



## HISTORIC PRESERVATION COMMISSION

Marc Elrich  
County Executive

Robert K. Sutton  
Chairman

Date: August 19, 2024

### MEMORANDUM

TO: Rabbiah Sabbakhan, DPS Director Department of  
Permitting Services

FROM: Chris Berger  
Historic Preservation Section  
Maryland-National Capital Park & Planning Commission

SUBJECT: Historic Area Work Permit #1080449 - Solar Panels

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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** by the HPC staff.

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: Anne Fothergill  
Address: 33 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 Chris Berger at 301-495-4571 or [chris.berger@montgomeryplanning.org](mailto:chris.berger@montgomeryplanning.org) to schedule a follow-up site visit.





HISTORIC PRESERVATION COMMISSION

HAWP #: 1080449 at: 33 Columbia Avenue, Takoma Park

submitted on: 7/31/2024

has been reviewed and determined that the proposal fits into the following category/categories:

- Repair or replacement of a masonry foundation with new masonry materials that closely match the original in appearance;
Installation of vents or venting pipes in locations not visible from the public right-of-way;
New gutters and downspouts;
Removal of vinyl, aluminum, asbestos, or other artificial siding when the original siding is to be repaired and/or replaced in kind;
Removal of accessory buildings that are not original to the site or non-historic construction;
Repair or replacement of missing or deteriorated architectural details such as trim or other millwork, stairs or stoops, porch decking or ceilings, columns, railings, balusters, brackets shutters, etc., with new materials that match the old in design, texture, visual characteristics, and, where possible materials, so long as the applicant is able to provide one extant example, photographic evidence, or physical evidence that serves as the basis for the work proposed;
Construction of wooden decks that are at the rear of a structure and are not visible from a public right-of-way;
Roof replacement with -compatible roofing materials, or with architectural shingles replacing 3-Tab asphalt shingles;
Installation of storm windows or doors that are compatible with the historic resource or district;
Repair, replacement or installation of foundation-level doors, windows, window wells, and areaways, or foundation vents, venting pipes, or exterior grills that do not alter the character-defining features and/or the historic character of the resource;
Construction of fences that are compatible with the historic site or district in material, height, location, and design;
Fence is lower than 48" in front of rear wall plane;

- Construction of walkways, parking pads, patios, driveways, or other paved areas that are not visible from a public right-of-way and measure no more than 150 square feet in size;
Replacement of existing walkways, parking pads, patios, driveways, or other paved areas with materials that are compatible with the visual character of the historic site and district and that are no greater than the dimensions of the existing hardscape;
Construction of small accessory buildings no larger than 250 square feet in size that are not visible from the public right-of-way;
Installations of skylights on the rear of a structure that will not be visible from the public right-of-way, and would not remove or alter character-defining roof materials;
[checked] Installation of solar panels and arrays in locations that are not readily visible from the public right-of-way or that are designed so as to have a minimal impact on the historic resource or the historic district (e.g., systems that are ground-mounted in areas other than the front or side yard of a corner lot, located on accessory or outbuildings, on non-historic additions, or on rear facing roof planes);
Installation of car charging stations in any location on a property or in the right-of-way;
Installation of satellite dishes;
Removal of trees greater than 6" in diameter (d.b.h.) that are dead, dying, or present an immediate hazard.
Removal of trees greater than 6" in diameter (d.b.h.) in the rear of the property that will not impact the overall tree canopy of the surrounding district or historic site;
Replacement tree required as a condition; and,
Other minor alterations that may be required by the Department of Permitting Services post-Commission approval that would have no material effect on the historic character of the property.

Staff finds the proposal complies with Chapter 24A, the Secretary of the Interior's Standards for Rehabilitation, and any additional requisite guidance. Under the authority of COMCOR No. 24A.04.01, this HAWP is approved by Christopher J. Barger on 8/19/2024. The approval memo and stamped drawings follow.



**APPLICATION FOR  
HISTORIC AREA WORK PERMIT**  
HISTORIC PRESERVATION COMMISSION  
301.563.3400

FOR STAFF ONLY:  
HAWP# 1080449  
DATE ASSIGNED \_\_\_\_\_

**APPLICANT:**

Name: Anne Fothergill  
Address: 33 Columbia Avenue  
Daytime Phone: (202) 550-7892

E-mail: anneandjake@hotmail.com  
City: Takoma Park Zip: 20912  
Tax Account No.: 13-01077533

**AGENT/CONTACT (if applicable):**

Name: Tina Crouse  
Address: 14880 Sweitzer Lane  
Daytime Phone: 410-579-2009

E-mail: tcrouse@solarenergyworld.com  
City: Laurel Zip: 20707  
Contractor Registration No.: 127353

**LOCATION OF BUILDING/PREMISE:** MIHP # of Historic Property 1080449

Is the Property Located within an Historic District?  Yes/District Name Takoma Park  
 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: 33 Street: Columbia Avenue  
Town/City: Takoma Park Nearest Cross Street: Hickory Avenue  
Lot: 3 Block: 20 Subdivision: 0025 Parcel: 0000

**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 checked="" 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

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

<b>Owner's mailing address</b>		<b>Owner's Agent's mailing address</b>	
Anne Fothergill 33 Columbia Avenue Takoma Park, MD 20912		Solar Energy World-Tina Crouse 14880 Sweitzer Lane Laurel, MD 20912	
<b>Adjacent and confronting Property Owners mailing addresses</b>			
Inan Phillips 35 Columbia Avenue Takoma Park, MD 20912  (Adjacent Property)		Judy Kirpich 7118 Poplar Avenue Takoma Park, MD 20912  (Adjacent Property)	
David Groberg 34 Columbia Avenue Takoma Park, MD  (Confronting Property)		Elizabeth Hone 36 Columbia Avenue Takoma Park, MD 20912  (Confronting Property)	



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

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

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

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

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

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

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



# SnapNrack™

Solar Mounting Solutions

## Ultra Rail

Residential Roof Mount System  
Installation Manual

**REVIEWED**

*By Chris Berger at 9:25 pm, Aug 19, 2024*

APPROVED

Montgomery County

Historic Preservation Commission



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

SnapNrack Ultra Rail Solar Mounting System offers a low profile, visually appealing, photovoltaic (PV) module installation system. This innovative system simplifies the process of installing solar PV modules, shortens installation times, and lowers installation costs..

SnapNrack systems, when installed in accordance with this manual, will be structurally adequate for the specific installation site and will meet the local and International Building Code. Systems will also be bonded to ground, under SnapNrack's UL 2703 Listing.

The SnapNrack installation system is a set of engineered components that can be assembled into a wide variety of solar mounting structures. It is designed to be installed by qualified solar installation technicians. With SnapNrack you will be able to solve virtually any PV module mounting challenge.

## Benefits of Installing the SnapNrack Ultra Rail System

### Install With Existing Roof Attachments

Compatible with existing SnapNrack roof attachments

### Install With Very Few Tools

All Ultra Rail hardware is attached using a standard 1/2" socket

### 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 on its own, so it does not require an aesthetic skirt. SnapNrack does offer an optional skirt for those looking for a high end look to the system.

**REVIEWED**

*By Chris Berger at 9:25 pm, Aug 19, 2024*

APPROVED

Montgomery County

Historic Preservation Commission



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**REVIEWED**  
By Chris Berger at 9:25 pm, Aug 19, 2024

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List of Approved Modules. . . . .48

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## Certification Details

SnapNrack Ultra Rail system has been evaluated by Underwriters Laboratories (UL) and Listed to UL/ANSI Standard 2703 for Grounding/Bonding, Mechanical Loading, and Fire Classification.

### Grounding/Bonding

The Ultra Rail system has been designed in compliance with UL Standard 2703 Section 9.1 Exception, which permits accessible components that **are not part** of the fault current ground path to **not be electrically bonded** to the mounting system (e.g. roof attachments, array skirt, etc.). For more details on the integrated grounding functionality see the [Grounding Specifications](#) section.

This racking system may be used to ground and/or mount a PV module complying with UL 1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included instructions. See the [Grounding Specifications](#) for the list of modules tested with the Ultra Rail system for integrated grounding.

Ground Lugs have been evaluated to both UL 467 and UL 2703 Listing requirements.

Ultra Rail has been listed with the following Enphase microinverter models for grounding/bonding: M215, M250, and C250. The Enphase microinverters are certified to be mounted to SnapNrack rail with the MLPE Attachment or to the module frame with the Enphase Frame Mount. When installing the Enphase microinverters per the specifications in the MLPE Installation section of this manual, the total roof-mounted PV system is bonded (modules, racking and microinverters) and grounded through the Enphase ground circuit when the Enphase units are properly grounded through to the service entrance. Therefore, no ground lugs or equipment grounding conductor (EGC) are required on the SnapNrack systems.

Ultra Rail has been Listed with the following SolarEdge optimizer models for grounding/bonding: P300-5NC4ARS, P320-5NC4ARS, P370-5NC4AFS, and P400-5NC4AFS. The SolarEdge optimizers are certified to be mounted to SnapNrack rail with the MLPE Attachment or to the module frame with the SolarEdge Power Optimizer Frame-Mounted Module Add-On. When installing the SolarEdge optimizers per the specifications in the MLPE Installation section of this manual, the total roof-mounted PV system is bonded to the optimizer backing plate (modules, racking and optimizers) and grounded through the ground lugs installed on the SnapNrack rail. Therefore, it is not necessary to run an EGC to each SolarEdge optimizer.

**Note: Frame-Mounted Module Add-On has been evaluated for all modules except Suniva modules.**

Ultra Rail has been Listed with the following Ginlong Rapid Shutdown Units for grounding/bonding: Solis-RSD-1G 1:1 and Solis-RSD-1G 2:2. The Ginlong Rapid Shutdown Units are certified to be mounted to SnapNrack rail with the MLPE Attachment.

The mounting system Bonding Listing is only valid when installed with a **REVIEWED** by Chris Berger at 9:25 pm, Aug 19, 2024. The system is required to have a direct electrical connection to another source, such as a utility service entrance or inverter.

SnapNrack recommends that bare copper never come into contact with aluminum.

### Mechanical Loading

The Ultra Rail system is Listed for mechanical loading for different load ratings depending on the PV module installed. For more details on the mechanical loading details see the [Mechanical Loading Specifications](#) section.

SnapNrack engineered systems should only be used with SnapNrack components and hardware of those specified in this Installation Manual and the Structural Engineering Report may become invalid.

If the module clamps have been engaged and need to be loosened and reengaged, SnapNrack recommends moving the module frame 3mm to engage the bonding pin in a new location.

The UL Listing covers mechanical load ratings for the various span lengths, module orientations and positive, negative, and side load ratings. These values can be found in the [Mechanical Loading Specifications](#) section.

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.

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## Fire

The Ultra Rail system has been evaluated for a Class A System Fire Classification for a Steep-Sloped Roof ( $\geq 2:12$  pitch) using Type 1 and Type 2 modules. In order to maintain the System Classification, modules are clamped to the mounting rails between 0 and 12 inches from the top and bottom edges of the module.

The Ultra Rail system has been evaluated for a Class A System Fire Classification for a Low-Sloped Roof ( $< 2:12$  pitch) using Type 1 and Type 2 modules. In order to maintain the System Classification, modules are clamped to the mounting rails between 0 and 16.3 inches from the top and bottom edges of the module.

The optional Array Skirt accessory has also been evaluated and the Ultra Rail system will maintain the Class A System Fire Classification detailed above if installed with the Skirt.

Because the system was tested at 5 inches above the test roof fixture Ultra Rail can be installed without any height restrictions and will maintain the Class A System Fire Classification. See [Rail Installation](#) section for potential module-specific height restrictions due to module temperature.

**REVIEWED**

*By Chris Berger at 9:25 pm, Aug 19, 2024*

APPROVED

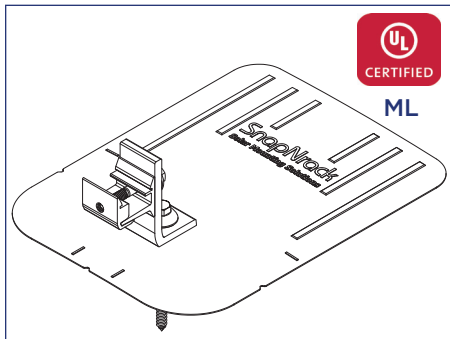
Montgomery County

Historic Preservation Commission



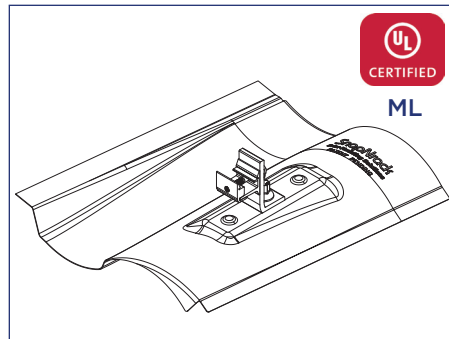
Robert H. Patton

## Structural Components



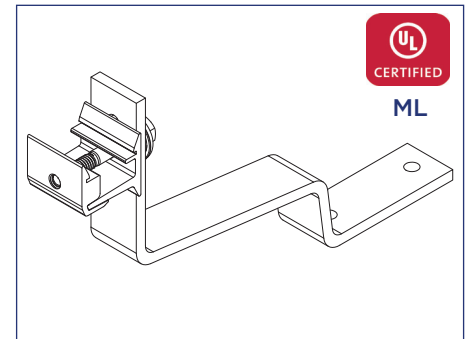
**UL**  
CERTIFIED  
ML

**Composition Roof Attachment**  
Roof attachment kit for composition shingle roofs including L foot, umbrella lag screw, flashing, and hardware



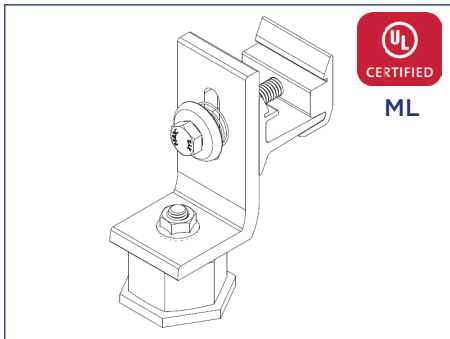
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CERTIFIED  
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**Tile Replacement Roof Attachment**  
Roof attachment kit for flat, S, and W tile roofs including base, riser, tile replacement flashing, L foot, and hardware



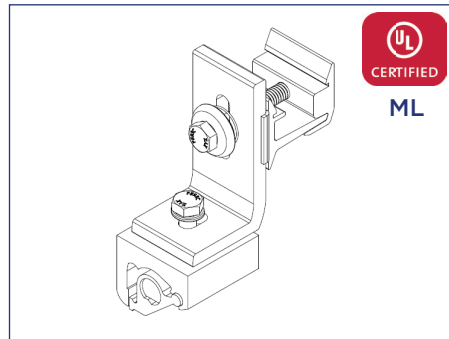
**UL**  
CERTIFIED  
ML

**Flat Tile Roof Attachment**  
Roof attachment kit for flat tile roofs including tile hook and hardware



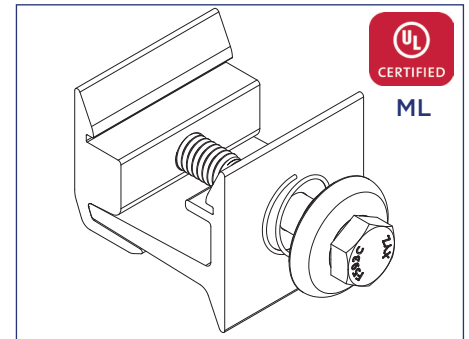
**UL**  
CERTIFIED  
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**Metal Roof Base Attachment**  
Roof attachment kit for flat metal roofs including metal roof base, L foot, and hardware



**UL**  
CERTIFIED  
ML

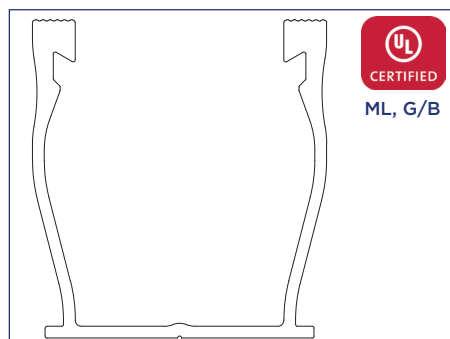
**Seam Clamp Roof Attachment**  
Roof attachment for standing seam metal roofs including seam clamp, L foot, and hardware



**UL**  
CERTIFIED  
ML

**Ultra Rail Mounting Hardware**

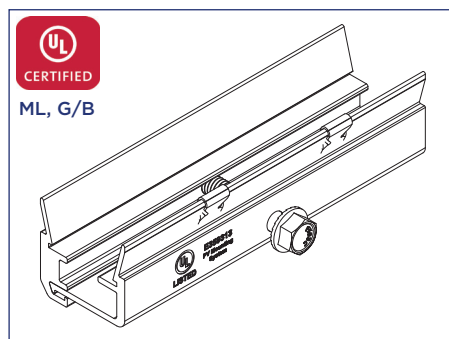
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By Chris Berger at 9:25 pm, Aug 19, 2024



**UL**  
CERTIFIED  
ML, G/B

**UR-40 Rail**

UR-40 rail for Ultra Rail roof mount racking system



**UL**  
CERTIFIED  
ML, G/B

**Ultra Rail Splice**

Rail splice component including two splice halves and hardware

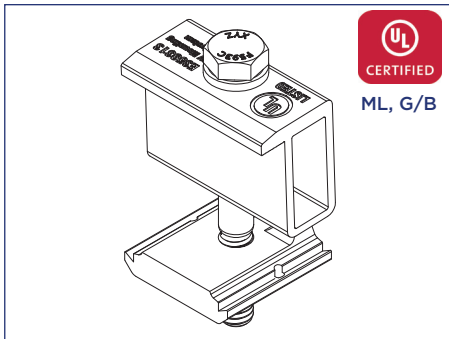


Top-down module mid clamp including clamp and hardware

**UL Listing Legend:**

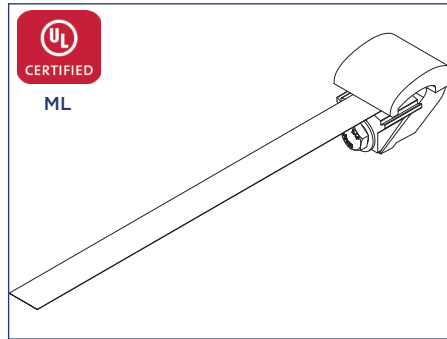
- ML - Evaluated for Mechanical Loading
- G/B - Evaluated for Grounding/Bonding

## Wire Management/Grounding Component



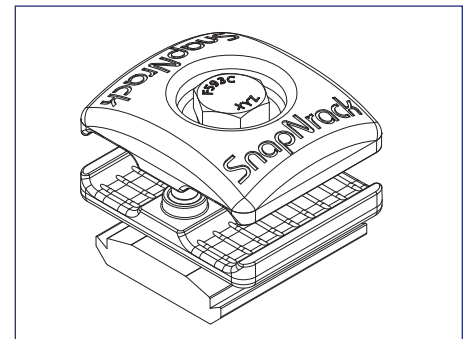
**Adjustable End Clamp**

Top-down module end clamp including clamp and hardware



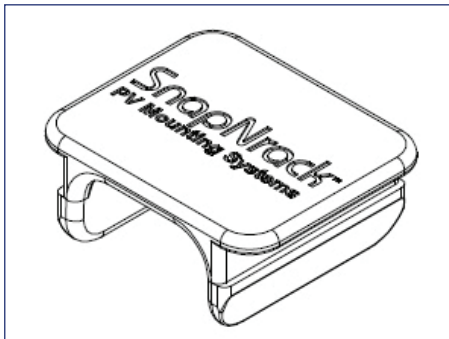
**Universal End Clamp**

Bottom-mount module end clamp including clamp and hardware



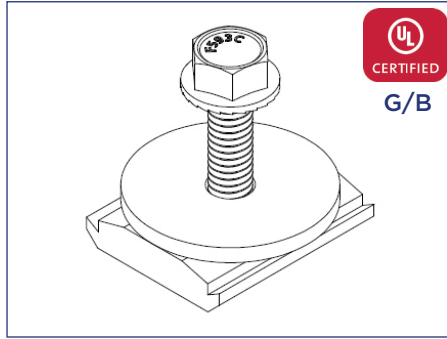
**Universal Wire Clamp**

Wire management component used to secure conductors between rails



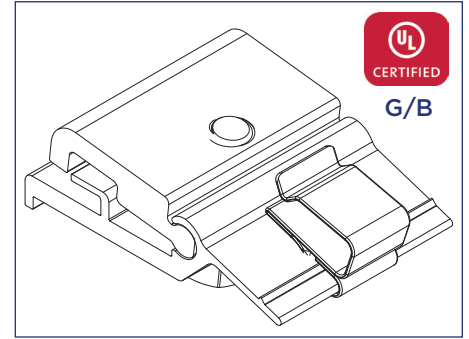
**Wire Retention Clip**

Wire management component used to secure conductors in rails



**MLPE Rail Attachment Kit**

Rail attachment for module level power electronics like microinverters and optimizers

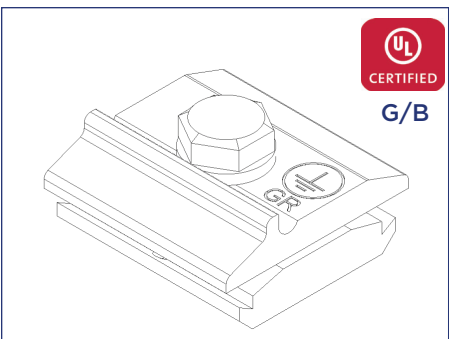


**MLPE Frame Attachment Kit**

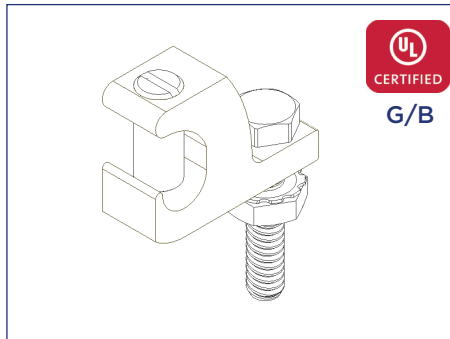
Module frame attachment for module level power electronics like microinverters and optimizers

