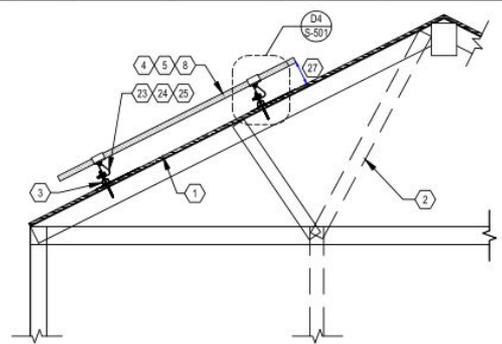
Designed and Certified for Compliance with the International Building Code & ASCE/SEI-7.

Water Seal Ratings

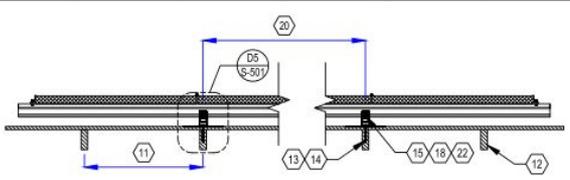
Water Sealing Tested to UL 441 Section 27 "Rain Test" and TAS 100-95 "Wind Driven Rain Test" by Intertek. Ratings applicable for composition shingle roofs having slopes between 2:12 and 12:12.

UL 2703

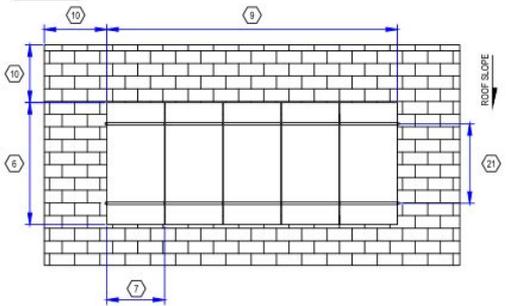
Conforms to UL 2703 Mechanical and Bonding Requirements. See Flush Mount Install Manual for full ratings.



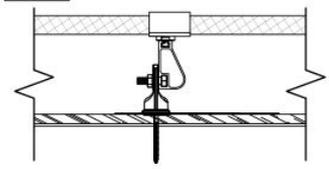
D1 RACKING DETAIL (TRANSVERSE)
NOT TO SCALE



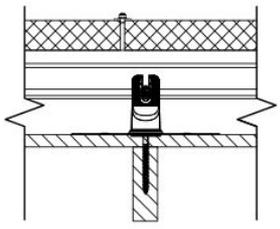
D2 RACKING DETAIL (LONGITUDINAL)
NOT TO SCALE



D3 RACKING DETAIL (TOP)
NOT TO SCALE



D4 DETAIL (TRANSVERSE)
NOT TO SCALE



D5 DETAIL (LONGITUDINAL)
NOT TO SCALE

GENERAL NOTES

1. FIELD VERIFY ALL MEASUREMENTS

SHEET KEYNOTES

1. ROOF MATERIAL: ASPHALT SHINGLE
2. ROOF STRUCTURE: TRUSS
3. ATTACHMENT TYPE: IRONRIDGE FLASHFOOT2
4. MODULE MANUFACTURER: SILAFB
5. MODULE MODEL: SLA310M
6. MODULE LENGTH: 64.96"
7. MODULE WIDTH: 38.98"
8. MODULE WEIGHT: 41.89 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: 2X4 NOMINAL
13. LAG BOLT DIAMETER: BOLT/SCREW SUPPLIED WITH RACKING
14. LAG BOLT EMBEDMENT: PER RACKING MFG SPECIFICATIONS
15. TOTAL # OF ATTACHMENTS: 58
16. TOTAL AREA: 562.7 SQ. FT.
17. TOTAL WEIGHT: 1536.25 LBS.
18. WEIGHT PER ATTACHMENT: 26.49 LBS.
19. DISTRIBUTED LOAD: 2.73 PSF.
20. MAX. HORIZONTAL STANDOFF: 48 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.

Installed Weight of PV System on Asphalt Shingle Roof

PV Module 60 Cell Framed Solar Module

Weight = 44lbs

Area = 39" x 65" nominal (17.6 Sq. Ft.)

Mounting Rail (Extruded Aluminum) Weight = 1.03/ lf

There are 80" of rail per module = 6.87 Lbs

Module + Rail = 50.87 lbs over 17.6 Sq. Ft. = ***2.89 lbs/ Sq. Ft.**

Foot Spacing is 32" O.C. Across Panel Width with 2 rows per module.

Typical layout provides 13 feet on one rail for each 10 modules in a row.

