



## HISTORIC PRESERVATION COMMISSION

Marc Elrich  
County Executive

Robert K. Sutton  
Chairman

Date: October 10, 2024

### MEMORANDUM

TO: Rabbiah Sabbakhan, Director  
Department of Permitting Services

FROM: Laura DiPasquale  
Historic Preservation Section  
Maryland-National Capital Park & Planning Commission

SUBJECT: Historic Area Work Permit # 1085271 - Solar panel installation

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The Montgomery County Historic Preservation Commission (HPC) has reviewed the attached application for a Historic Area Work Permit (HAWP). This application was **approved** at the October 9, 2024 HPC meeting.

The HPC staff has reviewed and stamped the attached construction drawings.

THE BUILDING PERMIT FOR THIS PROJECT SHALL BE ISSUED CONDITIONAL UPON ADHERENCE TO THE ABOVE APPROVED HAWP CONDITIONS AND MAY REQUIRE APPROVAL BY DPS OR ANOTHER LOCAL OFFICE BEFORE WORK CAN BEGIN.

Applicant: Dave Groberg; Tina Crouse (Agent)  
Address: 34 Columbia Avenue, Takoma Park

This HAWP approval is subject to the general condition that the applicant will obtain all other applicable Montgomery County or local government agency permits. After the issuance of these permits, the applicant must contact this Historic Preservation Office if any changes to the approved plan are made. Once work is complete the applicant will contact Laura DiPasquale at 301-495-2167 or [laura.dipasquale@montgomeryplanning.org](mailto: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:**

- |   |  |  |
|---|--|--|
| <input type="checkbox"/> New Construction   | <input type="checkbox"/> Deck/Porch          | <input type="checkbox"/> Shed/Garage/Accessory Structure |
| <input type="checkbox"/> Addition           | <input type="checkbox"/> Fence               | <input type="checkbox"/> Solar                           |
| <input type="checkbox"/> Demolition         | <input type="checkbox"/> Hardscape/Landscape | <input type="checkbox"/> Tree removal/planting           |
| <input type="checkbox"/> Grading/Excavation | <input type="checkbox"/> Roof                | <input type="checkbox"/> Window/Door                     |
|   |  | <input type="checkbox"/> 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

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:

**REVIEWED**

*By Laura DiPasquale, M-NCPPC at 8:06 pm, Oct 09, 2024*

APPROVED


Montgomery County

Historic Preservation Commission



Robert H. Mott

# DAVID C. HERNANDEZ, PE

513-418-8812 

4912 Prospect Ave., Blue Ash OH 45242 

davehernandezpe@gmail.com 

DATE: September 3, 2024

RE: 34 Columbia Ave, Takoma Park, MD, 20912

To Whom It May Concern,

As per your request, Exactus Energy has conducted a site assessment of the building at the above address.

PV solar panels are proposed to be installed on roof areas as shown in the submitted plans. The panels are clamped and attached to the roof deck with a rail-less mounting system. The PV system (PV modules, racking, mounting hardware, etc.) shall be installed according to the manufacturer's approved installation specifications. The Engineer of Record and Exactus Energy claim no responsibility for misuse or improper installation.

It was found that the roof systems satisfactorily meet the applicable code standards included in the IBC 2018, IRC 2018 and ASCE 7-16 as well as the design criteria shown below:

Design Criteria:

|                        |           |
|------------------------|-----------|
| Risk Category          | = II      |
| Exposure Category      | = B       |
| Wind speed             | = 115 mph |
| Ground snow load       | = 30 psf  |
| Roof dead load         | = 9 psf   |
| Solar system dead load | = 3 psf   |

Overall, the roof system integrity is adequate to support the PV alteration with no modifications or reinforcements as required per 2018 IEBC Sections 502.4 and 502.5.

This letter was completed in accordance to recognized design standards, professional engineering experience, and judgement. Prior to installation, the on-site contractor must notify Exactus Energy if there are any discrepancies, or damages to the members, that was not addressed in the plan set.

If you have any further questions, please do not hesitate to contact me.

Acknowledged by:

**REVIEWED**

By Laura DiPasquale, M-NCPPC at 8:06 pm, Oct 09, 2024


APPROVED  
Montgomery County  
Historic Preservation Commission



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. 49993, EXP. 10/06/2024. 5024-99-04



# DAVID C. HERNANDEZ, PE

513-418-8812 

4912 Prospect Ave., Blue Ash OH 45242 

davehernandezpe@gmail.com 

| IEBC IMPACT CHECK                        |              |              |      |
|--|--------------|--------------|------|
| Inputs                                   | Roof 1       | Roof 2       | Unit |
| Existing Gravity Loads                   |              |              |      |
| Roof Dead Load (DL <sub>r</sub> )        | 9            | 9            | psf  |
| Roof Live Load (LL <sub>r</sub> )        | 20           | 20           | psf  |
| Roof Snow Load (SL <sub>r</sub> )        | 23.1         | 23.1         | psf  |
| (DL <sub>r</sub> +LL <sub>r</sub> )/Cd = | 23.2         | 23.2         | psf  |
| (DL <sub>r</sub> +SL <sub>r</sub> )/Cd=  | 27.91        | 27.91        | psf  |
| Max. Existing Gravity Load               | <b>27.91</b> | <b>27.91</b> | psf  |
| Proposed Gravity Loads                   |              |              |      |
| Roof Dead Load with PV Panel Load (DL)   | 12           | 12           | psf  |
| Roof Live Load (LL)                      | 0            | 0            | psf  |
| Roof Snow Load (SL)                      | 18.48        | 18.48        | psf  |
| (DL+LL)/Cd =                             | 13.33        | 13.33        | psf  |
| (DL+SL)/Cd=                              | 26.5         | 26.5         | psf  |
| Max. Proposed Gravity Load               | <b>26.5</b>  | <b>26.5</b>  | psf  |
|  |              |              |      |
| % Change =                               | <b>-5.05</b> | <b>-5.05</b> | %    |


*The change in gravity loads for Roofs 1 and 2 after the proposed solar installation is less than 5%, therefore passes the Impact Check.*

APPROVED  
Montgomery County  
Historic Preservation Commission

**REVIEWED**

By Laura DiPasquale, M-NCPPC at 8:06 pm, Oct 09, 2024

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## SEISMIC CHECK

| Breakdown of Loads |     |     |
|--------------------|-----|-----|
| Asphalt Shingles:  | 4   | psf |
| Insulation:        | 1.5 | psf |
| Plywood Sheathing: | 1.5 | psf |
| Rafters:           | 1   | psf |
| Misc:              | 1   | psf |
| Live load:         | 20  | psf |

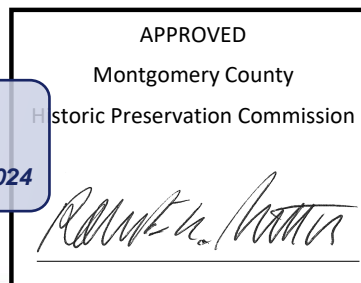
| Existing Roof Seismic Weight              |                   |              |              |
|---|-------------------|--------------|--------------|
| Element                                   | Unit Weight (psf) | Area (Sq.ft) | Weight (lbs) |
| Roof DL                                   | 9                 | 1659.00      | 14931        |
| Exterior Walls                            | 8                 | 3376.64      | 27013.12     |
| Interior Walls                            | 6                 | 3376.64      | 20259.84     |
| Existing Seismic Weight @Roof Level, We = |                   |              | 62203.96     |

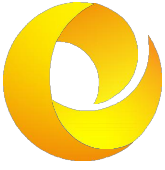
| New PV System Seismic Weight           |                   |              |              |
|--|-------------------|--------------|--------------|
| Element                                | Unit Weight (psf) | Area (Sq.ft) | Weight (lbs) |
| Pv System                              | 3                 | 294.00       | 882.00       |
| Seismic Weight of New PV System, Wpv = |                   |              | 882.00       |

|   |       |              |
|---|-------|--------------|
| % Increase in Lateral (Seismic) Weight @Roof Level Due to PV System Addition, %-increase = $W_{pv} / W_e$ | 1.42% | < 10% - Pass |
|---|-------|--------------|

**REVIEWED**

By Laura DiPasquale, M-NCPPC at 8:07 pm, Oct 09, 2024





Solar Energy World  
Because Tomorrow Matters

**REVIEWED**

By Laura DiPasquale, M-NCPPC at 8:07 pm, Oct 09, 2024



Project Property Owner Dave Groberg

Address 34 Columbia Ave, Takoma Park, MD, 20912

I reviewed the design of the photovoltaic (PV) system, as designed by the manufacturer, and the design criteria utilized for the mounting equipment and panel mounting assembly (rack system) for the installation of (14) panels supported by the rack system, as shown on the drawings prepared for the above referenced address. I certify that the configurations and design criteria meet the standards and requirements of the International Residential Code (IRC) and International Existing Building Code (IEBC) adopted by Montgomery County in COMCOR08.00.02.

The attachment of the rack system to the building at the above address, including the location, number, and type of attachment points; the number of fasteners per attachment point; and the specific type of fasteners (size, diameter, length, minimum embedment into structural framing, etc.) meets the standards and requirements of the IRC and IEBC adopted by Montgomery County in COMCOR 08.00.02.

I evaluated the existing roof structure of the building at the above address and analyzed its capacity to support the additional loads imposed by the PV system. I certify that no structural modifications of the existing roof structure are required. The existing roof structure meets the standards and requirements of the IRC and IEBC, adopted by Montgomery County in COMCOR 08.00.02, necessary to support the PV system.

I evaluated the existing roof structure of the building at the above address and analyzed its capacity to support the additional loads imposed by the PV system. Structural modifications of the existing roof structure are required. I certify that the roof structure, as modified on the drawings for this project, will support the additional loads imposed by the PV system. I further certify that design of the modified roof structure meets the standards and requirements of the IRC and IEBC, adopted by Montgomery County in COMCOR 08.00.02.

I prepared or approved the construction documents for the mounting equipment, rack system, roof structure for this project.

49993  
Maryland PE License Number

Date September 3, 2024

Signature \_\_\_\_\_

Seal



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. 49993, EXP. 10/06/2024.  
2024-09-04

**Must be submitted with plans**





Property Owners Name: \_\_\_\_\_

Property Owners Address: \_\_\_\_\_

Address of installation if different than owner's address:

\_\_\_\_\_

I certify that:

- o I prepared or approved the electrical drawings and related documents for the photovoltaic {PV} system at the above location.
- o The design of the PV system, and all electrical Installations and equipment, meets the standards and requirements of the National Electrical Code as adopted by Montgomery County *in* COMCOR 17.02.01.
- o I reviewed and completed the Worksheet for PV System, which was attached to the permit application for the PV system at the **above** location.

15732

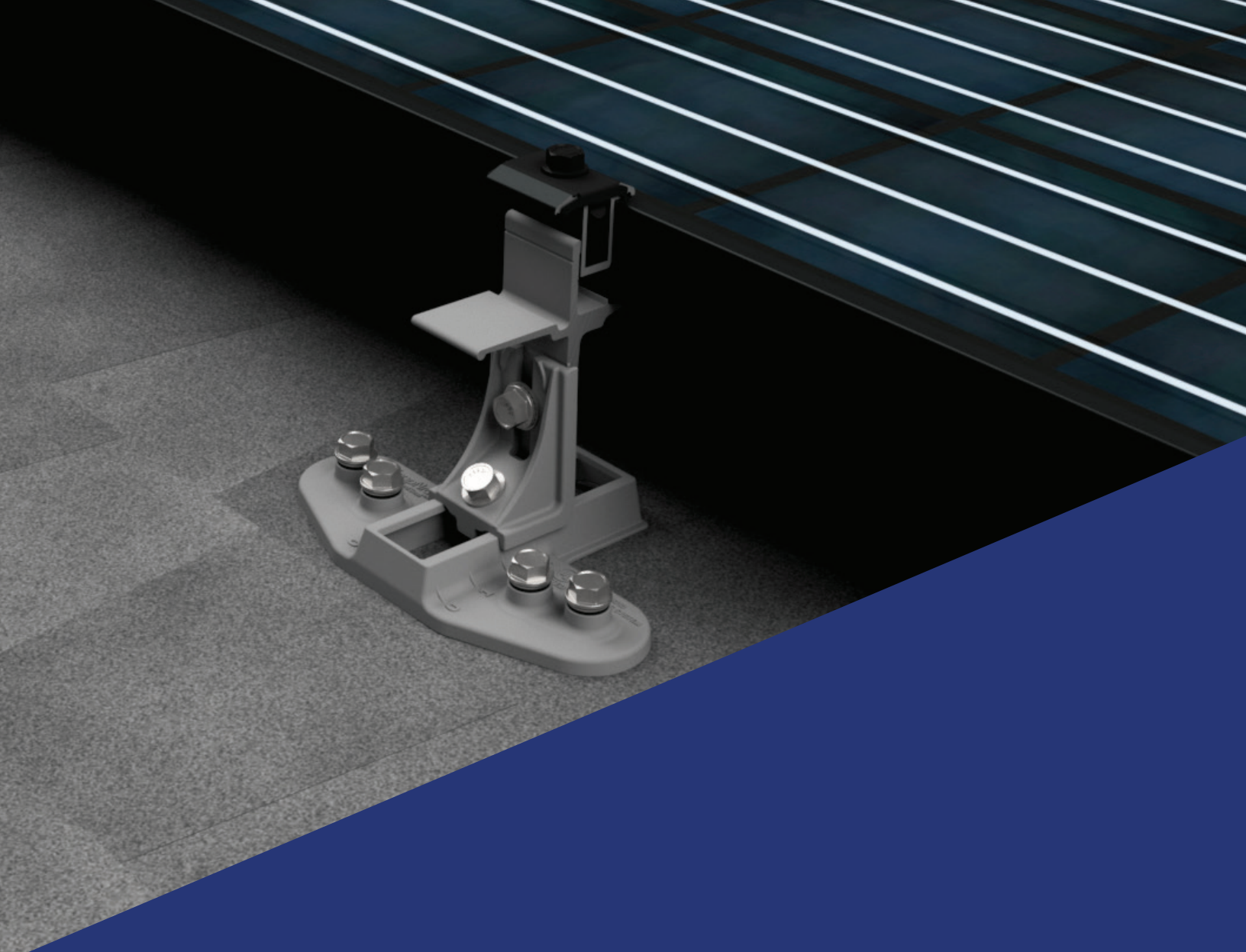
\_\_\_\_\_  
State Master Electrician License Number

Date: \_\_\_\_\_

Signature:           *Matt Heun*          

**REVIEWED**  
By Laura DiPasquale, M-NCPPC at 8:07 pm, Oct 09, 2024

|   |
|---|
| APPROVED<br>Montgomery County<br>Historic Preservation Commission |
|   |



# SnapNrack™

Solar Mounting Solutions

---

## TopSpeed™ Mounting System

Installation Manual

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**REVIEWED**

By Laura DiPasquale, M-NCPPC at 8:07 pm, Oct 09, 2024

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[snapnrack.com](https://snapnrack.com)



SnapNrack's primary goal is to provide our customers with the lowest possible installed cost for mounting residential solar modules, without compromising the values the industry has come to expect: ease of use, quality, aesthetics, and safety. Designing with this goal in mind, we are proud to present the SnapNrack TopSpeed™ mounting system with SpeedSeal™ Technology.

SnapNrack has created a ground breaking system combining great features and benefits we are known for, with our TopSpeed™ System and the most up to date technical innovation in the industry, thus reducing parts while driving down labor, material, and total installation costs. Designed to work with standard module frames, achieving UL 2703 Listing for Grounding/Bonding and Fire Classification, providing integrated wire management, aesthetics and our industry leading "Snap-In" features, SnapNrack is providing the simplest and most cost effective solar mounting solution on the market with TopSpeed™ including integrated fasteners and SpeedSeal™ Technology.

## Advantages of Installing the SnapNrack TopSpeed™ System

**Modules are installed with a minimum number of parts**

This elimination of parts leads to a lower estimated system cost for both the installer and home owner.

**Built in Wire Management and Aesthetics**

Extensive wire management solutions have been designed specifically for the system that adapts to multiple possible mounting positions.

The system is designed to be aesthetically pleasing and sturdy with a skirt that provides considerable strength at the leading edge and an elegant look for those seeking high end looking systems.

**SnapNrack TopSpeed™ includes SpeedSeal™ Technology**

SpeedSeal™ Technology features integrated flashing. This eliminates loosening layers of composition and removing nails with a pry bar, leading to less damage to the roof, minimized potential roof leaks, and much faster installs.

**TopSpeed™ Mounts attach Directly to the Decking**

As well as all of the benefits associated with the standard SpeedSeal™ Technology, TopSpeed™ attaches to the roof sheathing and does not require rafter attachment. Simply attaching to the roof sheathing removes the requirement for finding rafters and drilling pilot holes, creating potential rafter misses that can cause leaks.

**REVIEWED**

By Laura DiPasquale, M-NCPPC at 8:07 pm, Oct 09, 2024



## Project Plans

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## Installation Steps

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**REVIEWED**

By Laura DiPasquale, M-NCPPC at 8:08 pm, Oct 09, 2024

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## Certification Details

SnapNrack TopSpeed™ mounting system has been evaluated by Underwriters Laboratories (UL) and Listed to UL Standard 2703 for Grounding/Bonding, and Fire Classification.

### Grounding/Bonding

Only specific components have been evaluated for bonding, and are identified as being in the ground path. The TopSpeed™ components that have been evaluated for bonding are the Mount Assembly (Mount Clamp Top, Module Clamp Tower, Angle Bracket), Clamp Assembly, Universal Skirt, Universal Skirt Clamp, Ground Lugs, and Smart Clips.

Universal Skirt Spacers, Mount Channel Nut, and Mount Base are not required to be bonded to the system based on the exceptions in clause 9.1 of UL 2703 1st Ed. Wire management clips are utilized to route conductors away from these components and must be assembled according to the instructions.

This mounting system may be used to ground and/or mount a PV module complying with UL 1703 or UL 61703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions. See Appendix A for the list of modules tested for use with the TopSpeed™ System for integrated grounding.

Ground Lugs have been evaluated to both UL 467 and UL 2703 Listing requirements. The following ground lugs have been approved for use: SnapNrack model 242-92202, and IlSCO models GBL-4DBT and SGB-4.

The following components have been evaluated for bonding as the fault current ground path: TopSpeed™ Mount Assembly, (Mount Clamp Top, Module Clamp Tower, Angle Bracket), Clamp Assembly, Wire Management Clips, and Ground Lugs. In order to maintain the Listing for bonding, wire management clips must be assembled to route conductors away from parts that have not been evaluated for bonding.

A Listed (QIMS) and Unlisted Component (KDER3) grounding lug, SnapNrack part no. 242-92202, is attached to the module frame flange for the normal attachment of a Grounding Electrode Conductor, which provides bonding within the system and eventual connection to a Grounding Electrode, as required by the U.S. NEC. Details of part no. 242-92202 can be found in Volume 1, Section 4, and Volume 2, Section 2. When this method is used, the grounding symbol is stamped onto the body of the ground lug to identify the grounding terminal.

An alternate method of grounding, a UL Listed (KDER and QIMS) grounding lug, IlSCO (E34440 and E354420) model SGB-4 is attached to the module frame flange. When this method is used, the grounding terminal is identified by the green colored screws of the lug.

An alternate method of grounding, a UL Listed (KDER and QIMS) grounding lug, IlSCO (E34440 and E354420) model GBL-4BDT is attached to the module frame flange through the specified hardware and torque values. When this method is used, the grounding terminal is identified by the green colored set screw of the lug.