**REVIEWED**

By Chris Berger at 9:25 pm, Aug 19, 2024



**SnapNrack Ground Lug**



**IlSCO Lay-In Lug - GBL-4DBT**



**UR-40 Rail End Cap**

Plastic end cap for UR-40 Rail

**UL Listing Legend:**

ML - Evaluated for Mechanical Loading

G/B - Evaluated for Grounding/Bonding

## Hardware Torque Specifications

Hardware Description	Torque Specification
SnapNrack Ground Lug model 242-02101 to Grounding Electrode Conductor (6-12 AWG Solid Copper)	16 ft-lbs (192 in-lbs)
SnapNrack Ground Lug model 242-92202 to Grounding Electrode Conductor and Module Frame	8 ft-lbs (96 in-lbs)
Ilsco Lay-in Lug GBL-4DBT to Rail or Module Frame	2.92 ft-lbs (35 in-lbs)
Ilsco Lay-in Lug GBL-4DBT to Grounding Electrode Conductor (10-14 AWG Solid Copper)	1.67 ft-lbs (20 in-lbs)
Ilsco Lay-in Lug GBL-4DBT to Grounding Electrode Conductor (8 AWG Stranded Copper)	1.04 ft-lbs (25 in-lbs)
Ilsco Lay-in Lug GBL-4DBT to Grounding Electrode Conductor (4-6 AWG Stranded Copper); Ground Lug SGB-4 to Grounding Electrode Conductor (4-14 AWG Solid or Stranded Copper)	1.46 ft-lbs (35 in-lbs)
Ilsco Ground Lug SGB-4 to Module Frame	6.25 ft-lbs (75 in-lbs)
Adjustable End Clamp, Mid Clamp, Universal End Clamp, Umbrella Nut for Tile Replacement Kits, Flange Nut for MRB	10 ft-lbs (120 in-lbs)
Rail Splice, Flashed L-Foot to Rail, Flat Tile Roof Hook to Rail, MRB to Rail, Seam Clamp to Rail	12 ft-lbs (144 in-lbs)
Standard Base Seam Clamp, Wide Base Seam Clamp	16.7 ft-lbs (200 in-lbs)
SolarEdge Frame Mounted Bracket to Module Frame	7 ft-lbs (84 in-lbs)
MLPE Rail Attachment Kit, MLPE Frame Attachment Kit	10 ft-lbs (120 in-lbs)
Enphase Frame Mounted Bracket to Module Frame	13 ft-lbs (156 in-lbs)

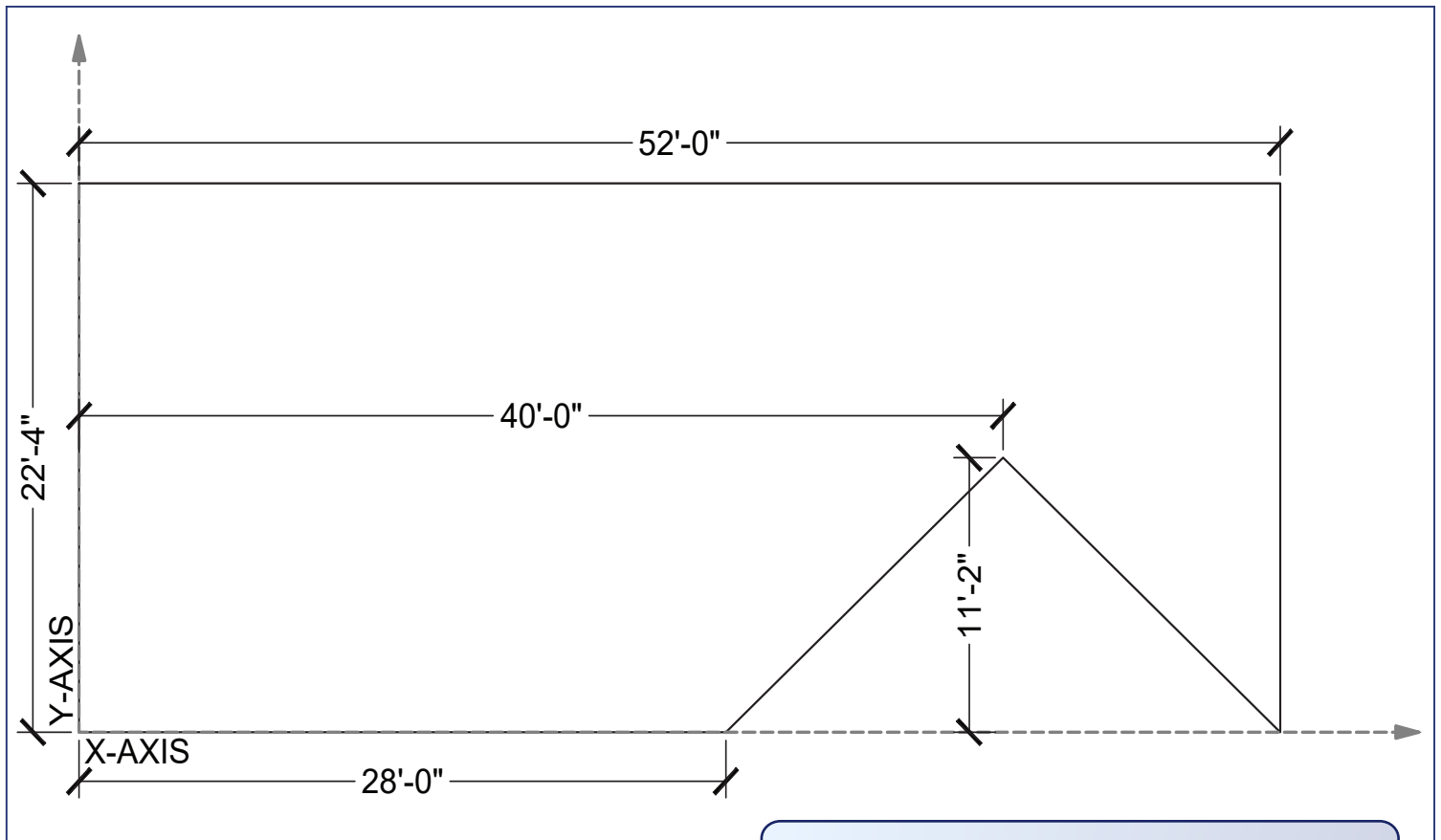
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 By Chris Berger at 9:25 pm, Aug 19, 2024

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 Montgomery County  
 Historic Preservation Commission



## Site Survey

- Measure the roof surfaces and develop an accurate drawing, including any obstacles such as chimneys and roof vents.
- If plans are available, check to make sure that the plans match the final structure.
- Identify any roof access areas or keep-out areas as required by the local AHJ (i.e. fire lanes).
- Identify any construction issues that may complicate the process of locating roof framing members from the roof surface.
- If you find structural problems such as termite damage or cracked roof framing members that may compromise the structure's integrity, consult a structural engineer.



**REVIEWED**

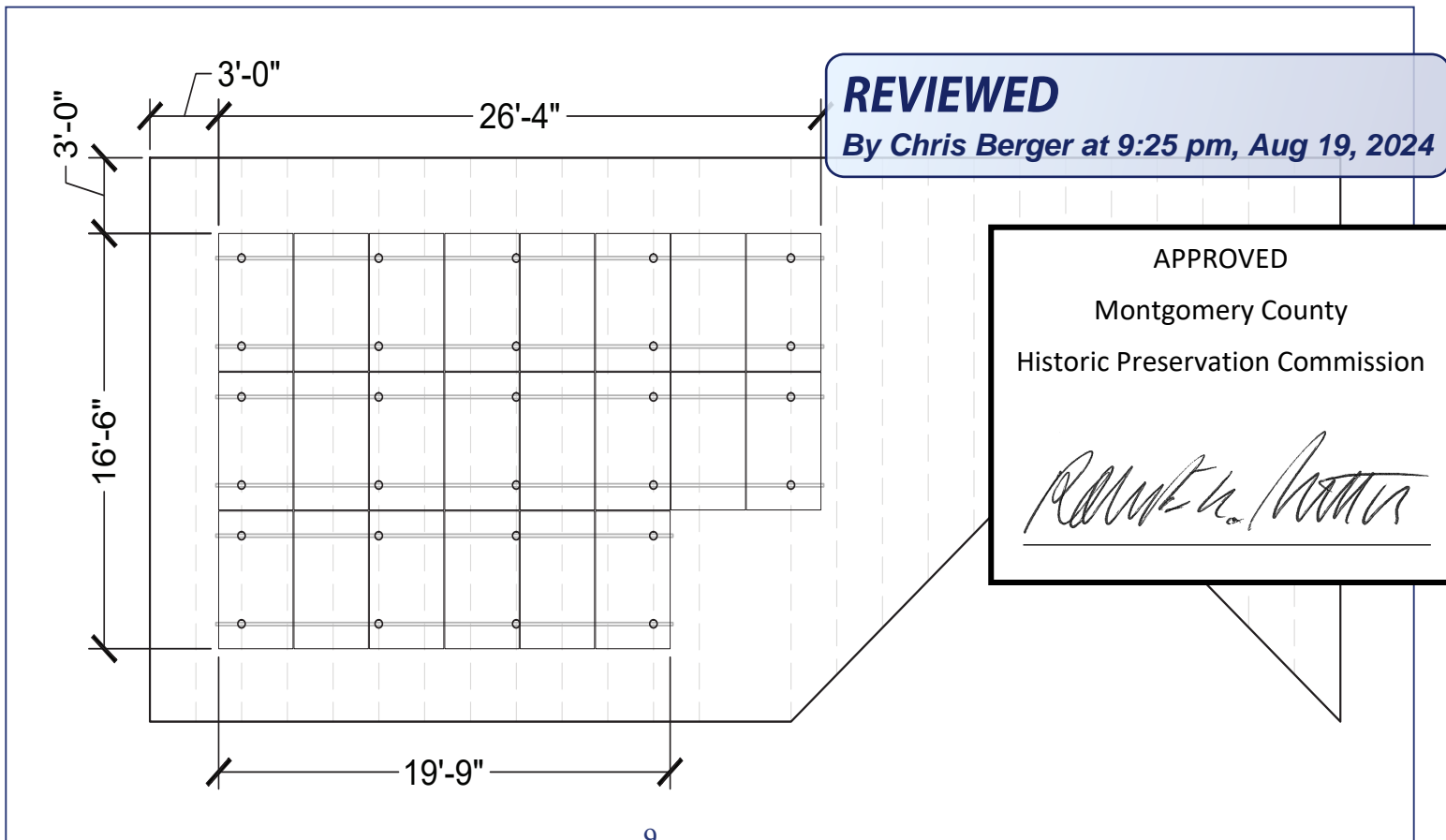
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Montgomery County  
Historic Preservation Commission



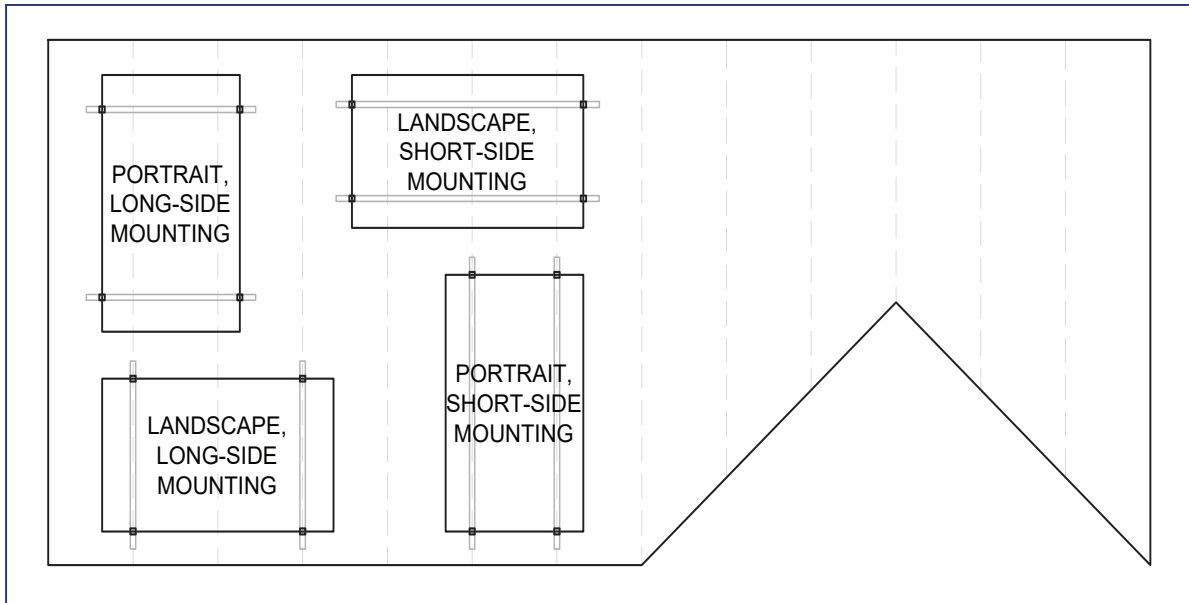
## Design Guidance

- 1) Layout the modules in the available roof area. Adjacent modules in the same row are spaced 1/2" apart by Mid Clamps. Adjustable End Clamps require an additional 1" of rail extending past module frame, while Universal End Clamps require no extra rail. When installing multiple rows of modules, a minimum spacing gap of 1/8" should be used between rows.
- 2) Draw the roof framing member location on the layout to identify where roof attachments can be installed.
- 3) Determine site conditions for calculating the engineering values, confirm site conditions and code versions comply with local AHJ requirements.
- 4) Reference site conditions and system specifications in Ultra Rail Structural Engineering Report to determine maximum attachment spacing and resulting cantilever values (34% of maximum attachment spacing).
- 5) Draw roof attachment locations on layout based on maximum attachment spacing and cantilever values.
- 6) Confirm design complies with UL 2703 Listing for Mechanical Loading. For more details on the mechanical loading details see the [Mechanical Loading Specifications](#) section.
- 7) To simplify the design process and automatically generate a bill of materials (BOM) for the mounting system, use the Ultra Rail Configuration Tool located on the SnapNrack website. Always refer to Approved Module Lists in Installation Manuals to ensure installation complies with UL 2703 Listing.
- 8) Mark distance from array edge to identifiable roof features in x and y axes.
- 9) Insert SnapNrack installation details in to design set specific to the project requirements.



## Design Note:

Ultra Rail allows for multiple mounting configurations. Modules can be mounted in portrait (long side of module perpendicular to ridge) or landscape (long side of module parallel to ridge) orientations. In addition, modules can also be short side-mounted (module clamps on short side) or long side-mounted (module clamps on long side). Long-side mounting is recommended for maximum material efficiency. Most residential structures utilize roof framing members that run in-slope with the roof, so a portrait orientation with long-side mounting is typically the most efficient use of materials.



## Installation Note:

- Ensure the lag screws will be installed in a solid portion of the roof framing member.
- If the roof framing member is not found then seal the pilot hole immediately with roofing sealant.

## Safety Guidance

- Always wear appropriate OSHA approved safety equipment when at active construction site
- Appropriate fall protection or prevention gear should be used. Always use extreme caution when near the edge of a roof
- Use appropriate ladder safety equipment when accessing the roof from ground level
- Safety equipment should be checked periodically for wear and quality issues
- Always wear proper eye protection

**REVIEWED**

By Chris Berger at 9:25 pm, Aug 19, 2024

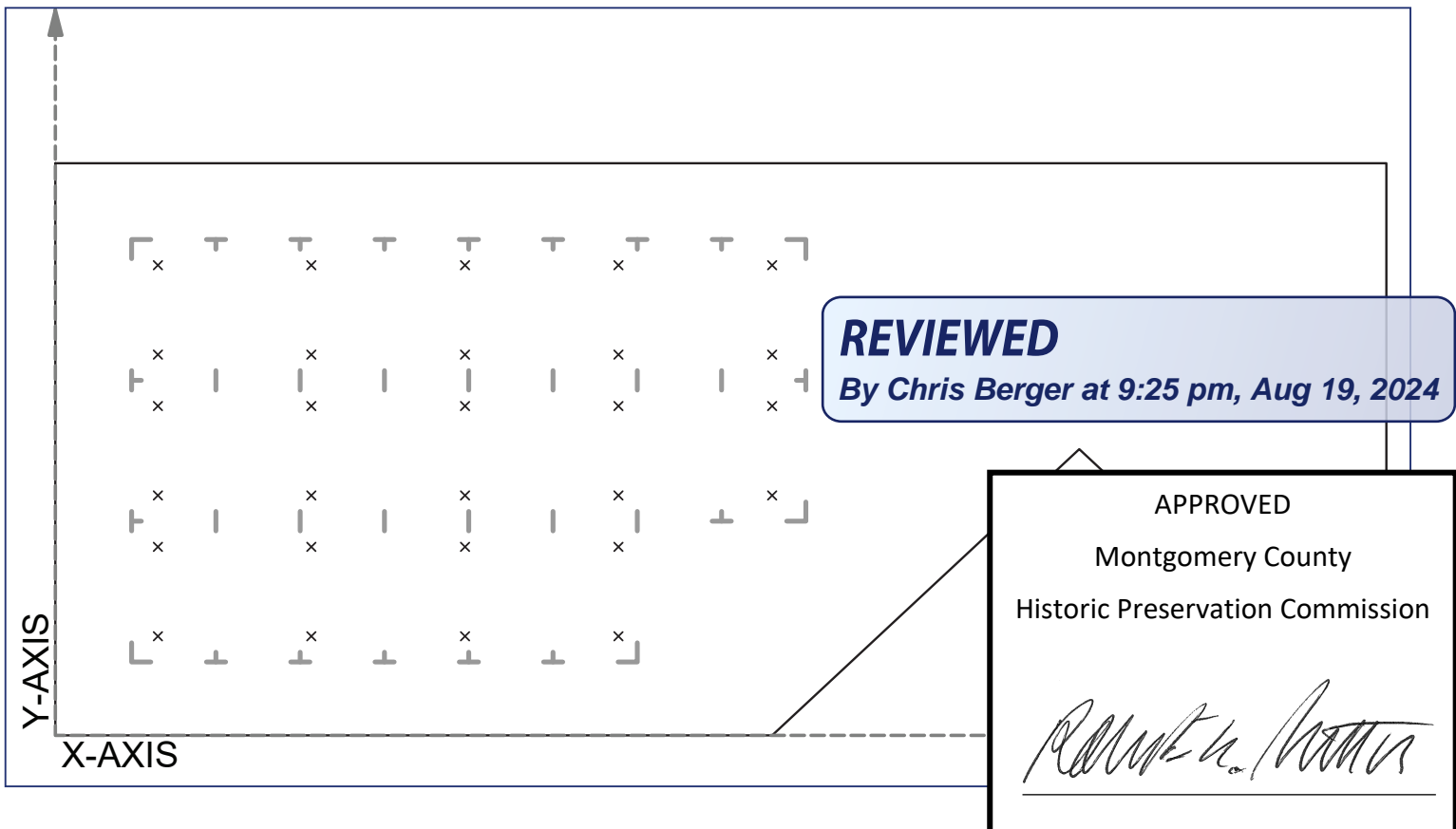
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## System Layout

- 1) Transfer the array layout to the roof using a roof marking crayon to mark the inside and outside corners of the array.
- 2) Locate the estimated roof framing member positions and mark them in the array area with a roof marking crayon.
- 3) Transfer rail locations using a chalk line.
- 4) Mark roof attachment locations on the roof, noting that attachments will be located at intersections of rails and roof framing members. Layout rails such that module frames do not overhang mounting rails more than specified by module manufacturer, more than 25% of total module length, or more than required by the Class A Fire Certification (see Certification Details section).

### Layout Note:

Ensure final roof attachment locations do not exceed the maximum attachment spacing and cantilever specified in the design.