This provides for an average of 1.3 feet/ Module/rail x 2 rails = 2.6 feet/module

Module + Rail weight distributed per mounting foot = 58.87 lbs /2.6 feet = 19.56 lbs / mtg foot.

Composite Shingle Roofing = 3.8 PSF

½" Ext Ply Sheathing = 1 PSF

Installed Solar Array = **2.89 #/ Sf ***

Total Load = 7.69#/sf

IRC-Table R802.5.1(3) Rafter Spans for Common Lumber Species.

13. Systems using CAMO module clamps shall be installed with the following guidance:

- 1) For single module installations ("orphan modules") using modules with a length greater than 67.5", CAMO clamps shall not be installed in regions that experience ground snow loads of 70psf and greater; such scenarios are shown by asterisks in the applicable span table.
- 2) CAMO will function within a module's design load ratings. Be sure the specific module being used with CAMO is listed in IronRidge's installation manual, is suitable for the environmental conditions of a particular project, and meets the dimensional requirements shown in the figure below.

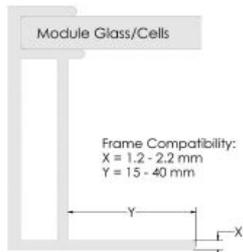


Figure 1: CAMO Module Frame Dimensional Requirements

The span tables provided in this letter are certified based on the structural performance of IronRidge XR Rails only with no consideration of the structural adequacy of the chosen roof attachments, PV modules, or the underlying roof supporting members. It is the responsibility of the installer or system designer to verify the structural capacity and adequacy of the aforementioned system components in regards to the applied or resultant loads of any chosen array configuration.

Sincerely,




Date:
2018.09.18
09:52:26 -07'00'

Gang Xuan, PE, LEED AP
Senior Structural Engineer



Attn: Corey Geiger, COO, IronRidge Inc.

Date: September 7th, 2018

Re: Structural Certification and Span Tables for IronRidge Flush Mount System

This letter addresses the structural performance and code compliance of IronRidge's Flush Mount System. The Flush Mount System is a proprietary rooftop mounting system used to support photovoltaic (PV) modules installed in portrait or landscape orientation and set parallel to the underlying roof surface. PV modules are supported by extruded aluminum XR Rails and secured to the rails with IronRidge mounting clamps. The XR Rails are side mounted to a selected roof attachment with 3/8" stainless steel bonding hardware and then attached directly to the roof structure or to a stanchion that is fastened to the underlying roof structure. Assembly details of a typical Flush Mount installation and its core components are shown in Exhibit EX-0015.

The IronRidge Flush Mount System is designed and certified to the structural requirements of the reference standards listed below, for the load conditions and configurations tabulated in the attached span tables.

- ASCE/SEI 7-10 Minimum Design Loads for Buildings and Other Structures (ASCE 7-10)
- 2015 International Building Code (IBC-2015)
- 2015 Michigan Building Code
- 2015 Aluminum Design Manual (ADM-2015)

The tables included in this letter provide the maximum allowable spans of XR Rails in the Flush Mount System for the respective loads and configurations listed, covering wind exposure categories B, C, & D, roof zones 1, 2 & 3, and roof slopes from 0° to 45°. The span tables are applicable provided that the following conditions are met:

1. Span is the distance between two adjacent roof attachment points (measured at the center of the attachment fastener)
2. The underlying roof pitch, measured between roof surface and horizontal plane, is 45° or less.
3. The *mean roof height*, defined as the average of the roof eave height and the roof ridge height measured from grade, does not exceed 30 feet.
4. Module length shall not exceed the listed maximum dimension provided for the respective span table and module width shall not exceed 48".
5. All Flush Mount components shall be installed in a professional workmanlike manner per IronRidge's *Flush Mount installation manual* and other applicable standards for general roof construction practice.

The parameters and adjustments allowed in the span tables are defined as the following:

1. The Flush Mount System is designed as a Risk Category II structure as defined by ASCE 7-10 Chart 1.5-1.
2. When designing with a roof slope not listed in the span tables, but no greater than 45°, the lesser of the two span values listed immediately below and above the desired slope shall be used. For instance, if one is designing to a roof slope of 12°, use the lesser of the two span values associated with 10° and 15°.
3. The wind speed selection shall conform to ASCE 7-10 Fig. 26.5-1A (Risk Category II wind) and any state & local county/city amendments to the IBC. No special wind topographic features are included in the span tables and the topographic coefficient (Kzt) is taken as 1.0.
4. The snow load used in the span tables is the *ground snow* and shall conform to ASCE 7-10 Fig. 7-1. If a more restrictive snow load is imposed by a local building code/amendment to the IBC, such snow load requirement shall also be complied with. If the local jurisdiction specified snow load is in the format of a flat roof snow load, it shall first be converted to a ground snow following the local building code/amendment before the application of the attached span tables. No special snow conditions are considered including unbalanced, drifting, sliding or ponding snow. Snow load conditions presented in the span tables do not include buildings which are intentionally kept below freezing, kept just above freezing, or unheated.
5. The span tables reflect the ASCE 7 prescribed earthquake loads with the maximum magnitudes being:
 - 1) For ground snow no greater than 42psf: $S_s \leq 2.0g$ for Site Class A, B, C, or D.
 - 2) For ground snow greater than 42psf: $S_s \leq 1.0g$ for Site Class A, B, C, or D.
 - 3) For ground snow between 42 and 65psf: $S_s \leq 1.5g$ for Site Class A, B, C, or D.
6. Roof zone size and definition conforms to ASCE 7-10 Fig. 30.4-2A.
7. Allowable span length in the charts may be multiplied by a factor of 1.08 if the rails are continuous over a minimum of three spans.
8. An array to roof clearance of 2" minimum must be provided.
9. The maximum cantilever length measured from the rail end to the nearest attachment point shall not exceed 40% of the *allowable span* provided for the respective load & configuration condition from the span tables.
10. No rail splices are allowed in the cantilever, outer 2/3 of end spans, or middle 1/3 of interior spans.
11. For shaded cells of the span tables, UFO Mid Clamps shall not be installed closer than 20" to the shaded cell's associated Roof Zone.
12. When a roof attachment listed in IronRidge's Flush Mount *installation manual* is considered, the span values provided in this letter can be adjusted using IronRidge's online Design Assistant by checking the capacity of the selected roof attachment against the reaction forces provided in Design Assistant.

