

MONTGOMERY COUNTY HISTORIC PRESERVATION COMMISSION
STAFF REPORT

Address:	3939 Washington Street, Kensington	Meeting Date:	10/23/2024
Resource:	Secondary Resource Kensington Historic District	Report Date:	10/16/2024
Applicant:	Timothy Stelzig Margie Reaver, Celestial Solar (Agent)	Public Notice:	10/9/2024
Review:	HAWP	Tax Credit:	No
Permit Number:	1080544	Staff:	Laura DiPasquale
PROPOSAL:	Solar panels		

STAFF RECOMMENDATION

Staff recommends that the HPC **approve** the HAWP application.

ARCHITECTURAL DESCRIPTION

SIGNIFICANCE: Secondary Resource within the Kensington Historic District
STYLE: Colonial Revival
DATE: c. 1935

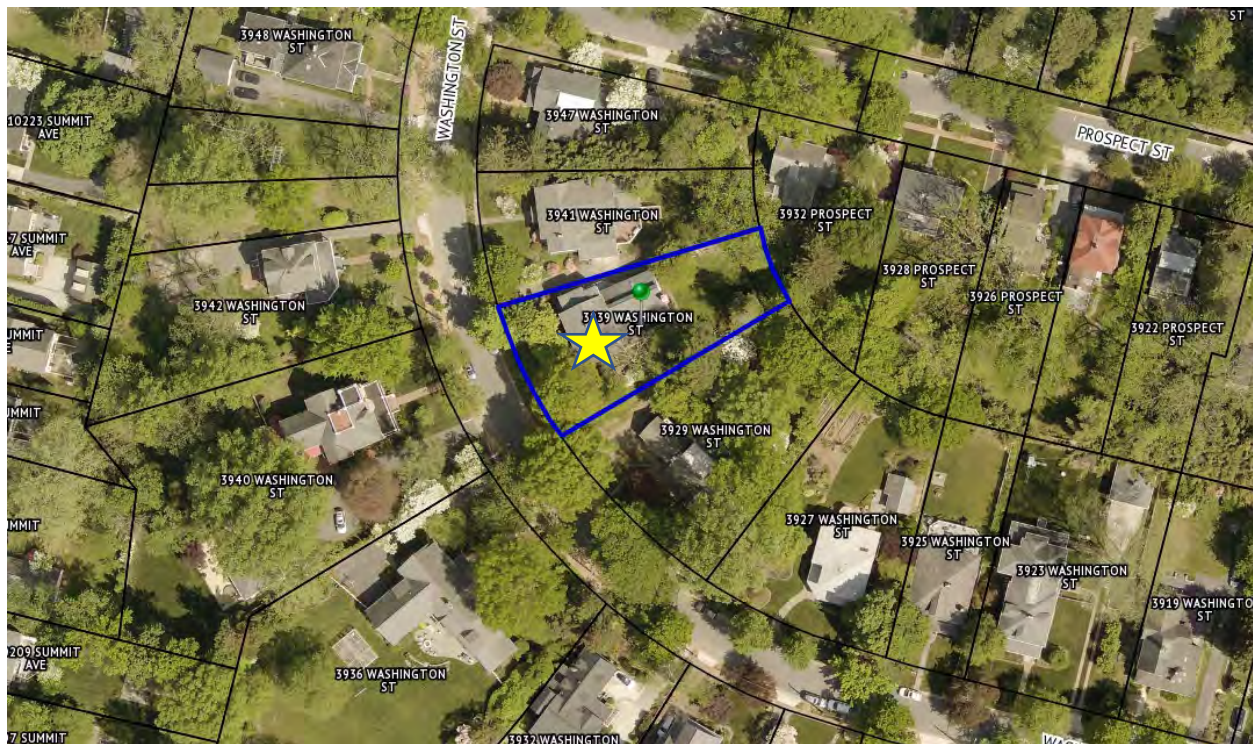


Figure 1: Aerial view of 3939 Washington Street, Kensington, within the Kensington Historic District.

PROPOSAL

The applicant proposes to install 30 rooftop solar panels in three arrays. Twelve panels are proposed on the southwest-facing front roof slope, ten on the rear main roof slope, and eight on the southeast-facing slope of the rear addition. The Rec Alpha Pure-Rx Series panels will be flush-mounted to the asphalt shingle roof with Quickmount Halo Ultra Grip mounts no more than ten inches above the roof surface and run parallel to the roof slope. The load center and disconnect switch are proposed on the southeast corner of the front façade, adjacent to the existing meter and electrical panel.

Roof	Roof Area	Panel Area	Percentage
A	603	181	30.02%
B	498	223	44.78%
C	498	268	53.82%


 MONTGOMERY COUNTY SETBACK
 COMPLIES WITH IRC, ISEP 2021 AND NEC 2023 CODES





Firm License Number: 09-55266
 VSE Project Number: U1910.0420.241
Under Maryland Engineering law, between the existing and proposed loading, from the load service area system connections to the existing framing. The design of the racking system, racking connections, and all other structural aspects of the design are by others. Mechanical, electrical, and all other non-structural aspects of the design are by others. Mechanical & by others, unless otherwise by their license.



09/11/2024

PANEL SIZE:
68" X 47.4"
SCALE: 1" TO 8'

Figure 2: Proposed solar installation.

REC ALPHA[®] PURE-RX SERIES

DATASHEET



GENERAL DATA	
Cell Type	88 half-cut bifacial REC heterojunction cells, with gapless technology
Glass	3.2 mm solar glass with anti-reflective surface treatment in accordance with EN12150
Backsheet	Highly resistant polymer (Black)
Frame	Anodized aluminum (Black)
Junction Box	4-part, 4 bypass diodes, IP68 rated, in accordance with IEC 62790
Connectors	Stäubli MC4 PV-KBT4/KST4 (4 mm ²) in accordance with IEC 62852, IP68 only when connected
Cable	4 mm ² solar cable, 1.7 m + 1.7 m in accordance with EN50618
Dimensions	1728 x 1205 x 30 mm (2.08 m ²)
Weight	22.7 kg
Origin	Made in Singapore

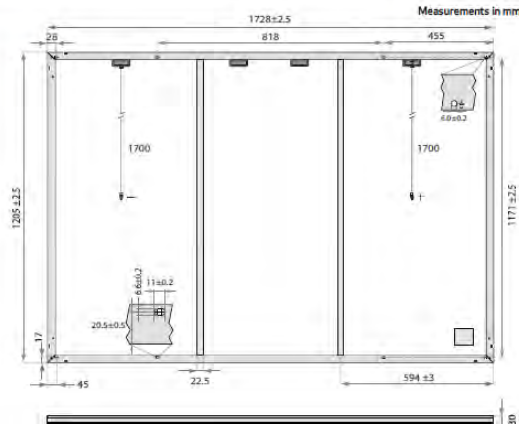


Figure 3: Specifications for the solar panels.

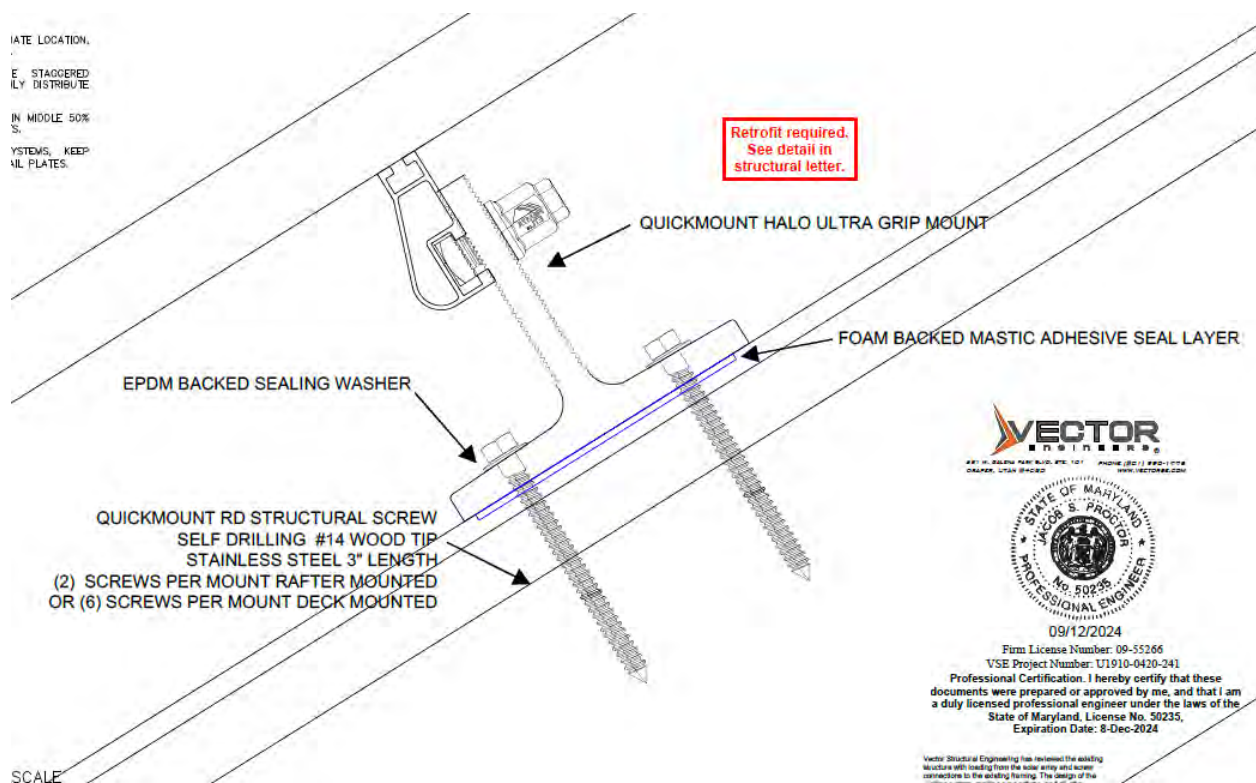


Figure 4: Installation details for the Quickmount system.