An alternate method of grounding, Enphase R/C (QIKH2)(QIMS2) model M250, M215 & C250 is bonded to the Listed PV module frame by the Enphase R/C (QIMS2) Model EFM-XXMM anodization piercing mounting/clamping kit. The total roof-mounted PV system is bonded (modules and microinverters) together and the assembly is bonded to ground through the Enphase R/C (QIMS2) Engage Cables; Model ETXX-240, ETXX-208 or ETXX-277, when used with the Enphase R/C (QIMS2) Dynoraxx (E357716) photovoltaic lugs. Dynobond is an optional bonding device that has been evaluated to provide a bonding path between the flange of adjacent modules and has been investigated to bond

**REVIEWED**

By Laura DiPasquale, M-NCPPC at 8:08 pm, Oct 09, 2024

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Montgomery County

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## Fire

SnapNrack TopSpeed™ has been investigated for a Class A System Fire Classification for Steep-Sloped and low sloped roofs with Type 1 and Type 2 modules. Because the system was tested at 5 inches above the test roof fixture, TopSpeed™ can be installed without any height restrictions due to System Fire Classification. See Appendix A for potential module-specific height restrictions due to module temperature. The Skirt is considered an optional component with respect to Fire Classification, as SnapNrack TopSpeed™ maintains the same Fire Classification Rating both with and without the skirt.

**NOTE:** Modules with an asterisk\* have a fire rating that is different from Type 1, Type 2 or Type 29. SNR systems have only been evaluated for use with Type 1, Type 2, or Type 29 modules. Modules with a different fire type rating should be considered to not have been evaluated for use with SNR systems with respect to a system fire rating.

## Inspection Practices

SnapNrack recommends a periodic re-inspection of the completed installation for loose components, loose fasteners, and any corrosion, such that if found, the affected components are to be immediately replaced.

**REVIEWED**

By Laura DiPasquale, M-NCPPC at 8:08 pm, Oct 09, 2024

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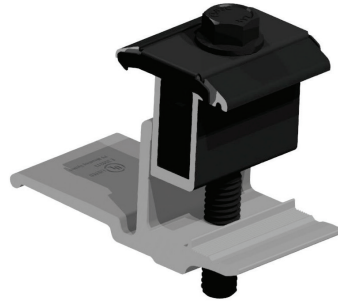


## TopSpeed™ Structural Components



### TopSpeed™ Mount

SnapNrack TopSpeed™ Mount assembly including SpeedSeal™ base, clamp top, and (4) SnapNrack #14 SS Wood Screws with 1/2" Hex Head.



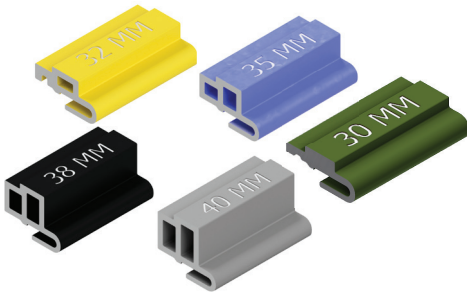
### TopSpeed™ Clamp

SnapNrack TopSpeed™ Clamp assembly including including Link bottom, Link top, and springs.



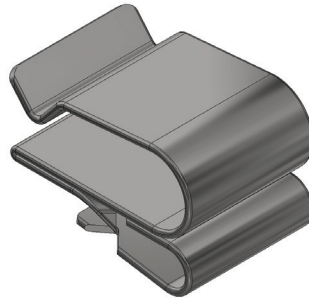
### Universal Skirt

SnapNrack Universal Skirt in double portrait or single landscape lengths.



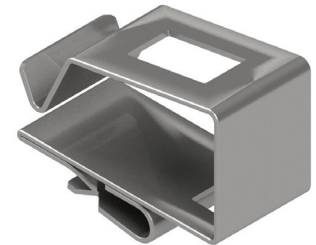
### Skirt Spacers

SnapNrack Universal Skirt Spacer for 40mm, 38mm, 35mm, 32mm, and 30mm modules.



### Smart Clip

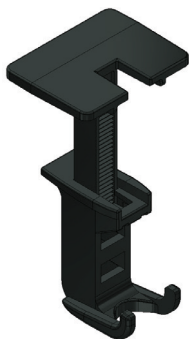
Module frame cable clip, holds two PV wires or Enphase IQ-Cables.



### Smart Clip XL

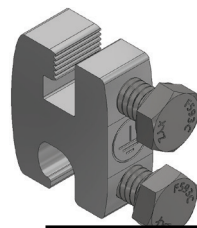
Module frame cable clip, holds six PV wires or four Enphase IQ-Cable.

## Grounding/MLPE Components

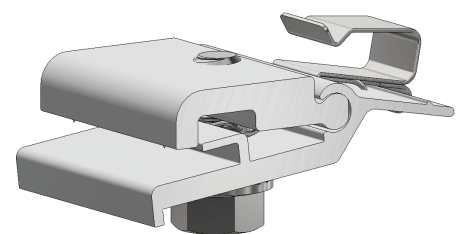


### Wire Saver

Designed to secure conductors that become loose over time. It holds one conductor per array.



### Grounding



### MLPE Frame Attachment Kit

Attaches MLPEs (Module Level Performance Enhancers) and other related equipment to the module frame.

**REVIEWED**

By Laura DiPasquale, M-NCPPC at 8:08 pm, Oct 09, 2024

## Hardware Torque Specifications

The recommended torque to be applied to components for proper assembly and bonding are as follows:

| Hardware Description  | Torque Specification |
|---|----------------------|
| All TopSpeed™ ½” bolts; System Leveling Bolt, TopSpeed™ Mount Clamping Bolt, Clamp Bolt   | 16 ft-lb             |
| Ground Lug model 242-92202 to Module Frame or anywhere on the TopSpeed™ Mount, and Ground Lug model 242-92202 to Grounding Electrode Conductor (6-12 SOL) | 8 ft-lb              |
| MLPE Frame Attachment Kit, MLPE Rail Attachment Kit   | 10 ft-lb             |
| SolarEdge Frame Mounted Microinverter Bracket to Module Frame   | 11 ft-lb             |
| Enphase Frame Mounted Microinverter Bracket to Module Frame   | 13 ft-lb             |
| Ground Lug model SGB-4 to module  | 75 in-lb             |
| Ground Lug model SGB-4 to Grounding Electrode Conductor (4-14 SOL or STR)   | 35 in-lb             |
| Ground Lug model GBL-4DBT to module   | 35 in-lb             |
| Ground Lug model GBL-4DBT to Grounding Electrode Conductor (10-14 SOL or STR)   | 20 in-lb             |
| Ground Lug model GBL-4DBT to Grounding Electrode Conductor (8 SOL or STR)   | 25 in-lb             |
| Ground Lug model GBL-4DBT to Grounding Electrode Conductor (4-6 SOL or STR)   | 35 in-lb             |

**REVIEWED**

By Laura DiPasquale, M-NCPPC at 8:08 pm, Oct 09, 2024

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Montgomery County  
Historic Preservation Commission



6

## Site Survey

- Measure the roof surfaces and develop an accurate drawing, including any obstacles such as chimneys and roof vents.
- If plans for the roof structure are available, verify that the plans match the final structure.
- Identify any roof access or setback areas as required by the local AHJ.
- Identify any construction issues that may complicate the process of locating rafters from the roof surface.
- If you find structural problems such as termite damage or cracked rafters that may compromise the structure's integrity consult a structural engineer.

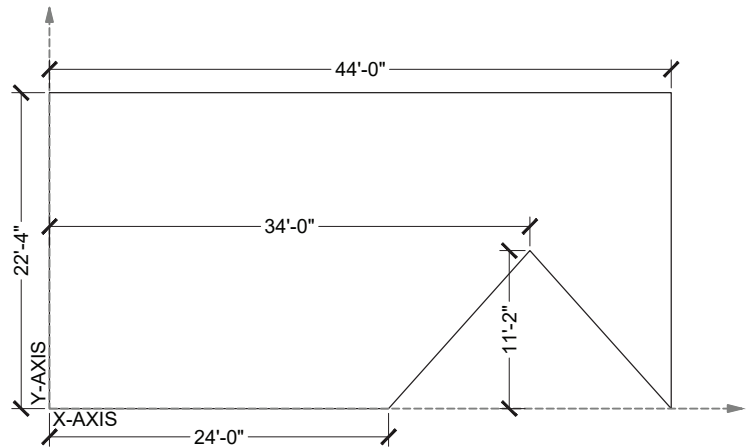


Image note: X-Axis described in this manual is cross-slope on the roof, Y-Axis is in line with the roof slope.

## Design Guidance

- PV Designers should account for the 0.75 inch spacing between rows and columns of modules when creating the layout.
- Determine site conditions for calculating the engineering values, confirm site conditions and code versions comply with local AHJ requirements.
- Reference site conditions and system specifications in TopSpeed™ Structural Engineering Report to determine the number of attachments per module side.
- Insert SnapNrack installation details into design plan set specific to the project requirements.
- Draw roof attachment locations on plan set layout based on TopSpeed™ Structural Engineering.

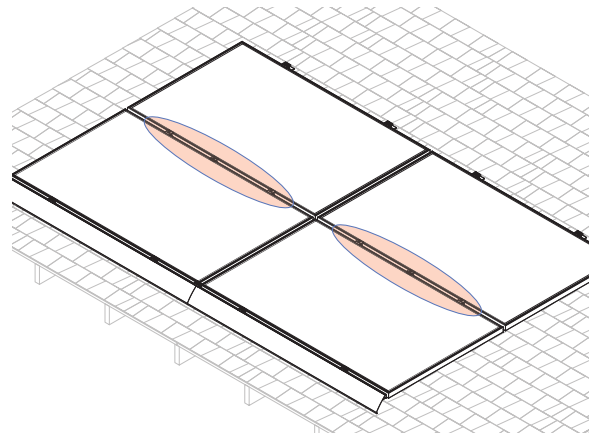
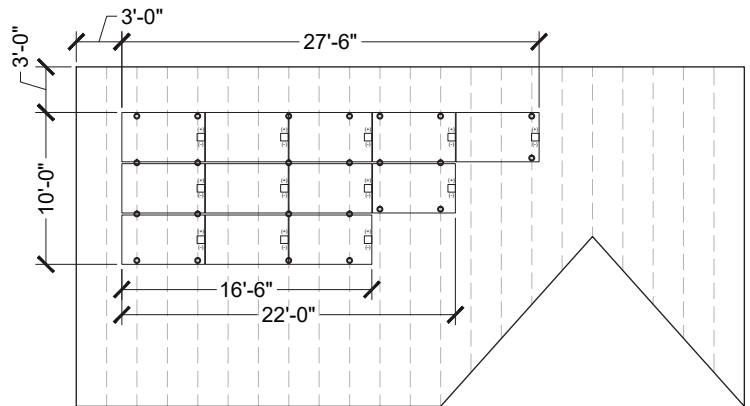


Image note: This four module array is installed in a high load configuration with three attachments per side where two modules share attachments. See highlighted area. As shown, attachments are never required at the skirt or the top

### Best Practice:

If environmental load conditions require three TopSpeed™ attachments per module side this is only required when modules share attachments.

- Identify homerun and Junction Box locations based on rooftop wiring requirements.
- Mark distance from array edge to identifiable roof feature in x and y axes.

### Safety Guidance

- Always wear appropriate OSHA approved safety equipment when at active construction site.
- Appropriate fall protection or prevention gear should be used. Exercise caution when near the edge of a roof.
- Use appropriate ladder safety equipment when accessing the roof from ground level.

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By Laura DiPasquale, M-NCPPC at 8:08 pm, Oct 09, 2024

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*[Signature]*

Continued  
be checked periodically for wear  
protection when required.

## Required Tools

● Socket Wrench/Impact Driver

● Torque Wrench

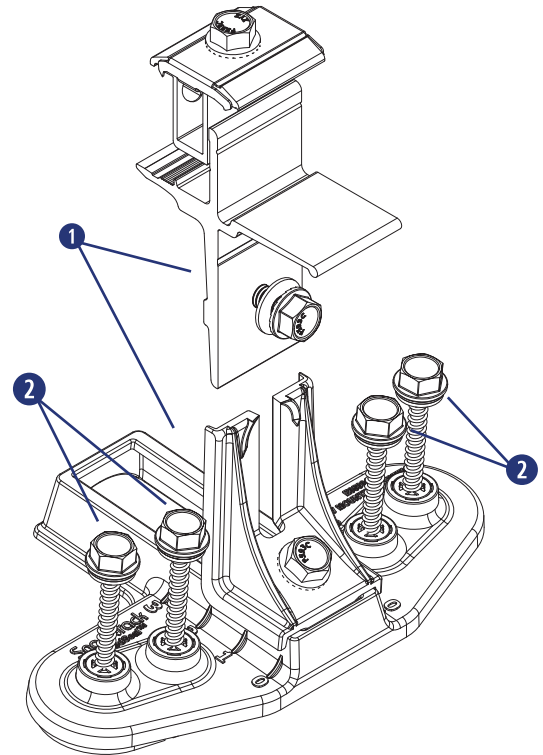
● 1/2" Socket

## Materials Included - TopSpeed™ System with SpeedSeal™ Technology

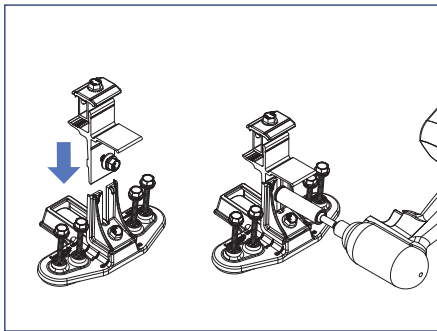
- 1 (1) SnapNrack TopSpeed™ Mount
- 2 (4) SnapNrack #14 Wood Screw with 1/2" Hex Head & sealing washer

### Best Practice:

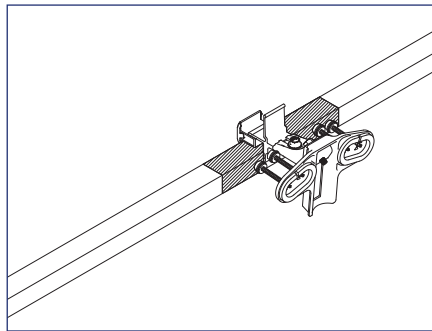
Attach all TopSpeed™ mounts as the modules are being prepped with MLPEs on the ground. Attach Mounts before attaching MLPEs to simplify wire management.



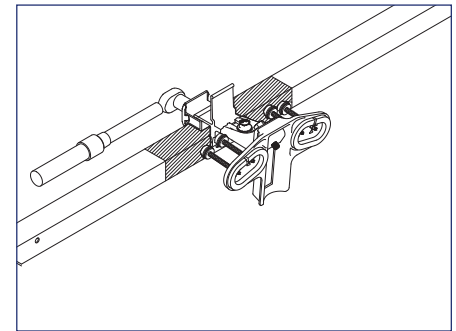
## INSTALLATION INSTRUCTIONS



1) Assemble all TopSpeed™ Mounts required for the installation. Slide the clamp tower assembly into the angle bracket riser and tighten the leveling bolt to 16 ft-lbs.



2) Position TopSpeed™ Mount clamp on the module frame within the module manufacturers required clamping zone.



3) Tighten 1/2" clamping bolt to 16 ft-lb. Only two Mounts are required per module on one side.

### Install Note:

For high load conditions add a third attachment in the middle of the module frame.

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## Required Tools

- Roof Marking Crayon or Chalk
- Tape Measure

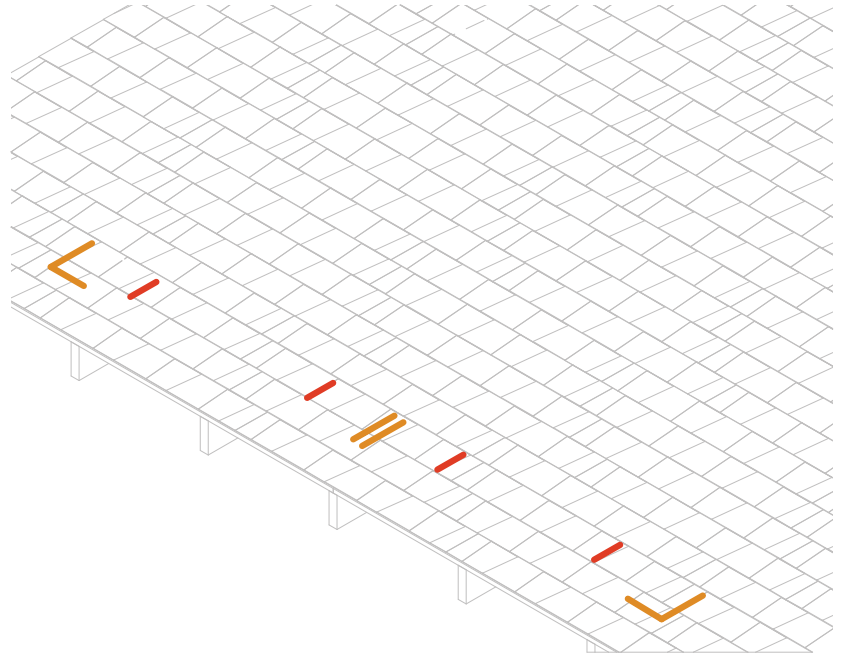
## LAYOUT INSTRUCTIONS

1) Use a tape measure to verify that all modules will fit properly on the roof surface.

2) On the roof draw the layout for the skirt installation including module gaps (recommended 0.75 inch gap), bottom corners, and locations of the two TopSpeed™ attachments per module that clamp to the skirt. Three attachments per module is never required at the skirt.

### Install Note:

If environmental load conditions require three TopSpeed™ attachments per module side this is only required when modules share attachments.



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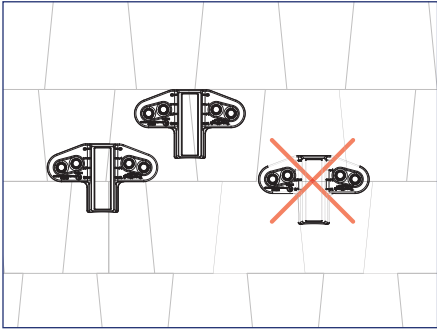


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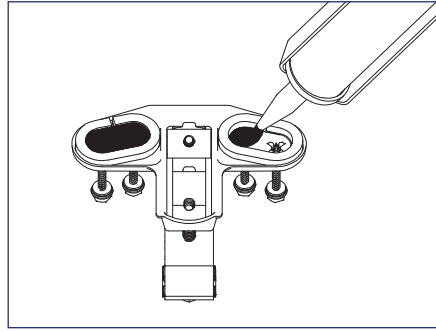




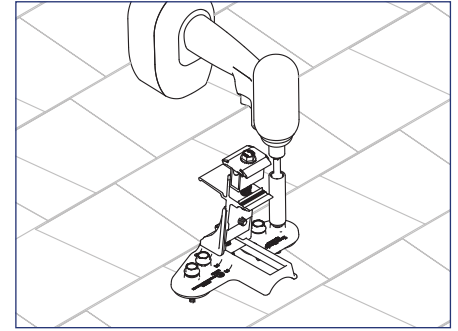
## INSTALLATION INSTRUCTIONS



1) Install TopSpeed™ Mounts at locations drawn during the skirt layout. Mounts must be installed entirely on one course of composition.



2) Fill both cavities on bottom of TopSpeed™ Mount created by SpeedSeal™ gasket with roof sealant to ensure a watertight seal.

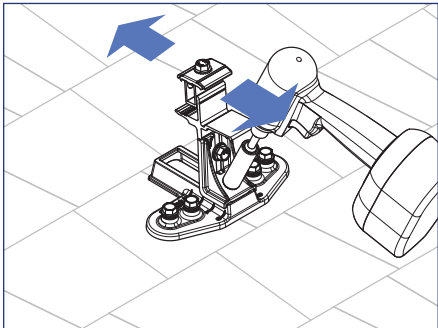


3) Attach TopSpeed™ Mount to roof using the (4) SnapNrack #14 Wood Screws with 1/2" hex head that are captured in the Mount.