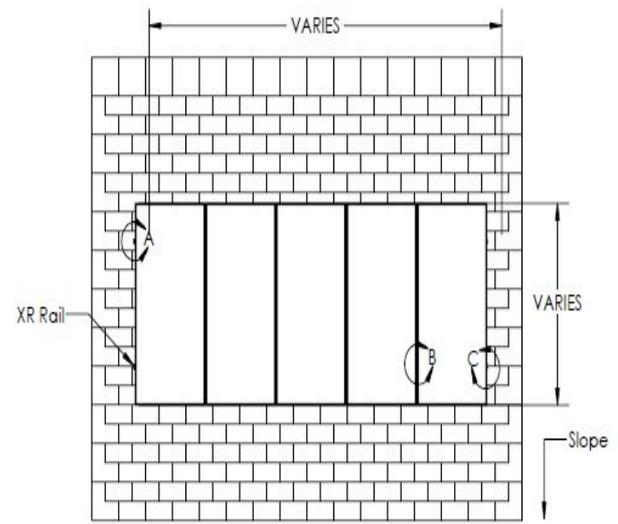


Rail: XR100		Flush Mount System Span Table (inches) Portrait Installation (Maximum Module Length 67.5") Exposure B																				
		Ground Snow: 0 psf			10 psf			20 psf			30 psf			40 psf			50 psf			60 psf		
Wind Speed (mph)	Roof Slope (degs.)	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3	Zone 1	Zone 2	Zone 3
110	5	118	104	83	98	98	83	83	83	83	81	81	81	73	73	73	67	67	67	61	61	61
	10	116	104	84	96	96	84	81	81	81	80	80	80	70	70	70	63	63	63	57	57	57
	15	115	103	83	95	95	83	80	80	80	76	76	76	67	67	67	60	60	60	54	54	54
	20	113	101	82	95	95	82	80	80	80	76	76	76	67	67	67	60	60	60	55	55	55
	25	112	100	82	95	95	82	81	81	81	77	77	77	68	68	68	61	61	61	56	56	56
	30	110	110	110	96	96	96	82	82	82	79	79	79	70	70	70	63	63	63	57	57	57
	35	109	109	109	97	97	97	85	85	85	83	83	83	74	74	74	67	67	67	61	61	61
	40	108	108	108	99	99	99	88	88	88	87	87	87	78	78	78	71	71	71	66	66	66
	45	107	107	107	102	102	102	92	92	92	91	91	91	85	85	85	78	78	78	72	72	72
115	5	118	99	79	98	98	79	83	83	79	81	81	79	73	73	73	67	67	67	61	61	61
	10	116	100	80	96	96	80	81	81	80	80	80	80	70	70	70	63	63	63	57	57	57
	15	115	98	80	95	95	80	80	80	80	76	76	76	67	67	67	60	60	60	54	54	54
	20	113	97	79	95	95	79	80	80	79	76	76	76	67	67	67	60	60	60	55	55	55
	25	112	96	78	95	95	78	81	81	78	77	77	77	68	68	68	61	61	61	56	56	56
	30	107	107	107	94	94	94	82	82	82	79	79	79	70	70	70	63	63	63	57	57	57
	35	106	106	106	96	96	96	84	84	84	83	83	83	74	74	74	67	67	67	61	61	61
	40	105	105	105	98	98	98	87	87	87	86	86	86	78	78	78	71	71	71	66	66	66
45	105	104	104	100	100	100	90	90	90	90	90	90	84	84	84	78	78	78	72	72	72	
120	5	118	95	76	98	95	76	83	83	76	81	81	76	73	73	73	67	67	67	61	61	61
	10	116	96	77	96	96	77	81	81	77	80	80	77	70	70	70	63	63	63	57	57	57
	15	115	94	76	95	94	76	80	80	76	76	76	76	67	67	67	60	60	60	54	54	54
	20	113	93	76	95	93	76	80	80	76	76	76	76	67	67	67	60	60	60	55	55	55
	25	112	92	75	95	92	75	81	81	75	77	77	75	68	68	68	61	61	61	56	56	56
	30	104	104	104	93	93	93	81	81	81	79	79	79	70	70	70	63	63	63	57	57	57
	35	103	103	103	94	94	94	83	83	83	82	82	82	74	74	74	67	67	67	61	61	61
	40	103	102	102	96	96	96	86	86	86	85	85	85	78	78	78	71	71	71	66	66	66
	45	102	101	101	98	98	98	89	89	89	88	88	88	83	83	83	78	78	78	72	72	72

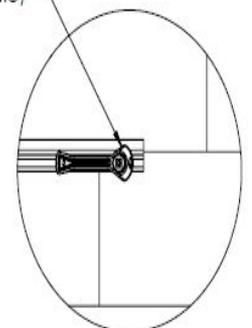
Project: Lancaster 10 kW Solar Project



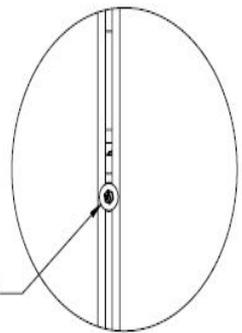
Module Mounting System
 Bonding End Clamp (CAMO)



PLAN VIEW

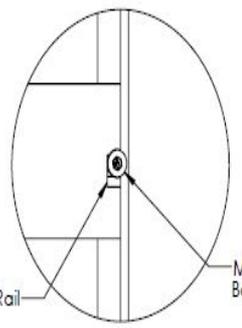


DETAIL C
 (Module Removed For Clarity)



DETAIL B

Module Mounting System
 Bonding Mid Clamp



DETAIL A

Module Mounting System
 Bonding End Clamp (UFO)

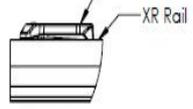


FLUSH MOUNT SYSTEM

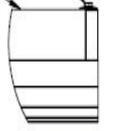
SEE	DWG. NO.	EX-0015
SCALE: NTS	WEIGHT: N/A	SHEET 1 OF 3

Module Mounting System
 Bonding End Clamp (CAMO)

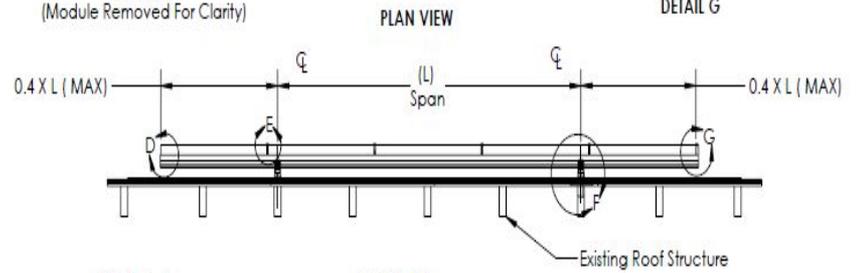
Module Mounting System
 Bonding End Clamp (UFO)