APPLICABLE GUIDELINES

When reviewing alterations and new construction within the Kensington Historic District several documents are to be utilized as guidelines to assist the Commission in developing their decision. These documents include the *Approved & Adopted Amendment to the Master Plan for Historic Preservation: Kensington Historic District, Atlas #31/6 (Amendment)*; *Vision of Kensington: A Long-Range Preservation Plan (Vision)*; *Montgomery County Code Chapter 24A (Chapter 24A)*; and the *Secretary of*

the Interior's Standards for Rehabilitation (Standards). The pertinent information in these documents is outlined below.

Approved & Adopted Amendment to the Master Plan for Historic Preservation: Kensington Historic District, Atlas #31/6

According to the Guidelines, a Historic District as identified...shall consist of the entire area represented by all of the historic resources with their appurtenances and environmental setting. Non-historic properties within the boundaries of the Historic District are also subject to regulation, as they are considered appurtenances and part of the environmental setting of the historic resources of the District.

In regard to the properties identified as secondary resources--that is visually contributing, but non-historic structures or vacant land within the Kensington District--the Ordinance requires the Preservation Commission to be lenient in its judgment of plans for contemporary structures or for plans involving new construction unless such plans would seriously impair the historic or architectural value of surrounding resources or impair the character of the district.

Vision of Kensington: A Long-Range Preservation Plan

The HPC formally adopted the planning study, *Vision of Kensington: A Long-Range Preservation Plan*, and is directed by the Executive Regulations, which were approved by the County Council, to use this plan when considering changes and alterations to the Kensington Historic District. The goal of this preservation plan as noted on Page 1 "was to establish a sound database of information from, which to produce a document that would serve the HPC, M-NCPPC, their staff and the community in wrestling with the protection of historic districts amidst the pressures of life in the 21st century." The plan provides a specific physical description of the district as it is; an analysis of character-defining features of the district; a discussion of the challenges facing the district; and a discussion of proposed strategies for maintaining the character of the district while allowing for appropriate growth and change.

Montgomery County Code Chapter 24A-8

- (b) The commission shall instruct the director to issue a permit, or issue a permit subject to such conditions as are found to be necessary to ensure conformity with the purposes and requirements of this chapter, if it finds that:
 - (1) The proposal will not substantially alter the exterior features of an historic site or historic resource within an historic district; or
 - (2) The proposal is compatible in character and nature with the historical, archeological, architectural or cultural features of the historic site or the historic district in which an historic resource is located and would not be detrimental thereto or to the achievement of the purposes of this chapter; or
 - (3) The proposal would enhance or aid in the protection, preservation and public or private utilization of the historic site or historic resource located within an historic district in a manner compatible with the historical, archeological, architectural or cultural value of the historic site or historic district in which an historic resource is located; or
 - (4) The proposal is necessary in order that unsafe conditions or health hazards be remedied; or
- (d) In the case of an application for work on an historic resource located within an historic district, the commission shall be lenient in its judgment of plans for structures of little historical or design significance or for plans involving new construction, unless such plans would seriously impair the historic or architectural value of surrounding historic resources or would impair the character of the historic district. (Ord. No. 9-4, § 1; Ord. No. 11-59.)

Secretary of the Interior's Standards for Rehabilitation

The Secretary of the Interior defines rehabilitation as “the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features, which convey its historical, cultural, or architectural values.” The Standards read are as follows:

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.

Historic Preservation Commission Policy No. 20-01: Addressing Emergency Climate Mobilization Through The Installation of Roof-Mounted Solar Panels

Now, THEREFORE:

WHEREAS, Historic Area Work Permit decisions are guided by the criteria in Section 24A, The Secretary of the Interior's Standards for Rehabilitation, and pertinent guidance from applicable master plan amendments and/or site or district-specific studies;

WHEREAS, The Secretary of the Interior's Standards for Rehabilitation as interpreted by the National Park Service limit the placement of rooftop solar panels under Standards 2, 9, and 10 to less conspicuous locations;

WHEREAS, the County Council has established a Climate Emergency;

WHEREAS, the Historic Preservation is a body established by the County Executive and County Council;

WHEREAS, Section 24-8(b)(6) states, “In balancing the interest of the public in preserving the historic site or historic resource located within an historic district, with the interests of the public from the use and benefit of the alternative proposal, the general public welfare is better served by granting the permit;”

WHEREAS, the widespread use of solar panels, both for hot water and for electricity production, will reduce greenhouse gases in the county, in accordance with the aims of the Emergency Climate Mobilization resolution (Resolution No.: 18-974), it shall be the policy of the Historic Preservation Commission that:

1. The preferred locations for solar panel installation(s) on a designated historic site or an historic resource located within an historic district is a) on the rear of the property, b) on non-historic building additions, c) on accessory structures, or d) in ground-mounted arrays;
2. If it is not feasible to install solar panels in one of the identified preferred locations due to resource orientation or other site limitations; and,

3. The roof is determined to be neither architecturally significant, nor a character-defining feature of the resource, nor is it a slate or tile roof, that unless it can be demonstrated that the solar array will be installed without damaging the historic character of the resource or historic fabric; then
4. The public welfare is better served by approving a Historic Area Work Permit for solar panels on all visible side or front roof slopes under Section 24A-8(b)(6).
5. A Historic Area Work Permit (HAWP) is required for all work referenced in this policy.

STAFF DISCUSSION

Staff supports the installation of the proposed 30 solar panels and recommends approval.

As a Secondary resource in the Kensington Historic District, the *Amendment* states that the HPC should be lenient in its judgment of plans unless such plans would seriously impair the character of the district. Staff acknowledges that the 12-panel front array will be visible from the public right-of-way, but does not find the installation of the panels and associated equipment will affect the surrounding streetscape or landscape and impair the character of the historic district. The applicant will install the panels in a symmetrical pattern that follows the shape of the roof and will minimize their visual impact.

According to the shade map and corresponding statement provided by the applicant, the panels on the front roof plane will produce more kilowatt-hours (kWh) per panel than the rear slope or rear addition roof planes, contributing approximately 45% of the total production, with each panel estimated to produce 475 kWh, as opposed to 336 kWh on the rear slope and 380 kWh on the southeast-facing slope of the rear addition. The applicant's statement explains that the home had an annual usage of roughly 12,351 kWh in 2023 and the proposed system is estimated to have 12,765 kWh in annual production (see and attached justification).



Figure 5: Front elevation of 2929 Washington Avenue (Google Streetview, July 2022).

Staff finds that, in accordance with the *Standards*, the proposed work will not destroy the historic materials, features, or spatial relationships that characterize the property and will not be detrimental to the existing streetscape, satisfying *Standards 2 and 9*, if removed in the future, the essential form and integrity of the property would be unimpaired, satisfying *Standard 10*.

Shade Map



Figure 6: Shade map for 3939 Washington Street.

The HPC and staff also utilize *Policy Guidance #20-01: Solar Technology* as the baseline for their review and to articulate their findings in the review of solar technology. The most preferred location for solar systems is a freestanding array in the rear yard, but this location is not feasible at the subject property due to the size of the lot and existing tree canopy. The second preferred location is a roof-mounted array on an accessory or non-historic building. The subject property does not contain any accessory or non-historic buildings. The third preferred panel location is on non-historic additions of the main building. Panels are proposed on the southeast-facing slope of the subject property's non-historic rear addition, constructed in 1989,¹ but not on the northwest-facing roof, which was dismissed owing to poor orientation and shading. Staff notes that the southeast-facing slope of the rear addition may be able to accommodate additional panels.

In accordance with the Policy, the asphalt gable roof has been determined to be neither architecturally significant nor a character-defining feature of the resource, and it is not a slate or tile roof, per the Policy, the public welfare is better served by approving a Historic Area Work Permit for solar panels on all visible side or front roof slopes in accordance with Chapter 24A-8(b)(6) of the County Code.

Four Primary resources are located within the viewshed of the panels. These include properties at 3948 (200 feet northwest), 3942 (100 feet northwest), 3940 (50 feet southwest) and 3932 Washington Street

¹ HAWP application for construction of a rear addition and garage, approved by the HPC in January 1989: https://mcatlas.org/tiles/06_HistoricPreservation_PhotoArchives/Padlock/HAR60640004/Box026/HAWP%201-89_Kensington_3939%20Washington%20St_01-06-1989.pdf

(185 feet southeast). Staff maintains that the panels will not have a detrimental impact to the character of the district as a whole and will have no visual impact to these Outstanding resources.



Figure 7: Location of Primary resources (denoted with yellow stars) within the viewshed of the proposed solar panels at 3939 Washington Street (outlined in blue).

After full and fair consideration of the applicant's submission, staff finds the proposal is consistent with the Criteria for Issuance in Chapter 24A-8(b), (1), (2), and (d), having found the proposal is consistent with the *Secretary of the Interior's Standards for Rehabilitation #2, 9 and 10*, the *Vision of Kensington: A Long-Range Preservation Plan*, and the HPC's Policy No. 20-01 as outlined above.