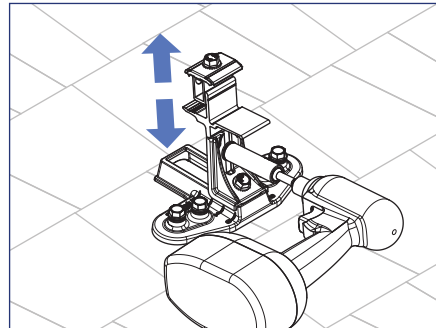


### Install Note:

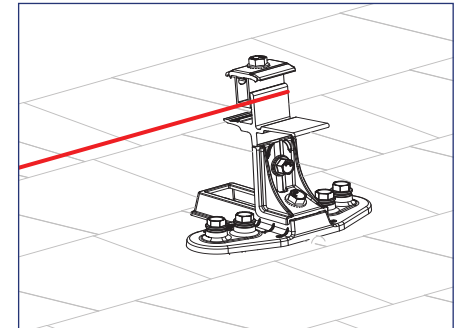
Roof sealant should be expelled from both vents of the TopSpeed™ Mount as it is installed to assure the proper amount of roof sealant has been applied. If sealant is not expelled from all four vents, remove TopSpeed™ Mount, add more sealant to the cavity, then reinstall.



4) Loosen Course Adjustment bolt and adjust end Mounts up or down until aligned with bottom edge of array as marked on the roof, then tighten the Course Adjustment bolt.



5) To set the TopSpeed™ Mount level loosen the Leveling bolt and move the clamp up or down, then tighten the Leveling bolt and torque to 16 ft-lb.



6) Pull string line tight from one corner mount to opposite corner mount to align and level all TopSpeed™ Mounts between the end mounts.



### Install Note:

Use the string line alignment feature on Mounts to level and align the Mounts.

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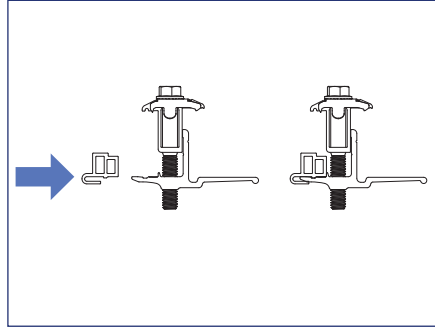
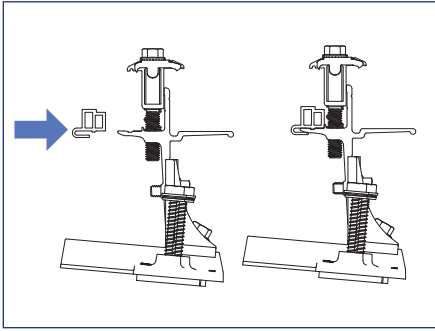
By Laura DiPasquale, M-NCPPC at 8:08 pm, Oct 09, 2024

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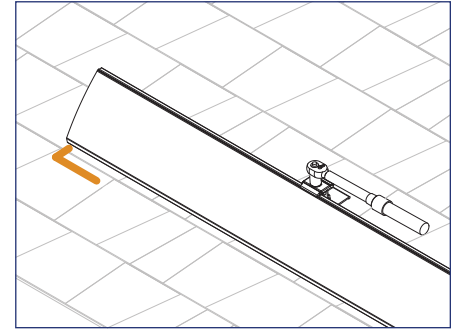
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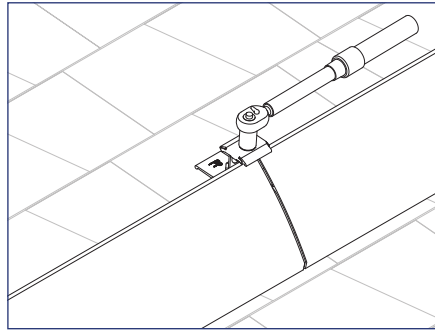
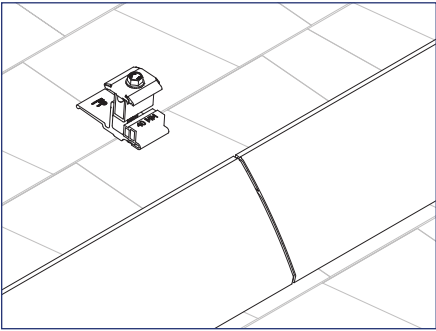
## INSTALLATION INSTRUCTIONS



7) Universal Spacers will need to be added to Mounts and Clamps where Skirt will be installed.



8) Install Universal Skirt by holding the skirt in Mount, sliding Skirt to align with array layout marks, and clamping skirt into mount.



9) Use TopSpeed™ Clamps to connect multiple lengths of Array Skirt.



### Install Note:

Optionally use Universal Links to connect lengths of Array Skirt.

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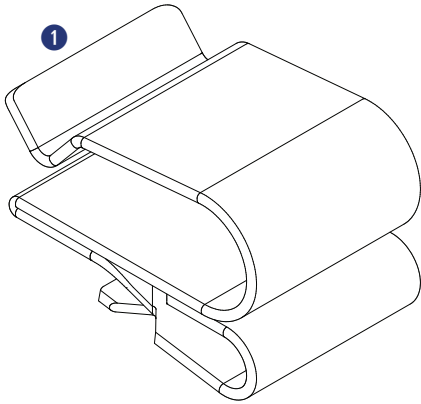
## Required Tools

- Socket Wrench
- Torque Wrench
- 1/2" Socket
- Electrician Tools

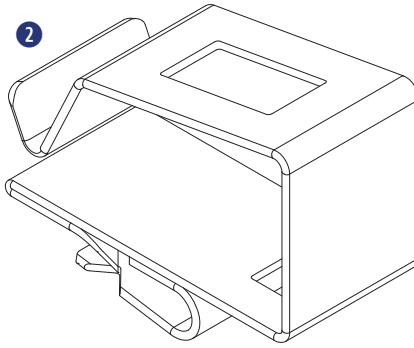
## Materials Included

### Smart Clips

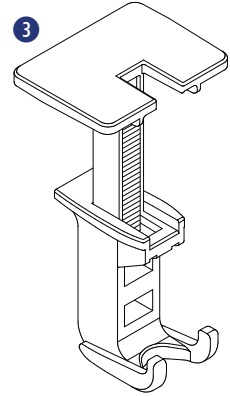
- 1 (1) Smart Clip [(2) PV Wire, (1) Enphase IQ Cable]
- 2 (1) Smart Clip XL [(6) PV Wire, (4) Enphase IQ]
- 3 (1) Wire Saver [(1) PV Wire]



Smart Clip



Smart Clip XL



Wire Saver

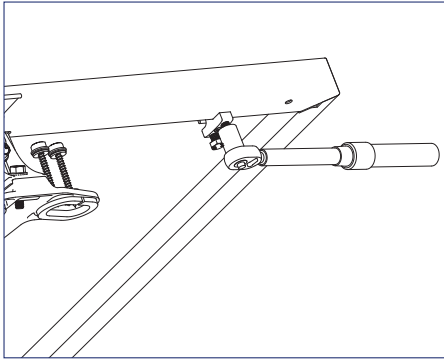
**REVIEWED**

By Laura DiPasquale, M-NCPPC at 8:08 pm, Oct 09, 2024

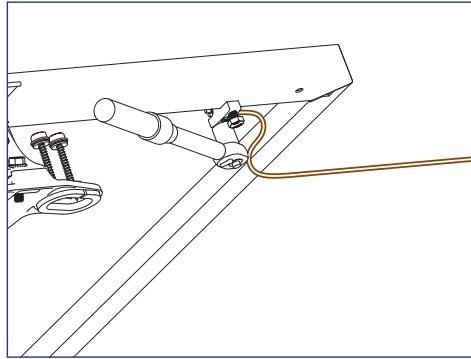


## INSTALLATION INSTRUCTIONS - GROUND LUG

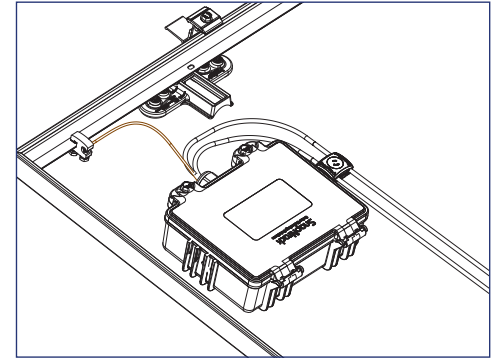
The SnapNrack Ground Lug to be used in accordance with the National Electric Code, ANSI/NFPA 70.



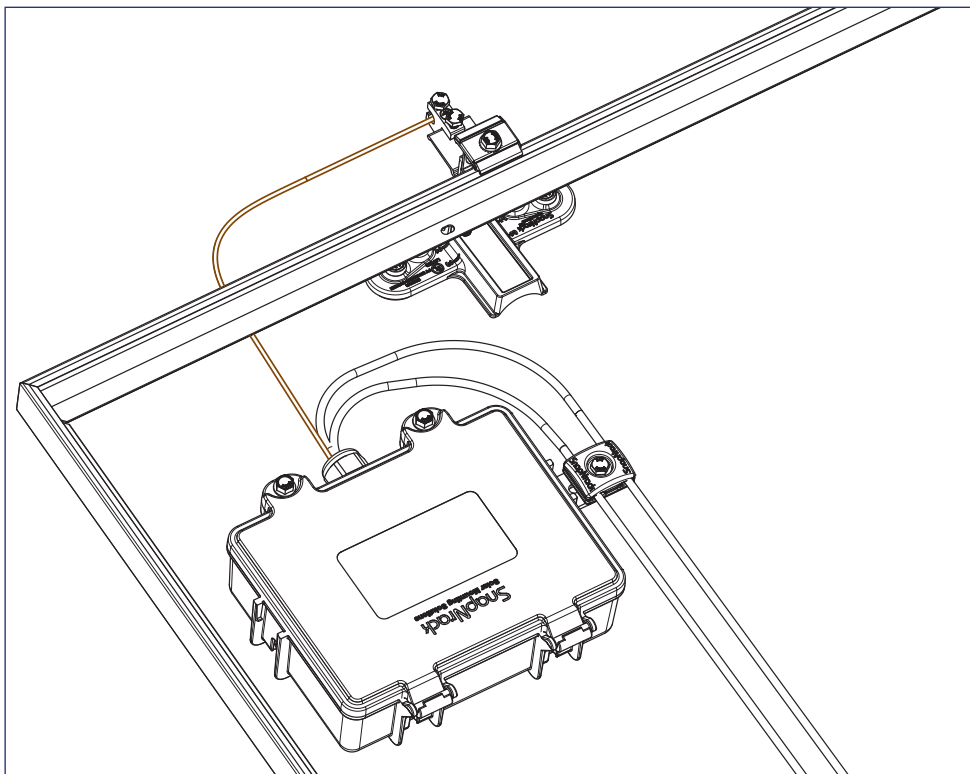
1) Ground Lug (242-92202) can be attached anywhere along the module frame or any TopSpeed™ Mount near the Junction Box. Torque module clamping bolt to 8 ft-lb.



2) Run 10 - 6 AWG, solid, bare copper GEC into Ground Lug channel, torque wire clamping bolt to 8 ft-lb.



3) Run bare, solid EGC from Ground Lug R to Junction Box, bond bare EGC to stranded EGC in Junction Box. For details on installing the Junction Box reference the **Junction Box Installation Manual**.



4) Optionally; Install Ground Lug on the Mount Landing Pad at the top of the array. Run bare copper between ground lug and Junction Box.

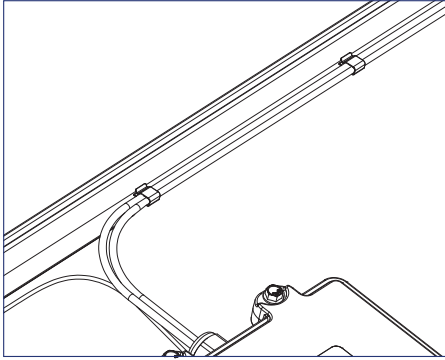
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By Laura DiPasquale, M-NCPPC at 8:08 pm, Oct 09, 2024

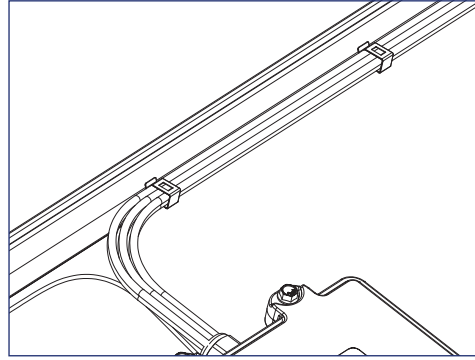
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## INSTALLATION INSTRUCTIONS - SMART CLIPS

SmartClip and SmartClip XL should be used to route conductors in a neat and workmanlike manner away from all non-bonded components and support the conductors adequately to eliminate potential damage.



1) Use SnapNrack Smart Clip II to manage up to two PV wires inside the module frame while prepping out the modules on the ground or installing modules on the roof.



2) Use SnapNrack Smart Clip XL to manage larger bundles of PV wire; up to 6 PV wires per clip

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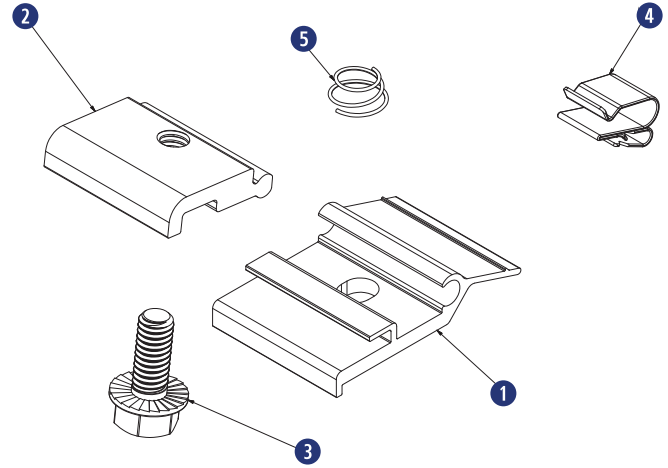
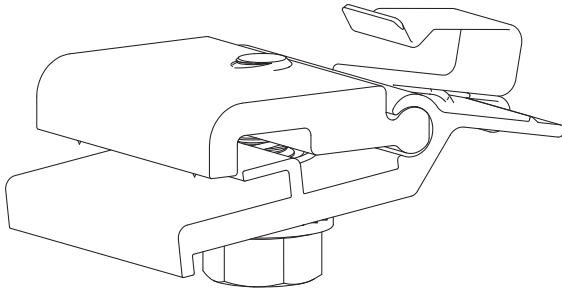
A handwritten signature in black ink, appearing to read "Robert H. [unclear]", is written over a horizontal line within the approval box.

## Required Tools

- Socket Wrench
- Torque Wrench
- 1/2" Socket

## Materials Included - MLPE Rail Attachment Kit

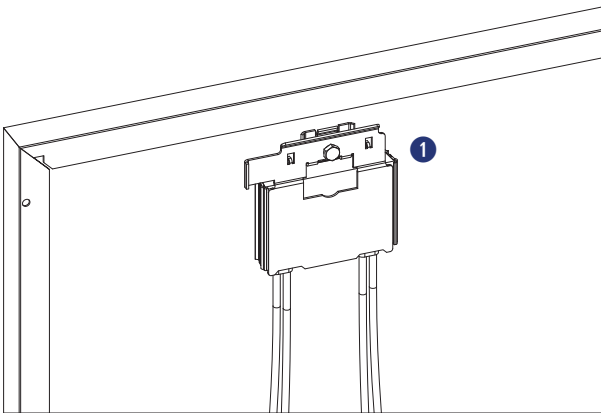
- 1 (1) SnapNrack MLPE Frame Attachment Top
- 2 (1) SnapNrack MLPE Frame Attachment Bottom
- 3 (1) 5/16"-18 X 3/4" Serrated Flange Bolt SS
- 4 (1) SnapNrack Smart Clip
- 5 (1) SnapNrack MLPE Frame Attachment Coil Spring SS



## Materials Included

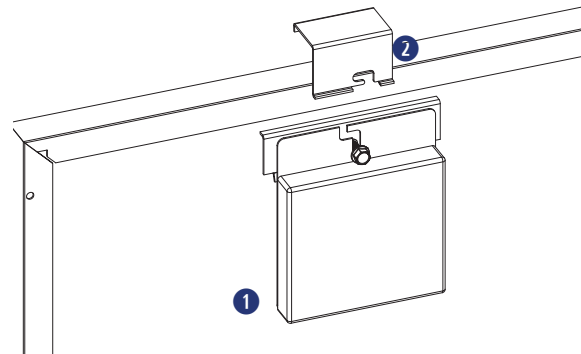
### SolarEdge Frame Mount

- 1 (1) SolarEdge Optimizer w/ Frame-Mounted Module Add-On



### Enphase Frame Mount

- 1 (1) Enphase Microinverter
- 2 (1) Enphase Frame Mount



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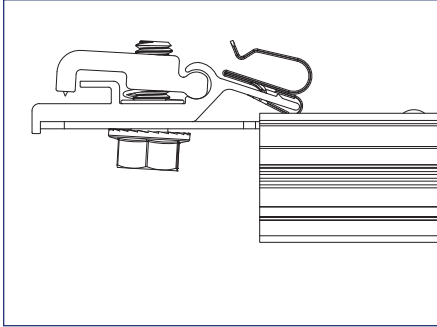
By Laura DiPasquale, M-NCPPC at 8:09 pm, Oct 09, 2024

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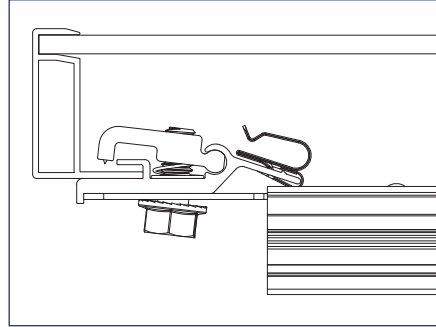
A handwritten signature in black ink, appearing to read "R. W. H. H. H.", is written over a horizontal line.

## INSTALLATION INSTRUCTIONS - SNAPRACK MLPE FRAME ATTACHMENT KIT

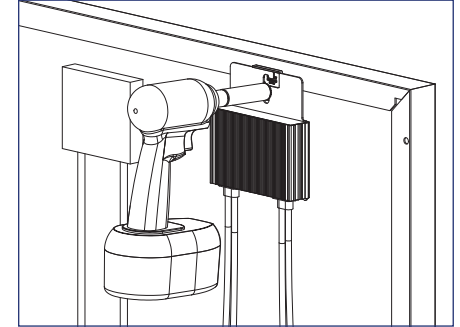
SnapNrack MLPE Frame Attachment kit are used to attach module level performance enhancing devices, and other devices such as an SRD (rapid shutdown device), directly to module frames, and provide integrated grounding/bonding for Devices grounded through metal back plate. (Refer to the list of tested MLPE devices on page XX of this manual).



1) Slide the backplate channel of the MLPE device under the MLPE Frame Attachment Kit bolt. The MLPE mounting plate should rest against the MLPE mounting plate backstop on the MLPE Frame Attachment Kit.



2) Position the MLPE Frame Attachment Kit on the module frame flange in a location that will not interfere with mounting system components. The module frame flange should rest against the module flange backstop on the MLPE Frame Attachment Kit.



3) Tighten the mounting bolt on the MLPE Frame Attachment Kit to 12 lb-ft (144 lb-in).



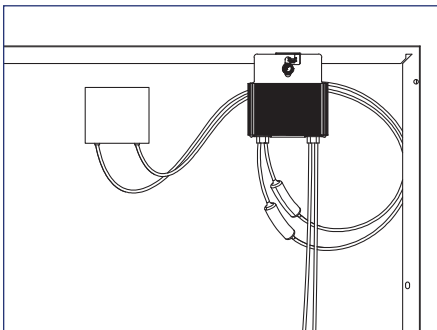
### Install Note:

The MLPE Frame Attachment Kit bonds the following components:  
Module Frame, MLPE backplate and Smart Clip.