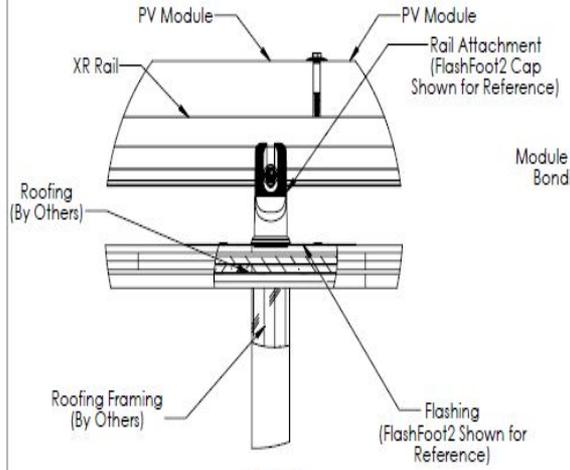
DETAIL D
 (Module Removed For Clarity)



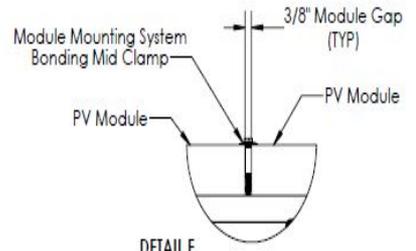
DETAIL G



PLAN VIEW



DETAIL F



DETAIL E

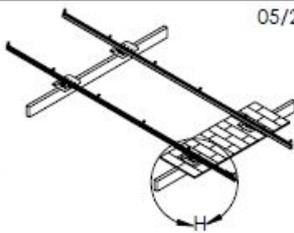
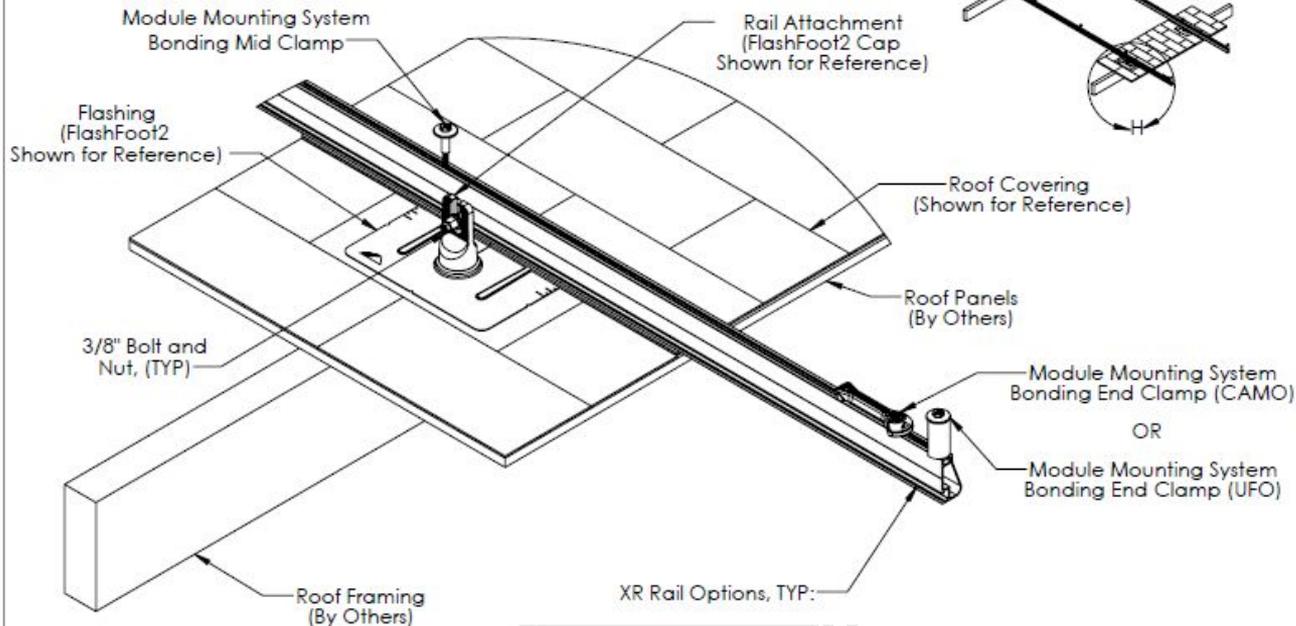


FLUSH MOUNT SYSTEM

SEE	DWG. NO.	EX-0015
SCALE: NTS	WEIGHT: N/A	SHEET 2 OF 3

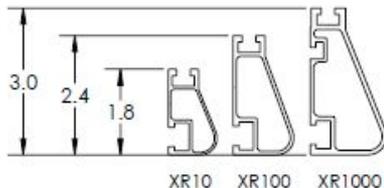
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05/25/2018



DETAIL H

XR Rail Options, TYP:



IRONRIDGE

FLUSH MOUNT SYSTEM

SEE	DWG. NO.	EX-0015
SCALE: NTS	WEIGHT: N/A	SHEET 3 OF 3