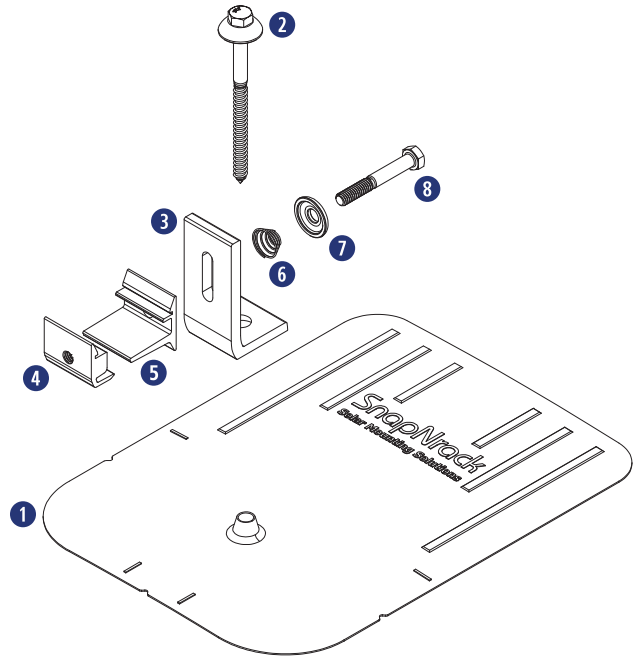


## Required Tools

- Hammer or Stud Finder
- Roof Marking Crayon
- Drill with 3/16" Pilot Drill Bit
- Roof Sealant
- Torque Wrench
- Socket Wrench
- 1/2" Socket

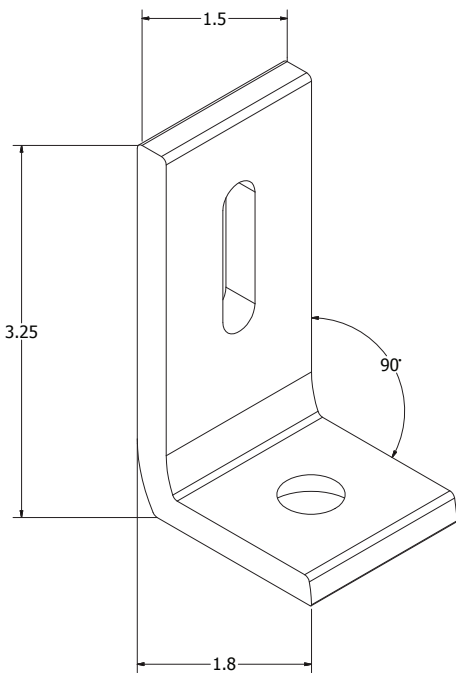
## Materials Included - L Foot Mount

- 1 (1) SnapNrack Comp Umbrella Flashing
- 2 (1) SnapNrack Umbrella Lag Screw
- 3 (1) SnapNrack Umbrella L Foot
- 4 (1) SnapNrack Ultra Mount (Tapped)
- 5 (1) SnapNrack Ultra Mount (Thru-Hole)
- 6 (1) SnapNrack Ultra Mount Spring
- 7 (1) SnapNrack Ultra Mount Spring Cage
- 8 (1) 5/16"-18 X 2-1/4" SS HCS Bolt

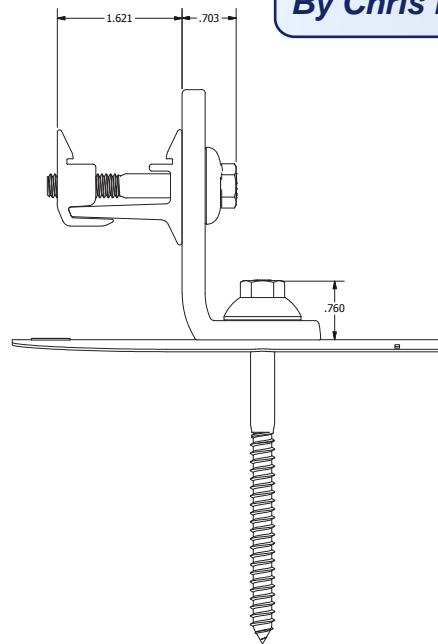


Application Note:  
Install on composition shingle roofs

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By Chris Berger at 9:25 pm, Aug 19, 2024



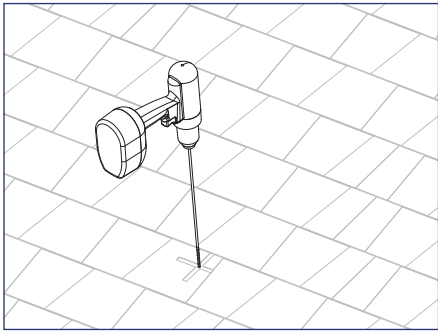
Dimensioned L Foot



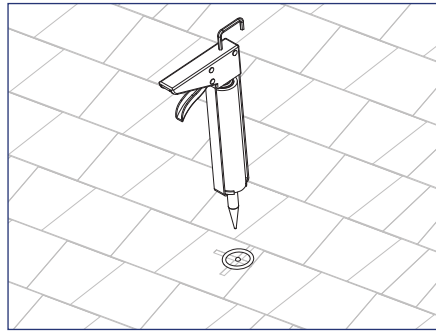
Dimensioned L Foot Assembly

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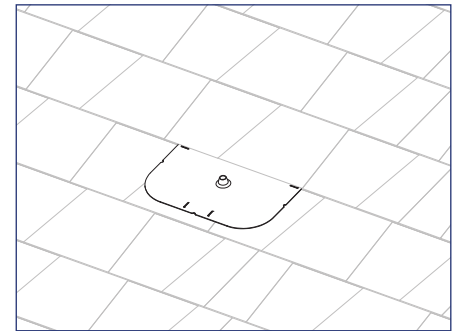
## INSTALLATION INSTRUCTIONS



1) Using roof attachment locations drawn during system layout, drill a pilot hole through the roofing material into the roof framing member.



2) Apply roofing sealant in and around the pilot hole, and directly onto the lag screw to ensure a water tight seal.



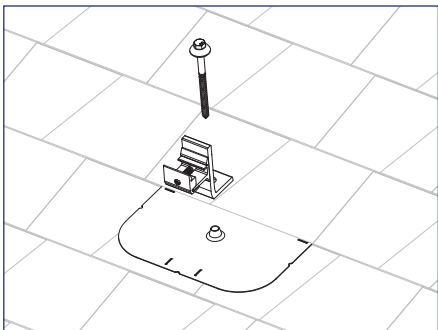
3) Pry up shingles with a breaker bar and install flashing underneath shingle course above pilot hole and, position flashing so cone is in line with pilot hole.



### Install Note:

Ensure flashing extends minimum (2) courses above pilot hole, and does not overhang bottom edge of shingle course.

Apply a horseshoe of sealant under flashing to direct water away from penetration.



4) Insert Umbrella Lag Screw through Umbrella L Foot and cone in flashing, then drive lag screw for minimum 2.5" embedment into the roof framing member.



### Install Note:

The L Foot can be attached in any orientation.



### Best Practice:

If using an impact driver, finish tightening lag screw with a hand wrench to prevent L Foot from rotating.

## REVIEWED

By Chris Berger at 9:25 pm, Aug 19, 2024

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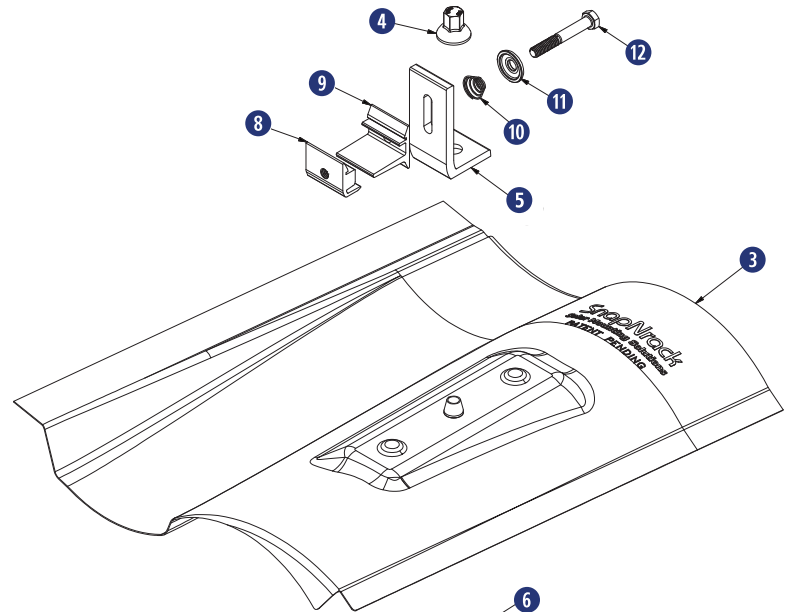
Historic Preservation Commission

## Required Tools

- Hammer or Stud Finder
- Roof Marking Crayon
- Drill with 3/16" Pilot Drill Bit
- Roof Sealant
- Torque Wrench
- Socket Wrench
- 1/2" Socket
- Flat Pry Bar
- Tape Measure
- SnapNrack Tile Replacement Installation Template (optional)

## Materials Included - Tile Replacement

- ① (1) SnapNrack Tile Replacement Base
- ② (1) SnapNrack Tile Replacement Riser
- ③ (1) SnapNrack Tile Replacement Flashing
- ④ (1) SnapNrack Umbrella Nut
- ⑤ (1) SnapNrack Umbrella L Foot
- ⑥ (1) 5/16"-18 X 1-3/4" SS Set Screw
- ⑦ (1) 5/16"-18 X 1" SS Flange Bolt
- ⑧ (1) SnapNrack Ultra Mount (Tapped)
- ⑨ (1) SnapNrack Ultra Mount (Thru-Hole)
- ⑩ (1) SnapNrack Ultra Mount Spring
- ⑪ (1) SnapNrack Ultra Mount Spring Cage
- ⑫ (1) 5/16"-18 X 2-1/4" SS HCS Bolt

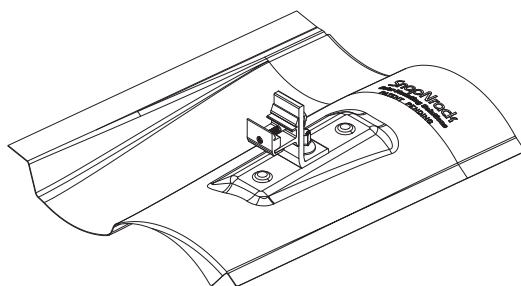
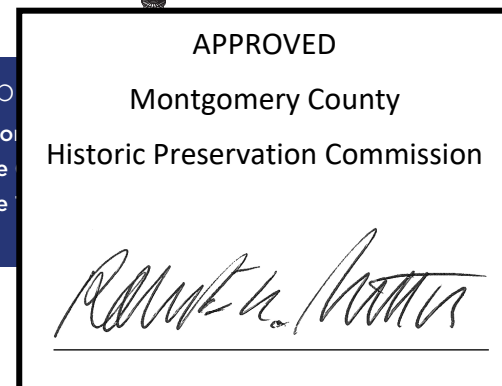
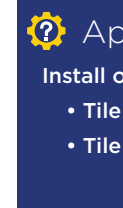


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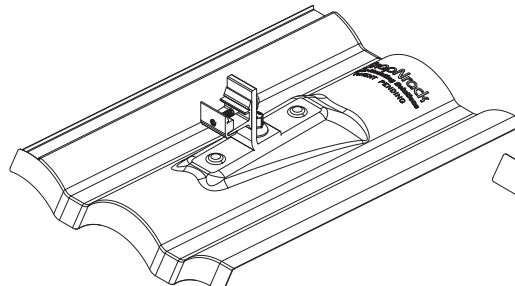
By Chris Berger at 9:25 pm, Aug 19, 2024

## Other Materials Required - Not Shown

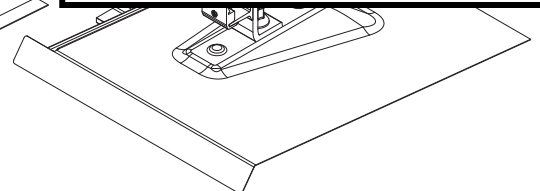
- ① (2) 5/16" Lag Screw
- ② (2) 5/16" Washer
- ③ Flexible Flashing (when required for deck level flashing)



S Tile Replacement



W Tile Replacement

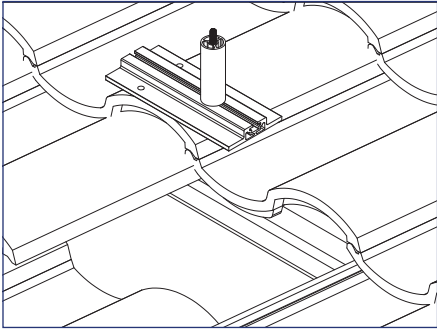


Flat Tile Replacement

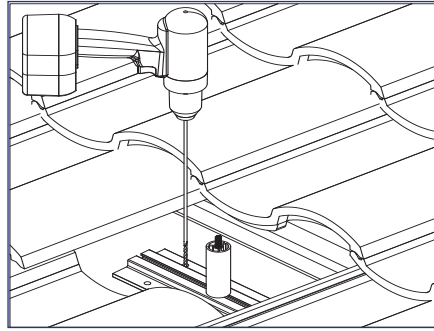


# Tile Replacement

## INSTALLATION INSTRUCTIONS



1) Using roof attachment locations drawn during system layout, remove roof tile where the roof attachment will be installed. Slide riser assembly into base channel and snug by hand.



2) Locate base over rafter using riser position and Diagram 1 with measurements found in Table 1, then drill two pilot holes through the roofing material into the roof framing member.

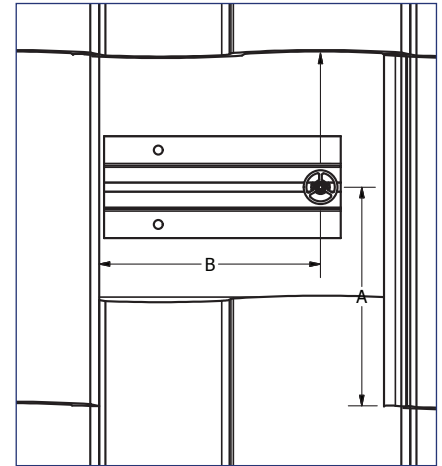


Diagram 1

Tile Profile	Riser Center to Tile Front Edge (A)	Riser Center Side - Side (B)
S	8.25"	Center of peak
W	8"	Center of peak
Flat	8"	5"

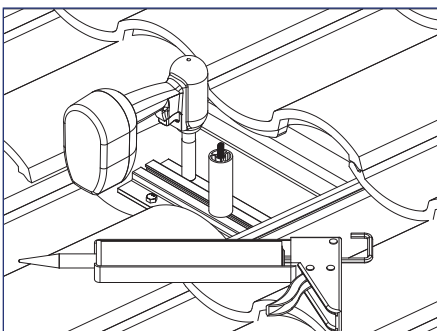
Table 1



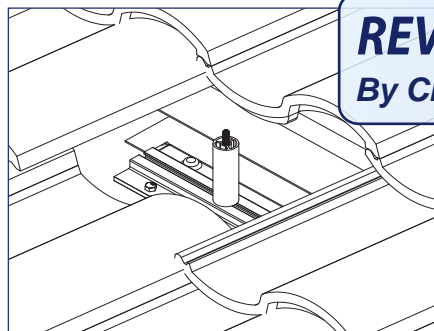
### Install Note:

Base can be flipped and neighboring tile may need to be removed to attach to the roof framing member and line up riser with flashing.

Working from RIGHT TO LEFT and UP THE ROOF will prevent neighboring tiles from lifting flashings.



3) Apply roofing sealant and attach the base with (2) 5/16" lag screws, drive lag screws for minimum 2.5" embedment into the roof framing member.



4) If deck level flashing is required, install flexible flashing per the Deck Level Flashing for Tile Replacement Installation Manual.

**REVIEWED**

By Chris Berger at 9:25 pm, Aug 19, 2024



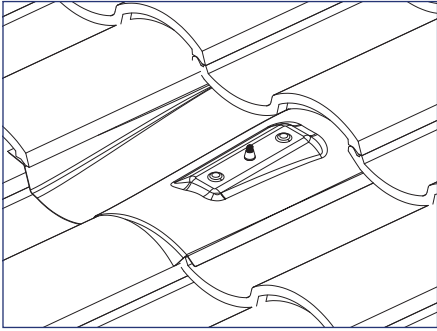
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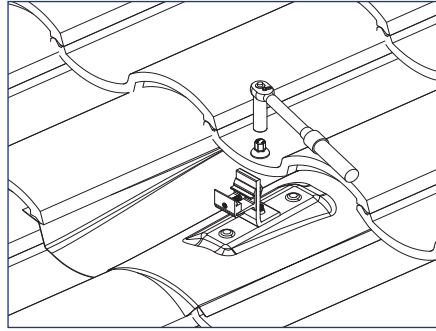
locating riser.

# Tile Replacement

## INSTALLATION INSTRUCTIONS



6) Install flashing into place on top of riser, allowing stud to come through hole in Tile Replacement flashing.



7) Install L Foot onto stud with Umbrella Nut, and tighten hardware to 10 ft-lbs.

**REVIEWED**

*By Chris Berger at 9:25 pm, Aug 19, 2024*

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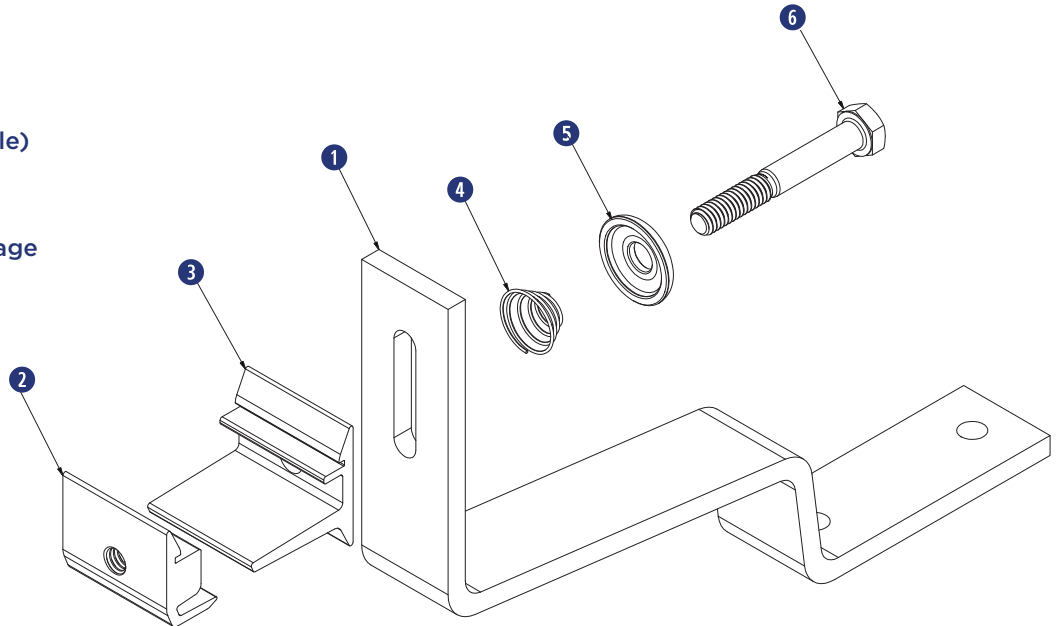
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## Required Tools

- Hammer or Stud Finder
- Roof Marking Crayon
- Drill with 3/16" Pilot Drill Bit
- Roof Sealant
- Torque Wrench
- Socket Wrench
- 1/2" Socket
- Flat Pry Bar

## Materials Included - Flat Tile Hook

- ① (1) SnapNrack Flat Tile Hook
- ② (1) SnapNrack Ultra Mount (Tapped)
- ③ (1) SnapNrack Ultra Mount (Thru-Hole)
- ④ (1) SnapNrack Ultra Mount Spring
- ⑤ (1) SnapNrack Ultra Mount Spring Cage
- ⑥ (1) 5/16"-18 X 2-1/4" SS HCS Bolt



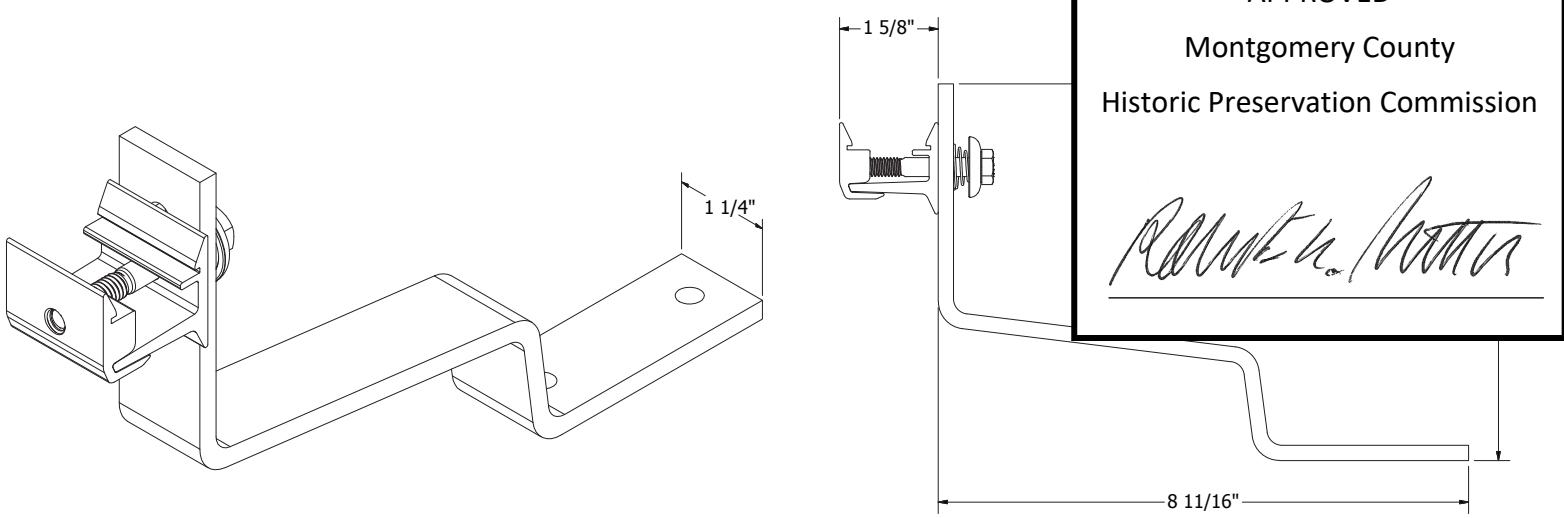
## Other Materials Required - Not Shown

- ① (2) 5/16" Lag Screw
- ② (2) 5/16" Washer
- ③ Flexible Flashing (when required for deck level flashing)

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 By Chris Berger at 9:25 pm, Aug 19, 2024

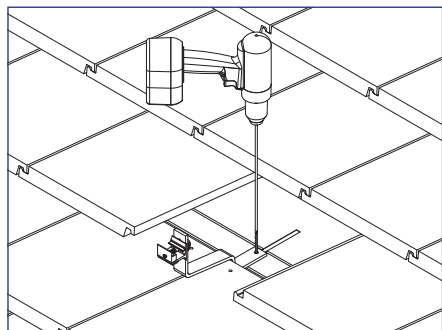
Application Note  
 Install on flat concrete tile roofs

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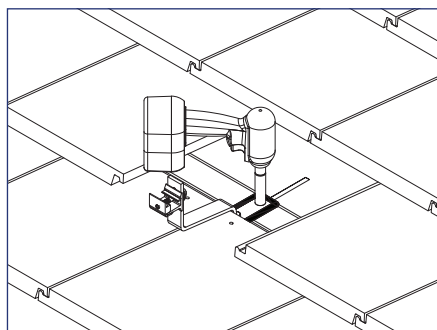



Dimensioned Flat Tile Hook Assembly

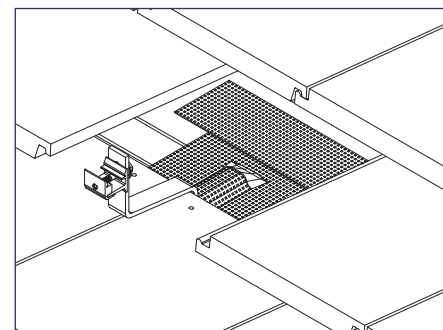
## INSTALLATION INSTRUCTIONS



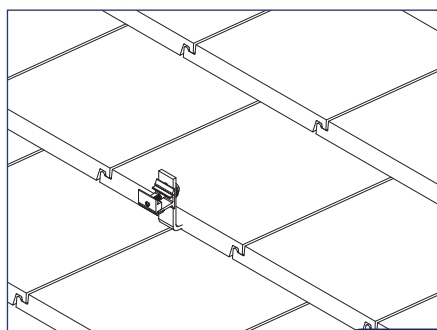
1) Using roof attachment locations drawn during system layout, remove roof tile where the roof attachment will be installed and drill two pilot holes through the roofing material into the roof framing member.



2) Apply roofing sealant and attach the Tile Hook with (2) 5/16" lag screws, drive lag screws for minimum 2.5" embedment into the roof framing member.