STAFF RECOMMENDATION

Staff recommends that the Commission **approve** the HAWP application under the Criteria for Issuance in Chapter 24A-8(b)(1), (2), and (6) and Chapter 24A-8(d), having found that the proposal will not substantially alter the exterior features of the historic resource and is compatible in character with the purposes of Chapter 24A;

the *Vision of Kensington: A Long-Range Preservation Plan*;

and with the *Secretary of the Interior's Standards for Rehabilitation # 2, 9, and 10*;

and with the *Historic Preservation Commission Policy No. 20-01: Addressing Emergency Climate*

Mobilization Through The Installation of Roof-Mounted Solar Panels;

and with the general condition that the applicant shall present an electronic set of drawings, if applicable, to HPC staff for review and stamping prior to submission for the Montgomery County Department of Permitting Services (DPS) building permits;

and with the general condition that final project design details, not specifically delineated by the Commission, shall be approved by HPC staff or brought back to the HPC as a revised HAWP application at staff's discretion;

and with the general condition that the applicant shall notify the HPC staff if they propose to make **any alterations** to the approved plans. Once the work is completed the applicant will contact the staff person assigned to this application at 301-495-2167 or laura.dipasquale@montgomeryplanning.org to schedule a follow-up site visit.



APPLICATION FOR HISTORIC AREA WORK PERMIT
HISTORIC PRESERVATION COMMISSION
301.563.3400

FOR STAFF ONLY:
HAWP# _____
DATE ASSIGNED _____

APPLICANT:

Name: _____ E-mail: _____
Address: _____ City: _____ Zip: _____
Daytime Phone: _____ Tax Account No.: _____

AGENT/CONTACT (if applicable):

Name: _____ E-mail: _____
Address: _____ City: _____ Zip: _____
Daytime Phone: _____ Contractor Registration No.: _____

LOCATION OF BUILDING/PREMISE: MIHP # of Historic Property _____

Is the Property Located within an Historic District? __Yes/District Name _____
__No/Individual Site Name _____

Is there an Historic Preservation/Land Trust/Environmental Easement on the Property? If YES, include a map of the easement, and documentation from the Easement Holder supporting this application.

Are other Planning and/or Hearing Examiner Approvals /Reviews Required as part of this Application? (Conditional Use, Variance, Record Plat, etc.?) If YES, include information on these reviews as supplemental information.

Building Number: _____ Street: _____

Town/City: _____ Nearest Cross Street: _____

Lot: _____ Block: _____ Subdivision: _____ Parcel: _____

TYPE OF WORK PROPOSED: See the checklist on Page 4 to verify that all supporting items for proposed work are submitted with this application. Incomplete Applications will not be accepted for review. Check all that apply:

- Checklist of work types: New Construction, Addition, Demolition, Grading/Excavation, Deck/Porch, Fence, Hardscape/Landscape, Roof, Shed/Garage/Accessory Structure, Solar, Tree removal/planting, Window/Door, Other.

I hereby certify that I have the authority to make the foregoing application, that the application is correct and accurate and that the construction will comply with plans reviewed and approved by all necessary agencies and hereby acknowledge and accept this to be a condition for the issuance of this permit.

Signature of owner or authorized agent _____ Date _____

HAWP APPLICATION: MAILING ADDRESSES FOR NOTIFYING
[Owner, Owner's Agent, Adjacent and Confronting Property Owners]

Owner's mailing address	Owner's Agent's mailing address
Adjacent and confronting Property Owners mailing addresses	

Description of Property: Please describe the building and surrounding environment. Include information on significant structures, landscape features, or other significant features of the property:

Description of Work Proposed: Please give an overview of the work to be undertaken:

Work Item 1: _____	
Description of Current Condition:	Proposed Work:

Work Item 2: _____	
Description of Current Condition:	Proposed Work:

Work Item 3: _____	
Description of Current Condition:	Proposed Work:

**HISTORIC AREA WORK PERMIT
CHECKLIST OF
APPLICATION REQUIREMENTS**

	Required Attachments						
Proposed Work	I. Written Description	2. Site Plan	3. Plans/ Elevations	4. Material Specifications	5. Photographs	6. Tree Survey	7. Property Owner Addresses
New Construction	*	*	*	*	*	*	*
Additions/ Alterations	*	*	*	*	*	*	*
Demolition	*	*	*		*		*
Deck/Porch	*	*	*	*	*	*	*
Fence/Wall	*	*	*	*	*	*	*
Driveway/ Parking Area	*	*		*	*	*	*
Grading/Exc avation/Land scaing	*	*		*	*	*	*
Tree Removal	*	*		*	*	*	*
Siding/ Roof Changes	*	*	*	*	*		*
Window/ Door Changes	*	*	*	*	*		*
Masonry Repair/ Repoint	*	*	*	*	*		*
Signs	*	*	*	*	*		*

REC ALPHA[®] PURE-RX SERIES

DATASHEET

470 W_P
22.6% EFFICIENCY
226 W/M²



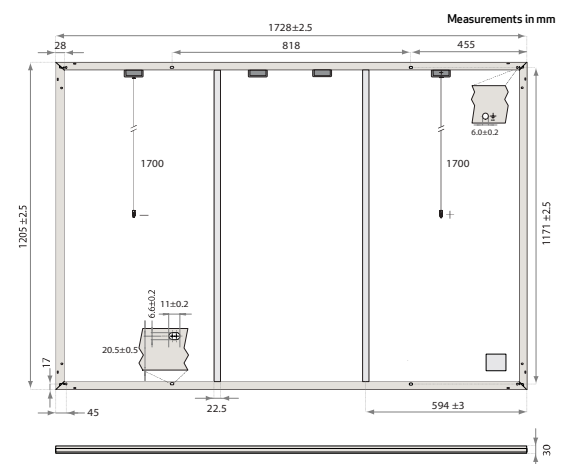
9 A MODULE CURRENT
COMPATIBLE WITH MLPE



EXPERIENCE
α
PERFORMANCE

REC ALPHA[®] PURE-RX SERIES DATASHEET

GENERAL DATA	
Cell Type	88 half-cut bifacial REC heterojunction cells, with gapless technology
Glass	3.2 mm solar glass with anti-reflective surface treatment in accordance with EN12150
Backsheet	Highly resistant polymer (Black)
Frame	Anodized aluminum (Black)
Junction Box	4-part, 4 bypass diodes, IP68 rated, in accordance with IEC 62790
Connectors	Stäubli MC4 PV-KBT4/KST4 (4 mm ²) in accordance with IEC 62852, IP68 only when connected
Cable	4 mm ² solar cable, 1.7 m + 1.7 m in accordance with EN50618
Dimensions	1728 x 1205 x 30 mm (2.08 m ²)
Weight	22.7 kg
Origin	Made in Singapore



ELECTRICAL DATA		PRODUCT CODE*: RECxxxAA Pure-RX		
Power Output - P _{MAX} (W _p)	450	460	470	
Watt Class Sorting - (W)	0/+10	0/+10	0/+10	
Nominal Power Voltage - V _{MPP} (V)	54.3	54.9	55.4	
Nominal Power Current - I _{MPP} (A)	8.29	8.38	8.49	
Open Circuit Voltage - V _{OC} (V)	65.1	65.3	65.6	
Short Circuit Current - I _{SC} (A)	8.81	8.88	8.95	
Power Density (W/m ²)	216	221	226	
Panel Efficiency (%)	21.6	22.1	22.6	

STC

Power Output - P _{MAX} (W _p)	343	350	358
Nominal Power Voltage - V _{MPP} (V)	51.2	51.7	52.2
Nominal Power Current - I _{MPP} (A)	6.70	6.77	6.86
Open Circuit Voltage - V _{OC} (V)	61.3	61.6	61.8
Short Circuit Current - I _{SC} (A)	7.11	7.17	7.23

NMOT

Values at standard test conditions (STC: air mass AM1.5, irradiance 1000 W/m², temperature 25°C) based on a production spread with a tolerance of P_{MAX}, V_{OC} & I_{SC} +3% within one watt class. Nominal module operating temperature (NMOT: air mass AM1.5, irradiance 800 W/m², temperature 20°C, windspeed 1 m/s). * Where xxx indicates the nominal power class (P_{MAX}) at STC above.

MAXIMUM RATINGS*	
Operational Temperature	-40 °C - 85 °C
System Voltage	1000 V
Maximum Test Load (front)	+7000 Pa (713 kg/m ²)
Maximum Test Load (rear)	-4000 Pa (407 kg/m ²)
Max Series Fuse Rating	25 A
Max Reverse Current	25 A

TEMPERATURE RATINGS*	
Nominal Module Operating Temperature	44 °C ± 2°C
Temperature coefficient of P _{MAX}	-0.24% / °C
Temperature coefficient of V _{OC}	-0.24% / °C
Temperature coefficient of I _{SC}	0.04% / °C

DELIVERY INFORMATION	
Panels per Pallet	33
Panels per 40 ft GP/high cube container	594 (18 Pallets)
Panels per 13.6 m truck	660 (20 Pallets)

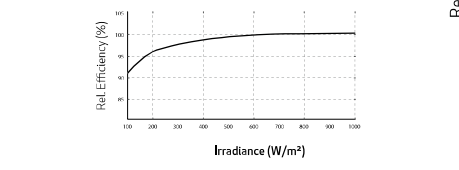
Available from:

CERTIFICATIONS	
IEC 61215:2021; IEC 61730:2016; UL 61730	
ISO 11925-2 Ignitability (EN 13501-1 Class E)	
IEC 62716 Ammonia Resistance	
IEC 61701 Salt Mist (SM6)	
IEC 61215:2016 Hailstone (35 mm)	
UL 61730 Fire Type 2	
ISO 14001; ISO 9001; IEC 45001; IEC 62941	



	WARRANTY		
	Standard	REC ProTrust	
Installed by an REC Certified Professional	No	Yes	Yes
System Size	All	<25 kW	25-500 kW
Product Warranty (yrs)	20	25	25
Power Warranty (yrs)	25	25	25
Labor Warranty (yrs)	0	25	10
Power in Year 1	98%	98%	98%
Annual Degradation	0.25%	0.25%	0.25%
Power in Year 25	92%	92%	92%

LOW LIGHT BEHAVIOUR
Typical low irradiance performance of module at STC.