### Install Note:

Avoid blocking module frame drainage holes when installing the MLPE Frame Attachment Kit.



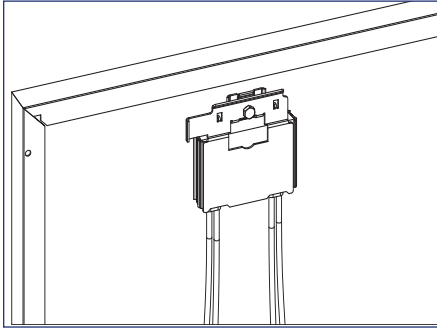
4) Connect the module leads to the input connectors on the MLPE device and manage conductors with the integrated Smart Clip.

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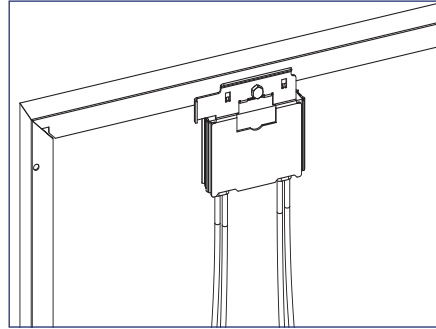
By Laura DiPasquale, M-NCPPC at 8:09 pm, Oct 09, 2024

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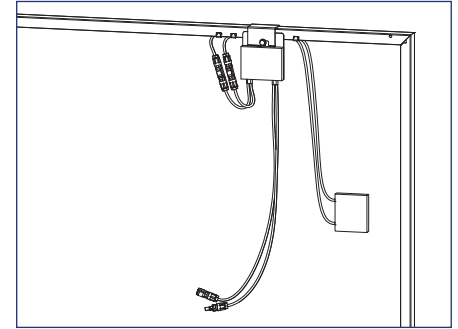
## INSTALLATION INSTRUCTIONS - SOLAREGE FRAME MOUNT



1) Locate the SolarEdge optimizer with Frame-Mounted Module Add-On at a location on the module frame that will not interfere with the TopSpeed™ Mounts.



2) Install the optimizer mounting plate onto the module frame and tighten hardware to 11 ft-lbs.



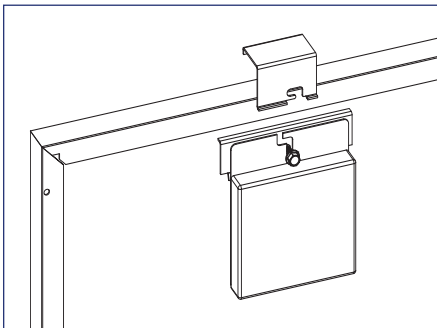
3) Connect the module leads to the input connectors on the optimizer and manage conductors with SnapNrack Smart Clips.



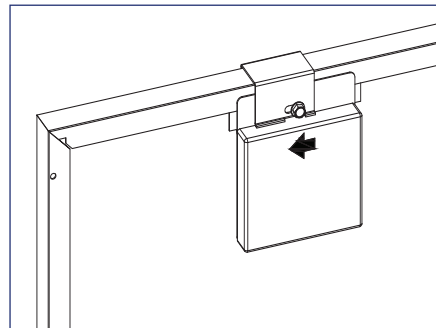
### Install Note:

If module is mounted in portrait, install MLPE on long side, short side for landscape.

## INSTALLATION INSTRUCTIONS - ENPHASE FRAME MOUNT



1) Locate the Enphase Frame Mount bracket clamp at a location on the module frame that will not interfere with the TopSpeed™ Mounts.

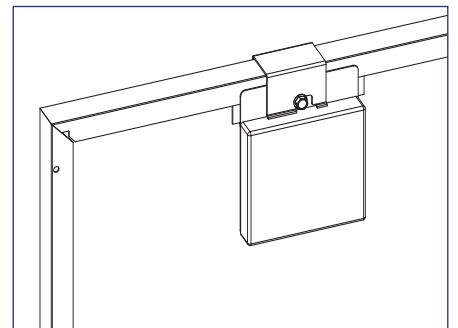


2) Slide the microinverter unit onto the bracket clamp, then move it slightly to the left.



### Install Note:

The microinverter mounting flange should be on the outside of the module frame.



3) Tighten the hardware to 13 ft-lbs.

4) Connect module leads to microinverter DC connectors.



### Install Note:

Refer to the Enphase Frame Mount installation guide for additional instructions.

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By Laura DiPasquale, M-NCPPC at 8:09 pm, Oct 09, 2024

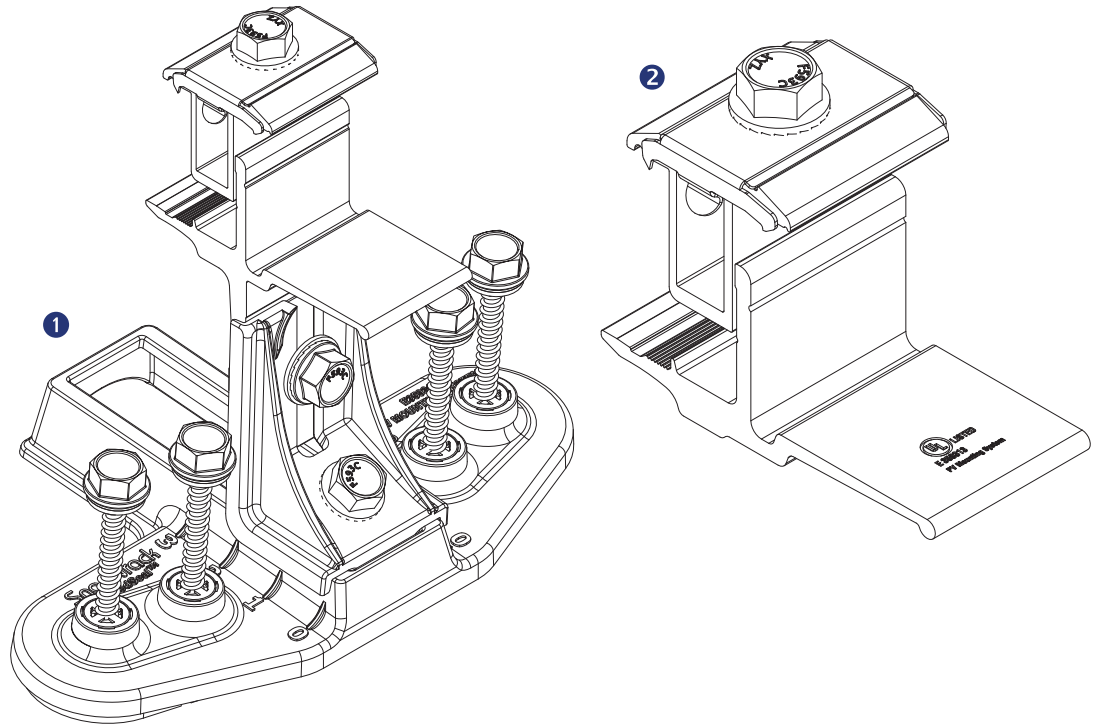
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## Required Tools

- Socket Wrench
- Torque Wrench
- 1/2" Socket
- Roofing Sealant

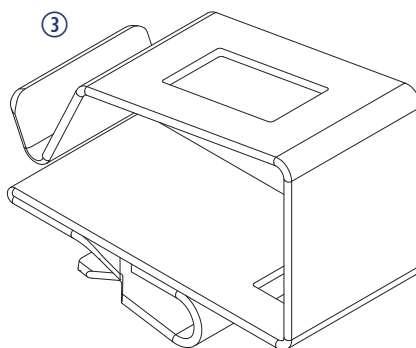
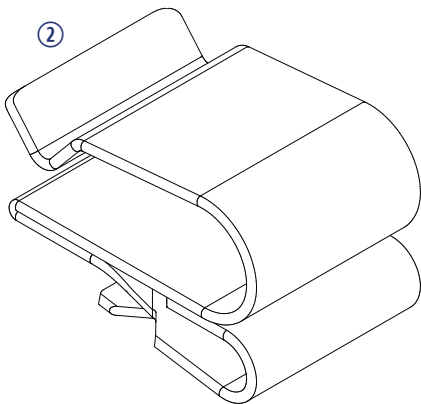
## Materials Included

- ① SnapNrack TopSpeed™ Mount
- ② SnapNrack TopSpeed™ Clamp



## Other Materials Required

- ② SnapNrack Smart Clip (2-5 per module)  
*See Wire Management section for details*
- ③ SnapNrack Smart Clip XL (10-20 per array)  
*See Wire Management section for details*



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## INSTALLATION INSTRUCTIONS - BOTTOM ROW

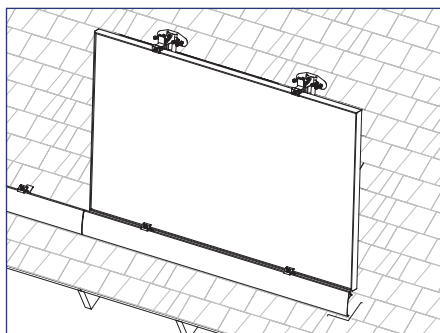
### Recommended Best Practice:

Attach all TopSpeed™ mounts as the modules are being prepped with MLPEs on the ground. Attach Mounts before attaching MLPEs to simplify wire management.

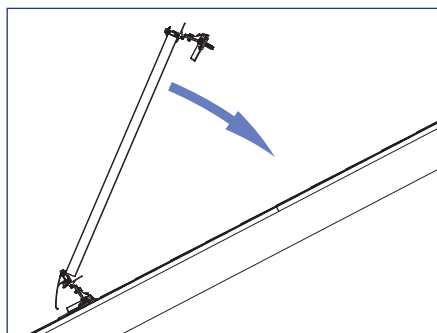
### Install Note:

It is recommended that module leads and connectors are prepared for installation using SnapNrack Smart Clips before being brought to the rooftop.

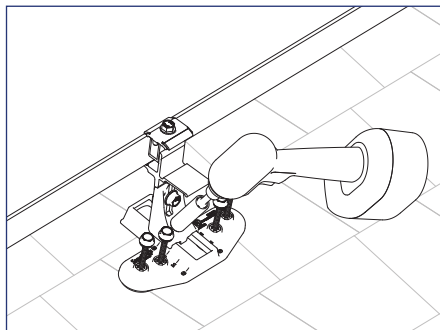
- With no MLPE, secure module leads to module frame to allow access to connectors while modules are installed
- Secure MLPE device to module frame with SnapNrack MLPE Frame Attachment Kit and connect module leads to MLPE, and manage leads by positioning connectors to allow access during installation



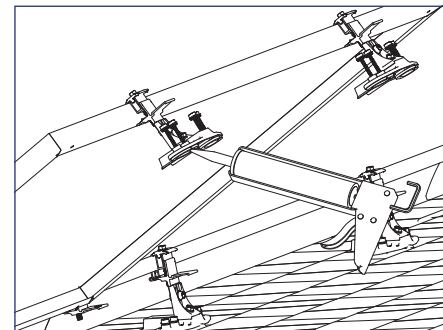
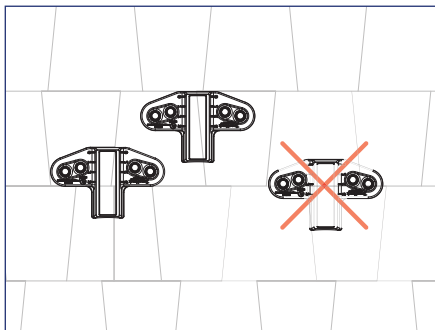
1) Rest downslope edge of module on the Mounts and/or Clamps position module so side edge is flush with marked edge of array layout or Skirt.



2) Lower upslope edge of module while simultaneously applying slight pressure to seat module into Mounts and/or Clamps.



3) When module is level with roof verify the Speedseal™ portion of the TopSpeed™ Mounts are positioned entirely on one course of composition. If required listen the 1/2" nut and adjust the base as needed then tighten the bolt.



4) Lift the upslope edge of the module and fill the SpeedSeal™ reservoir with roofing sealant.

### Install Note:

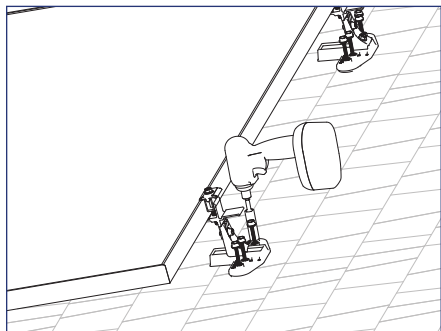
Roof sealant should be expelled from both vents of the TopSpeed™ Mount as it is installed to assure the proper amount of roof sealant has been applied. If sealant is not expelled from all four vents, remove TopSpeed™ Mount, add more sealant to the cavity, then reinstall.

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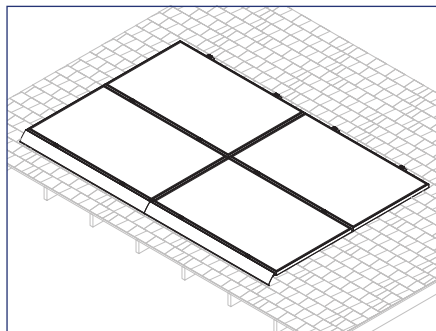
By Laura DiPasquale, M-NCPPC at 8:09 pm, Oct 09, 2024

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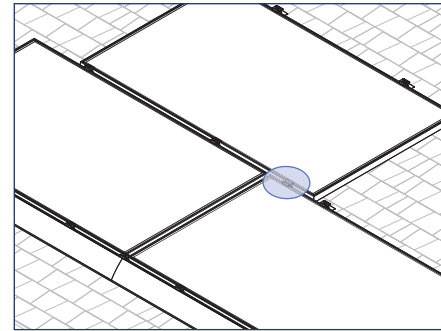
## INSTALLATION INSTRUCTIONS - BOTTOM ROW



5) Lower the module to the roof and drive the (4) pre installed Snapnrack #14 Wood Screws with 1/2" hex head into the roof sheathing.



6) Repeat steps 1 through 5 for additional modules in the array.



7) For staggered arrays and arrays with mixed orientation, use the TopSpeed™ Clamp as needed to support the modules.

### Install Note:

Roof sealant should be expelled from both vents of the TopSpeed™ Mount as it is installed to assure the proper amount of roof sealant has been applied. If sealant is not expelled from both vents, remove TopSpeed™ Mount, add more sealant to the cavity, then reinstall.

When installing a TopSpeed™ Clamp for support of an over cantilevered module, the clamp shall be installed 2-6" from the edge of the upslope (cantilevered) module.

**REVIEWED**

By Laura DiPasquale, M-NCPPC at 8:09 pm, Oct 09, 2024

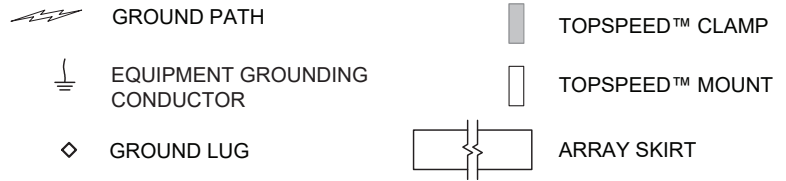
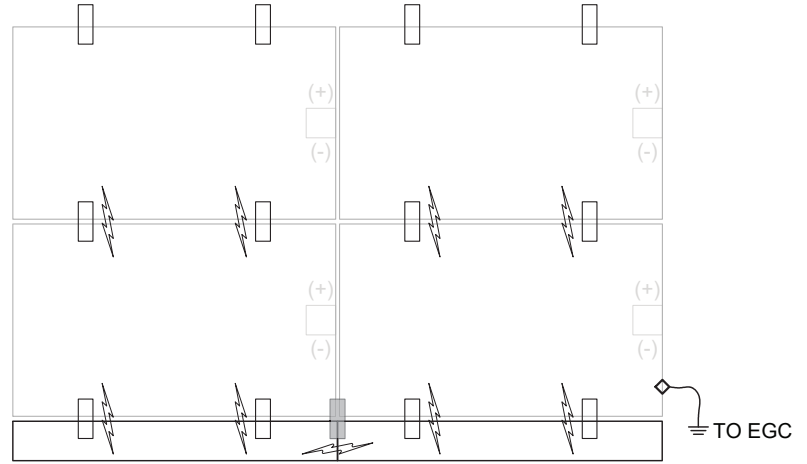
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## GROUND PATH DETAILS

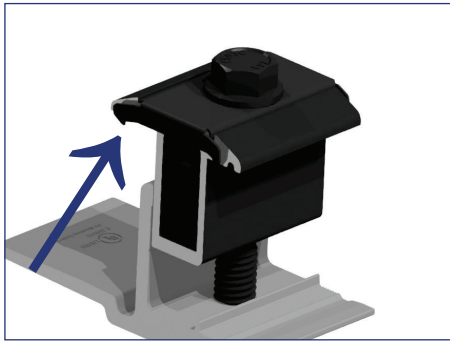
All TopSpeed™ components in the fault current ground path have been Certified to be used multiple times for grounding/bonding. The UL 2703 Listing does not specify a maximum number of uses for the Mount, Link, or Ground Lug. Review the requirements of the National Electrical Code (NEC) Article 250 to select the appropriate Equipment Grounding Conductor size based on the short-circuit current of the PV system.

When using Ground Lug R the following components are part of the fault current ground path:

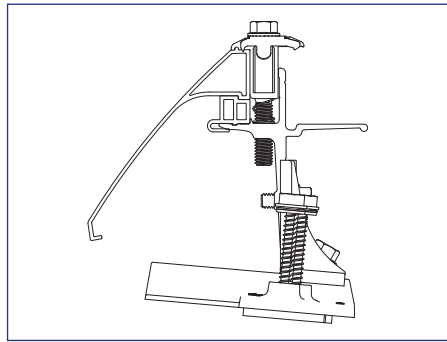
- SnapNrack, TopSpeed™ Mount
- SnapNrack, TopSpeed™ Clamp



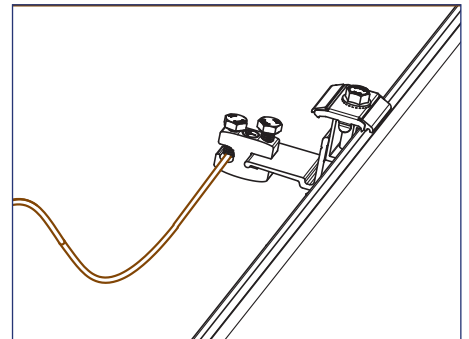
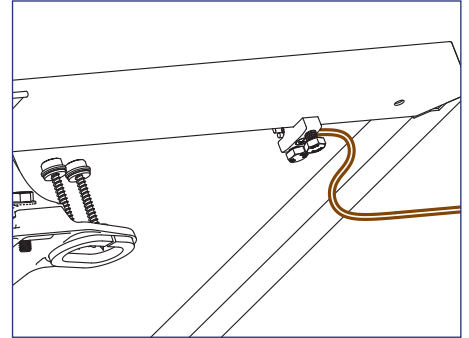
## GROUNDING METHOD DETAILS



1) Row to row module bonding provided by bonding clips in Mount assembly and Clamp assembly.



2) Column to column bonding provided by Universal Skirt and bonding clips in the Clamp assembly and/or the RL Universal Link assembly.  
Module heights evaluated for bonding with Link Bonding Clamps: 40mm, 38mm, 35mm, 32mm, 30mm

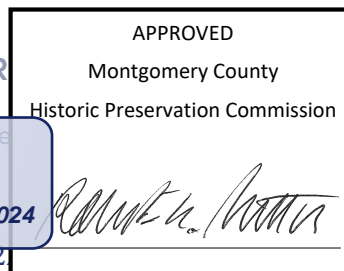


3) Each continuous array is connected to Equipment Grounding Conductor through Ground Lug (242-92202) installed on one module per array.