3) If deck level flashing is required, integrate roof felt or a flexible flashing with the existing underlayment and over the Tile Hook.



4) Replace the roof tiles.

**REVIEWED**

*By Chris Berger at 9:25 pm, Aug 19, 2024*

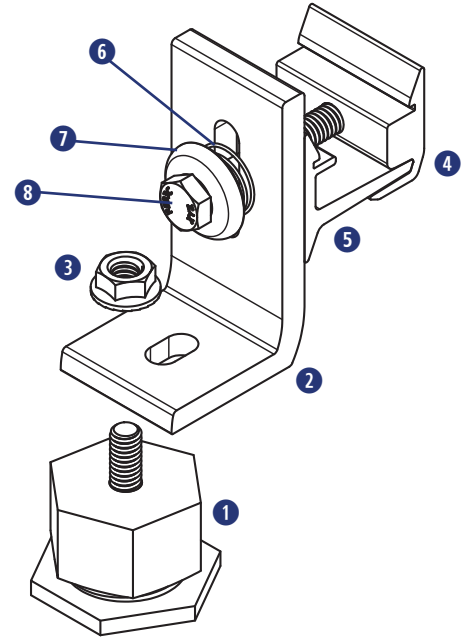
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## Required Tools

- Hammer Or Stud Finder
- Roof Marking Crayon
- Drill with 3/16" Pilot Drill Bit
- Torque Wrench
- Socket Wrench
- 1/2" Socket

## Materials Included - Metal Roof Base

- ① (1) SnapNrack Metal Roof Base
- ② (1) SnapNrack All Purpose L Foot
- ③ (1) 5/16"-18 SS Flange Nut
- ④ (1) SnapNrack Ultra Mount (Tapped)
- ⑤ (1) SnapNrack Ultra Mount (Thru-Hole)
- ⑥ (1) SnapNrack Ultra Mount Spring
- ⑦ (1) SnapNrack Ultra Mount Spring Cage
- ⑧ (1) 5/16"-18 X 2-1/4" SS HCS Bolt

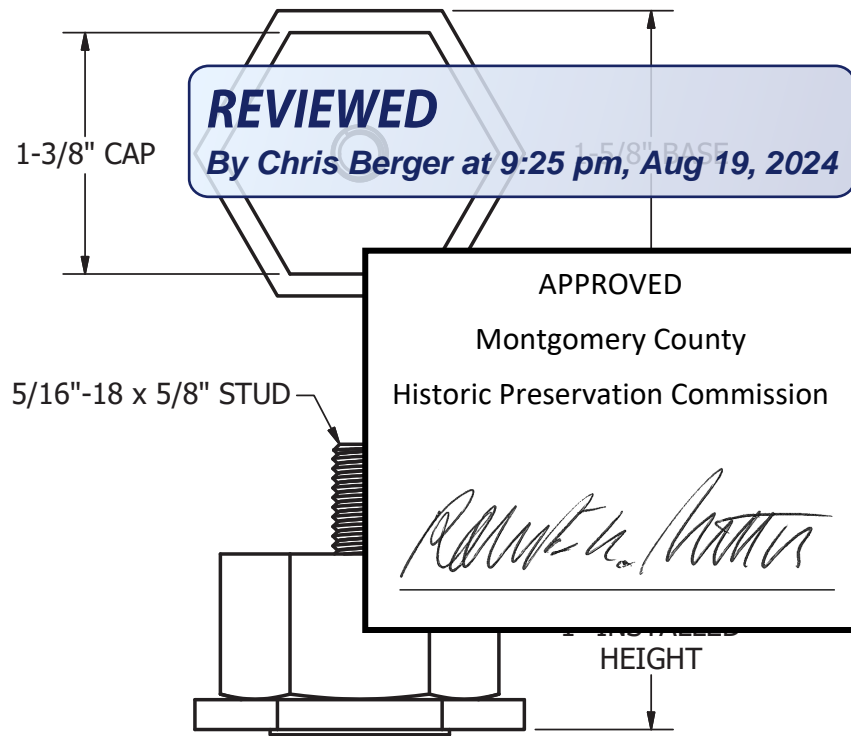


## Other Materials Required - Not Shown

- ① (1) 5/16" Lag Screw or 1/4" Self-Drilling Screw
- ② (1) 5/16" or 1/4" Washer (3/4" max O.D.)

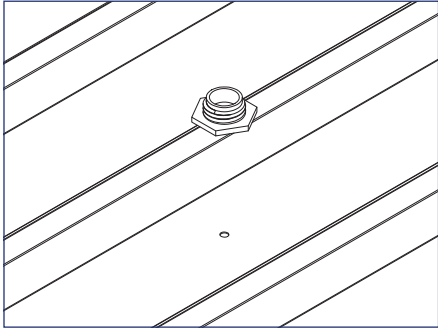
**Application Note:**  
Install on metal roof profiles with flat surface large enough to accommodate 1-5/8" wide base

**Installation Note:**  
Grounding and bonding of mounting system to metal roof panels shall meet local AHJ requirements.

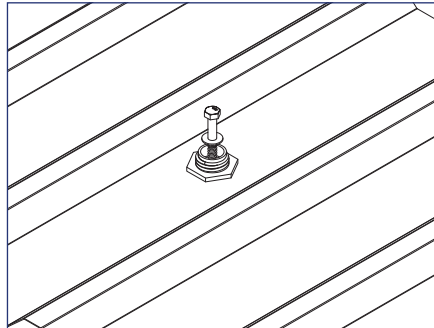


Dimensioned Metal Roof Base Assembly

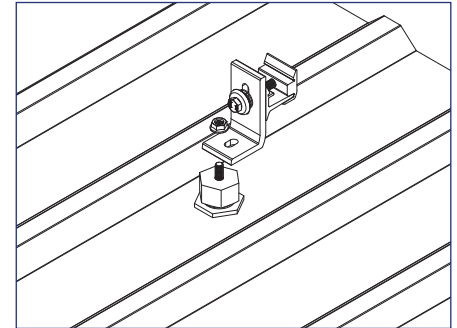
## INSTALLATION INSTRUCTIONS



1) Using roof attachment locations drawn during system layout, drill a pilot hole through the roofing material into the roof framing member.



2) Attach the base with 5/16" lag screw (or 1/4" self-drilling screw for metal structures), drive screw for minimum 2.5" embedment into the roof framing member.



3) Thread Metal Roof Base cap onto Metal Roof Base bottom, ensuring cap is fully seated to base.



### Install Note:

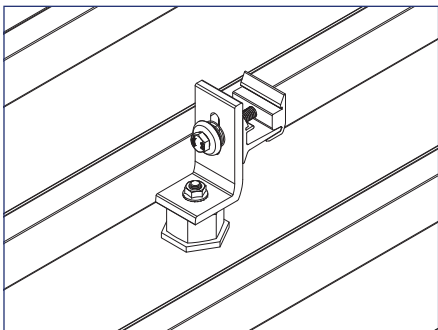
Ensure area is free from metal shavings and debris before installing Metal Roof Base. Metal roofs with excessive debris, corrosion, or non-factory coating should be evaluated for adequate sealing surface.

Additional roof sealant not required but can be applied after tightening the Metal Roof Base to roof, if desired.



### Install Note:

Take care to ensure the base does not twist when cap is tightened.



4) Attach L Foot to stud in Metal Roof Base cap and tighten hardware to 10 ft-lbs.

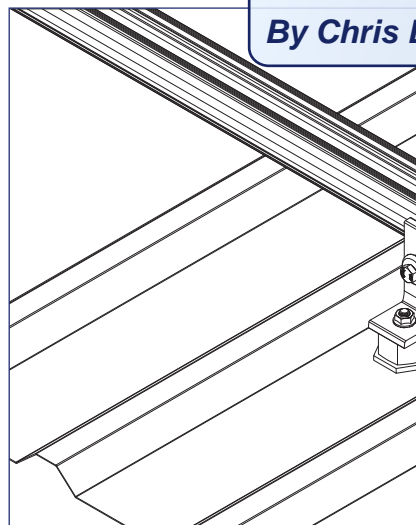


### Best Practice:

Finish tightening hardware with a hand wrench to prevent L Foot from rotating.

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By Chris Berger at 9:25 pm, Aug 19, 2024



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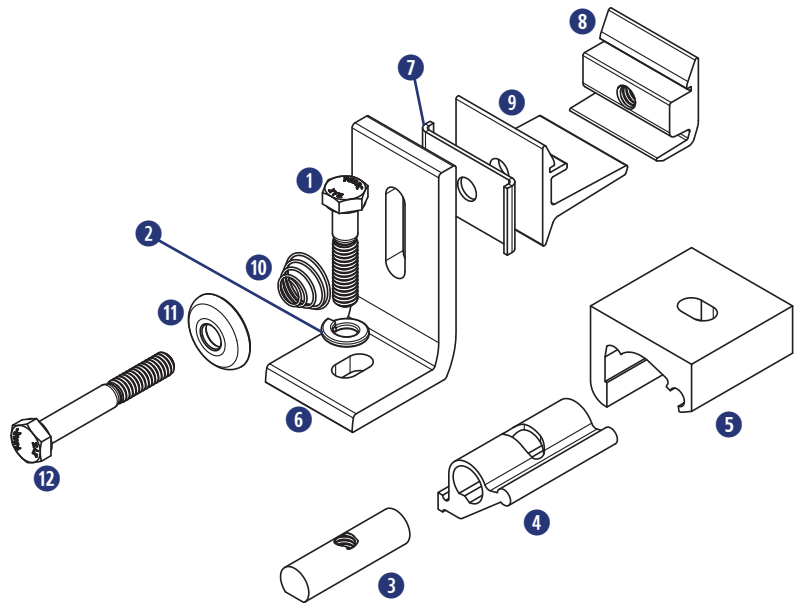


## Required Tools

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

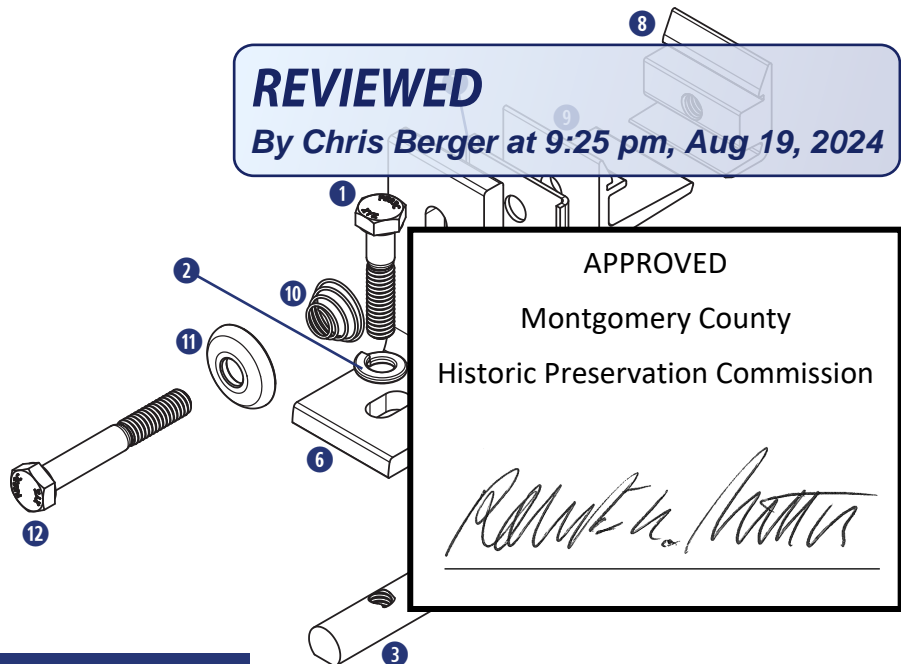
## Materials Included - Standard Base Seam Clamp Kit

- ① (1) 5/16"-18 X 1-1/2" SS HCS Bolt (Black)
- ② (1) 5/16" SS Split Lock Washer
- ③ (1) SnapNrack Seam Clamp Insert
- ④ (1) SnapNrack Seam Clamp Cam
- ⑤ (1) SnapNrack Seam Clamp Standard Base
- ⑥ (1) SnapNrack All Purpose L Foot
- ⑦ (1) SnapNrack Rotation Lock
- ⑧ (1) SnapNrack Ultra Mount (Tapped)
- ⑨ (1) SnapNrack Ultra Mount (Thru-Hole)
- ⑩ (1) SnapNrack Ultra Mount Spring
- ⑪ (1) SnapNrack Ultra Mount Spring Cage
- ⑫ (1) 5/16"-18 X 2-1/4" SS HCS Bolt



## Materials Included - Wide Base Seam Clamp Kit

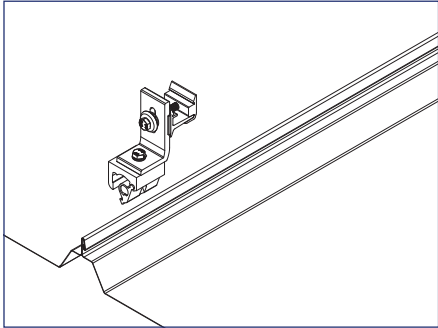
- ① (1) 5/16"-18 X 1-1/2" SS HCS Bolt (Black)
- ② (1) 5/16" SS Split Lock Washer
- ③ (1) SnapNrack Seam Clamp Insert
- ④ (1) SnapNrack Seam Clamp Cam
- ⑤ (1) SnapNrack Seam Clamp Wide Base
- ⑥ (1) SnapNrack All Purpose L Foot
- ⑦ (1) SnapNrack Rotation Lock
- ⑧ (1) SnapNrack Ultra Mount (Tapped)
- ⑨ (1) SnapNrack Ultra Mount (Thru-Hole)
- ⑩ (1) SnapNrack Ultra Mount Spring
- ⑪ (1) SnapNrack Ultra Mount Spring Cage
- ⑫ (1) 5/16"-18 X 2-1/4" SS HCS Bolt



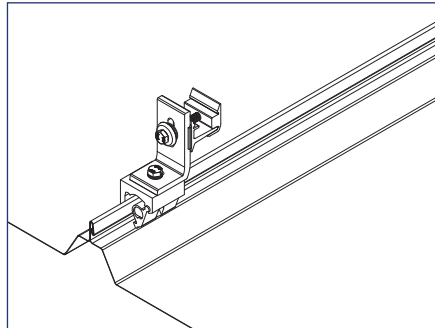
**Application Note:**  
Install on standing metal seam roofs

**Installation Note:**  
Grounding and bonding of mounting system to metal roof panels shall meet local AHJ requirements.

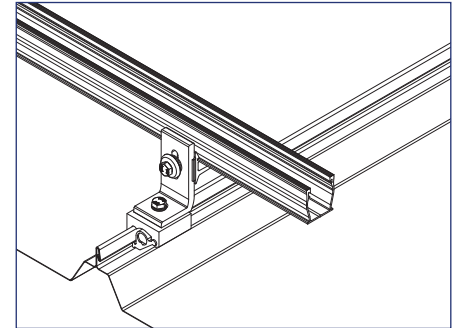
## INSTALLATION INSTRUCTIONS



1) Loosen seam clamp hardware and use roof attachment locations to lay out seam clamps on roof.



2) Attach the seam clamp to the standing metal seam by opening the seam clamp cam and placing the clamp over the top of the standing metal seam.

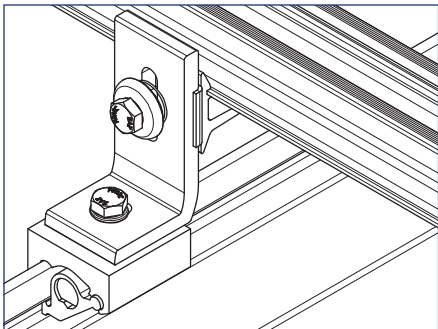


3) Torque black seam clamp bolt to 200 in-lbs (16.7 ft-lbs).



Install Note:

Seam clamps should never be installed using an impact driver.



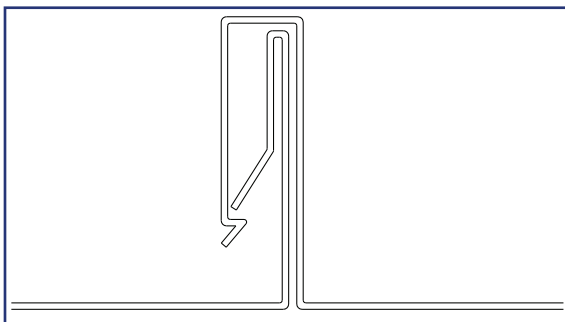
4) Ensure rotation lock is properly aligned with Ultra Mount and L foot during rail installation.

**REVIEWED**  
By Chris Berger at 9:25 pm, Aug 19, 2024

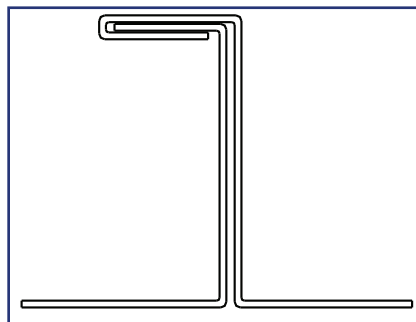
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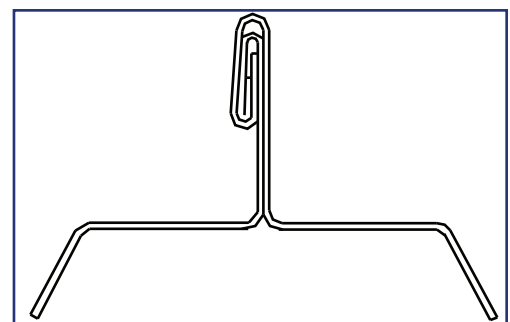
SnapNrack Seam Clamps have been designed to work with a variety of standing seam metal roofs, the most common seam types are:



Snap Lock



Single Lock



Double Lock



Install Note:

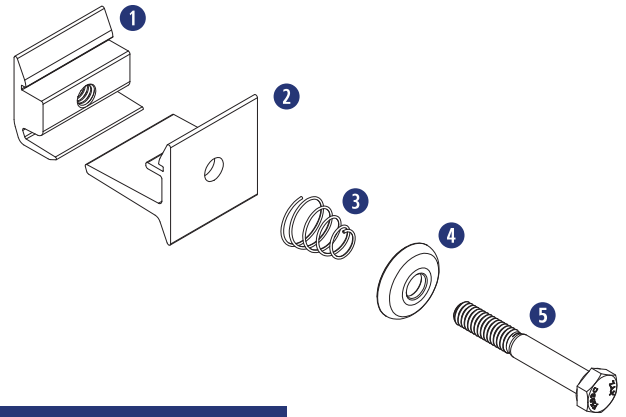
If a specific roof seam is not found on list, contact SnapNrack prior to installation.

## Required Tools

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

## Materials Included - Ultra Rail Mounting Hardware

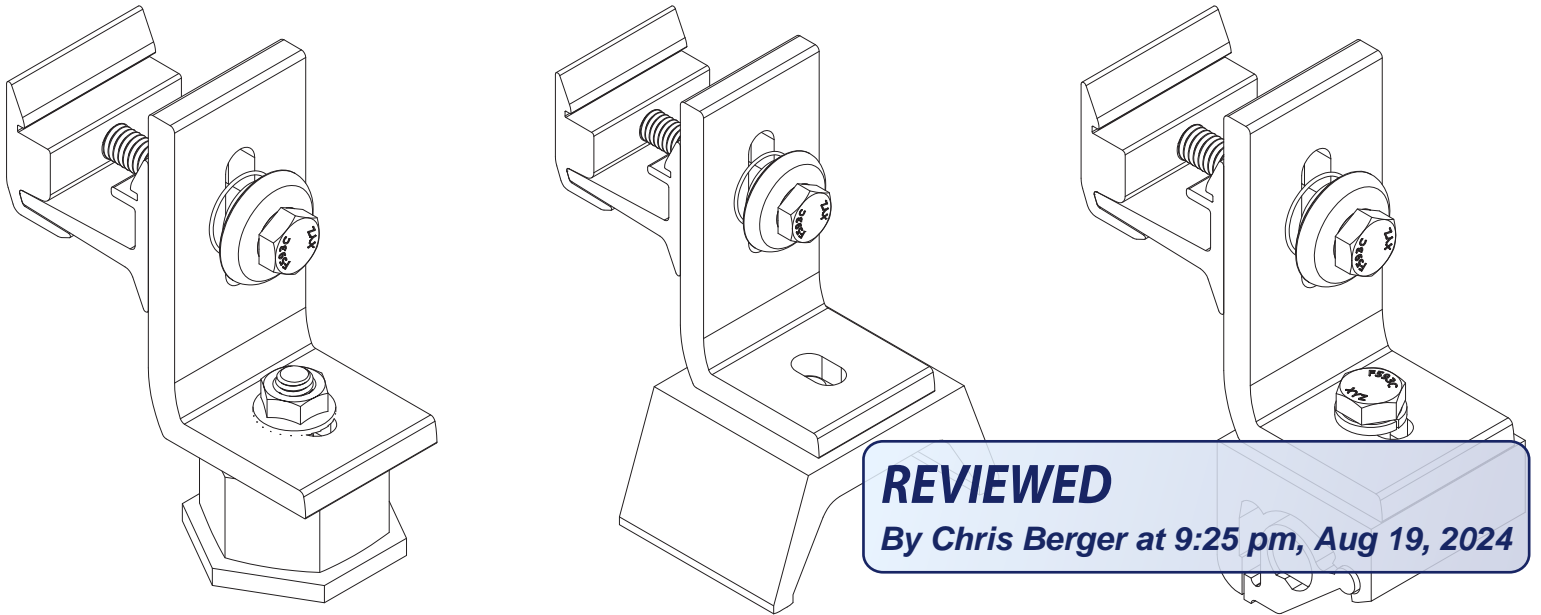
- ① (1) SnapNrack Ultra Mount (Tapped)
- ② (1) SnapNrack Ultra Mount (Thru-Hole)
- ③ (1) SnapNrack Ultra Mount Spring
- ④ (1) SnapNrack Ultra Mount Spring Cage
- ⑤ (1) 5/16"-18 X 2-1/4" SS HCS Bolt



## Other Materials Required - Not Shown

- ① Roof Attachment

**Application Note:**  
Install Ultra Rail onto any roof attachment that uses an L foot or other slotted mount that accepts 5/16" hardware.