Founded in 1996, REC Group is an international pioneering solar energy company dedicated to empowering consumers with clean, affordable solar power. As Solar's Most Trusted, REC is committed to high quality, innovation, and a low carbon footprint in the solar materials and solar panels it manufactures. Headquartered in Norway with operational headquarters in Singapore, REC also has regional hubs in North America, Europe, and Asia-Pacific.

REC Solar PTE. LTD.
20 Tuas South Ave. 14
Singapore 637312
post@recgroup.com
www.recgroup.com



Specifications subject to change without notice. Ref: PM-DS-12-06-Rev-4.4.5.2024



IQ8X Microinverter

Our newest IQ8 Series Microinverters are the industry's first microgrid-forming*, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC), which enables the microinverter to operate in grid-tied or off-grid mode. This chip is built using advanced 55-nm technology with high-speed digital logic and superfast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.

IQ8X Microinverter is the latest addition to this family, designed to support PV modules with high output DC voltage and cell counts, such as 80-half-cut cells, 88-half-cut cells and 96-cells.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the IQ Battery, IQ Gateway, and the Enphase App monitoring and analysis software.



IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



Connect PV modules quickly and easily to the IQ8 Series Microinverters with integrated MC4 connectors.



IQ8 Series Microinverters are UL Listed as PV rapid shutdown equipment and conform with regulations when installed according to the manufacturer's instructions.

*Meets UL 1741 only when installed with IQ System Controller 2 or 3.

Easy to install

- Lightweight and compact with plug-and-play connectors
- Power line communication (PLC) between components
- Faster installation with simple two-wire cabling

High productivity and reliability

- Produces power even when the grid is down*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) and IEEE 1547:2018 (UL 1741-SB)

NOTE:

- IQ8 Series Microinverters cannot be mixed with previous generations of Enphase microinverters (IQ7 Series, IQ6 Series, and so on) in the same system.
- IQ Microinverters ship with default settings that meet North America's IEEE 1547 interconnection standard requirements. Region-specific adjustments may be requested by an Authority Having Jurisdiction (AHJ) or utility representative, according to the IEEE 1547 interconnection standard. An IQ Gateway is required to make these changes during installation.

IQ8X Microinverter

INPUT DATA (DC)	UNIT	IQ8X-80-M-US
Commonly used module pairings ¹	W	320-540
Module compatibility	—	To meet compatibility, PV modules must be within the following maximum input DC voltage and maximum module I _{sc} . Module compatibility can be checked at https://enphase.com/installers/microinverters/calculator
MPPT voltage range	V	43-60
Operating range	V	25-79.5
Minimum and maximum start voltage	V	30-79.5
Maximum input DC voltage	V	79.5
Maximum continuous operating DC current	A	10
Maximum input DC short-circuit current	A	16
Maximum module I _{sc}	A	13
Overvoltage class DC port	—	II
DC port backfeed current	mA	0
PV array configuration	—	Ungrounded array; no additional DC side protection required; AC side protection requires a maximum of 20 A per branch circuit

OUTPUT DATA (AC)	UNIT	IQ8X-80-M-US @240 VAC	IQ8X-80-M-US @208 VAC
Peak output power	VA	384	366
Maximum continuous output power	VA	380	360
Nominal grid voltage (L-L)	V	240, split-phase (L-L), 180°	208, single-phase (L-L), 120° ⁴
Minimum and maximum grid voltage ²	V	211-264	183-229
Max. continuous output current	A	1.58	1.73
Nominal frequency	Hz	60	
Extended frequency range	Hz	47-68	
AC short circuit fault current over three cycles	Arms	2.70	
Maximum units per 20 A (L-L) branch circuit ³	—	10	9
Total harmonic distortion	%	<5	
Overvoltage class AC port	—	III	
AC port backfeed current	mA	18	
Power factor setting	—	1.0	
Grid-tied power factor (adjustable)	—	0.85 leading ... 0.85 lagging	
Peak efficiency	%	97.3	97.0
CEC weighted efficiency	%	96.5	96.5
Nighttime power consumption	mW	26	12

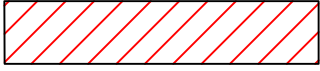
MECHANICAL DATA	
Ambient temperature range	-40°C to 65°C (-40°F to 149°F)
Relative humidity range	4% to 100% (condensing)
DC connector type	Stäubli MC4
Dimensions (H x W x D); Weight	212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2"); 1.1 kg (2.43 lb)
Cooling	Natural convection - no fans
Approved for wet locations; Pollution degree	Yes; PD3
Enclosure	Class II double-insulated, corrosion-resistant polymeric enclosure
Environmental category; UV exposure rating	NEMA Type 6; outdoor

COMPLIANCE	
Certifications	CA Rule 21 (UL 1741-SA), UL 62109-1, IEEE 1547:2018 (UL 1741-SB), FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01. This product is UL Listed as PV rapid shutdown equipment and conforms with NEC 2014, NEC 2017, NEC 2020, and NEC 2023 section 690.12 and C22.1-2018 Rule 64-218 rapid shutdown of PV systems for AC and DC conductors when installed according to the manufacturer's instructions.

(1) No enforced DC/AC ratio.
 (2) Nominal voltage range can be extended beyond nominal if required by the utility.
 (3) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.
 (4) IQ8X is not certified for use with Enphase Three Phase Network Protection Relay (NPR-3P-208-NA) and is, therefore, designed for single-phase operation only. Check with the local utility requirements if you wish to install single-phase inverters across three phases.

Revision history

REVISION	DATE	DESCRIPTION
DSH-00185-3.0	February 2024	Updated the information about IEEE 1547 interconnection standard requirements.
DSH-00185-2.0	November 2023	Preliminary release - public.
DSH-00185-1.0	October 2023	Preliminary release.



MONTGOMERY COUNTY SETBACK

Roof	Roof Area	Panel Area	Percentage
A	603	181	30.02%
B	498	223	44.78%
C	498	268	53.82%



THE INSTALLATION OF SOLAR ARRAYS AND PHOTOVOLTAIC POWER SYSTEMS SHALL BE IN ACCORDANCE WITH THE MOST RECENT NATIONAL ELCTRIC AND BUILDING CODES AND STANDARDS, AS AMENDED BY LOCAL JURISDICTION.

System Summary

Equipment:

30 – REC Alpha 460W Solar Module
30 – Enphase IQ8X Microinverters
13.8kW DC System Size

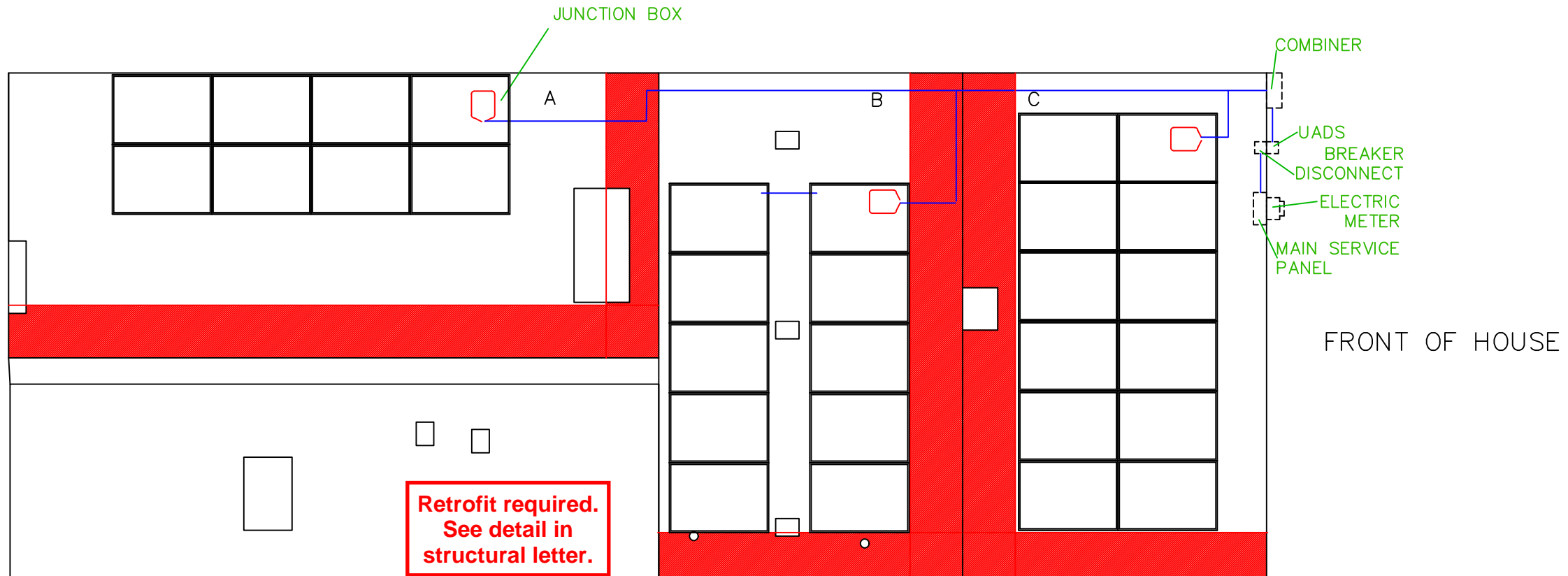
Roof Details:

- A: Tilt: 9 Degrees
Azimuth: 155 Degrees
- B: Tilt: 32 Degrees
Azimuth: 65 Degrees
- C: Tilt: 32 Degrees
Azimuth: 247 Degrees

SHEET NO.	SHEET TITLE
PV1.0	COVER AND SITE PLAN
PV2.0	STRUCTURAL
PV3.0	ELECTRICAL DETAIL
PV4.0	CALCULATION

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COMPLIES WITH IRC, ISEP 2021 AND NEC 2023 CODES



Firm License Number: 09-55266
VSE Project Number: U1910.0420.241
Vector Structural Engineering has reviewed the existing structure with loading from the solar array and screw connections to the existing framing. The design of the racking system, racking connections, and all other structural is by others. Mechanical, architectural, and all other nonstructural aspects of the design are by others. Electrical is by others, unless stamped by Dean Levorsen.



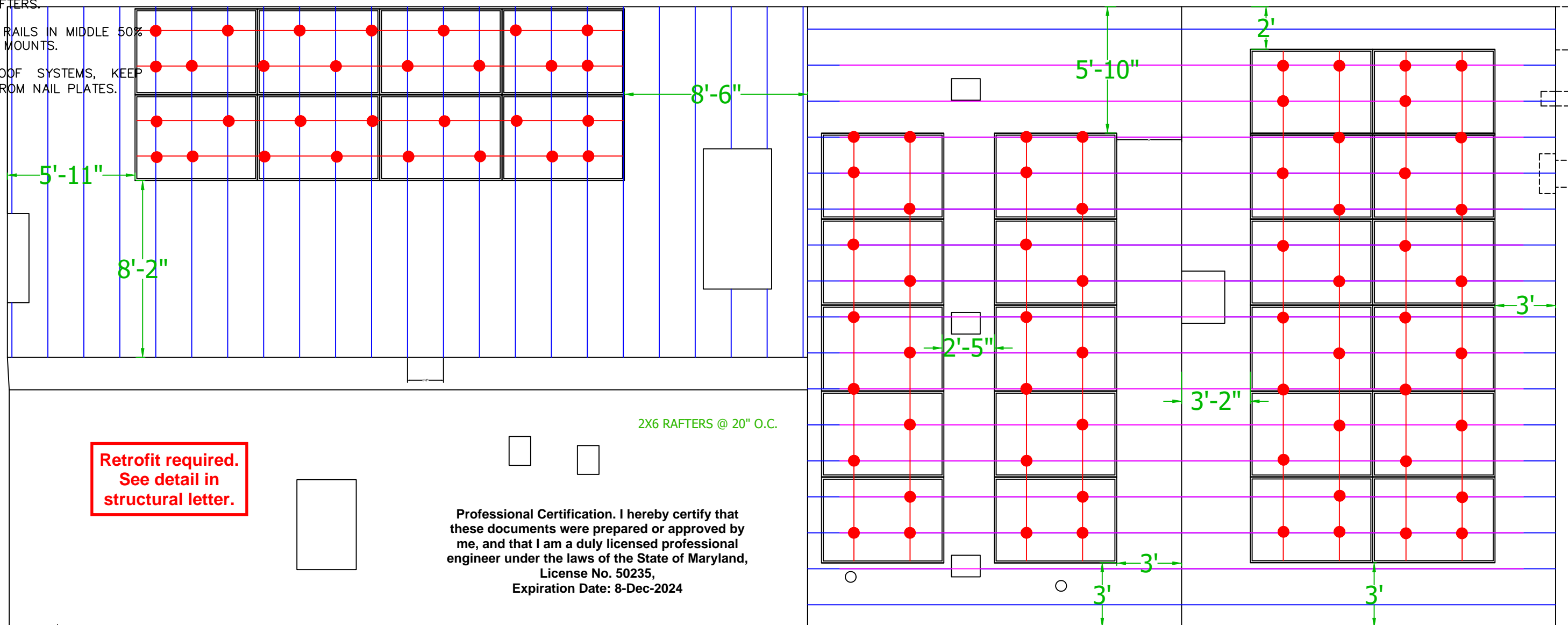
09/11/2024

PANEL SIZE:
68" X 47.4"
SCALE: 1" TO 8'

Celestial Solar Innovations, LLC	Date:	7/31/2024	Cover and Site Plan	Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 50235, Expiration Date: 8-Dec-2024		
Frederick, MD 21703 240.409.1148 celestialsolarinnovations.com	Designed By:	River Reichel	Tim Stelzig 3939 Washington Street Kensington, MD 20895			
	Designer Contact:	410.418.5650				
	Revision:	0				
	Jurisdiction:	Montgomery County				

STRUCTURAL NOTES:

1. MOUNTS ARE APPROXIMATE LOCATION, BUT ACCURATELY SPACED.
2. MOUNTS SHOULD BE STAGGERED WHEN POSSIBLE TO EVENLY DISTRIBUTE LOAD AMONGST RAFTERS.
3. DO NOT SPLICE RAILS IN MIDDLE 50% OF SPAN BETWEEN MOUNTS.
4. ON TRUSS ROOF SYSTEMS, KEEP ATTACHMENTS 6' FROM NAIL PLATES.



**Retrofit required.
See detail in
structural letter.**

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 50235, Expiration Date: 8-Dec-2024

2X6 RAFTERS @ 20" O.C.



Firm License Number: 09-55266
VSE Project Number: U1910-0420-241

Vector Structural Engineering has reviewed the existing structure with loading from the solar array and screw connections to the existing framing. The design of the racking system, racking connections, and all other structural is by others. Mechanical, architectural, and all other nonstructural aspects of the design are by others. Electrical is by others, unless stamped by Dean Levorsen.



09/12/2024

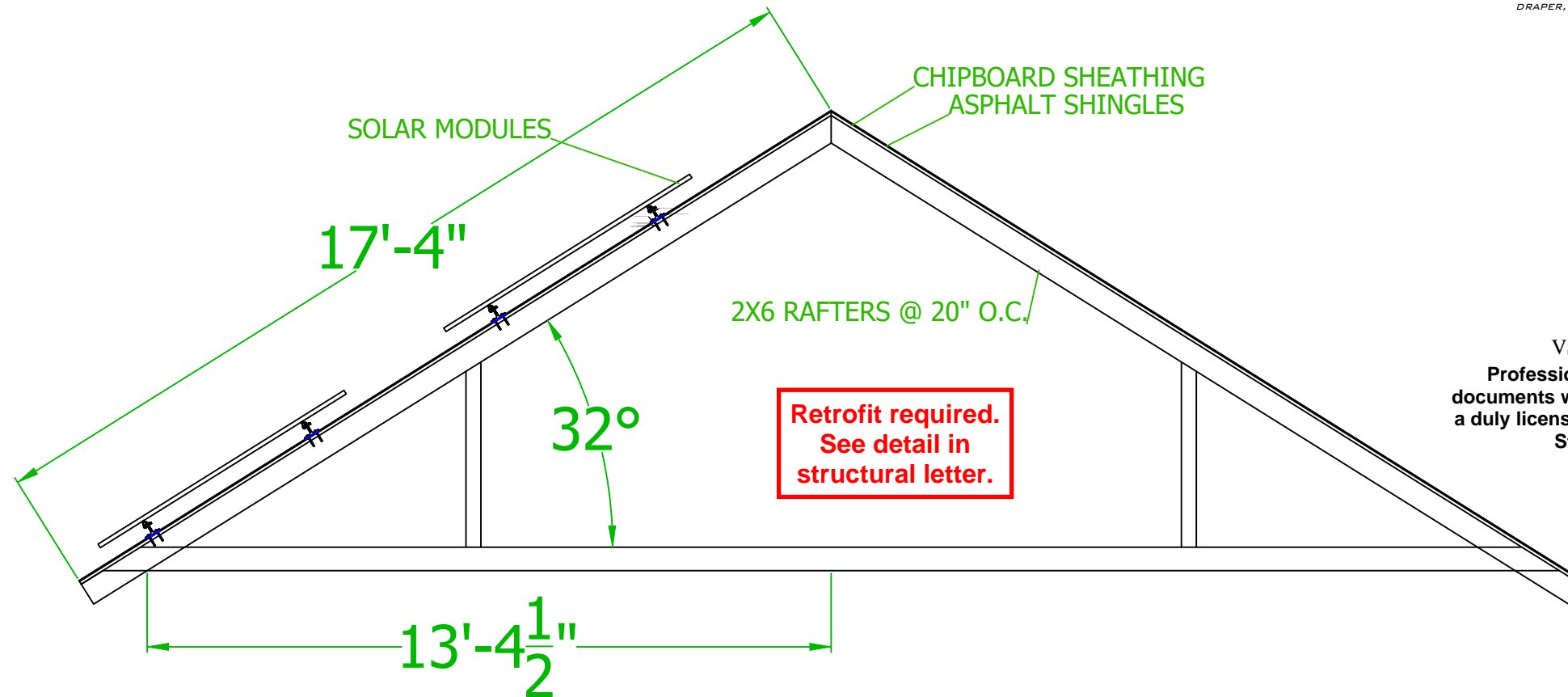
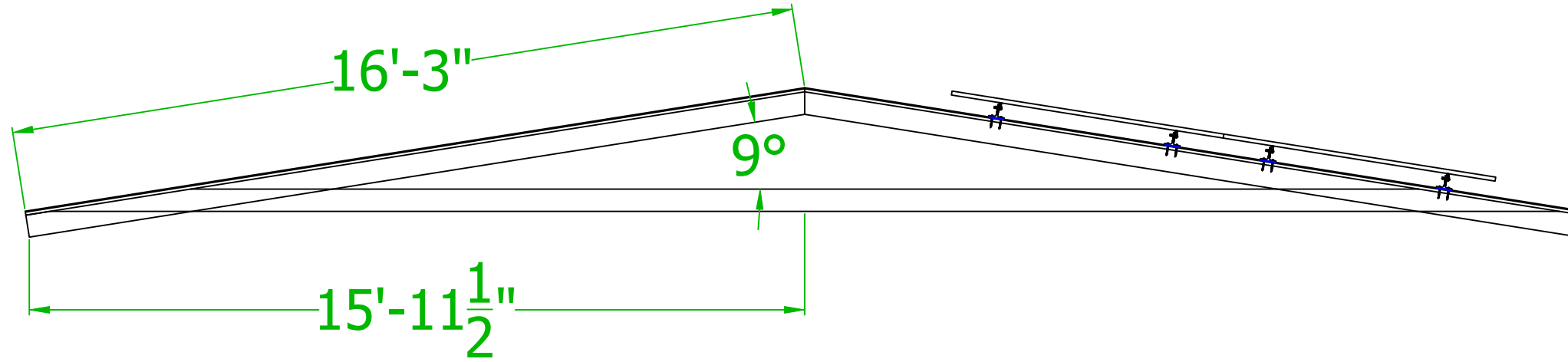
SCALE: 1" TO 8'