### GROUNDING MARKING

The Ground Lug is marked with the ground symbol.



Optionally; Install Ground Lug on the Mount Landing Pad at the top of the array.

# Maintaining the Grounding Bonding When Removing a Module

## INSTRUCTION FOR MAINTAINING THE GROUNDING BONDING WHEN REMOVING A MODULE FOR SERVICING

**CAUTION:** Module removal may disrupt the bonding path and could introduce the risk of electric shock. Additional steps may be required to maintain the bonding path. Modules should only be removed by qualified persons in compliance with the instructions in this manual.

Module removal is not presented as a frequently expected occurrence and will not be required as part of routine maintenance.

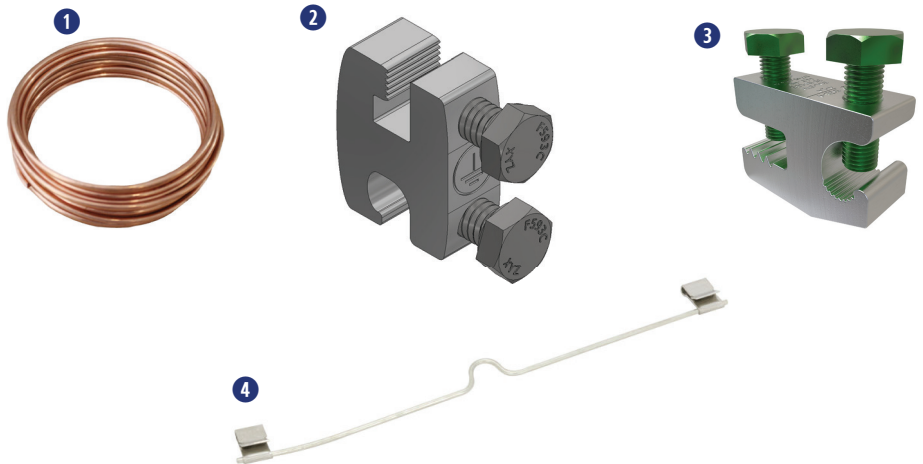
Scenarios that could result in a disruption of the bonding path are described, for example irregularly-shaped arrays, arrays consisting of individual rows, and any other scenario where module removal could disrupt the bonding path. In most cases, the removal of a module for servicing will not disturb or break grounding continuity. If a module is to be removed that will break continuity, these are the steps that must be taken to maintain a continuously bonded SnapNrack TopSpeed™ System.

### Required Tools

- Socket Wrench
- Torque Wrench
- 1/2" Socket
- 7/16" Socket

### Required Materials

- 1 #10 Or Larger Bare Copper Conductor
- 2 SnapNrack Ground Lug part no. 242-92202
- 3 IlSCO Part No. SGB-4
- 4 DnoRaxx Dynobond™



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By Laura DiPasquale, M-NCPPC at 8:09 pm, Oct 09, 2024

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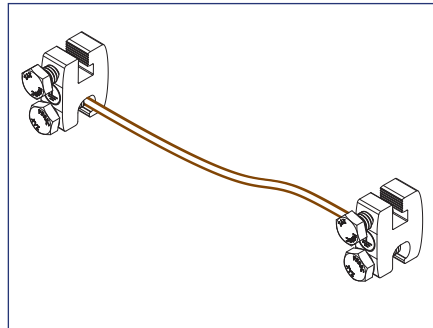
2

# Maintaining the Grounding Bonding When Removing a Module

## JUMPER ASSEMBLY INSTRUCTION & INSTALLATION

**CAUTION:** Do Not Remove the Module until the Jumper is installed

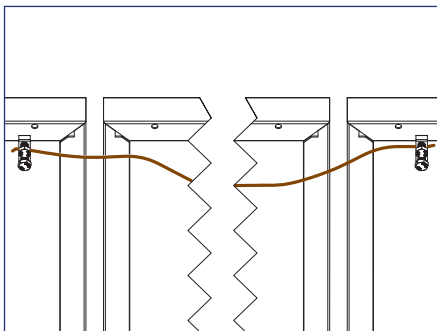
1) Identify the existing ground path at the location of module removal and choose an appropriate length of #10 bare copper to bridge the soon to be broken ground path.



*Example of assembled bonding jumper using (2) SnapNrack Ground Lugs*

2) Attach one ground lug to each end of #10 bare copper wire. See recommended options below:

1. (2) SnapNrack Ground Lug part no. 242-922022
2. (2) IlSCO part no. SGB-4
3. (1) DroRaxx DynoBond™



3) Before the module is removed, attach the assembled bonding jumper. Depending on where the module will be removed and choice of ground lug, jumper attachment locations will vary.

- SnapNrack Ground Lug part no. 242-92202 or IlSCO SGB-4 lugs can be attached to module frames or anywhere on the TopSpeed™ Mount.
- DynoRaxx DynoBond™ is approved and appropriate when a short bonding jumper is needed from module to module.

4) Service the array. With the bonding jumper installed, it is now safe to remove the module for service or maintenance.

5) After Servicing the array reinstall the module and original ground path. Only then Remove the bonding jumper.

**Caution:** Do not remove the bonding jumper until original ground path is established.

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By Laura DiPasquale, M-NCPPC at 8:09 pm, Oct 09, 2024



## APPROVED MODULE & MLPE INFORMATION

SnapNrack TopSpeed™ System has been tested with the following UL Listed module series: The SnapNrack TopSpeed™ System employs top-down clamps and links which have been evaluated for frame-to-system bonding, at specific mounting torques and with the specific module series listed below. All wattage values are covered.

Module manufacturer approval letters can be found at [www.snaprack.com](http://www.snaprack.com).

| Manufacturer    | Model                   |                             |
|-----------------|-------------------------|-----------------------------|
| Aptos Solar     | DNA-120-MF23-XXX        | DNA-120-BF26-XXXW           |
|                 | DNA-120-BF23-XXX        | DNA-144-BF26-XXXW           |
|                 | DNA-144-MF23-XXX        | DNA-108-BF10-xxxW           |
|                 | DNA-144-BF23-XXX        | DNA-120-BF10-xxxW           |
|                 | DNA-120-MF26-XXXW       | DNA-108-MF10-xxxW           |
|                 | DNA-144-MF26-XXXW       |                             |
| Canadian Solar  | CS6K-XXX-M              | CS1H-XXX-MS                 |
|                 | CS6K-XXX-M-SD           | CS1H-XXX-MS-AB              |
|                 | CS6K-XXX-P              | CS3W-XXX-P                  |
|                 | CS6K-XXX-P-SD           | CS3N-XXX-MS                 |
|                 | CS6K-XXX-MS             | CS1Y-XXX-MS                 |
|                 | CS3K-XXX-P              | CS3W-MB-AG                  |
|                 | CS3K-XXX-MS             | CS3Y-MB-AG                  |
|                 | CS3U-XXX-MS             | CS6W-XXXMB-AG               |
|                 | CS3U-XXX-P              | CS6R-XXXMS-HL               |
|                 | CS1K-XXX-MS             | CS3W-XXX-MS                 |
| CertainTeed     | CTXXXHC11-06            |                             |
| Chint Solar     | CHSM6612M-XXX           | CHSM72M-HC-XXX* (Astro 4)   |
|                 | CHSM6612M(BL)-XXX       | CHSM72M-HC-XXX* (Astro 5)   |
|                 | CHSM6612M/HV-XXX        |                             |
| Dehui Solar     | DH-M760B-XXXW           | DH-M760F-XXXW               |
|                 | DH-M760W-XXXW           | DH-M772F-XXXW               |
|                 | DH-M772W-XXXW           |                             |
| Freedom Forever | FF-MP-BBB-xxx           |                             |
| Hanwha Q Cells  | Q.PEAK DUO-G5-XXX       | Q.PEAK DUO XL-G10.3/BFG-XXX |
|                 | Q.PEAK DUO-BLK-G5-XXX   | Q.PEAK DUO G10-XXX          |
|                 | Q.PLUS DUO-G5-XXX       | Q.PEAK DUO BLK G10-XXX      |
|                 | Q.PEAK DUO-G7-XXX       | Q.PEAK DUO G10+-XXX         |
|                 | Q.PEAK DUO-BLK-G7-XXX   | Q.PEAK DUO BLK G10+-XXX     |
|                 | Q.PEAK DUO-G7.2-XXX     | Q.PEAK DUO XL-G10.3-XXX     |
|                 | Q.PEAK DUO-G7.2-XXX     | Q.PEAK DUO XL-G10.c-XXX     |
|                 | Q.PEAK DUO-BLK-G7.2-XXX | Q.PEAK DUO XL-G10.d-XXX     |
|                 | Q.PEAK DUO-G7.2-XXX     | Q.PEAK DUO L-G8.3/BFG-XXX   |
|                 | Q.PEAK DUO-BLK-G7.2-XXX | Q.PEAK DUO L-G8.3/BGT-XXX   |
|                 | Q.PEAK DUO-G7.2-XXX     | Q.PEAK DUO ML-G10-XXX       |
|                 | Q.PEAK DUO-BLK-G7.2-XXX | Q.PEAK DUO BLK ML-G10+-XXX  |

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| Manufacturer   | Model                      |                              |
|--|----------------------------|------------------------------|
| Hanwha Q Cells   | Q.PEAK DUO-G8-XXX          | Q.PEAK DUO ML-G10+-XXX       |
|  | Q.PEAK DUO-BLK-G8-XXX      | Q.PEAK DUO BLK ML-G10-XXX    |
|  | Q.PEAK DUO BLK-G6+/AC-XXX  | Q.PEAK DUO ML-G10.a+-XXX     |
|  | Q.PEAK DUO-ML-G9-XXX       | Q.PEAK DUO BLK ML-G10.a+-XXX |
|  | Q.PEAK DUO-BLK-ML-G9-XXX   | Q.PEAK DUO ML-G10.a-XXX      |
|  | Q.PEAK DUO-BLK-G9-XXX      | Q.PEAK DUO BLK ML-G10.a-XXX  |
|  | Q.PEAK DUO-BLK-ML-G9+-XXX  | Q.PEAK DUO BLK G10+/AC XXX   |
|  | Q.PEAK DUO-ML-G9+-XXX      | Q.PEAK DUO BLK G10+/HL XXX   |
|  | Q.PEAK DUO-BLK-ML-G9+-XXX  | Q.PEAK DUO XL-G11.3 XXX      |
|  | Q.PEAK DUO XL-G9.2-XXX     | Q.PEAK DUO XL-G11.3 BFG XXX  |
|  | Q.PEAK DUO XL-G9.3-XXX     | Q.TRON-G1+ XXX               |
|  | Q.PEAK DUO XL-G9.3/BFG-XXX | Q.TRON BLK-G1+ XXX           |
|  | Q.PEAK DUO XL-G10.2-XXX    |                              |
| HT-SAAE  | HT60-166M-XXX              | HT60-182M-XXX                |
| Heliene  | 60M-XXX                    | 72M-XXX                      |
|  | 60P-XXX                    | 72P-XXX                      |
| "Hyundai<br>(All may be followed by "BK")"   | HiA-SXXXMS                 | HiS-SXXXYI                   |
|  | HiS-SXXXXY                 | HiS-SXXXYPH(BK)              |
| Hyperion/Runergy   | HY-DH108P8-XXX(Y)          |                              |
| JA Solar   | JAM60S09-XXX/PR            | JAM72S10-XXX/PR              |
|  | JAM60S10-XXX/MR            | JAM72S12-XXX/PR              |
|  | JAM60S10-XXX/PR            | JAM60S17-XXX/MR              |
|  | JAM60S12-XXX/PR            | JAM54S30-XXX/MR              |
|  | JAM72S09-XXX/PR            | JAM54S31-XXX/MR              |
|  | JAM72S10-XXX/MR            | JAM72D30-XXX/MB              |
| Jinko Solar  | JKMXXXM-60                 | JKMXXXP-72-V                 |
|  | JKMXXXM-60L                | JKMXXXP-72                   |
|  | JKMXXXM-60HL               | JKMXXXP-72-V                 |
|  | JKMXXXM-60HBL              | JKMSXXXP-72                  |
|  | JKMXXXP-60                 | JKMXXXM-72HL-V               |
|  | JKMXXXP-60-J4              | JKMXXXM-72HL-TV              |
|  | JKMXXXP-60-V               | JKMXXXM-72HBL                |
|  | JKMXXXP-60B-J4             | JKMXXXM-6TL3-B               |
|  | JKMXXXP-60                 | JKMXXXM-6RL3-B               |
|  | JKMXXXP-60-V               | JKMXXXM-7RL3-V               |
|  | JKMXXXM-72                 | JKMXXXM-7RL3-TV              |
|  | JKMXXXM-72L-V              | JKMXXXM-72HL4-V              |
|  | JKMXXXP-72                 | JKMXXXM-72HL4-TV             |
| <div data-bbox="121 1879 771 2005" style="border: 1px solid black; padding: 5px;"> <p><b>REVIEWED</b><br/>By Laura DiPasquale, M-NCPPC at 8:09 pm, Oct 09, 2024</p> </div> | LGXXXN1C-A5                | LGXXXA1C-V5                  |
|  | LGXXXN1C-A5                | LGXXXM1C-L5                  |
|  | LGXXXN1C-A5                | LGXXXM1K-L5                  |
|  | LGXXXN1C-A5                | LGXXXN1C-N5                  |
|  | LGXXXN1C-A5                | LGXXXN1K-L5                  |
|  | LGXXXN1C-A5                | LGXXXN1K-A6                  |

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| Manufacturer         | Model               |                     |
|----------------------|---------------------|---------------------|
| LG                   | LGXXXN1C-G4         | LGXXXN1W-A6         |
|                      | LGXXXN1K-G4         | LGXXXQ1C-A6         |
|                      | LGXXXS1C-G4         | LGXXXQ1K-A6         |
|                      | LGXXXN2C-G4         | LGXXXM1K-A6         |
|                      | LGXXXN2K-G4         | LGXXXM1C-A6         |
|                      | LGXXXN2W-G4         | LGXXXA1C-A6         |
|                      | LGXXXS2C-G4         | LGXXXQAC-A6         |
|                      | LGXXXS2W-G4         | LGXXXQAK-A6         |
|                      | LGXXXN1C-V5         | LGXXXN1K-B6         |
|                      | LGXXXN1W-V5         | LGXXXN2W-E6         |
|                      | LGXXXN2T-V5         | LGXXXN2T-E6         |
|                      | LGXXXN2T-J5         | LGXXXN1K-E6         |
|                      | LGXXXN1T-V5         | LGXXXN3K-V6         |
|                      | Longi               | LR6-60-XXXM         |
| LR6-60BK-XXXM        |                     | LR4-60HIB-XXXM      |
| LR6-60HV-XXXM        |                     | LR4-60HPH-XXXM      |
| LR6-60PB-XXXM        |                     | LR4-60HIH-XXXM      |
| LR6-60PE-XXXM        |                     | LR6-60HIH-XXXM      |
| LR6-60PH-XXXM        |                     | LR6-60HIB-XXXM      |
| LR6-60HPB-XXXM       |                     | LR4-72HPH-XXXM      |
| LR6-60HPH-XXXM       |                     |                     |
| Meyer Burger         | Meyer Burger Black* | Meyer Burger White* |
| mSolar               | TXI6-XXX120BB       |                     |
| Mission Solar        | MSEXXS05T           | MSEXXSQ4S           |
|                      | MSEXXS05K           | MSEXXS8K            |
|                      | MSEXXSQ5T           | MSEXXS8T            |
|                      | MSEXXSQ5K           | MSEXXS9S            |
|                      | MSEXXM4J            | MSE60AXXX           |
|                      | MSEXXM6J            | MSEXXS5K            |
|                      | MSEXXS06W           | MSEXXS5T            |
|                      | MSEXXS04J           | MSEXXS6S            |
|                      | MSEXXS06J           | MSEXXS6W            |
|                      | MSEXXSQ6S           | MSEXXS5R            |
| Next Energy Alliance | USNEA-XXXM3-60      | USNEA-XXXM3-72      |
|                      | USNEA-XXXM3B-60     | USNEA-XXXM3B-72     |
| Panasonic            | VBHNXXXKA03         | VBHXXXRA18N         |
|                      | VBHNXXXKA04         | VBHXXXRA03K         |
|                      | VBHNXXXSA17         | EVPVXXX(K)          |
|                      | VBHNXXXSA19         | EVPVXXXH            |
|                      | VBHN325             | EVPVXXXPK           |
| PSXXXM               | PSxxxM8GF-18/VH     | PSxxxM8GFH-18/VH    |
|                      | PSxxxM8GFH-18/VH    | PSxxxM6-24/TH       |
|                      | PSxxxM6-24/TH       |                     |
|                      | PSxxxM6-24/TH       |                     |
|                      | PSxxxM6-24/TH       |                     |

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| Manufacturer                                     | Model                   |                            |
|--|-------------------------|----------------------------|
| REC<br>(All may be followed by "BLK" or "BLACK") | RECXXTP2                | RECXXTP2SM 72 BLK2         |
|  | RECXXTP2-BLK            | RECXXXAA                   |
|  | RECXXNP                 | RECXXTP3M                  |
|  | RECXXTP2M               | RECXXTP4                   |
|  | RECXXTP2M 72            | RECXXXAA Pure              |
|  | RECXXTP2M 72 BLK        | RECXXXAA Pure-R            |
|  | RECXXTP2M 72 BLK2       | RECXXNP2                   |
|  | RECXXTP2SM 72           | RECXXNP3                   |
| SEG Solar  | SEG-400-BMB-HV          | SEG-xxx-BMD-HV             |
|  | SEG-400-BMB-TB          | SEG-xxx-BMD-TB             |
| Silfab   | SLAXXX-M                | SILXXXNT                   |
|  | SLAXXX-P                | SILXXXHL                   |
|  | SSAXXX-M                | SILXXXBK                   |
|  | SSAXXX-P                | SILXXXNX                   |
|  | SILXXXBL                | SILXXXNU                   |
|  | SILXXXML                | SILXXXHC                   |
|  | SILXXXNL                | SILXXXHN                   |
|  | SLGXXX-M                | SILXXXBG                   |
|  | SLGXXX-P                | SIL-xxxHC+                 |
|  | SSGXXX-M                | SIL-xxxHM                  |
|  | SSGXXX-P                |                            |
| Solaria  | Solaria PowerXT-XXXR-PX | Solaria PowerXT-XXXR-PM    |
|  | Solaria PowerXT-XXXR-BX | Solaria PowerXT-XXXR-PM-AC |
|  | Solaria PowerXT-XXXR-AC |                            |
| Sunpower   | SPR-AXXX-G-AC           | SPR-MXXX-H-AC              |
|  | SPR-AXXX                | SPR-MXXX                   |
|  | SPR-AXXX-BLK-G-AC       | SPR-MXXX-BLK-H-AC          |
|  | SPR-AXXX-BLK            | SPR-MXXX-BLK               |
| SunSpark   | SST-XXXM3-60            | SST-XXXM3-72               |
|  | SST-XXXM3B-60           | SST-XXXM3B-72              |
| Talesun  | TP660M-XXX              | TP672M-XXX                 |
|  | TP660P-XXX              | TP672P-XXX                 |
| Trina  | TSM-XXXDD05(II)         | TSMXXXDD05H.05(II)         |
|  | TSM-XXXDD05A.05(II)     | TSM-XXXDD06M.05(II)        |
|  | TSM-XXXDD05A.08(II)     | TSM-XXXDE15H(II)           |
|  | TSM-XXXDD05A.082(II)    | TSM-XXXDE15M(II)           |
|  | TSM-XXXPA05             | TSMXXXDE06X.05(II)         |
|  | TSM-XXXP                | TSMXXXDE09.05              |
|  | TSM-XXXP                | TSM-XXXDE15V(II)           |
|  | TSM-XXXP                | TSM-XXXDEG15VC.20(II)      |
|  | TSM-XXXP                | TSM-XXXDEG18MC.20(II)      |
|  | TSM-XXXP                | TSM-XXXDEG19C.20           |