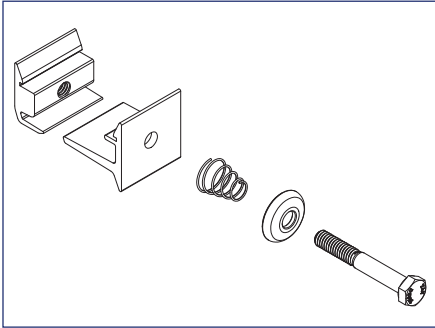
**REVIEWED**  
By Chris Berger at 9:25 pm, Aug 19, 2024

Ultra Rail Mounting Hardware Installed on Different Roof

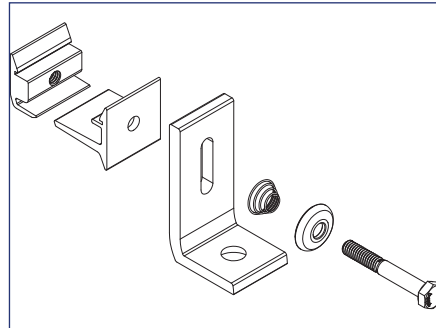
**Install Note:**  
Roof attachments used must always meet minimum structural requirements. Consult licensed structural engineer if necessary.

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## INSTALLATION INSTRUCTIONS



1) Disassemble Ultra Rail Mounting Hardware components, taking note of their installation order and orientation.



2) Re-assemble Ultra Rail Mounting Hardware components onto roof attachment in the following order:

*Ultra Mount (tapped) - Ultra Mount (thru-hole) - roof attachment - spring - spring cage - bolt*



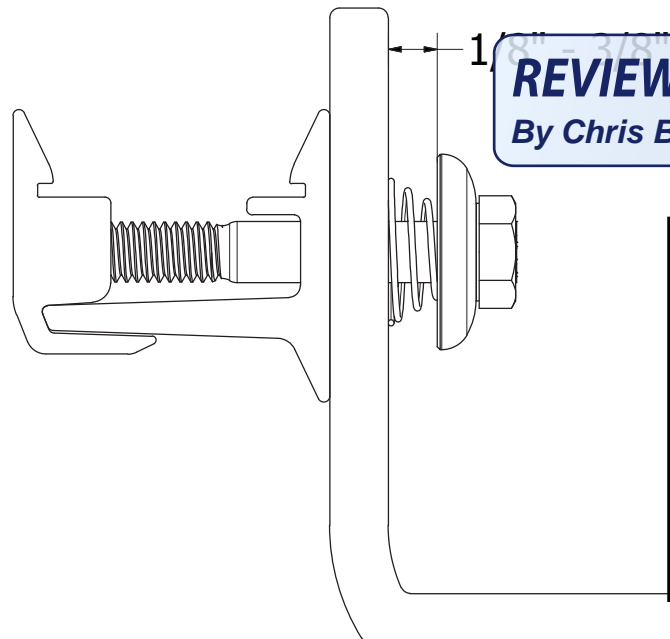
### Install Note:

See exploded view on previous page for clarification.



### Best Practice:

Ensure bolt is threaded into mount, but leave assembly loose for rail installation.



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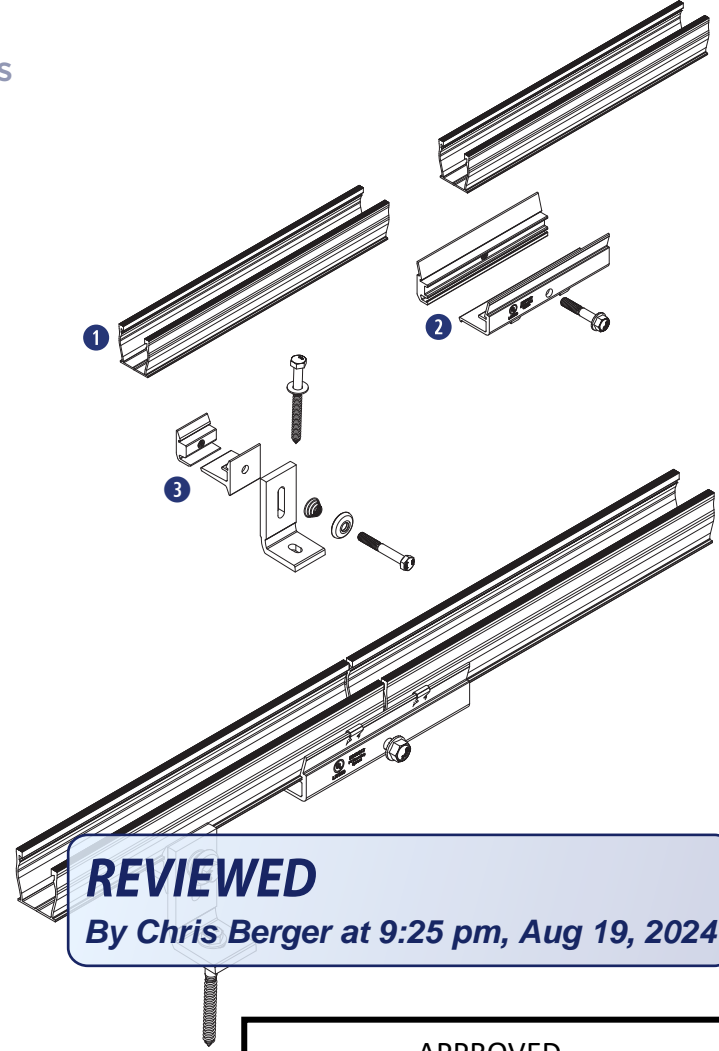
Recommended Ultra Rail Mounting Hardware Installation

## Required Tools

- Level
- String Line or Spare Rail
- Pitch Meter
- Torque Wrench
- Socket Wrench
- 1/2" Socket

## Materials Included - Installing and Leveling Rails

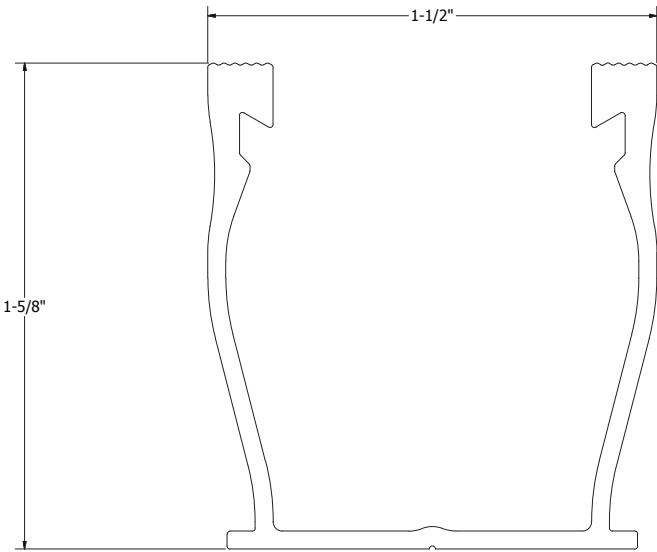
- 1 SnapNrack Ultra Rail
- 2 SnapNrack Ultra Rail Splice
- 3 Pre-Installed SnapNrack Roof Attachments  
(L Foot Mount, Tile Replacement, etc.)



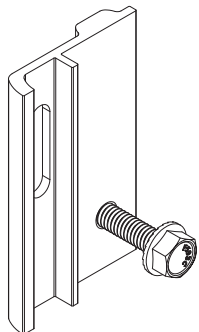
**REVIEWED**  
By Chris Berger at 9:25 pm, Aug 19, 2024

## Other Materials Required - Not Shown

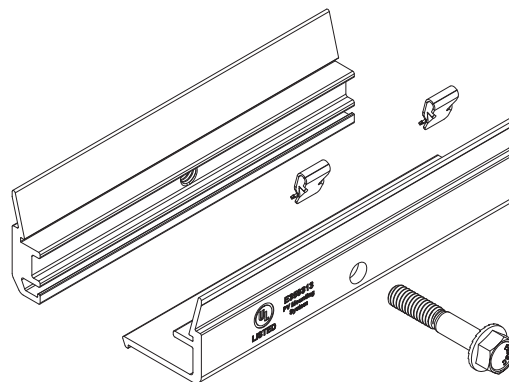
- 1 SnapNrack L Foot Extension



UR-40 Rail Profile



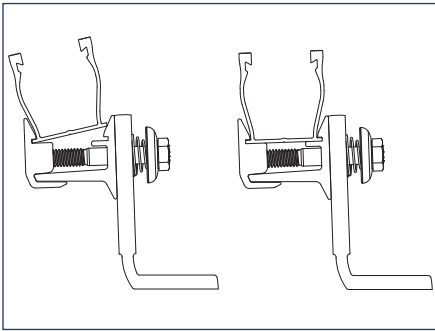
L Foot Extension



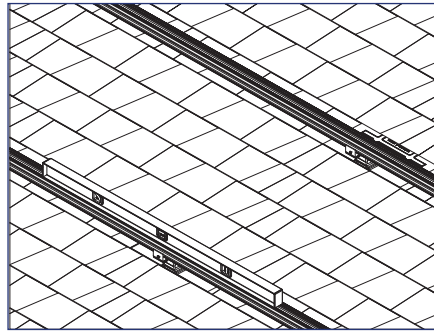
Ultra Rail Splice

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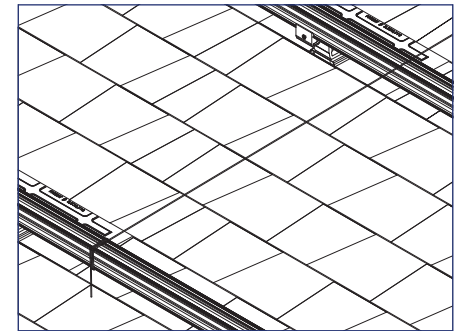
## INSTALLATION INSTRUCTIONS



1) Set rails into the attachments by dropping and snapping into the mounts. Connect multiple lengths of rail end to end using the SnapNrack Ultra Rail Splice (see “Ultra Rail Splice” section).



2) Level the bottom rail of the array to the roof and tighten attachment points.



3) Run a string line or spare rail from the bottom rail to the top rail and set desired pitch of the array by adjusting the top rail, add L Foot Extension if needed.

### Install Note:

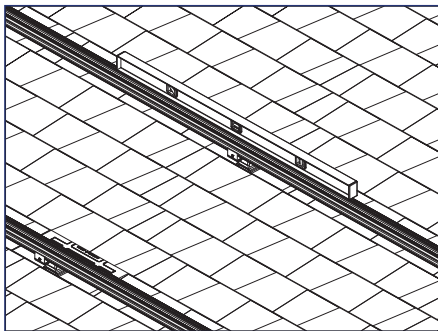
Slightly rocking rail into mounts can ease installation, leading first with side of rail furthest from mount.

### Best Practice:

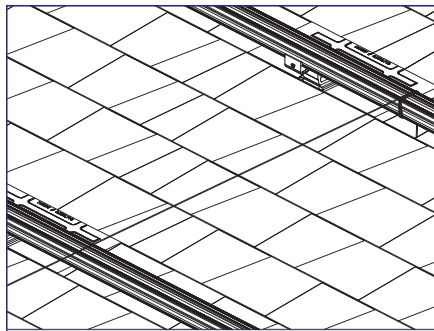
Set attachments in the middle of available leveling range to start.

### Install Note:

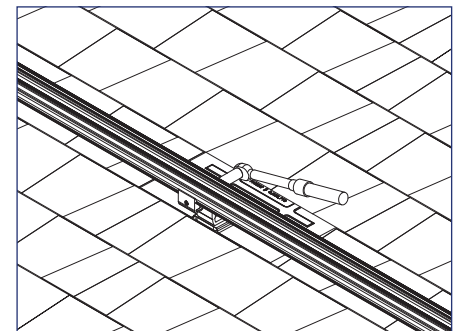
See “Leveling Components” section for installation instruction and restrictions.



4) Level the top rail by moving the string line down the length of the rail, matching pitch over the entire length of the array.



5) Level the remaining rails to the string line by working out from the middle rail, add L Foot Extension or spacers if needed.



6) Tighten all racking hardware to 12 ft-lbs.

### Note:

The minimum standoff height between the modules and roof is as follows:

- REC Solar, Yingli, and Suniva modules: 4.00"
- ReneSola modules: 3.93" (100 mm)
- Trina Solar modules: 4.53" (115 mm)

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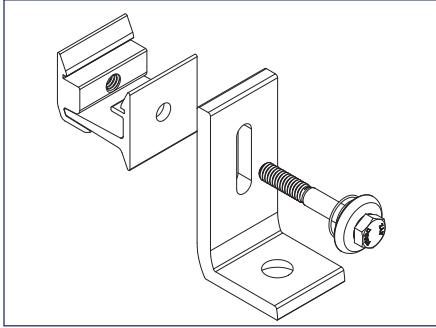
By Chris Berger at 9:25 pm, Aug 19, 2024

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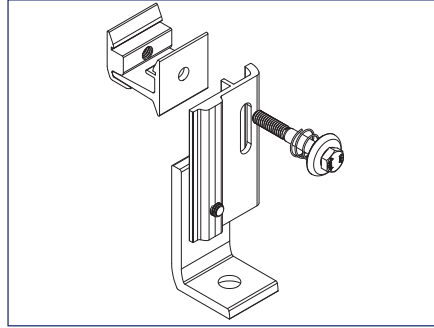
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## INSTALLATION INSTRUCTIONS

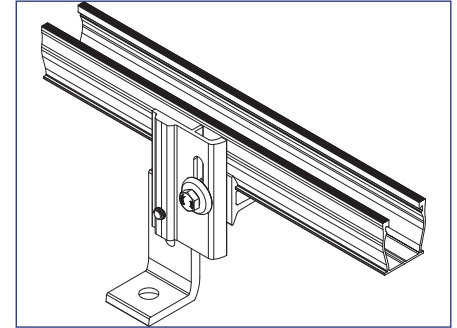
### SnapNrack L Foot Extension



1) Remove Ultra Mount components from roof attachment, taking note of their installation order and orientation.



2) Remove bolt from L Foot Extension and install onto pre-installed roof attachment, then set desired height and tighten hardware to 12 ft-lbs.



3) Re-install Ultra Rail Mounting Hardware components onto L Foot Extension in the following order:

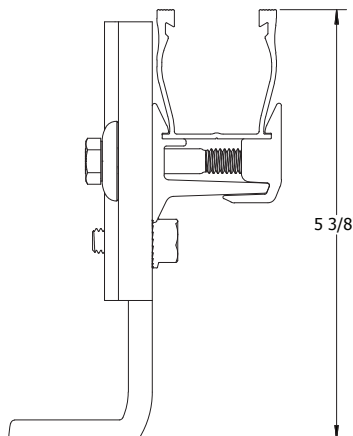
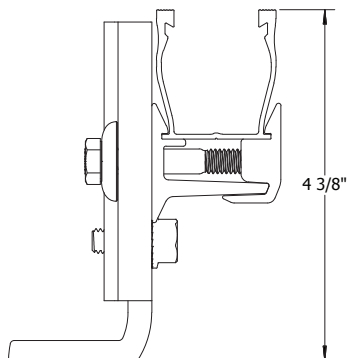
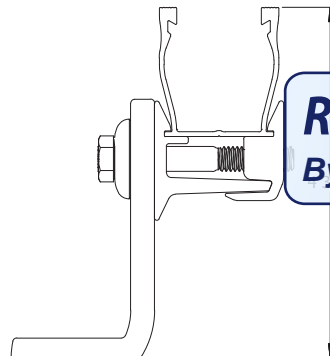
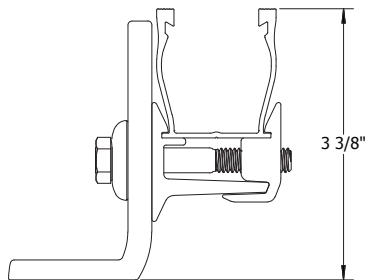
*Ultra Mount (tapped) - Ultra Mount (thru-hole) - L Foot Extension - spring - washer - bolt*

#### Install Note:

See exploded view in "Ultra Rail Mounting Hardware" section for clarification.

#### Best Practice:

Ensure bolt is threaded into mount, but leave assembly loose for rail installation.



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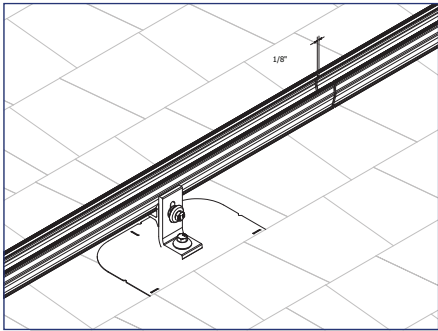
on no more than 50% of attachment points.

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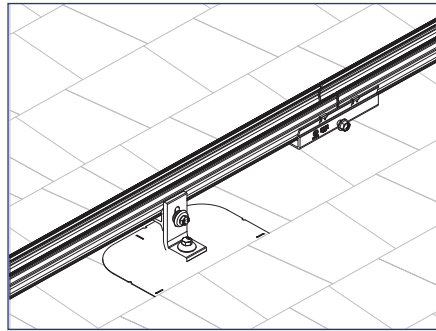
L Foot Extension Provides Up To 3" of Height Adjustment



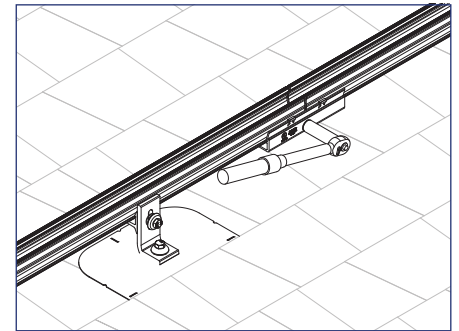
## INSTALLATION INSTRUCTIONS



1) Align sections of rail so that ends butt up to each other.



2) Install rail splice assembly onto bottom of rail, making sure both rails are seated in grooves of splice and that the splice is centered.



3) Tighten splice hardware to 12 ft-lbs.

### Install Note:

Leave approximately 1/8" gap between rails to allow for thermal expansion of rail.

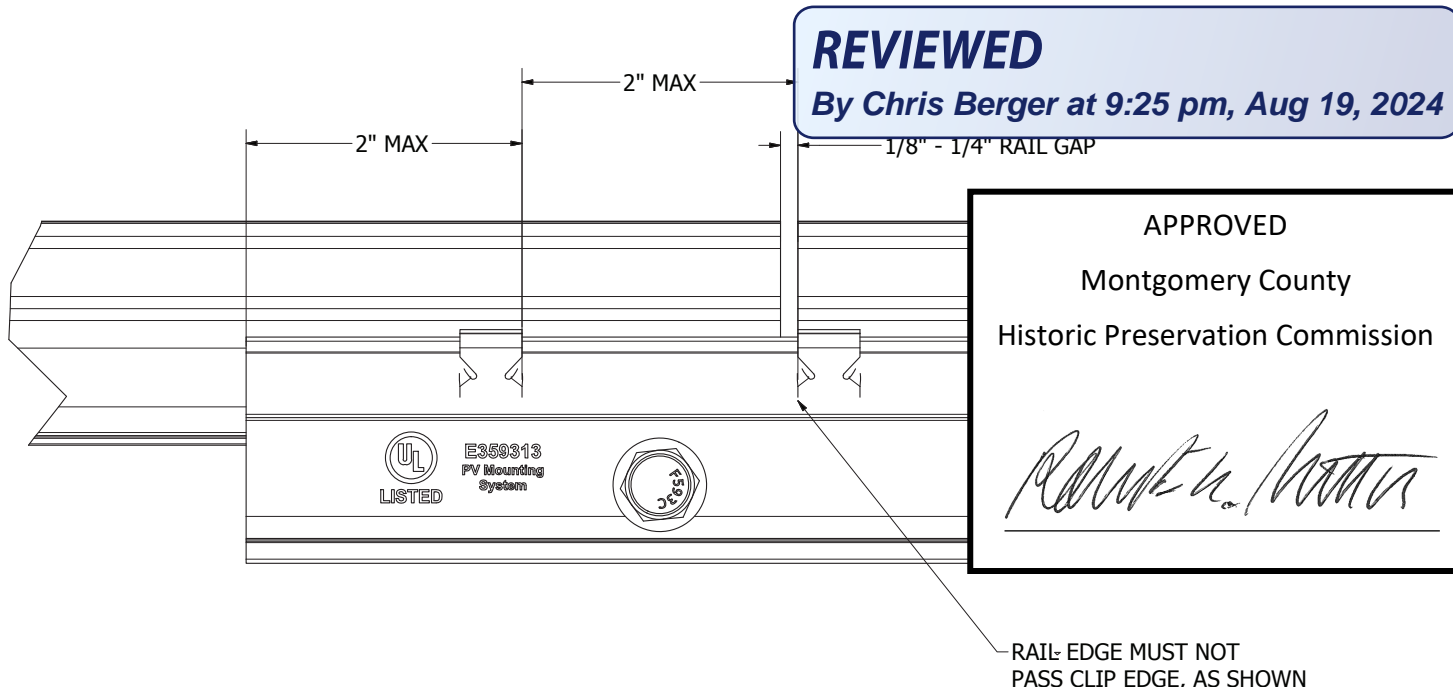
Any section of rail that is spliced will need to be supported by a roof attachment on both sides. Splices are not allowed to be installed on rail cantilevers.

### Install Note:

Gap between rails must land between bonding clips on splice.

### Best Practice:

Hold sides of splice together on rails with one hand and tighten with the other.