Celestial Solar Innovations, LLC	Date:	8/30/24	Structural
Frederick, MD 21703 240.409.1148 celestialsolarinnovations.com	Designed By:	Aline Thompson	Tim Stelzig 3939 Washington Street Kensington, MD 20895
	Designer Contact:	410.418.5650	
	Revision:	1	
	Jurisdiction:	Montgomery County	

PV
2.0

STRUCTURAL NOTES:

1. MOUNTS ARE APPROXIMATE LOCATION, BUT ACCURATELY SPACED.
2. MOUNTS SHOULD BE STAGGERED WHEN POSSIBLE TO EVENLY DISTRIBUTE LOAD AMONGST RAFTERS.
3. DO NOT SPLICE RAILS IN MIDDLE 50% OF SPAN BETWEEN MOUNTS.
4. ON TRUSS ROOF SYSTEMS, KEEP ATTACHMENTS 6' FROM NAIL PLATES.



09/12/2024

Firm License Number: 09-55266
VSE Project Number: U1910-0420-241

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 50235, Expiration Date: 8-Dec-2024

Vector Structural Engineering has reviewed the existing structure with loading from the solar array and screw connections to the existing framing. The design of the racking system, racking connections, and all other structural is by others. Mechanical, architectural, and all other nonstructural aspects of the design are by others. Electrical is by others, unless stamped by Dean Levorsen.

SCALE: 1" TO 3'

Celestial Solar Innovations, LLC	Date:	7/31/2024	Structural
Frederick, MD 21703 240.409.1148 celestialsolarinnovations.com	Designed By:	River Reichel	Tim Stelzig 3939 Washington Street Kensington, MD 20895
	Designer Contact:	410.418.5650	
	Revision:	0	
	Jurisdiction:	Montgomery County	

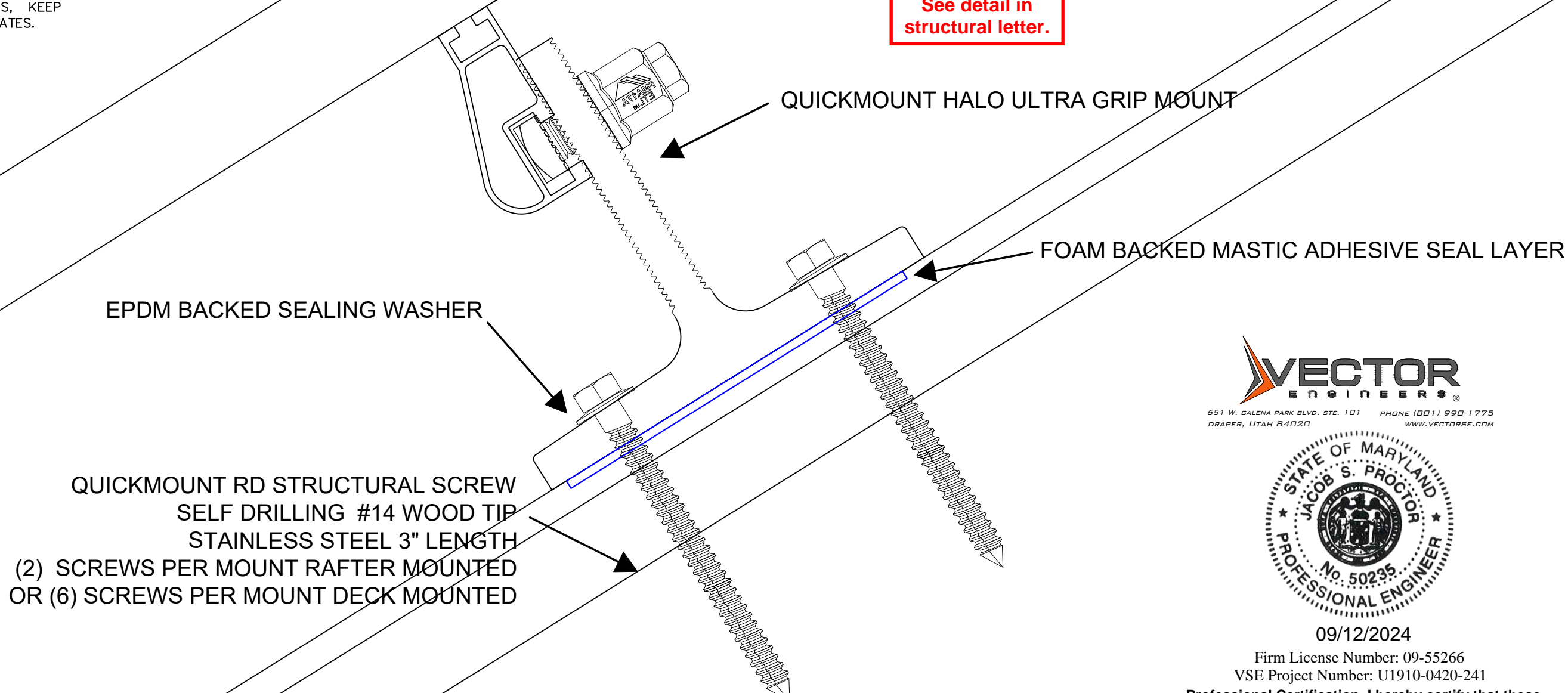


PV
2.1

STRUCTURAL NOTES:

1. MOUNTS ARE APPROXIMATE LOCATION, BUT ACCURATELY SPACED.
2. MOUNTS SHOULD BE STAGGERED WHEN POSSIBLE TO EVENLY DISTRIBUTE LOAD AMONGST RAFTERS.
3. DO NOT SPLICE RAILS IN MIDDLE 50% OF SPAN BETWEEN MOUNTS.
4. ON TRUSS ROOF SYSTEMS, KEEP ATTACHMENTS 6' FROM NAIL PLATES.

Retrofit required.
See detail in
structural letter.