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| Manufacturer | Model                   |                         |
|--------------|-------------------------|-------------------------|
| Trina        | TSM-XXXPD05.05S         | TSM-XXXDEG21C.20        |
|              | TSM-XXXPD05.08          | TSM-XXXDE09C.05         |
|              | TSM-XXXPD05.082         | TSM-XXXDE09C.07         |
|              | TSM-XXXPD05.08D         | TSM-xxxNE09RC.05        |
|              | TSM-XXXPD05.08S         |                         |
| Vikram Solar | SOMERA VSMHBB.60.XXX.05 | PREXOS VSMDHT.60.XXX.05 |
|              | SOMERA VSMH.72.XXX.05   | PREXOS VSMDHT.72.XXX.05 |
| VSUN         | VSUNXXX-144BMH-DG       | VSUNXXX-108BMH          |
|              | VSUNXXX-120BMH          |                         |
| ZNShine      | ZXM6-60-XXX/M           | ZXM6-NH144-XXXM         |
|              | ZXM6-NH120-XXXM         | ZXM7-SH108-XXXM         |

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**SnapNrack TopSpeed™ has been tested with the following Module Level Power Electronic (MLPE) devices:**

SnapNrack TopSpeed™ mounting systems has been tested with the following UL/NRTL Listed Module Level Power Electronic (MLPE) Devices. The back plates of the MLPEs have been evaluated for bonding to TopSpeed™ through the SnapNrack MLPE Frame Attachment Kit, model 242-02151.

| MLPE Manufacturer       | Model             |                   |         |
|-------------------------|-------------------|-------------------|---------|
| AP Smart                | RSD-S-PLC         |                   |         |
| Celestica International | DG-006-F001201x   | DG-006-F001401x   |         |
| Delta Electronics       | GPI00010105       |                   |         |
| Enphase                 | C250              | IQ7PLUS-72-2-US   |         |
|                         | M215              | IQ7PLUS-72-B-US   |         |
|                         | M250              | IQ8-60            |         |
|                         | IQ6-60-2-US       | IQ8PLUS-72        |         |
|                         | IQ6PLUS-72-2-US   | IQ8A-72           |         |
|                         | IQ7-60-2-US       | IQ8H-208-72       |         |
|                         | IQ7-60-B-US       | IQ8H-240-72       |         |
| Generec                 | S2502             |                   |         |
| Ginlong Technologies    | Solis-RSD-1G      |                   |         |
|                         | Solis-MLRSD-R1-1G | Solis-MLRSD-R2-1G |         |
| SolarEdge               | P300-5NC4ARS      | P320-5NC4ARS      |         |
|                         | P370-5NC4AFS      | P400-5NC4AFS      |         |
|                         | P320              | P340              |         |
|                         | P370              | P400              |         |
|                         | P401              | P405              |         |
|                         | P485              | P505              |         |
|                         | P730              | P800p             |         |
|                         | P850              | P860              |         |
|                         | P950              | P1100             |         |
|                         | P1101             | S440              |         |
|                         | S500              |                   |         |
|                         | SMA               | RSB-2S-US-10      |         |
|                         | Tigo              | TS4-R-F           | TS4-R-M |
| TS4-R-O                 |                   | TS4-R-S           |         |
| TS4-R-M-DUO             |                   | TS4-R-O-DUO       |         |
| TS4-R-S-DUO             |                   | TS4-A-F           |         |
| TS4-A-2F                |                   | TS4-A-O           |         |
| TS4-A-S                 |                   |                   |         |

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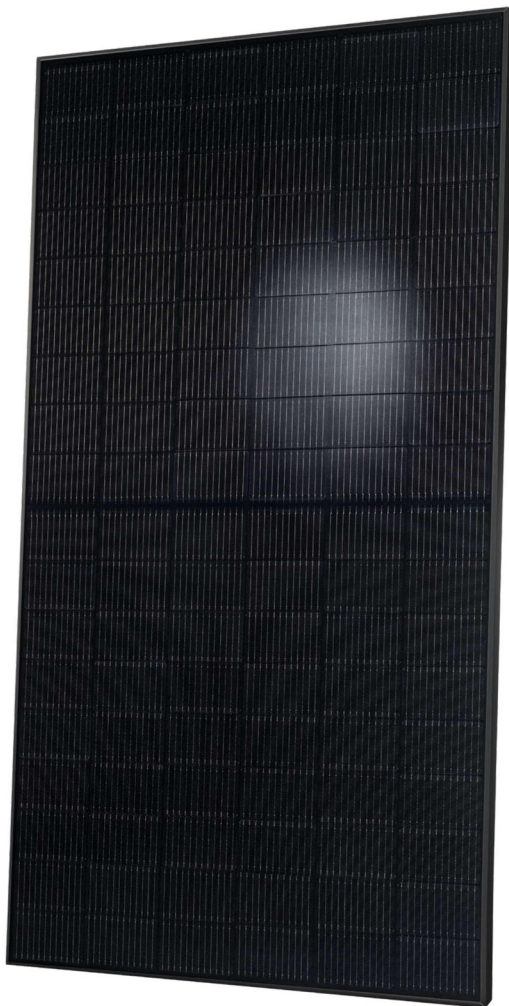


# Q.TRON BLK M-G2+ SERIES



405-430 Wp | 108 Cells  
22.0% Maximum Module Efficiency

MODEL Q.TRON BLK M-G2+



## High performance Qcells N-type solar cells

Q.ANTUM NEO Technology with optimized module layout boosts module efficiency up to 22.0%.



## A reliable investment

Inclusive 25-year product warranty and 25-year linear performance warranty<sup>1</sup>.



## Enduring high performance

Long-term yield security with Anti LeTID Technology, Anti PID Technology<sup>2</sup>, Hot-Spot Protect.



## Extreme weather rating

High-tech aluminium alloy frame, certified for high snow (8100 Pa) and wind loads (3600 Pa).



## Innovative all-weather technology

Optimal yields, whatever the weather with excellent low-light and temperature behaviour.



## The most thorough testing programme in the industry

Qcells is the first solar module manufacturer to pass the most comprehensive quality programme in the industry: The new "Quality Controlled PV" of the independent certification institute TÜV Rheinland.

<sup>1</sup> See data sheet on rear for further information.

<sup>2</sup> APT test conditions according to IEC/TS 62804-1:2015, method A (-1500V, 96h)

**REVIEWED**

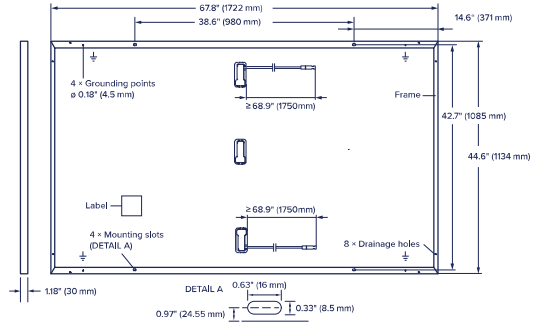
By Laura DiPasquale, M-NCPPC at 8:10 pm, Oct 09, 2024



# Q.TRON BLK M-G2+ SERIES

## Mechanical Specification

|              |   |
|--------------|---|
| Format       | 67.8 in × 44.6 in × 1.18 in (including frame)<br>(1722 mm × 1134 mm × 30 mm)  |
| Weight       | 46.7 lbs (21.2 kg)  |
| Front Cover  | 0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology   |
| Back Cover   | Composite film  |
| Frame        | Black anodised aluminium  |
| Cell         | 6 × 18 monocrystalline Q.ANTUM NEO solar half cells   |
| Junction box | 2.09-3.98 in × 1.26-2.36 in × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), Protection class IP67, with bypass diodes |
| Cable        | 4 mm <sup>2</sup> Solar cable; (+) ≥ 68.9 in (1750 mm), (-) ≥ 68.9 in (1750 mm)   |
| Connector    | Stäubli MC4; IP68   |



## Electrical Characteristics

| POWER CLASS | 405 | 410 | 415 | 420 | 425 | 430 |
|-------------|-----|-----|-----|-----|-----|-----|
|-------------|-----|-----|-----|-----|-----|-----|

MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC<sup>1</sup> (POWER TOLERANCE +5 W/-0 W)

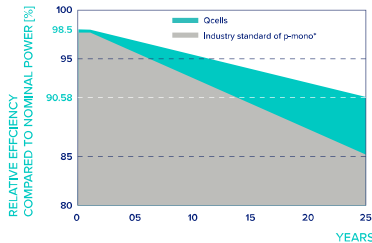
|                                    |           |     | Minimum |       |       |       |       |       |
|------------------------------------|-----------|-----|---------|-------|-------|-------|-------|-------|
|                                    |           |     | 405     | 410   | 415   | 420   | 425   | 430   |
| Power at MPP <sup>1</sup>          | $P_{MPP}$ | [W] | 405     | 410   | 415   | 420   | 425   | 430   |
| Short Circuit Current <sup>1</sup> | $I_{SC}$  | [A] | 13.33   | 13.41 | 13.49 | 13.58 | 13.66 | 13.74 |
| Open Circuit Voltage <sup>1</sup>  | $V_{OC}$  | [V] | 37.91   | 38.19 | 38.47 | 38.75 | 39.03 | 39.32 |
| Current at MPP                     | $I_{MPP}$ | [A] | 12.69   | 12.76 | 12.83 | 12.91 | 12.98 | 13.05 |
| Voltage at MPP                     | $V_{MPP}$ | [V] | 31.93   | 32.13 | 32.34 | 32.54 | 32.74 | 32.94 |
| Efficiency <sup>1</sup>            | $\eta$    | [%] | ≥20.7   | ≥21.0 | ≥21.3 | ≥21.5 | ≥21.8 | ≥22.0 |

MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT<sup>2</sup>

|                       |           |     | Minimum |       |       |       |       |       |
|-----------------------|-----------|-----|---------|-------|-------|-------|-------|-------|
|                       |           |     | 405     | 410   | 415   | 420   | 425   | 430   |
| Power at MPP          | $P_{MPP}$ | [W] | 306.1   | 309.9 | 313.7 | 317.5 | 321.2 | 325.0 |
| Short Circuit Current | $I_{SC}$  | [A] | 10.74   | 10.81 | 10.87 | 10.94 | 11.00 | 11.07 |
| Open Circuit Voltage  | $V_{OC}$  | [V] | 35.96   | 36.23 | 36.50 | 36.77 | 37.04 | 37.31 |
| Current at MPP        | $I_{MPP}$ | [A] | 9.98    | 10.04 | 10.10 | 10.15 | 10.21 | 10.27 |
| Voltage at MPP        | $V_{MPP}$ | [V] | 30.66   | 30.87 | 31.07 | 31.26 | 31.46 | 31.65 |

<sup>1</sup>Measurement tolerances  $P_{MPP} \pm 3\%$ ;  $I_{SC}$ ;  $V_{OC} \pm 5\%$  at STC; 1000 W/m<sup>2</sup>, 25 ± 2 °C, AM 1.5 according to IEC 60904-3 • <sup>2</sup>800 W/m<sup>2</sup>, NMOT, spectrum AM 1.5

## Qcells PERFORMANCE WARRANTY

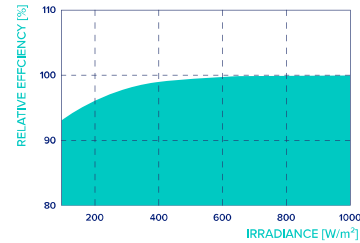


At least 98.5% of nominal power during first year. Thereafter max. 0.33% degradation per year. At least 95.53% of nominal power up to 10 years. At least 90.58% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Qcells sales organisation of your respective country.

<sup>\*</sup>Standard terms of guarantee for the 5 PV companies with the highest production capacity in 2021 (February 2021)

## PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m<sup>2</sup>).

## TEMPERATURE COEFFICIENTS

|                                      |          |       |       |                                      |         |       |                       |
|--------------------------------------|----------|-------|-------|--------------------------------------|---------|-------|-----------------------|
| Temperature Coefficient of $I_{SC}$  | $\alpha$ | [%/K] | +0.04 | Temperature Coefficient of $V_{OC}$  | $\beta$ | [%/K] | -0.24                 |
| Temperature Coefficient of $P_{MPP}$ | $\gamma$ | [%/K] | -0.30 | Nominal Module Operating Temperature | NMOT    | [°F]  | 109 ± 5.4 (43 ± 3 °C) |

## Properties for System Design

|  |           |                        |                            |   |  |
|--|-----------|------------------------|----------------------------|---|--|
| Maximum System Voltage                   | $V_{SYS}$ | [V]                    | 1000 (IEC)/1000 (UL)       | PV module classification                        | Class II                                   |
| Maximum Series Fuse Rating               |           | [A DC]                 | 25                         | Fire Rating based on ANSI/UL 61730              | C / TYPE 2                                 |
| Max. Design Load, Push/Pull <sup>3</sup> |           | [lbs/ft <sup>2</sup> ] | 113 (5400 Pa)/50 (2400 Pa) | Permitted Module Temperature on Continuous Duty | -40 °F up to +185 °F (-40 °C up to +85 °C) |
| Max. Test Load, Push/Pull <sup>3</sup>   |           | [lbs/ft <sup>2</sup> ] | 169 (8100 Pa)/75 (3600 Pa) |   |  |

<sup>3</sup> See Installation Manual

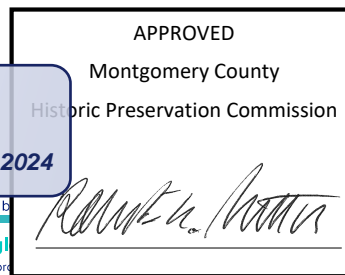
## Qualifications and Certificates



<sup>\*</sup>Contact your Qcells Sales Representative for details regarding the module's eligibility to be installed in historic districts.

Qcells pursues minimizing paper output in consideration of the green building goals.

Note: Installation instructions must be followed. Contact our technical service for further information on approved installers. Hanwha Q CELLS America Inc. 400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | TEL +1 949 748 59 96 | EMAIL [hqc-inquiry@qcells.com](mailto:hqc-inquiry@qcells.com) | WEB [www.qcells.com](http://www.qcells.com)



qcells



# IQ8M and IQ8A Microinverters

Our newest IQ8 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 modes. This chip is built in advanced 55nm technology with high speed digital logic and has superfast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



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 IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.



IQ8 Series Microinverters are UL listed as PV Rapid Shutdown Equipment and conform with various regulations, when installed according to manufacturer’s instructions.

### Easy to install

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

### High productivity and reliability

- Produce 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 3<sup>rd</sup> Ed.)

**Note:**

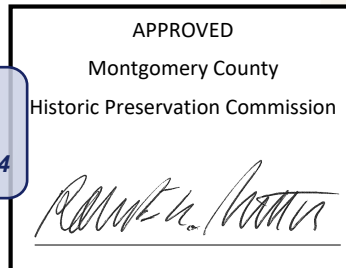
IQ8 Microinverters cannot be mixed together with previous generations of Enphase microinverters (IQ7 Series, IQ6 Series, etc) in the same system.

**REVIEWED**

\*Only IQ8M and IQ8A support split-phase, 240V installations only.

\*\*IQ8M and IQ8A support split-phase, 240V installations only.

By Laura DiPasquale, M-NCPPC at 8:10 pm, Oct 09, 2024



# IQ8M and IQ8A Microinverters

| INPUT DATA [DC]                            |    | IQ8M-72-2-US  | IQ8A-72-2-US |
|--|----|---|--------------|
| Commonly used module pairings <sup>1</sup> | W  | 260 – 460   | 295 – 500    |
| Module compatibility                       |    | 54-cell / 108 half-cell, 60-cell / 120 half-cell, 66-cell / 132 half-cell and 72-cell / 144 half-cell                     |              |
| MPPT voltage range                         | V  | 30 – 45   | 32 – 45      |
| Operating range                            | V  | 16 – 58   |              |
| Min. / Max. start voltage                  | V  | 22 / 58   |              |
| Max. input DC voltage                      | V  | 60  |              |
| Max. continuous input DC current           | A  | 12  |              |
| Max. input DC short-circuit current        | A  | 25  |              |
| Max. module I <sub>sc</sub>                | A  | 20  |              |
| Overvoltage class DC port                  |    | II  |              |
| DC port backfeed current                   | mA | 0   |              |
| PV array configuration                     |    | 1 x 1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit |              |

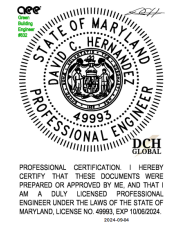
| OUTPUT DATA [AC]                                      |      | IQ8M-72-2-US                | IQ8A-72-2-US |
|---|------|-----------------------------|--------------|
| Peak output power                                     | VA   | 330                         | 366          |
| Max. continuous output power                          | VA   | 325                         | 349          |
| Nominal (L-L) voltage / range <sup>2</sup>            | V    | 240 / 211 – 264             |              |
| Max. continuous output current                        | A    | 1.35                        | 1.45         |
| Nominal frequency                                     | Hz   | 60                          |              |
| Extended frequency range                              | Hz   | 47 – 68                     |              |
| AC short circuit fault current over 3 cycles          | Arms | 2                           |              |
| Max. units per 20 A (L-L) branch circuit <sup>3</sup> |      | 11                          |              |
| Total harmonic distortion                             |      | <5%                         |              |
| Overvoltage class AC port                             |      | III                         |              |
| AC port backfeed current                              | mA   | 30                          |              |
| Power factor setting                                  |      | 1.0                         |              |
| Grid-tied power factor (adjustable)                   |      | 0.85 leading – 0.85 lagging |              |
| Peak efficiency                                       | %    | 97.8                        | 97.7         |
| CEC weighted efficiency                               | %    | 97.5                        | 97           |
| Night-time power consumption                          | mW   | 60                          |              |

| MECHANICAL DATA                        |  |
|--|--|
| Ambient temperature range              | -40°C to +60°C (-40°F to +140°F)                                   |
| Relative humidity range                | 4% to 100% (condensing)  |
| DC Connector type                      | MC4  |
| Dimensions (H x W x D)                 | 212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")                     |
| Weight                                 | 1.08 kg (2.38 lbs)   |
| Cooling                                | Natural convection – no fans                                       |
| Approved for wet locations             | Yes  |
| Pollution degree                       | PD3  |
| Enclosure                              | Class II double-insulated, corrosion resistant polymeric enclosure |
| Environ. category / UV exposure rating | NEMA Type 6 / outdoor  |