Splice Installation Limitations

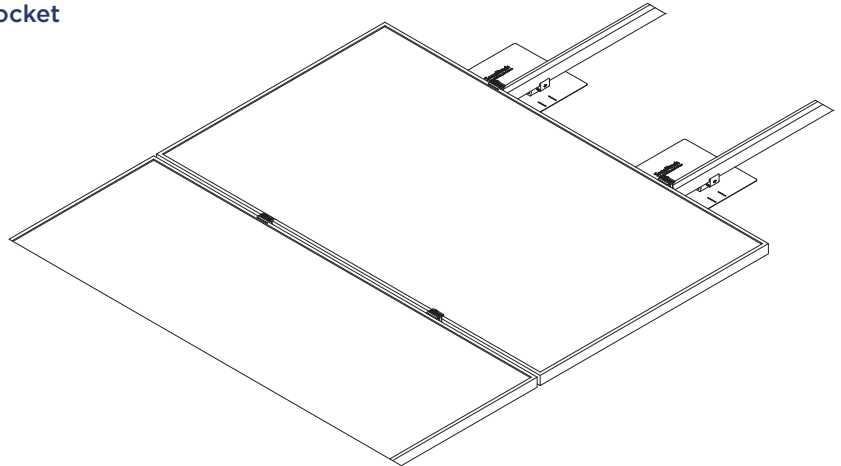


## Required Tools

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

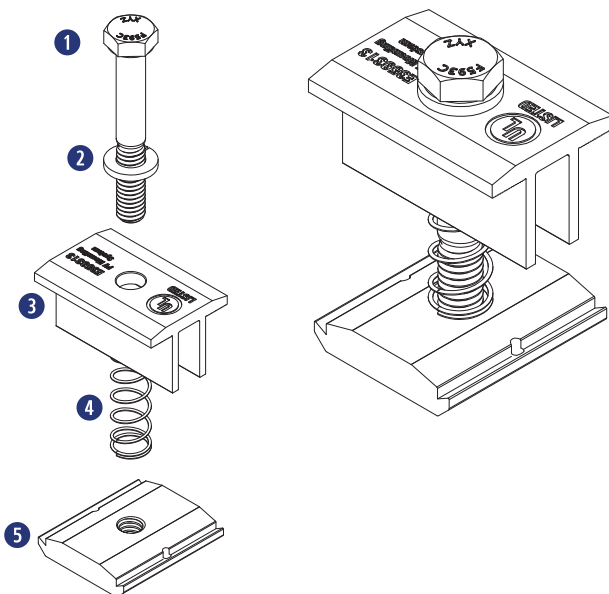
## Materials Needed - Module Installation

- 1 Pre-Installed SnapNrack Roof Attachments
- 2 Pre-Installed SnapNrack Rails
- 3 SnapNrack Mid Clamp Assemblies
- 4 SnapNrack End Clamp Assemblies
- 5 PV Modules



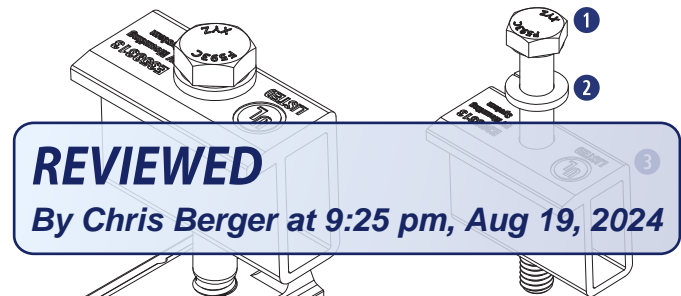
## Mid Clamp Assembly

- 1 (1) 5/16"-18 SS HCS Bolt
- 2 (1) 5/16" SS Split Lock Washer
- 3 (1) SnapNrack Mid Clamp
- 4 (1) SnapNrack SS Mid Clamp Spring
- 5 (1) 5/16"-18 SnapNrack Channel Nut



## Adjustable End Clamp Assembly

- 1 (1) 5/16"-18 SS HCS Bolt
- 2 (1) 5/16" SS Split Lock Washer
- 3 (1) SnapNrack Adjustable End Clamp Top
- 4 (1) SnapNrack Adjustable End Clamp Bottom



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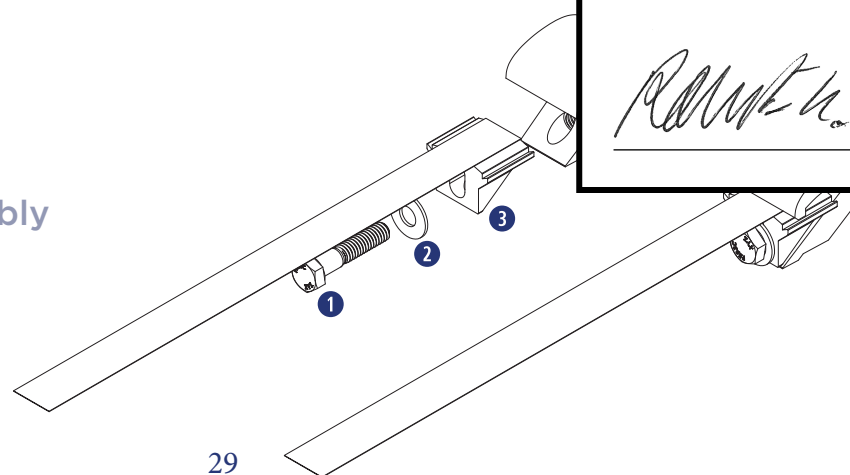
By Chris Berger at 9:25 pm, Aug 19, 2024

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A handwritten signature in black ink, reading "Robert H. Potter".

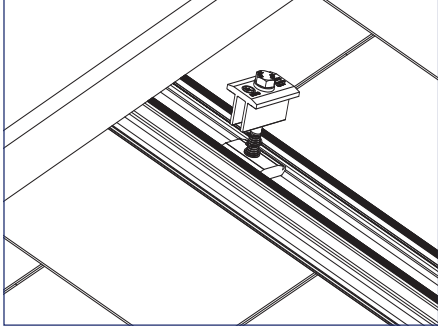
## Universal End Clamp Assembly

- 1 (1) 5/16"-18 X 1-1/2" SS HCS Bolt
- 2 (1) 5/16" X 3/4" SS Flat Washer
- 3 (1) SnapNrack Universal Wedge
- 4 (1) SnapNrack Universal Wave



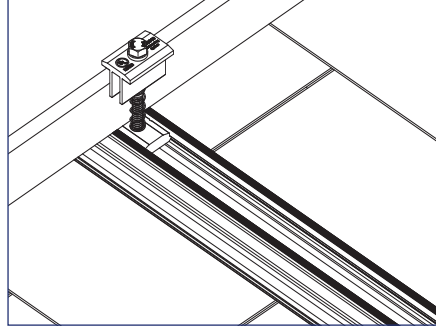
## INSTALLATION INSTRUCTIONS

### SnapNrack Mid Clamp



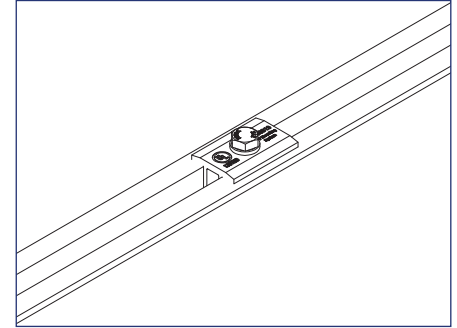
1) Snap the channel nut into the top channel of the rail.

**Best Practice:**  
Backing channel nut off bolt will ease installation into rail channel.



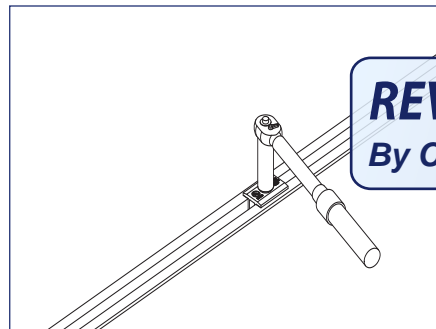
2) Slide the clamp flush to the module with the top lip of the mid clamp over the top edge of the module frame.

**Install Note:**  
Take care to avoid having wires pinched between modules and rails, as this can lead to system failure and be dangerous.



3) Place the next module flush to the other side of the mid clamp.

**Install Note:**  
Mid clamps create 1/2" gap between modules.



4) Tighten hardware to 10 ft-lbs.

**Install Note:**  
Mid clamps are Listed with and without springs.

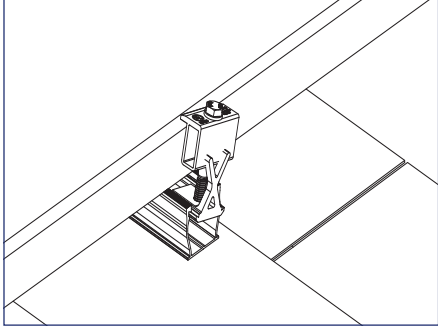
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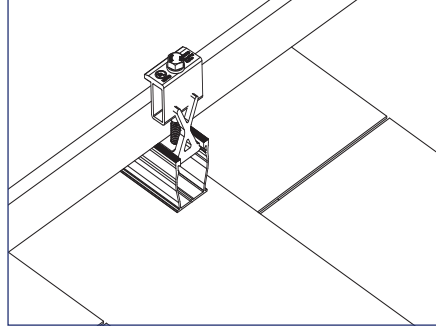


## INSTALLATION INSTRUCTIONS

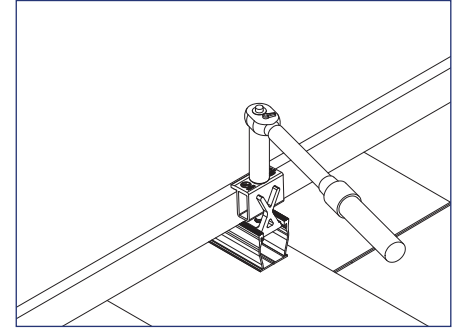
### SnapNrack Adjustable End Clamp



1) Snap the channel nut into the top channel of the rail.



2) Slide the clamp flush to the module with the top lip of the end clamp over the top edge of the module frame.



3) Tighten hardware to 10 ft-lbs.



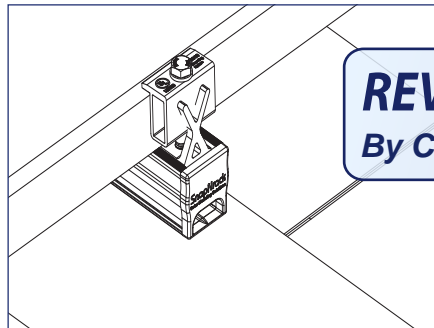
#### Install Note:

Adjustable End Clamps require extra rail to ensure that channel nut is fully engaged.



#### Install Note:

Take care to avoid having wires pinched between modules and rails, as this can lead to system failure and be dangerous.



4) Install end cap to finish.

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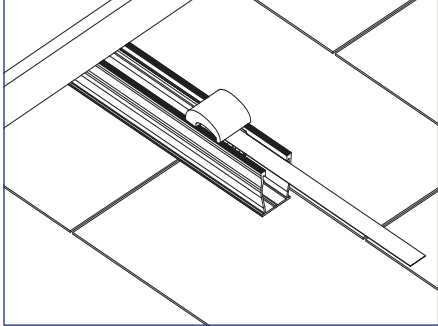
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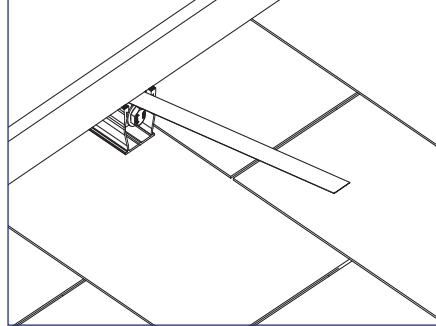
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## INSTALLATION INSTRUCTIONS

### SnapNrack Universal End Clamp



1) Slide the preassembled Universal End Clamp (UEC) into the end of the rail.

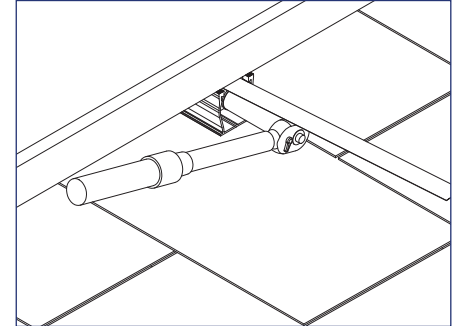


2) Lift the module and slide the clamp far enough under the module to pass the lip of the bottom edge of the module frame.



#### Install Note:

Take care to avoid having wires pinched between modules and rails, as this can lead to system failure and be dangerous.

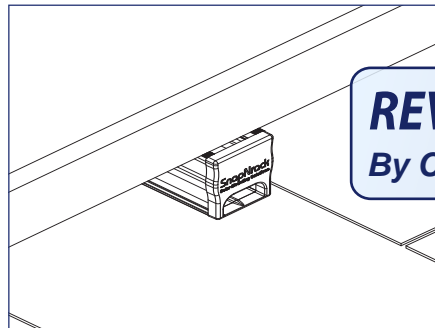


3) Use the pull tab to hold the UEC taut towards the end of the rail and tighten hardware to 10 ft-lbs.



#### Install Note:

Rail can be cut flush to the module when using UEC.



4) Install end cap to finish.



#### Install Note:

Modules need to be grounded separately when Universal End Clamps are the only type of clamp attaching a module.

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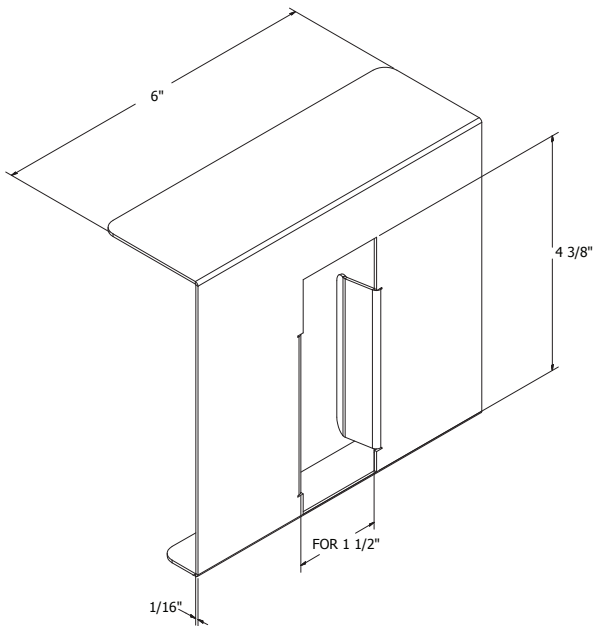
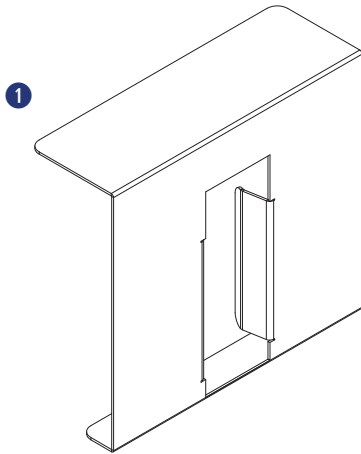
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## Required Tools

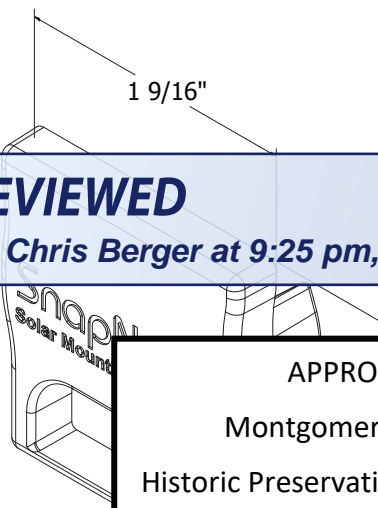
- Reciprocating Saw or Portable Band Saw

## Materials Included - Rail Cutting Tool and Rail End Cap

- ① (1) SnapNrack Rail Cutting Tool
- ② (1) SnapNrack Ultra Rail End Cap




Dimensioned Rail Cutting Tool



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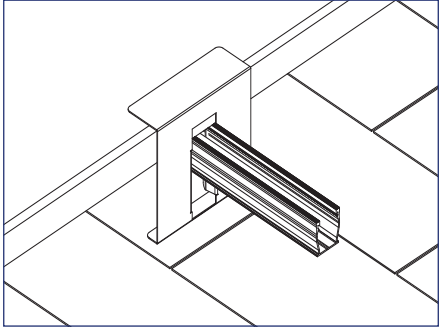
Dimensioned Rail End Cap



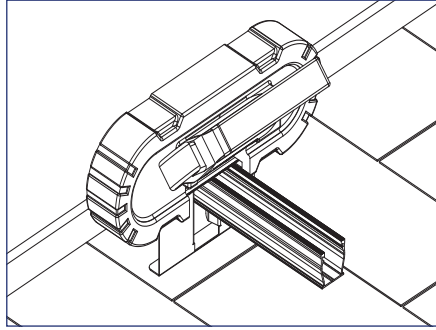
### Application Note:

Use to cut rail flush to module frame when using Universal End Clamps (UEC).

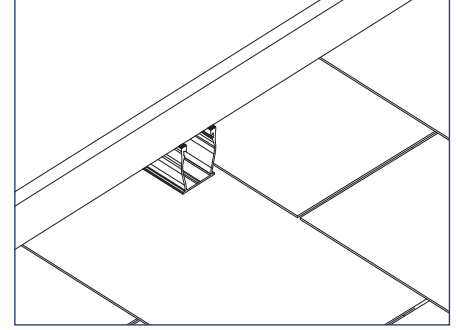
## INSTALLATION INSTRUCTIONS



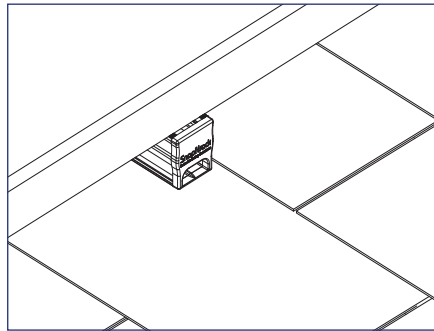
1) Slide the Rail Cutting Tool over the end of the rail and place it so that the upper lip is safely covering the edge of the module (*optional*).



2) Use the reciprocating saw or band saw to cut off the end of the rail, then remove any sharp edges.



3) Remove the Cutting Tool from the rail, then remove any sharp edges.



4) Insert SnapNrack Ultra Rail End Cap into the cut end of the rail to create a flush finish to the array.

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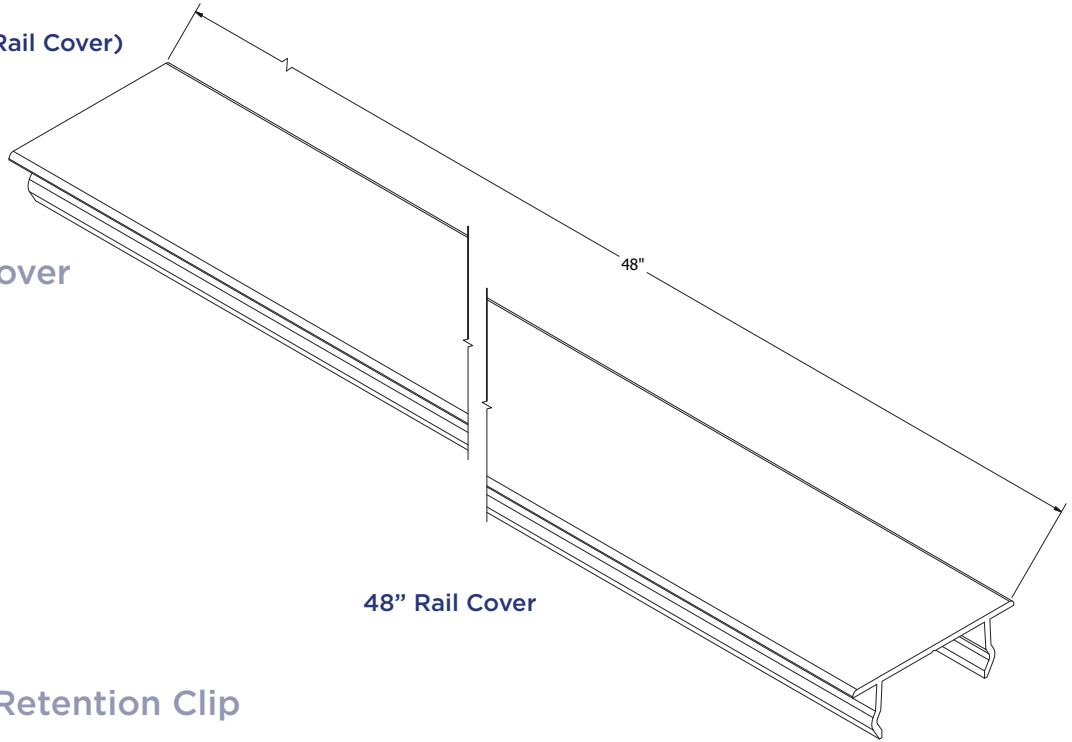
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## Required Tools

- Reciprocating Saw or Chop Saw (Rail Cover)
- Socket Wrench (Wire Clamp)
- 1/2" Socket (Wire Clamp)

## Materials Included - Rail Cover

- ① (1) SnapNrack 48" Rail Cover



**Application Note:**  
Install to protect any conductors that are exposed to sunlight that are not approved for use in UV light.

## Materials Included - Wire Retention Clip

- ① SnapNrack Wire Retention Clip



Wire Retention Clip

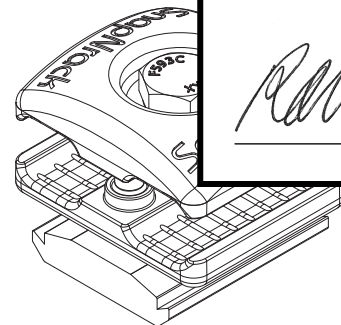
**Application Note:**  
Install as necessary to manage and safely retain conductors within SnapNrack rails.

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By Chris Berger at 9:25 pm, Aug 19, 2024

## Materials Included - Wire Clamp

- ① (1) SnapNrack 4-Wire Clamp, Trunk Cable Clamp, or Universal Wire Clamp

**Application Note:**  
Install as necessary to secure cables and conductors running from rail to rail, or transitioning out/in from a rail channel



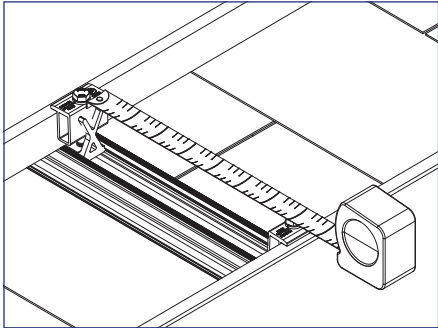
Universal Wire Clamp Assembly

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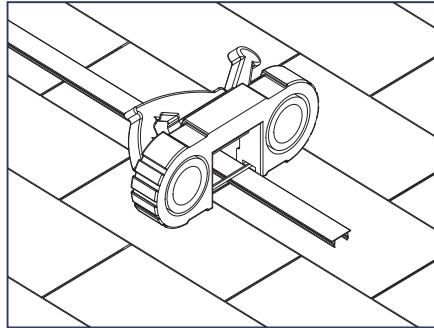


## INSTALLATION INSTRUCTIONS

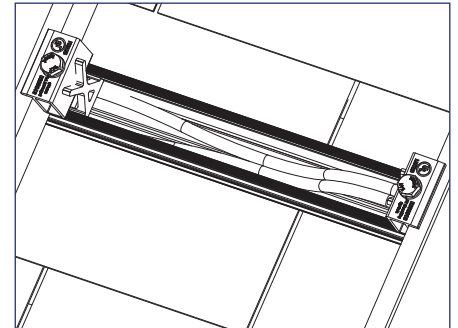
### SnapNrack 48" Rail Cover



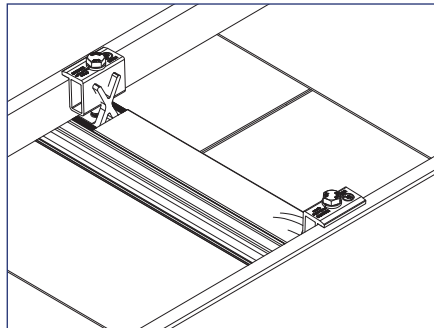
1) Measure the length of the SnapNrack 48" Rail Cover that is needed.