09/12/2024

Firm License Number: 09-55266
VSE Project Number: U1910-0420-241

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 50235, Expiration Date: 8-Dec-2024

SCALE: NOT TO SCALE

Celestial Solar Innovations, LLC	Date:	7/31/2024	Structural
Frederick, MD 21703 240.409.1148 celestialsolarinnovations.com	Designed By:	River Reichel	Tim Stelzig 3939 Washington Street Kensington, MD 20895
	Designer Contact:	410.418.5650	
	Revision:	0	
	Jurisdiction:	Montgomery County	

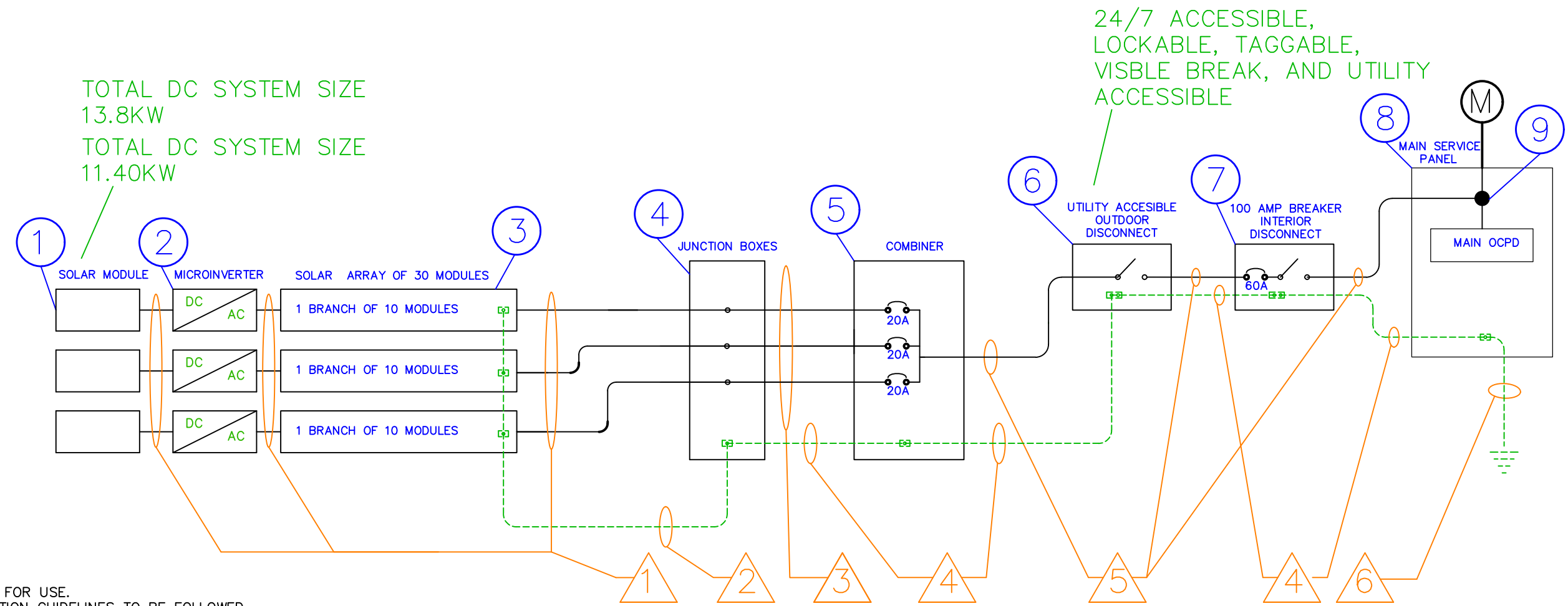
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PV
2.2

Equipment Schedule				
TAG	Item	Quantity	Item Number	Description
1	Solar PV Module	30	REC460	REC Alpha 460W Solar Modules
2	Inverter	30	IQ8X72-2-US	Enphase IQ8X Micro Inverter
3	Solar Array	2		30 Solar Modules in 3 Strings
4	Junction Box	2		NEMA3R
5	Solar Combiner Panel	1		Enphase IQ Combiner 3 w/ Envoy w/(3)20A Breakers
6	Utility Outdoor Disconnect	1		SquareD 60A Two Pole Outdoor Rated Disconnect
7	Interior Breaker Disconnect	1		SquareD 100A Breaker Disconnect w/ 60A Breaker
8	Main Service Panel	1		Cutler Hammer CH 200A 240 VAC Panel w/ 200A Main Breaker
9	Point of Interconnection	1		Insulation Piercing Connectors

TAG	Description or Conductor Type	Cond. Gauge	Number of Conductors	Conduit or Raceway Type	Conduit or Raceway Size
1	USE-2 (MFG Cables & Connectors)	10	6	N/A	
2	Bare Copper Equip Ground (EGC)	8	1	N/A	
3	THHN-2	10	6	EMT	3/4"
4	THHN-2 GROUND	8	1	EMT	3/4"
5	THHN-2	6	3	EMT	3/4"
6	DC Copper Grounding Electrode	6	1	N/A	




TOTAL DC SYSTEM SIZE
13.8KW
TOTAL DC SYSTEM SIZE
11.40KW

ELECTRICAL NOTES:

1. ALL EQUIPMENT IS LISTED FOR USE.
2. NEC AND LOCAL JURISDICTION GUIDELINES TO BE FOLLOWED.
3. ALL LABELS AND MARKING TO FOLLOW ARTICLE 690 (IV.)
4. THE POINT OF CONNECTION COMPLIES WITH CEC/NEC ARTICLE 690.64(B).
5. ALL WIRE, VOLTAGES, AMPERAGES AND EQUIPMENT IS SIZED ACCORDING TO TEMPERATURE DERATING AND LOCATIONS.
6. DISCONNECTS SHALL BE WIRED SO THAT SOLAR DC WIRES ARE ON THE LOAD SIDE AND AC UTILITY WIRE ARE ON THE LINE SIDE.
7. MAXIMUM VOLTAGE DOES NOT EXCEED 600 VDC.
8. ALL MODULES AND RACKING SHALL BE GROUNDED USING EITHER APPROVED STAINLESS STEEL WEEBS OR TIN PLATED DIRECT BURIAL RATED LUGS USING STAINLESS STEEL HARDWARE, STAR WASHERS, AND THREAD FORMING BOLTS.
9. ALL EQUIPMENT SHALL BE GROUNDED, INCLUDING BONDING JUMPERS WHERE NECESSARY ACROSS RAIL SPLICE PLATES TO BOND INDIVIDUAL PIECES OF RAIL.
10. ONLY COPPER (CU) CONDUCTORS SHALL BE USED. STRANDED OR SOLID WITH PROPERLY RATED CONNECTORS.
11. INVERTER(S) CONTAIN A GROUND FAULT DETECTION AND INTERRUPTION DEVICE.
12. ALL EQUATIONS ACCOUNT FOR WORST CASE SCENARIO CONDITIONS.
13. ALL EQUIPMENT IS COMPLIANT WITH NEC 2017 RAPID SHUTDOWN REQUIREMENT PER NEC 690.3

SCALE: NOT TO SCALE

Celestial Solar Innovations, LLC	Date:	7/2/2024	Electrical Detail		PV 3.0
Frederick, MD 21703 240.409.1148 celestialsolarinnovations.com	Designed By:	River Reichel	Tim Stelzig 3939 Washington Street Kensington, MD 20895		
	Designer Contact:	410.418.5650			
	Revision:	0			
	Jurisdiction:	Montgomery County			

DC WIRE SIZE

ISOURCE CIRCUIT [690.8(A)(1)](ISC): $I_{sc} * 1.25$
 OUTPUT CIRCUIT [690.8(A)(2)](ISC): $I_{sc} * 1.25 * \#STRINGS$
 MIN. DC WIRE AMPACITY:
 [690.8(A), 690.8(B), 210.19 (A), 215.2(A), 110.14(C)]
 THE MAXIMUM OF;
 1. $(I_{sc} * 1.25)/(CONDITIONS OF USE)$
 2. $(I_{sc} * 1.25 * 1.25)$
 DERATE WIRES FOR TERMINALS DEPENDING ON TEMP.

AC WIRE SIZE

INVERTER OUTPUT [690.8(A)](ISC): INV. OUTPUT*1.25
 MIN. AC WIRE AMPACITY:
 [690.8(A), 690.8(B), 210.19 (A), 215.2(A), 110.14(C)]
 THE MAXIMUM OF;
 1. (INV. OUTPUT * 1.25)
 2. (INV. OUTPUT)/ CONDITIONS OF USE
 DERATE WIRES FOR TERMINALS DEPENDING ON TEMP.

GROUNDING SIZE

GEC
 NEC 690.47
 Sized per Table 250.66 for AC
 Sized per Table 250.166 for DC
 DC EGG
 NEC 250.122
 Use $1.56 * I_{sc} * \#$ of strings (if applicable)
 AC EGG
 NEC 250.122
 Sized based on OCPD

MAXIMUM SYSTEM VOLTAGE

NEC2008/2011 requires to use manufacturers Coefficient if available.
METHOD A: $V_{oc} * \#$ of modules in series * NEC Coefficient
METHOD B: $\{[(T_{min} \text{ } ^\circ\text{C} - 25 \text{ } ^\circ\text{C}) * V / ^\circ\text{C}] + V_{oc}\} * \#$ of modules in series

120% RULE

NEC 2008: 690.64(B)2
 NEC 2011: 705.12(D)2
 MINIMUM BUSBAR OR CONDUCTOR=
 TOTAL NUMBER OF BREAKERS FEEDING/1.2

OCPD SIZING

MIN DC: $I_{sc} * 156$
 MIN AC: INVERTER OUTPUT * 1.25

VOLTAGE DROP

$(2KID/CM)/VOLTAGE * 100 =$ VOLTAGE DROP %
 K=12.9 FOR COPPER
 I= CURRENT (IMP OR OUTPUT AC)
 D=DISTANCE IN FEET, ONEWAY
 CM=CIRCULAR MILS

PV MODULE RATINGS @ STC (GUIDE SECTION 5)

Module Make	REC	
Module Model	AlphaRX460	
Max Power-Point Current(Imp)	9.51 A	
Max Power-Point Voltage(Vmp)	54.9 V	
Open Circuit Voltage(Voc)	65.3 V	
Short Circuit Current(Isc)	8.88 A	
Max Series Fuse (OCPD)	25 A	
Maximum Power (Pmax)	460 W	
Max Voltage	1000 V	
Voc Temperature COEFF	-0.24 %/ °C	
Number of Panels Per Branch	9,9,8,	
Number of Branches	3	

INVERTER RATINGS

Inverter Make	Enphase	
Inverter Model	IQ8X-80-M-US	
Number of Inverters	26	
Max DC Volt Rating	79.5 V	
Max Power @40°C	330 W	
Nominal AC Voltage	240 V	
Max AC Current	1.58 A	
Max OCPD Rating	30 A	

INTERACTIVE PHOTOVOLTAIC POWER SOURCE

AC OUTPUT CURRENT	41.08 A
NOMINAL AC VOLTAGE	240 V

INVERTER MPPT DC DISCONNECT

PHOTOVOLTAIC SYSTEM DISCONNECT

RATED MPP CURRENT	N/A	A
RATED MPP VOLTAGE	N/A	V
MAX SYSTEM VOLTAGE	N/A	V
MAX CIRCUIT CURRENT	N/A	A

1) LOWEST EXPECTED AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMPERATURE -23 C.

2) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE 32 C.

3) 2005 ASHRAE FUNDAMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 470 C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1 C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 470 C OR LESS (ALL OF UNITED STATES):

a) 12 AWG, 900 C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH I_{sc} OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12 AMP OR SMALLER FUSE.

b) 10 AWG, 900 C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH I_{sc} OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15 AMP OR SMALLER FUSE.

NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9)

1) IF THE UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES X NO N/A

2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES NO N/A X

3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT

4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING (See Guide Section 9)

5) DOES TOTAL SUPPLY BREAKERS COMPLY WITH THE 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES X NO

Celestial Solar Innovations, LLC
 Frederick, MD 21703
 240.409.1148
 celestialsolarinnovations.com

Date:	7/31/2024	Calculation
Designed By:	River Reichel	Tim Stelzig 3939 Washington Street Kensington, MD 20895
Designer Contact:	410.418.5650	
Revision:	0	
Jurisdiction:	Montgomery County	



PV
4.0

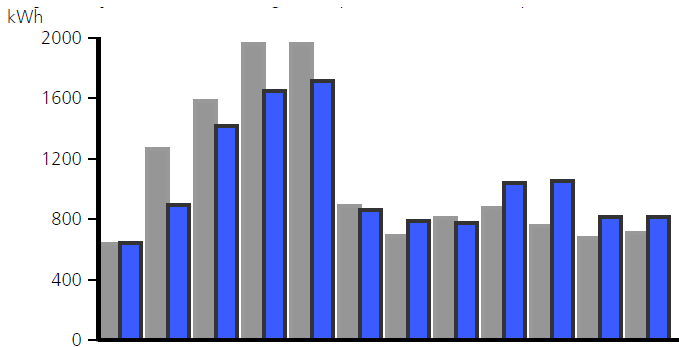


10/03/2024

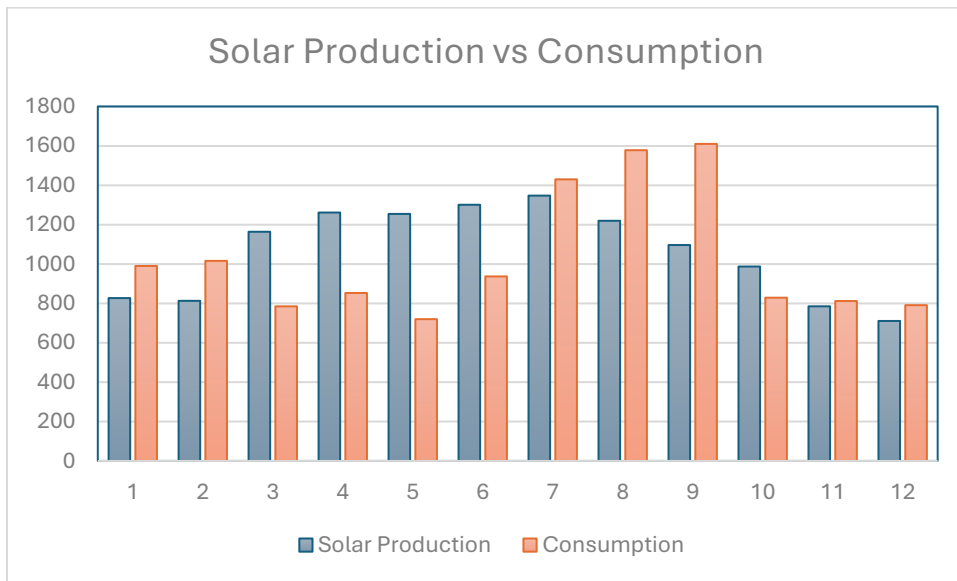
To whom it may concern,

Please consider our request to place a solar array on the front of the Stelzig residence located at 3939 Washington Street Kensington, Maryland, within the Kensington Historical District.

The Stelzig’s residence annual energy consumption is 12,351kWH in 2023, with the expectation that the consumption in 2024 will be greater than 2023.

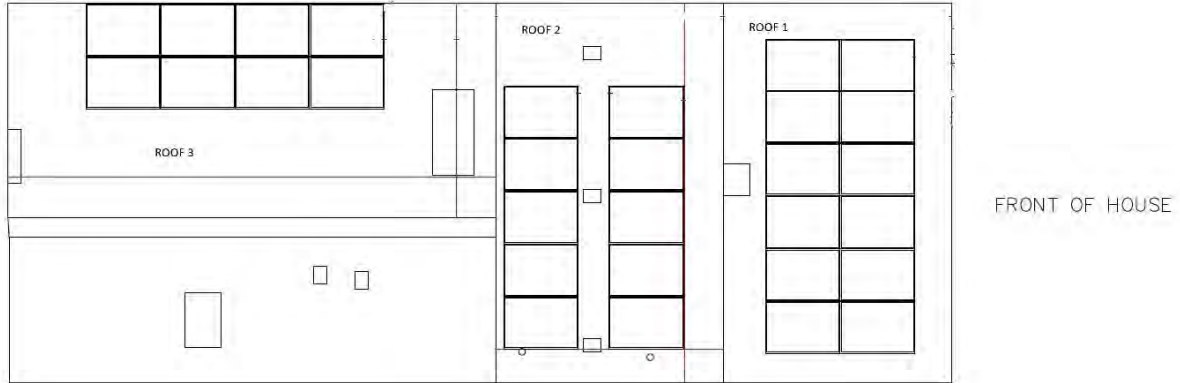


Year 2023 2023 2023 2023 2023 2023 2023 2023 2023 2024 2024 2024 2024
 Month May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr





Justification for the Placement of the panels.



• The panels will vary in production based on their location on the structure, but the estimated production chart was developed for the 32-panel system, comparing all usable areas of the roof and accounting for the effects of shading on each individual surface. No panels were considered for the North facing side roof surface because of poor orientation, heavy shading and existing skylights and plumbing vents. All other roof surfaces that do not face the street, were populated with as many panels as allowable, considering fire code setbacks, roof obstructions and shading.

Production Chart for 3939 Washington Street Using REC 460 Watt Solar Modules

Roof Number	Roof Orientation	Roof Azimuth	Roof Tilt	Shading Derate%	Panel Quantity	Panel Production	Roof Production	Percentage of Total
1	Street Facing	245	32	15	12	475W	5694W	45%
2	Rear Facing	65	32	24	12	336W	4028W	32%
3	Side Facing	155	9	36	8	380W	3043W	23%
Total							12765W	

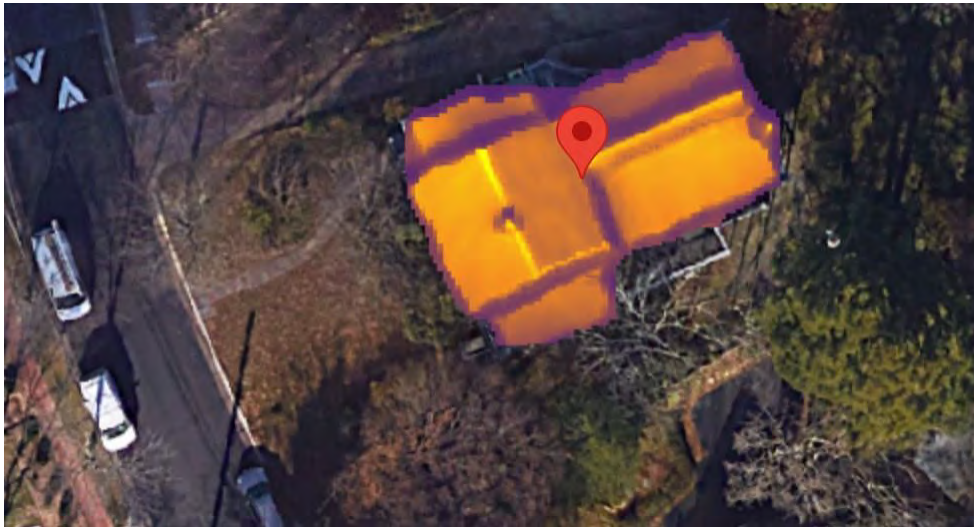
The panels on the front facing section of the home contribute about 45% of the system’s production (5,694 kWh annually), with each individual panel producing 475 Watts, the highest individual and grouped production of any of the roof surfaces.



The rear facing array, with its poor orientation and shading, contributed about 32% of the system's production (4,028 kWh annually), with each individual panel producing 336 Watts.

The side array, with its low slope, contributed about 23% of the system's production (3,043kWh annually), with each individual panel producing 380 Watts.

Shade Map



Thanks for your attention.

Signed by:

Robert Reichel

F7FB2F569C9F424...

10/3/2024

Robert Reichel
Lead Designer & Master Electrician
Celestial Solar Innovations, LLC