| COMPLIANCE    |  |
|---------------|--|
| Certification | UL 62109-1 (UL 1741 SA), UL 62109-1 IECF 1547-2015, IEC 62109-1, IEC 62109-2, IEC 62109-3, IEC 62109-4, IEC 62109-5, IEC 62109-6, IEC 62109-7, IEC 62109-8, IEC 62109-9, IEC 62109-10, IEC 62109-11, IEC 62109-12, IEC 62109-13, IEC 62109-14, IEC 62109-15, IEC 62109-16, IEC 62109-17, IEC 62109-18, IEC 62109-19, IEC 62109-20, IEC 62109-21, IEC 62109-22, IEC 62109-23, IEC 62109-24, IEC 62109-25, IEC 62109-26, IEC 62109-27, IEC 62109-28, IEC 62109-29, IEC 62109-30, IEC 62109-31, IEC 62109-32, IEC 62109-33, IEC 62109-34, IEC 62109-35, IEC 62109-36, IEC 62109-37, IEC 62109-38, IEC 62109-39, IEC 62109-40, IEC 62109-41, IEC 62109-42, IEC 62109-43, IEC 62109-44, IEC 62109-45, IEC 62109-46, IEC 62109-47, IEC 62109-48, IEC 62109-49, IEC 62109-50, IEC 62109-51, IEC 62109-52, IEC 62109-53, IEC 62109-54, IEC 62109-55, IEC 62109-56, IEC 62109-57, IEC 62109-58, IEC 62109-59, IEC 62109-60, IEC 62109-61, IEC 62109-62, IEC 62109-63, IEC 62109-64, IEC 62109-65, IEC 62109-66, IEC 62109-67, 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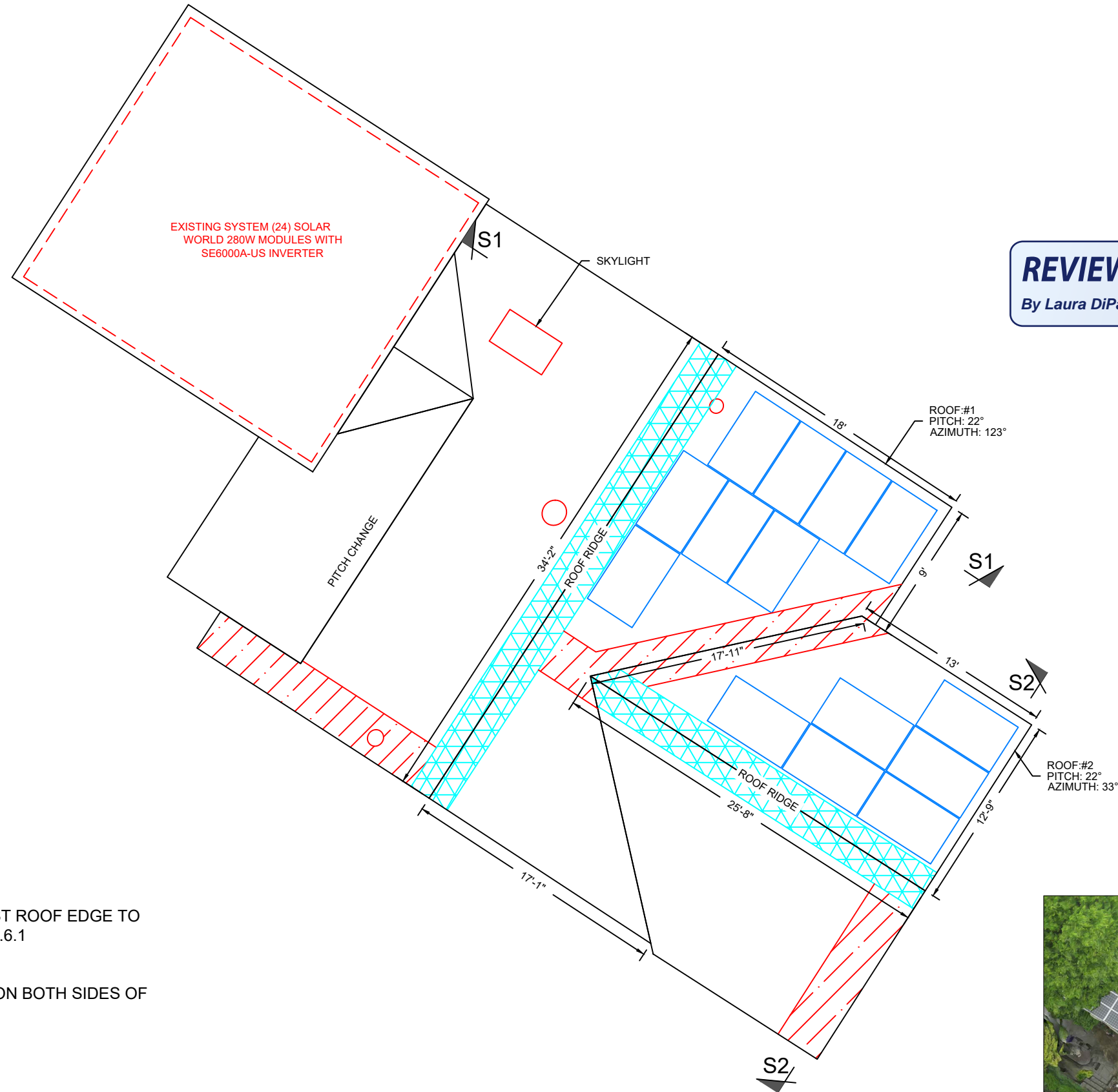
Add On System



APPROVED  
Montgomery County  
Historic Preservation Commission

*Rodolfo A. Torres*

**REVIEWED**  
By Laura DiPasquale, M-NCPPC at 8:10 pm, Oct 09, 2024



- KEY**
- FIRE SAFETY ZONE
  - 3' PATHWAYS FROM LOWEST ROOF EDGE TO RIDGE PROVIDED PER R324.6.1
  - 1'6" PATHWAYS PROVIDED ON BOTH SIDES OF RIDGE PER R324.6.2

PLAN VIEW TOTAL ROOF AREA: 1659 SQFT  
SOLAR ARRAY AREA: 294.00 SQFT  
THE SOLAR ARRAY IS 17.7% OF THE PLAN VIEW TOTAL ROOF AREA

- NOTES:**
- THE SYSTEM SHALL INCLUDE (14) HANWHA Q.TRON BLK M-G2+ 425W.
  - SNAPNRACK TOPSPEED WILL BE INSTALLED IN ACCORDANCE WITH SNAPNRACK INSTALLATION MANUAL.
  - EXISTING SYSTEM INCLUDE (24) SOLAR WORLD 280W MODULES WITH SE6000A-US INVERTER
  - REFER TO STRUCTURAL DRAWING FOR SECTIONS MARKED AND ADDITIONAL NOTES.

**SOLAR PANEL LAYOUT**  
Scale: 1/8" = 1'-0"

**Solar Energy World**  
Because Tomorrow Matters

Solar Energy World LLC.  
14880 Sweitzer Lane  
Laurel, MD 20707  
(888) 497-3233

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|   |                   |   |
|---|-------------------|---|
| Building Code   |                   | International Residential Code (IRC) 2018 |
| Electrical Code   |                   | National Electrical Code (NEC) 2017       |
| Wind Speed  | Snow Load         |   |
| 115 MPH   | 30 PSF            |   |
| Modules   |                   |   |
| (14) HANWHA Q.TRON BLK M-G2+ 425W                         |                   |   |
| Inverter(s)   |                   |   |
| (14) IQ8M-72-M-US   |                   |   |
| DC System Size  | AC System Size    |   |
| 5.950 kW  | 4.550 kW          |   |
| Customer Information                                      |                   |   |
| Dave Groberg<br>34 Columbia Ave<br>Takoma Park, MD, 20912 |                   |   |
| Permit/Lender   |                   |   |
| None  |                   |   |
| City  | Utility           |   |
| Montgomery  | Pepco             |   |
| Sheet Name  |                   |   |
| Solar Panel Layout  |                   |   |
| Drawn By  | Date              |   |
| AT  | September 3, 2024 |   |
| Scale   | Job Number        | Sheet                                     |
| AS NOTED  | MD20909           | A-1                                       |

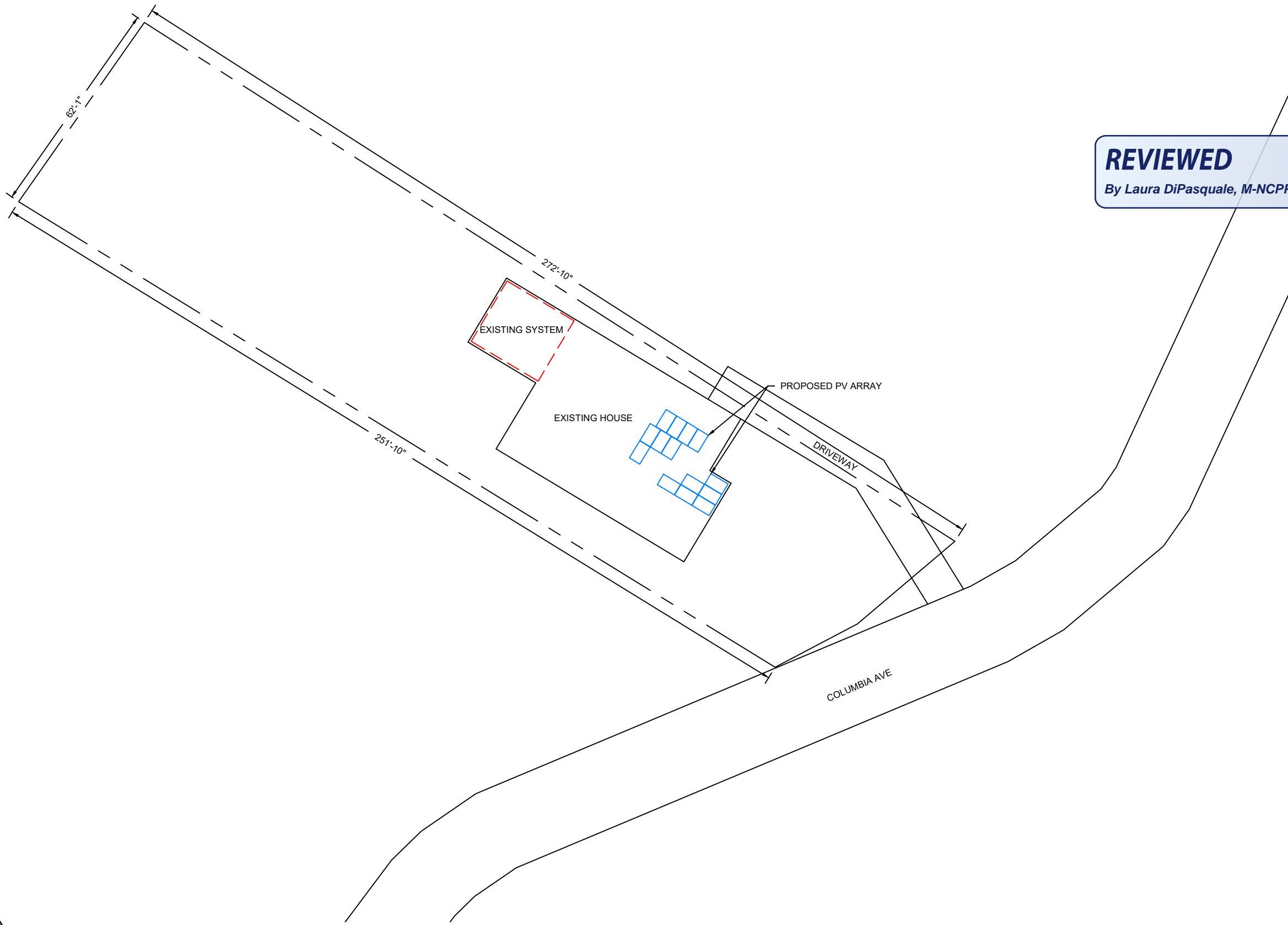





PROFESSIONAL CERTIFICATION I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A FULLY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND LICENSE NO. 49993 EXP. 10/30/2024

**REVIEWED**  
By Laura DiPasquale, M-NCPPC at 8:10 pm, Oct 09, 2024

APPROVED  
Montgomery County  
Historic Preservation Commission  
*Robert A. ...*



**SITE PLAN**  
Scale: 1" = 30'-0"



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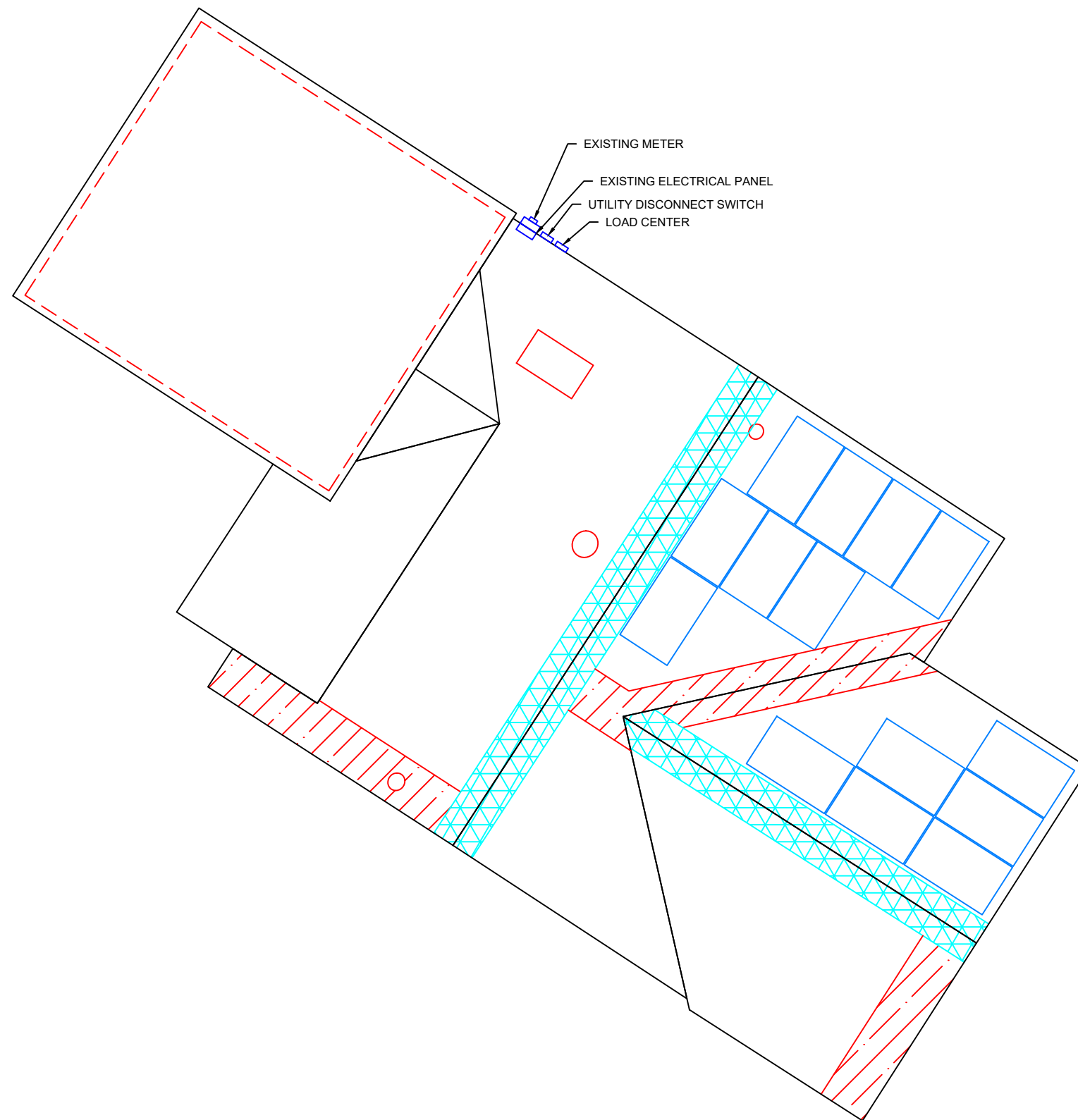
|   |                   |
|---|-------------------|
| Building Code   |                   |
| International Residential Code (IRC) 2018                 |                   |
| Electrical Code   |                   |
| National Electrical Code (NEC) 2017                       |                   |
| Wind Speed  | Snow Load         |
| 115 MPH   | 30 PSF            |
| Modules   |                   |
| (14) HANWHA Q.TRON BLK M-G2+ 425W                         |                   |
| Inverter(s)   |                   |
| (14) IQ8M-72-M-US   |                   |
| DC System Size  | AC System Size    |
| 5.950 kW  | 4.550 kW          |
| Customer Information                                      |                   |
| Dave Groberg<br>34 Columbia Ave<br>Takoma Park, MD, 20912 |                   |
| Payment/Lender  |                   |
| None  |                   |
| ATU   | Utility           |
| Montgomery  | Pepco             |
| Sheet Name  |                   |
| Site Plan   |                   |
| Drawn By  | Date              |
| AT  | September 3, 2024 |
| Scale   | Job Number        |
| AS NOTED  | MD20909           |
| Sheet   |                   |
| A-2   |                   |



APPROVED  
 Montgomery County  
 Historic Preservation Commission


*R. [Signature]*

**REVIEWED**  
 By Laura DiPasquale, M-NCPPC at 8:10 pm, Oct 09, 2024



**EQUIPMENT LOCATION PLAN**  
 Scale: NTS

**NOTE:**  
 EQUIPMENT LOCATION PLAN IS APPROXIMATE, EXACT LOCATION TO BE VERIFIED WITH INSTALLATION CREW AND HOME OWNER AT THE TIME OF INSTALLATION.



**Solar Energy World**  
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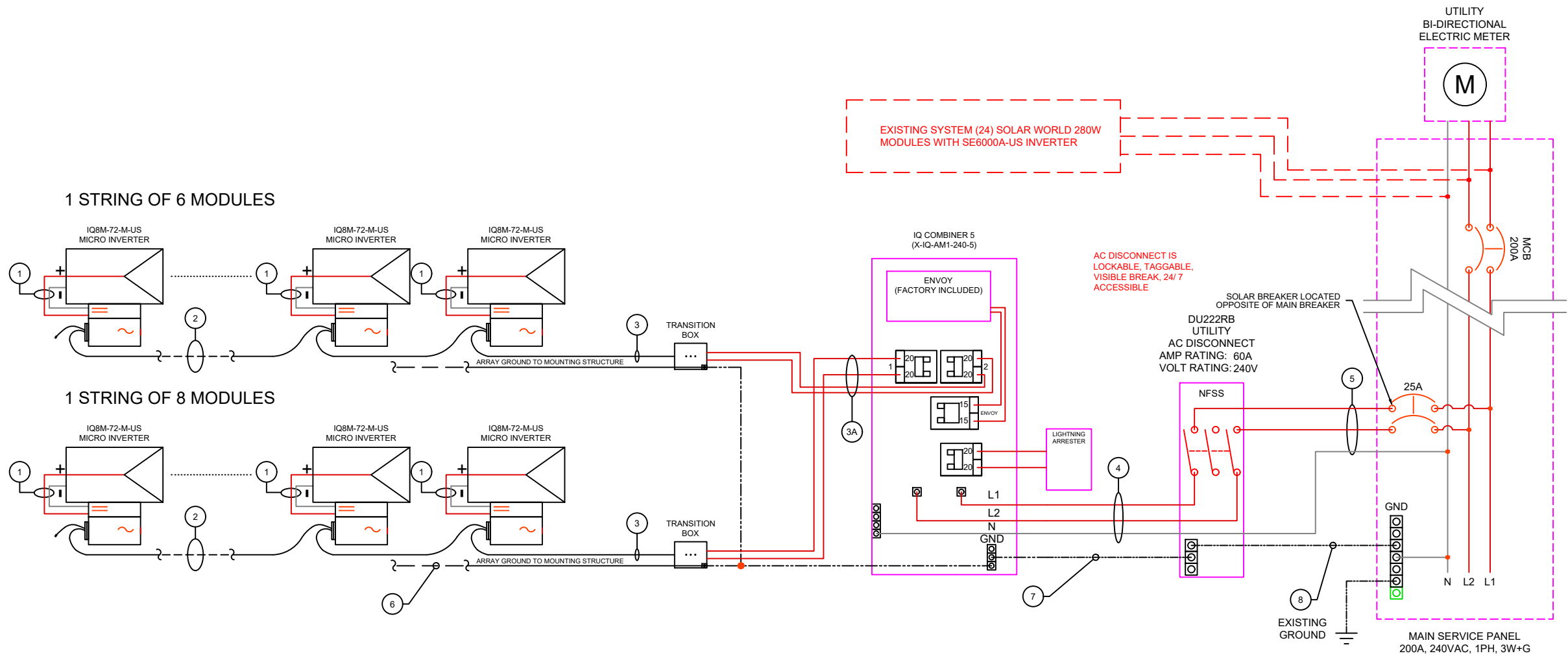
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 (888) 497-3233