2) Cut the rail cover to length, then remove any sharp edges.



3) Place all electrical conductors in the bottom of the rail channel.



4) Snap Rail Cover into place, enclosing all conductors inside of rail channel.

#### Install Note:

SnapNrack Rail Cover is designed to stay in place once installed, use a flat blade screw driver if it needs to be relocated or removed.

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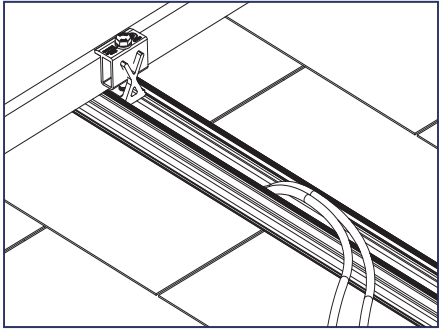
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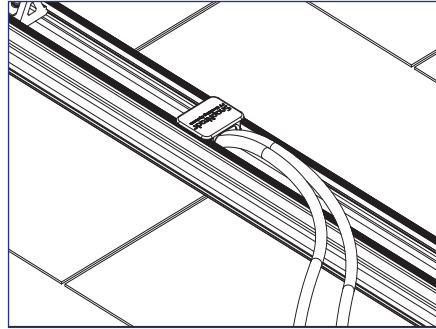


## INSTALLATION INSTRUCTIONS

### SnapNrack Wire Retention Clip

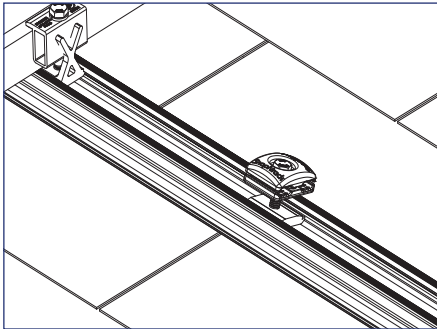


1) Place all electrical conductors in the bottom of the rail channel.

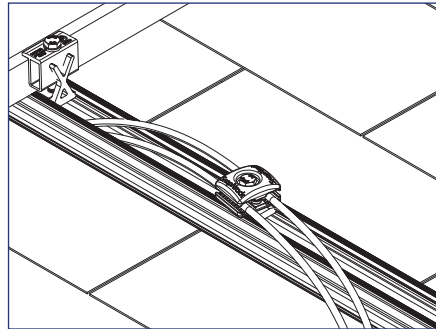


2) Install the Wire Retention Clip by snapping it into place on the rail.

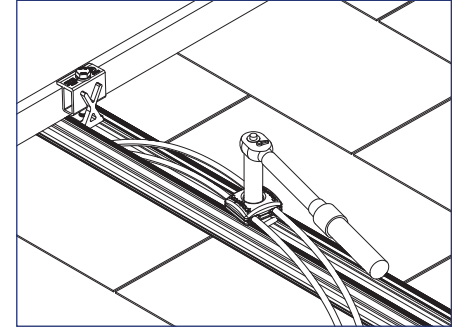
### SnapNrack 4-Wire, Trunk Cable, or Universal Wire Clamp



1) Snap Wire Clamp into top or side rail channel.



2) With Wire Clamp loose, place conductors or cables in slots.

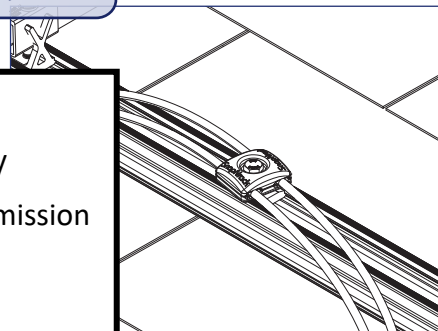


3) Tighten Wire Clamp with 1/2" socket, ensure cables and conductors are aligned in the clamp slots.

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The Clamp intended for PV conductors, Trunk Cable intended for trunk cables, Universal Wire Clamp intended for both PV Wire conductors and AC trunk cables.



Install Note:

Wire Clamps can be rotated and oriented in any direction.



Install Note:

Conductors of different types should be placed under separate Universal Wire Clamps.

## Required Tools

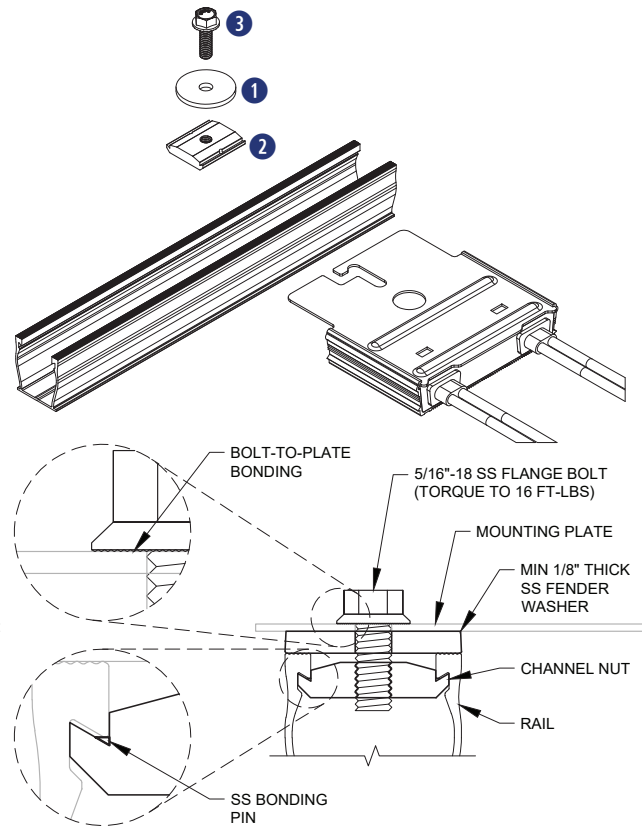
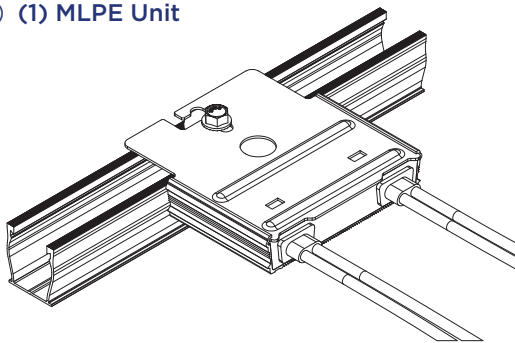
- Torque Wrench
- Socket Wrench
- 1/2" Socket

## Materials Included - MLPE Rail Attachment Kit

- ① (1) 5/16" X 1-1/2" X 0.125" SS Fender Washer
- ② (1) SnapNrack Channel Nut
- ③ (1) 5/16"-18 X 1-1/4" SS Flange Bolt

## Other Materials Required

- ① (1) MLPE Unit

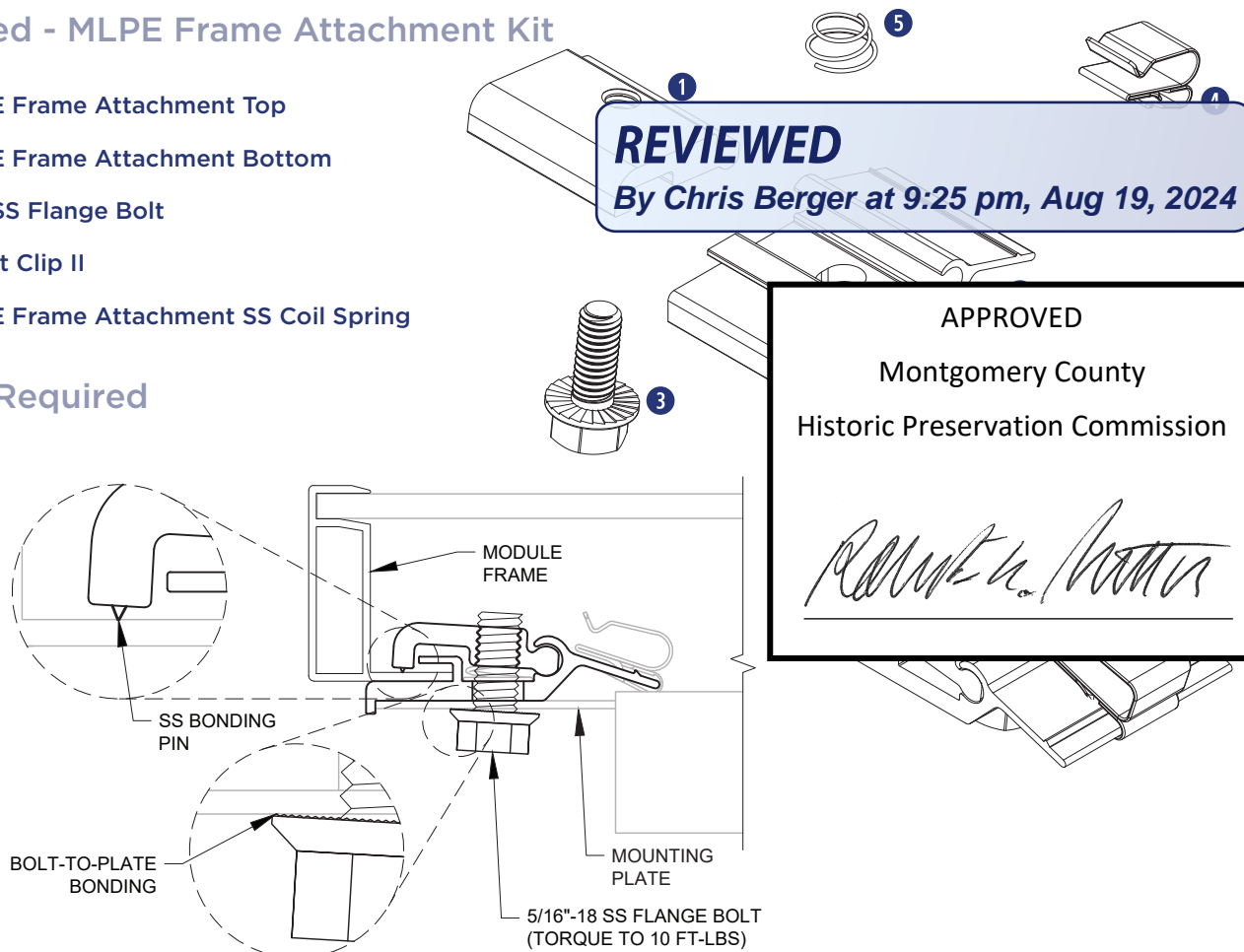


## Materials Included - MLPE Frame Attachment Kit

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

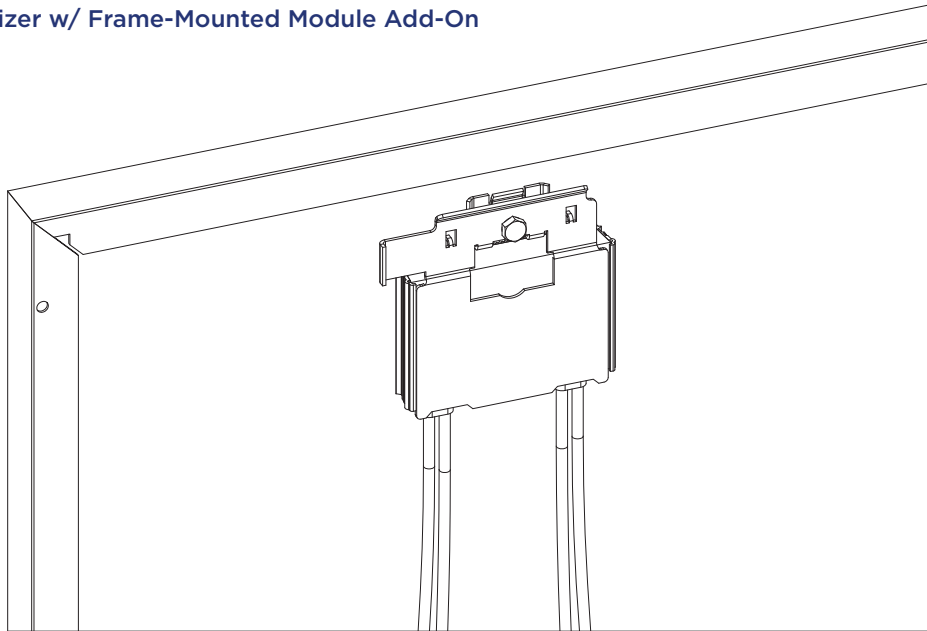
## Other Materials Required

- ① (1) MLPE Unit



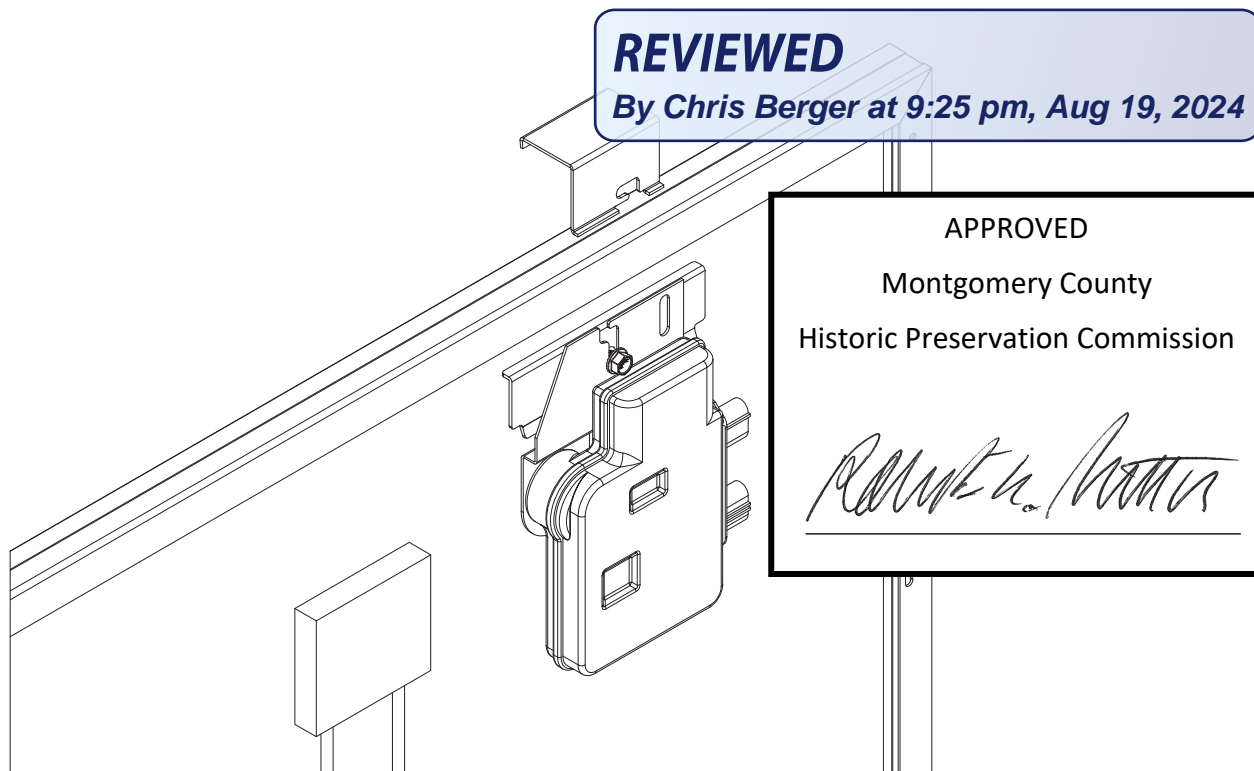
## Materials Needed - SolarEdge Frame Mount

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

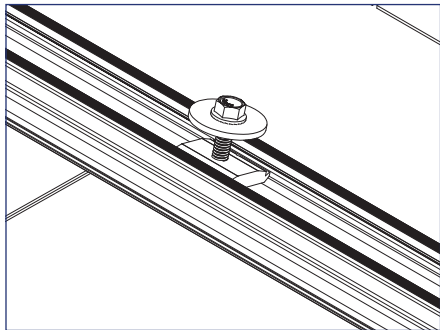


## Materials Needed - Enphase Frame Mount

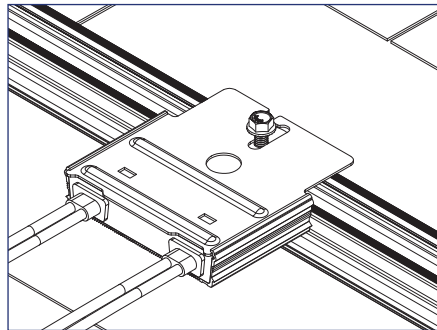
- ① (1) Enphase Microinverter
- ② (1) Enphase Frame Mount



## INSTALLATION INSTRUCTIONS - MLPE RAIL ATTACHMENT

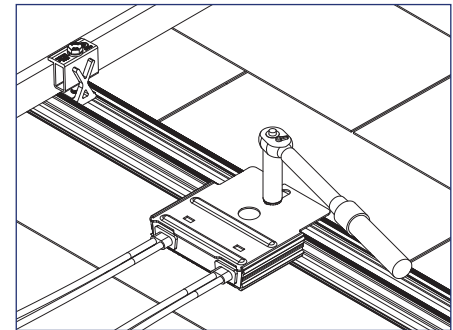


1) Snap the SnapRack MLPE Rail Attachment Kit channel nut into the desired location on the rail where the microinverter will be installed.



2) Install the microinverter mounting plate onto the bolt of the MLPE Rail Attachment Kit, ensuring that the large fender washer is between the rail and mounting plate.

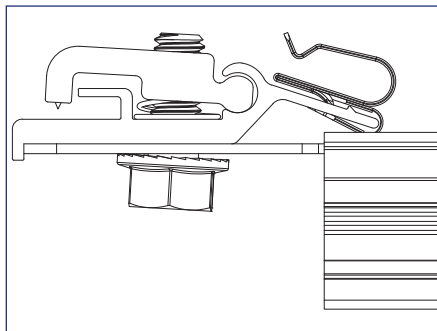
**Install Note:**  
Bolt and washers may need to be removed and then replaced.



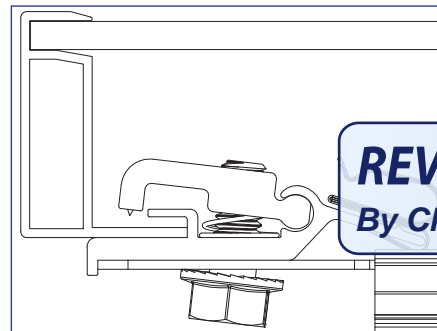
3) Tighten hardware to 10 ft-lbs.

**Install Note:**  
MLPE Attachment Kits are approved for bolt lengths between 1" and 1-1/2" long.

## INSTALLATION INSTRUCTIONS - MLPE FRAME ATTACHMENT

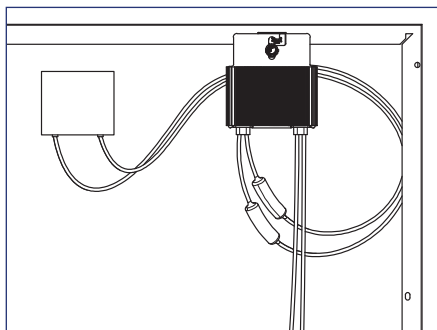


1) Slide the backplate channel of the MLPE device under the MLPE Frame Attachment Kit bolt. The MLPE mounting plate should rest against the MLPE mounting plate backstop on the MLPE Frame Attachment Kit.



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.


**Install Note:**  
Avoid blocking module frame drainage holes when installing the MLPE Frame Attachment Kit.



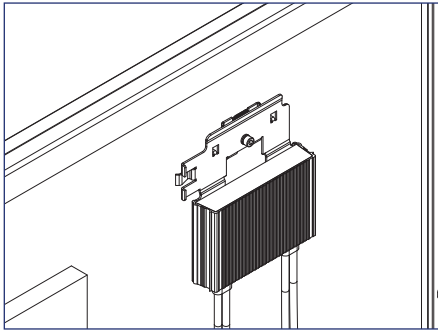
4) Connect the module leads to the input connectors on the MLPE device and manage conductors with the integrated Smart Clip.

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By Chris Berger at 9:25 pm, Aug 19, 2024

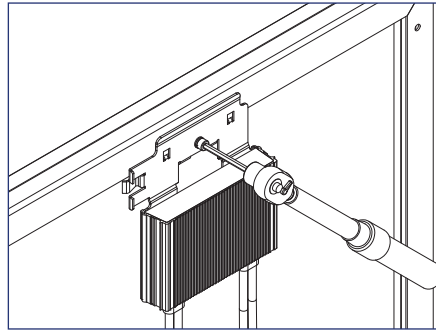
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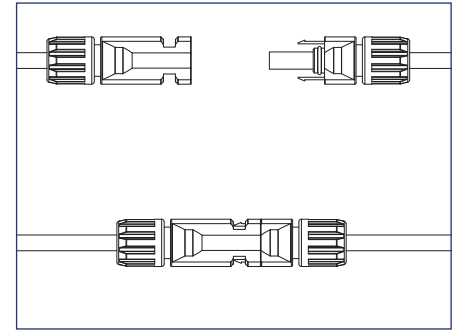
## INSTALLATION INSTRUCTIONS - SOLAREGE FRAME MOUNT



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



2) Install the optimizer mounting plate onto the module frame and tighten hardware to 7 ft-lbs.