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|   |                |   |                   |
|---|----------------|---|-------------------|
| Building Code   |                | International Residential Code (IRC) 2018 |                   |
| Electrical Code   |                | National Electrical Code (NEC) 2017       |                   |
| Wind Speed  | Snow Load      | 115 MPH                                   | 30 PSF            |
| Modules   |                |   |                   |
| (14) HANWHA Q.TRON BLK<br>M-G2+ 425W                      |                |   |                   |
| Inverter(s)   |                |   |                   |
| (14) IQ8M-72-M-US   |                |   |                   |
| DC System Size  | AC System Size | 5.950 kW                                  | 4.550 kW          |
| Customer Information                                      |                |   |                   |
| Dave Groberg<br>34 Columbia Ave<br>Takoma Park, MD, 20912 |                |   |                   |
| Payment/Lender  |                |   |                   |
| None  |                |   |                   |
| City  | Utility        | Montgomery                                | Pepco             |
| Sheet Name  |                |   |                   |
| Equipment Location Plan                                   |                |   |                   |
| Drawn By  | Date           | AT  | September 3, 2024 |
| Scale   | Job Number     | AS NOTED                                  | MD20909           |
|   |                |   | Sheet <b>E-1</b>  |

**REVIEWED**  
By Laura DiPasquale, M-NCPPC at 8:10 pm, Oct 09, 2024

APPROVED  
Montgomery County  
Historic Preservation Commission  
*[Signature]*



| MODULE SPECIFICATIONS                    |                      |      |
|--|----------------------|------|
| MODEL NUMBER                             | QTRON BLK M-G2+ 425W |      |
| PEAK POWER                               | 425 W                |      |
| RATED VOLTAGE (V <sub>mpp</sub> )        | 32.74 V              |      |
| RATED CURRENT (I <sub>mp</sub> )         | 12.98 A              |      |
| OPEN CIRCUIT VOLTAGE (V <sub>oc</sub> )  | 39.03 V              |      |
| SHORT CIRCUIT CURRENT (I <sub>sc</sub> ) | 13.66 A              |      |
| MAXIMUM SYSTEM VOLTAGE                   | 1000VDC              |      |
| INVERTER SPECIFICATIONS                  |                      |      |
| MODEL NUMBER                             | IQ8M-72-M-US         |      |
| MAXIMUM DC VOLTAGE                       | 60 V                 |      |
| MAXIMUM POWER OUTPUT                     | 325 W                |      |
| NOMINAL AC VOLTAGE                       | 240 VAC              |      |
| MAXIMUM AC CURRENT                       | 1.35 A               |      |
| CEC EFFICIENCY                           | 97.5%                |      |
| ARRAY DETAILS                            |                      |      |
| NO. OF MODULES PER STRING                | 6                    | 8    |
| NO. OF STRINGS                           | 1                    | 1    |
| ARRAY WATTS AT STC                       | 2550                 | 3400 |

**3-LINE DIAGRAM**

| WIRE/CONDUIT SCHEDULE ARRAY |  |                        |            |
|-----------------------------|--|------------------------|------------|
| TAG                         | DESCRIPTION                            | WIRE SIZE/TYPE         | NOTES      |
| 1                           | Panel to Micro Inverter                | PV Wire (Factory Made) | INTEGRATED |
| 2                           | Micro Inverter to Micro Inverter       | Pre-Manufactured Cable |            |
| 3                           | Micro Inverter to Transition Box       | Pre-Manufactured Cable |            |
| 3A                          | Transition Box to Load Center          | #10 THHN/THWN-2        | INTEGRATED |
| 4                           | Load Center to AC Disconnect           | #10 Cu THHN/THWN-2     |            |
| 5                           | AC Disconnect to Interconnection Point | #10 Cu THHN/THWN-2     |            |
| 6                           | Equipment Grounding Conductor          | #8 Cu Bare Copper Wire |            |
| 7                           | Equipment Grounding Conductor          | #8 Cu THHN/THWN-2      |            |
| 8                           | Grounding Electrode Conductor          | #6 Cu                  |            |

**GENERAL ELECTRIC NOTES: NEC2017**

- EQUIPMENT USED SHALL BE NEW, UNLESS OTHERWISE NOTED.
  - EQUIPMENT USED SHALL BE UL LISTED, UNLESS OTHERWISE NOTED.
  - EQUIPMENT SHALL BE INSTALLED PROVIDING ADEQUATE PHYSICAL WORKING SPACE AROUND THE EQUIPMENT AND SHALL COMPLY WITH NEC.
  - COPPER CONDUCTORS SHALL BE USED AND SHALL HAVE AN INSULATION RATING OF 600V, 90°C, UNLESS OTHERWISE NOTED.
  - CONDUCTORS SHALL BE SIZED IN ACCORDANCE TO THE NEC. CONDUCTORS AMPACITY SHALL BE DE-RATED FOR TEMPERATURE INCREASE, CONDUIT FILL AND VOLTAGE DROP.
  - ALL CONDUCTORS, EXCEPT PV WIRE SHALL BE INSTALLED IN APPROVED CONDUITS OR RACEWAY. CONDUITS SHALL BE ADEQUATELY SUPPORTED AS PER NEC.
  - AC DISCONNECT SHOWN IS REQUIRED IF THE UTILITY REQUIRES VISIBLE-BLADE SWITCH.
  - EXPOSED NON-CURRENT CARRYING METAL PARTS SHALL BE GROUNDED AS PER NEC.
  - LINE SIDE INTER-CONNECTION SHALL COMPLY WITH NEC.
  - SMS MONITORING SYSTEM AND IT'S CONNECTION SHOWN IS OPTIONAL. IF USED, REFER TO SMS INSTALLATION MANUAL FOR WIRING METHODS AND OPERATION PROCEDURE.
  - ASHRAE FUNDAMENTAL OUTDOOR DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE U.S. (PHOENIX, AZ OR PALM SPRINGS, CA)
  - FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF MOUNTED SUNLIGHT CONDUIT USING THE OUTDOOR TEMPERATURE OF 47°C
    - 10AWG CONDUCTOR ARE GENERALLY ACCEPTABLE FOR MODULES WITH AN I<sub>sc</sub> OF 9.6 AMPS WITH A 15 AMP FUSE.
- WIRE SIZING FOR OCPD  
EX (I<sub>sc</sub> \*(1.25)(1.25))/(# OF STRINGS IN PARALLEL) = WIRE AMPACITY OR USING NEC TABLE 690.8

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Building Code: International Residential Code (IRC) 2018  
Electrical Code: National Electrical Code (NEC) 2017

|                              |                            |
|------------------------------|----------------------------|
| Wind Speed<br><b>115 MPH</b> | Snow Load<br><b>30 PSF</b> |
|------------------------------|----------------------------|

Modules:  
**(14) HANWHA Q.TRON BLK M-G2+ 425W**

Inverter(s):  
**(14) IQ8M-72-M-US**

|                                   |                                   |
|-----------------------------------|-----------------------------------|
| DC System Size<br><b>5.950 kW</b> | AC System Size<br><b>4.550 kW</b> |
|-----------------------------------|-----------------------------------|

Customer Information:  
**Dave Groberg**  
34 Columbia Ave  
Takoma Park, MD, 20912

Permit/Lender:  
None

|                    |                  |
|--------------------|------------------|
| City<br>Montgomery | Utility<br>Peppo |
|--------------------|------------------|

Sheet Name:  
**Electrical 3-Line Diagram**

|                       |                                  |
|-----------------------|----------------------------------|
| Drawn By<br><b>AT</b> | Date<br><b>September 3, 2024</b> |
|-----------------------|----------------------------------|

|                          |                              |                     |
|--------------------------|------------------------------|---------------------|
| Scale<br><b>AS NOTED</b> | Job Number<br><b>MD20909</b> | Sheet<br><b>E-2</b> |
|--------------------------|------------------------------|---------------------|

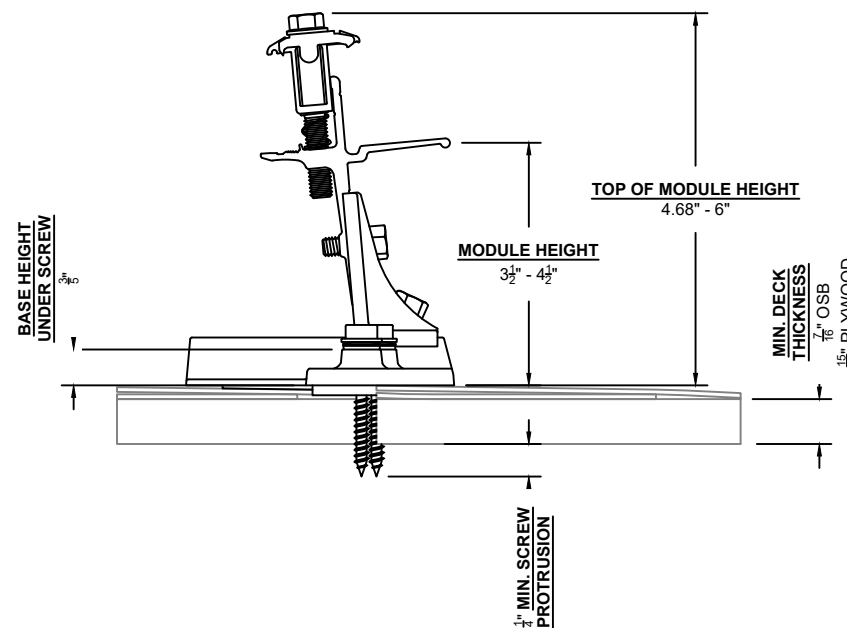
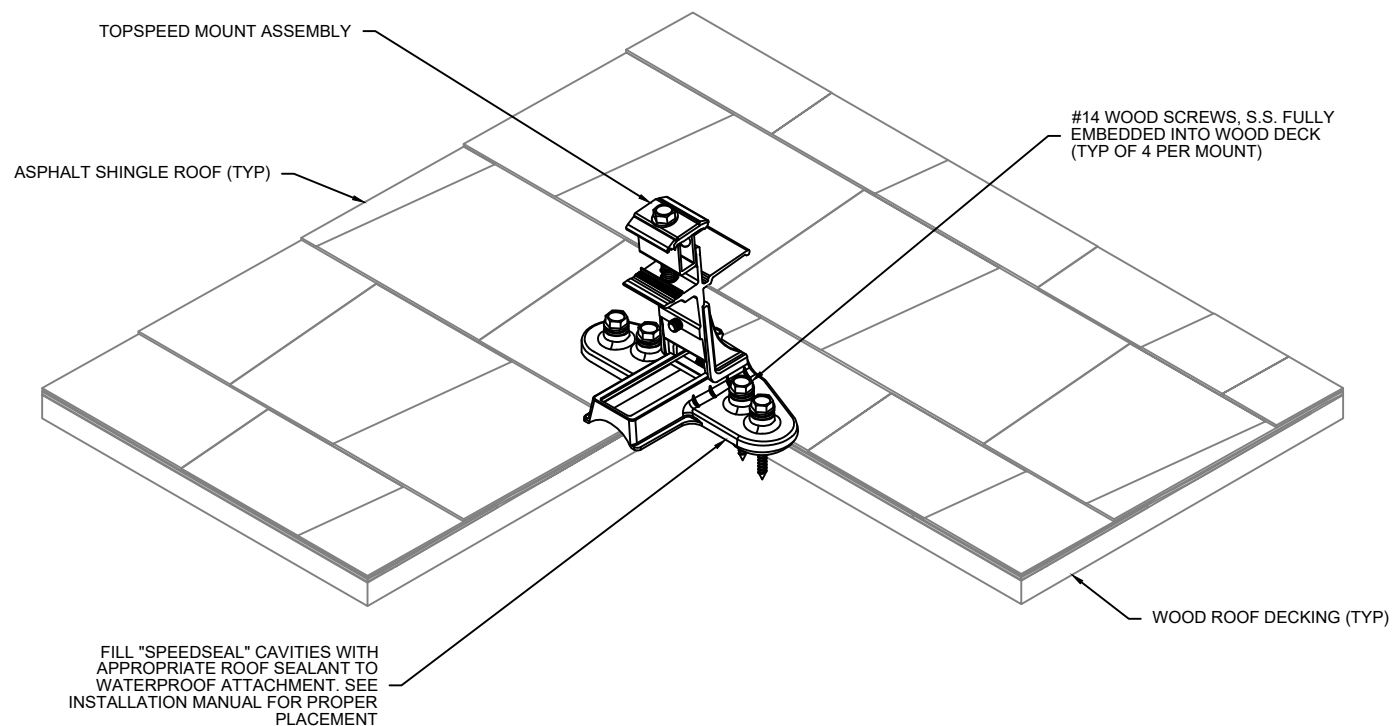




PROFESSIONAL CERTIFICATION I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME AND THAT I AM A FULLY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND LICENSE NO. 49993 EXP. 10/30/2024

**REVIEWED**  
By Laura DiPasquale, M-NCPPC at 8:10 pm, Oct 09, 2024

APPROVED  
Montgomery County  
Historic Preservation Commission  
*[Signature]*




| Structural Details |        |               |
|--------------------|--------|---------------|
| S1                 | Truss  | 2x4 O.C. 24"  |
| S2                 | Rafter | 2x10 O.C. 24" |

**NOTES:**

- ALL WORK SHALL COMPLY WITH REQUIREMENTS OF INTERNATIONAL RESIDENTIAL CODE (IRC 2018), LOADING CODE (ASCE 7-16), WOOD DESIGN CODE (NDS 2015), AND LOCAL REQUIREMENTS.
- LOAD CRITERIA PER :
  - EXPOSURE CATEGORY "B"
  - GROUND SNOW LOAD,  $P_g = 30$  PSF
  - LATERAL LOAD RISK CATEGORY "II"
  - ULTIMATE DESIGN WIND SPEED = 115 MPH
- SOLAR PANELS AND RACKING SYSTEMS SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATION.
- FOLLOW ALL LOCAL AND FEDERAL SAFETY REQUIREMENTS.

**STRUCTURAL ATTACHMENT DETAIL**



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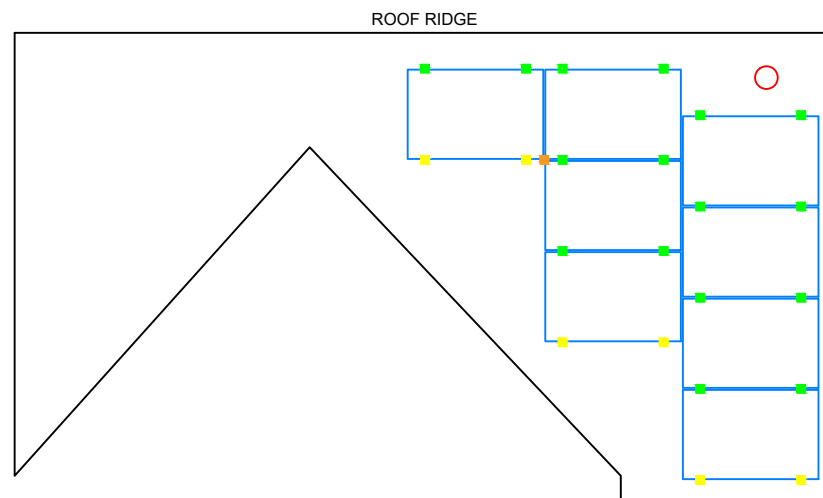
|   |                            |
|---|----------------------------|
| Building Code<br>International Residential Code (IRC) 2018                        |                            |
| Electrical Code<br>National Electrical Code (NEC) 2017                            |                            |
| Wind Speed<br>115 MPH   | Snow Load<br>30 PSF        |
| Modules<br>(14) HANWHA Q.TRON BLK M-G2+ 425W                                      |                            |
| Inverter(s)<br>(14) IQ8M-72-M-US  |                            |
| DC System Size<br>5.950 kW  | AC System Size<br>4.550 kW |
| Customer Information<br>Dave Groberg<br>34 Columbia Ave<br>Takoma Park, MD, 20912 |                            |
| Permit/Lender<br>None   |                            |
| City<br>Montgomery  | Utility<br>Peppo           |
| Sheet Name<br>Structural Attachment Details                                       |                            |
| Drawn By<br>AT  | Date<br>September 3, 2024  |
| Scale<br>AS NOTED   | Job Number<br>MD20909      |
| Sheet<br><b>S-1</b>   |                            |



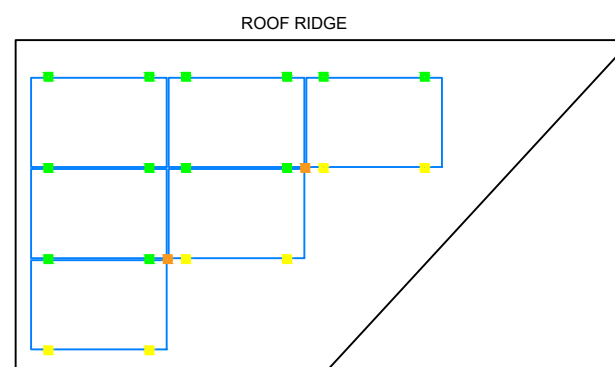
APPROVED  
 Montgomery County  
 Historic Preservation Commission







**REVIEWED**  
 By Laura DiPasquale, M-NCPPC at 8:10 pm, Oct 09, 2024



**SOLAR PANEL FOOTING PLAN R1**  
 Scale: 1/8" = 1'-0"



**SOLAR PANEL FOOTING PLAN R2**  
 Scale: 1/8" = 1'-0"

- KEY**
-  MOUNTS WITHOUT SPACERS
  -  MOUNTS WITH SPACERS
  -  CLAMPS WITHOUT SPACERS
  -  CLAMPS WITH SPACERS

**NOTES:**

1. SNAPRACK TOPSPEED SHALL BE INSTALLED IN ACCORDANCE WITH SNAPRACK INSTALLATION MANUAL.
2. ADD TOPSPEED CLAMP IF GREATER THAN (SOLAR PANEL LENGTH / 4) FOR LANDSCAPE OR (SOLAR PANEL WIDTH / 4) FOR PORTRAIT
3. NO SOLAR PANEL SHALL CANTILEVER MORE THAN 1/4 SOLAR PANEL LENGTH OR WIDTH DEPENDING ON ORIENTATION. UNLESS FOR MANUFACTURER SPECIFIED CLAMPING ZONE



**Solar Energy World**  
 Because Tomorrow Matters

Solar Energy World LLC.  
 14880 Sweitzer Lane  
 Laurel, MD 20707  
 (888) 497-3233

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Building Code  
 International Residential Code (IRC) 2018

Electrical Code  
 National Electrical Code (NEC) 2017

|                       |                     |
|-----------------------|---------------------|
| Wind Speed<br>115 MPH | Snow Load<br>30 PSF |
|-----------------------|---------------------|

Modules  
 (14) HANWHA Q.TRON BLK  
 M-G2+ 425W

Inverter(s)  
 (14) IQ8M-72-M-US

|                            |                            |
|----------------------------|----------------------------|
| DC System Size<br>5.950 kW | AC System Size<br>4.550 kW |
|----------------------------|----------------------------|

Customer Information  
 Dave Groberg  
 34 Columbia Ave  
 Takoma Park, MD, 20912

Permit/Lender  
 None

|                    |                  |
|--------------------|------------------|
| City<br>Montgomery | Utility<br>Pepco |
|--------------------|------------------|

Sheet Name  
 Solar Panel Footing Plan

|                |                           |
|----------------|---------------------------|
| Drawn By<br>AT | Date<br>September 3, 2024 |
|----------------|---------------------------|

|                   |                       |              |
|-------------------|-----------------------|--------------|
| Scale<br>AS NOTED | Job Number<br>MD20909 | Sheet<br>S-2 |
|-------------------|-----------------------|--------------|