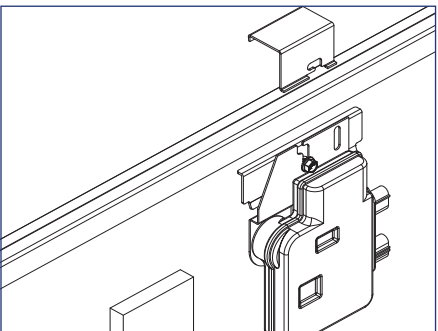


3) Connect the module leads to the input connectors on the optimizer.

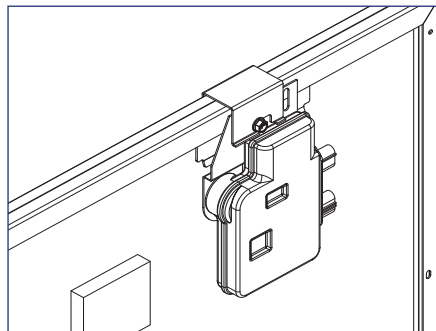
### Install Note:

Refer to the SolarEdge optimizer Frame-Mounted Module Add-On installation guide for additional instructions.

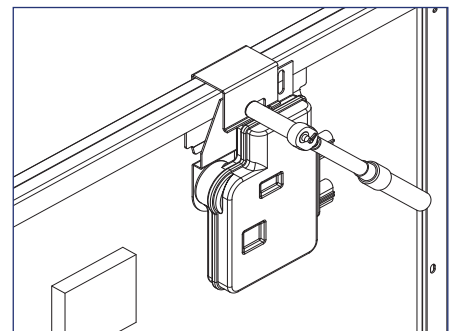
## INSTALLATION INSTRUCTIONS - ENPHASE FRAME MOUNT



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



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



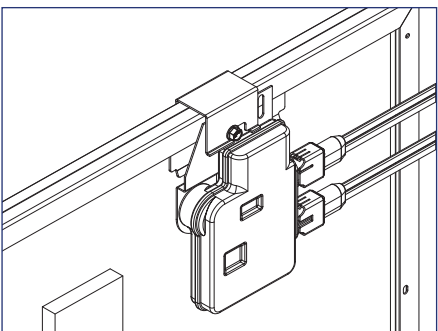
3) Tighten hardware to 13 ft-lbs

### Install Note:

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

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4) Connect the module leads to the microinverter DC connectors.

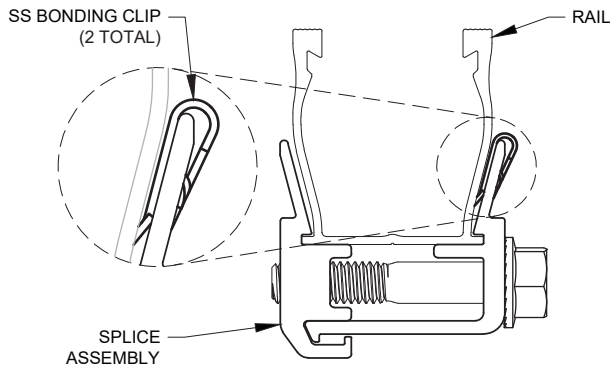
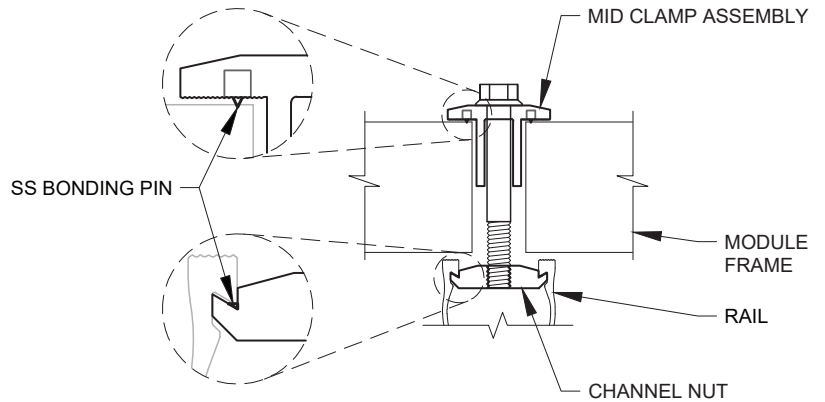
### Install Note:

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

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## System Bonding Methods

- 1 SnapNrack Mid Clamp
- 2 SnapNrack Adjustable End Clamp
- 3 SnapNrack Ultra Rail Splice

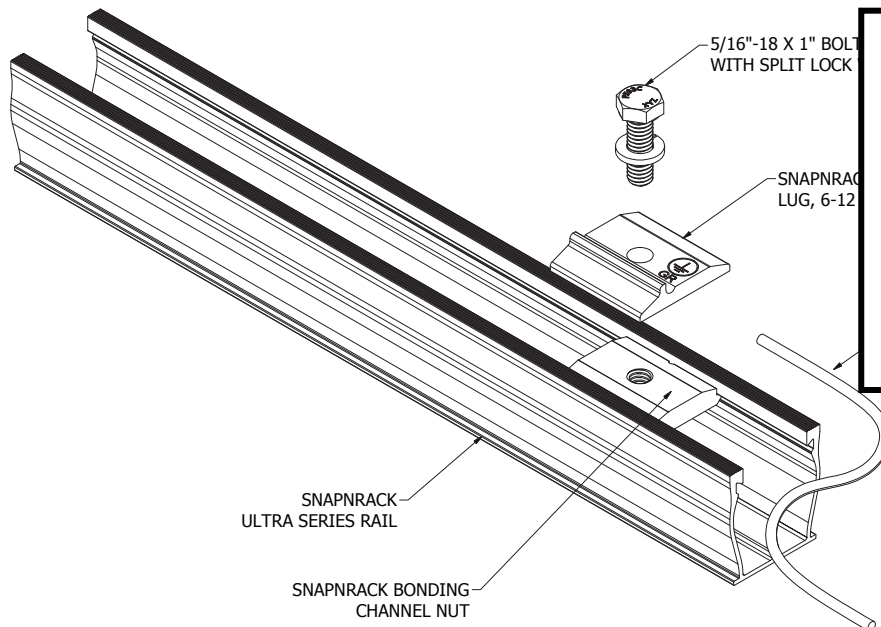


**Note:**  
SnapNrack module clamps contain a SnapNrack Channel Nut with integral bonding pins in assembly to properly bond the system (except Universal End Clamps).

**Note:**  
SnapNrack Ultra Rail Splices contain integral bonding clips in assembly to properly bond the system.

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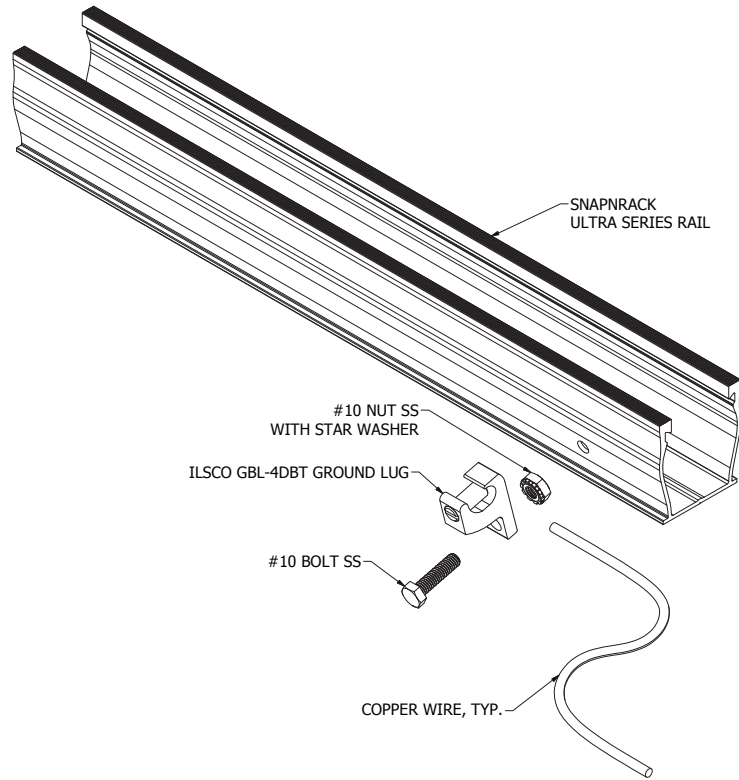
## SnapNrack Ground Lug Assembly



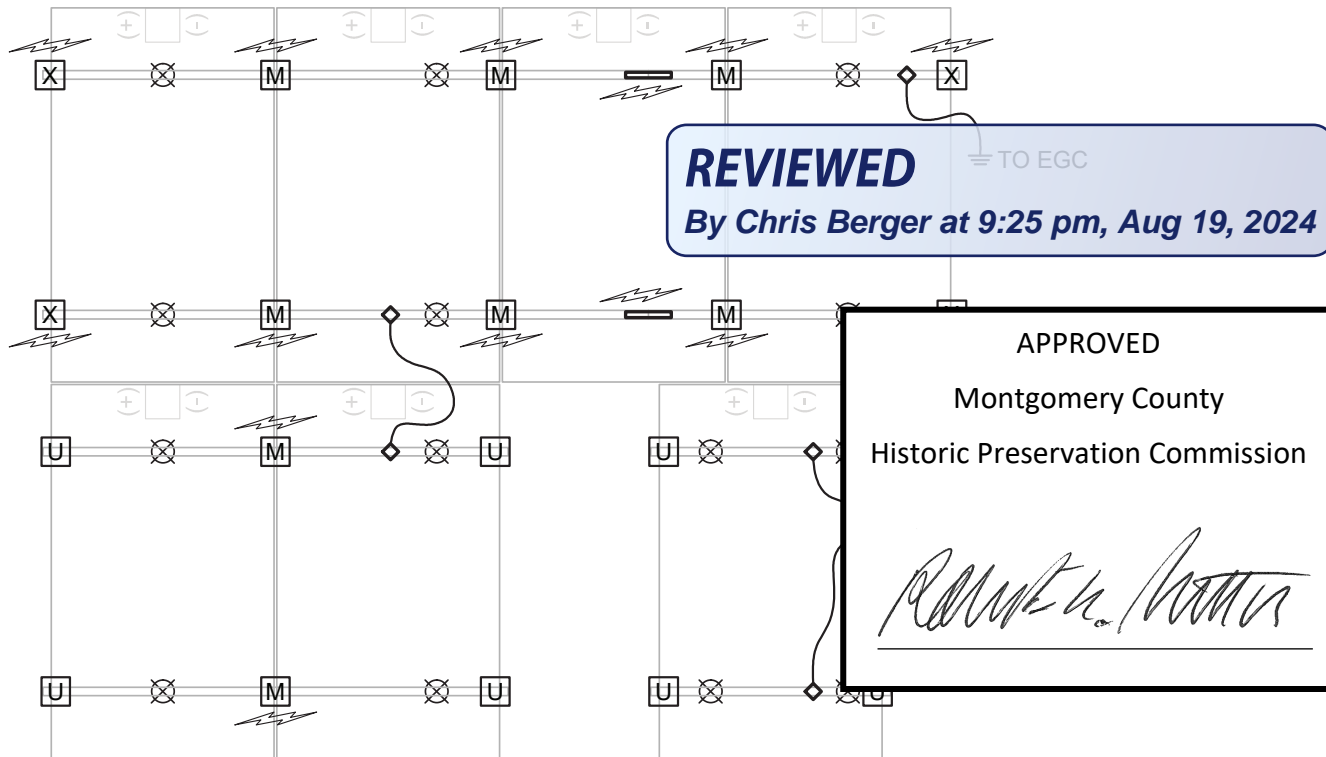
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*Robert H. [Signature]*



## IlSCO Lay-in Lug Assembly



## Ground Path Details

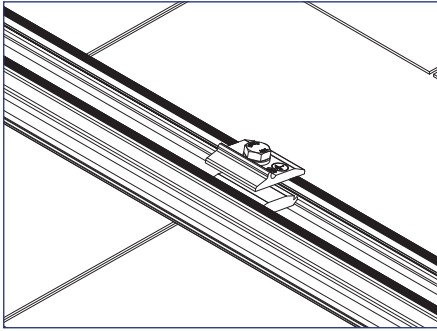


- |             |                               |       |            |                         |
|-------------|-------------------------------|-------|------------|-------------------------|
| RAIL        | RAIL SPLICE                   | MOUNT | GROUND LUG | MODULE CLAMP            |
| GROUND PATH | EQUIPMENT GROUNDING CONDUCTOR |       |            | M = MIDCLAMP            |
|             |                               |       |            | X = X-END CLAMP         |
|             |                               |       |            | U = UNIVERSAL END CLAMP |

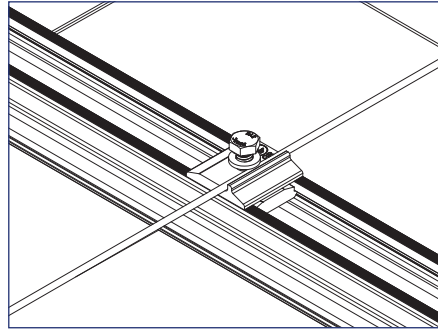




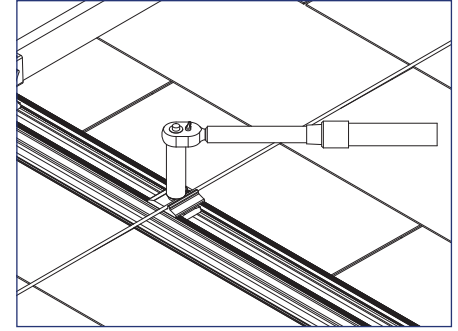
## INSTALLATION INSTRUCTIONS - SNAPNRACK GROUND LUG



1) Snap the SnapNrack Ground Lug into the rail channel on one rail per module row.



2) Place grounding conductor into slot underneath split ring washer.



3) Tighten hardware to 16 ft-lbs.

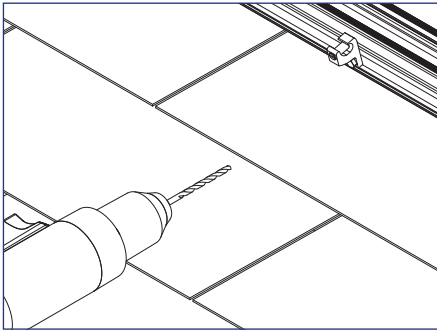
### Install Note:

SnapNrack Ground Lug may be used in side or top channel, and may be rotated 90 degrees relative to slot to facilitate running copper across top of rails.

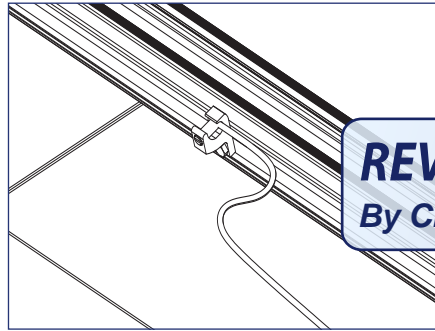
### Install Note:

SnapNrack Ground Lug only Listed for use with 6-12 AWG solid copper conductor.

## INSTALLATION INSTRUCTIONS - ILSCO LAY-IN LUG



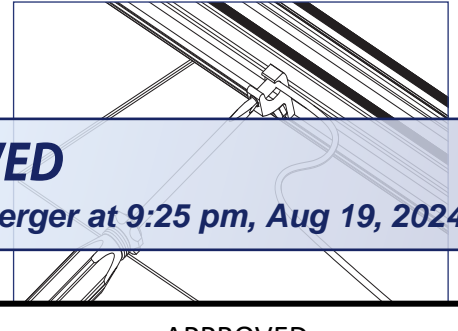
1) Drill and deburr a 1/4" hole in the back side of the rail for the IlSCO lug to attach to, place the bolt through the hole, and attach the lug assembly on one rail per module row.



2) Place grounding conductor into slot.

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### Install Note:

Torque rail connection to 35 in-lbs.

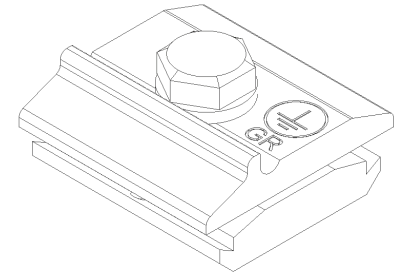
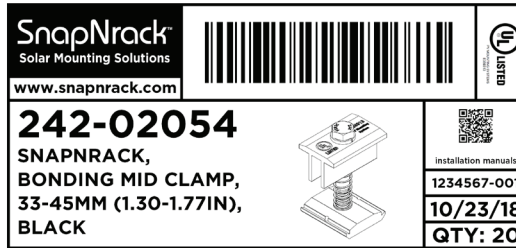
### Note:

- System has been evaluated to a maximum overcurrent device (OCD) protection level of 20 Amps.
- Universal End Clamp (UEC) does not bond module to rail. Be sure to separately ground any modules that are only secured by UECs, especially during servicing.
- SnapNrack recommends that bare copper never come into contact with aluminum.
- SnapNrack Ground Lug: torque bolt to 16 ft-lbs. The Ground Lug may be used in side or top channel. It may be rotated 90 degrees relative to slot to facilitate running copper across top of rails.
- Grounding with a standard IlSCO GBL-4DBT Lug is a listed alternate and requires drilling of a hole in the rail.
- IlSCO hardware connection to rail: 5 ft-lbs. Torque for lug set screw: #10-#14 solid and stranded copper- 20 in-lbs, #8 stranded copper- 25 in-lbs, #4-#6 stranded copper- 35 in-lbs.

## GROUNDING MARKING DETAILS

All components included in the Ultra Rail UL 2703 Listing for grounding/bonding are packaged and marked with the UL logo, SnapNrack File E359313, and “PV Mounting System”

The SnapNrack Ground Lug is marked with the ground symbol  
 IlSCO Ground Lugs have green colored set screws or bolts to indicate connection to the grounding electrode conductor



### Ultra Rail has been tested with the following UL Listed modules:

The Ultra Rail System employs top-down clamps which have been evaluated for frame-to-system bonding, at specific mounting torques and with the specific modules listed below. The system has been assessed to a maximum Over-Current Device (OCD) protection level of 20 amps. The UL file number is included in parentheses below.

Hyundai Heavy Industries Co Ltd (E325005): HiS-MXXXRG where XXX is 235 to 275; HiS-SXXXRG where XXX is 245 to 295; HiS-SXXXRW where XXX is 250 to 265; HiS-MXXXMG where XXX is 210 to 270; HiS-SXXXMG where XXX is 220 to 275. All may be followed by the suffix BK or blank.

Jinko Solar (E362479): Models JKMXXXP-60, JKMXXXPP-60, JKMXXXP-60-V, JKMXXXP-60-J4, JKMXXXP-60B-J4 where XXX is 200 to 290; JKMXXXP-72, JKMXXXPP-72, JKMXXXP-72-V, JKMXXXPP-72-V where XXX is 250 to 360; JKMXXXM-60 where XXX is 200 to 305; JKMXXXM-72 where XXX is 250 to 365 JKMXXXPP-60-V where XXX is 200 to 300; JKMSXXXP-72 where XXX is 250 to 330.

Kyocera (E467150) - KU-60 1000 V Series - KUXXX, where XXX is 250 to 275, followed -6BCA, -6BFA, -6BPA, -6DCA, -6DFA, -6DPA, -6MCA, -6MPA, -6XCA, -6XPA, -6ZCA, -6ZPA, -6ZPB, -6ZCB, -6ZPC, -6ZCC, -6ZPD, -6ZCD, -6ZPE, 6ZCE, -6MPC, -6MCC, -6MPB or -6MCB; KU-80 1000 V Series - KUXXX, where XXX is 315 to 335 followed -6BFA or -8BPA.

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LG (E329725) - LGXXXQ1C-A5 where XXX is 340 to 385; LGXXXQ1K-A5 where XXX is 340 to 385

Panasonic (E181540) - VBHNXXXSA16 where XXX is 320 to 335; VBHNXXXKA01 and VBHNXXXKA02 where XXX is 310 to 325; VBHNXXXKA03 and VBHNXXXKA04 where XXX is 310 to 325; VBHNXXXSA17 and VBHNXXXSA18 where XXX is 310 to 325

REC Solar AS (E308147): RECXXX, where XXX is 214 to 270, all may be followed by PE, PEQ, PEQ3.

Renesola Jiangsu Ltd (E312637): JCXXM-24/Bb Series where XXX is 200 to 270; JCXXM-24/Bb Series where XXX is 200 to 270.

Suniva Inc (E333709): MVX-XXX-60-5-YYY where XXX is 235 to 265 and YYY is 701 or 702 or 703 or 704 or 705 or 706 or 707 or 708 or 709 or 710 or 711 or 712 or 713 or 714 or 715 or 716 or 717 or 718 or 719 or 720 or 721 or 722 or 723 or 724 or 725 or 726 or 727 or 728 or 729 or 730 or 731 or 732 or 733 or 734 or 735 or 736 or 737 or 738 or 739 or 740 or 741 or 742 or 743 or 744 or 745 or 746 or 747 or 748 or 749 or 750 or 751 or 752 or 753 or 754 or 755 or 756 or 757 or 758 or 759 or 760 or 761 or 762 or 763 or 764 or 765 or 766 or 767 or 768 or 769 or 770 or 771 or 772 or 773 or 774 or 775 or 776 or 777 or 778 or 779 or 780 or 781 or 782 or 783 or 784 or 785 or 786 or 787 or 788 or 789 or 790 or 791 or 792 or 793 or 794 or 795 or 796 or 797 or 798 or 799 or 800 or 801 or 802 or 803 or 804 or 805 or 806 or 807 or 808 or 809 or 810 or 811 or 812 or 813 or 814 or 815 or 816 or 817 or 818 or 819 or 820 or 821 or 822 or 823 or 824 or 825 or 826 or 827 or 828 or 829 or 830 or 831 or 832 or 833 or 834 or 835 or 836 or 837 or 838 or 839 or 840 or 841 or 842 or 843 or 844 or 845 or 846 or 847 or 848 or 849 or 850 or 851 or 852 or 853 or 854 or 855 or 856 or 857 or 858 or 859 or 860 or 861 or 862 or 863 or 864 or 865 or 866 or 867 or 868 or 869 or 870 or 871 or 872 or 873 or 874 or 875 or 876 or 877 or 878 or 879 or 880 or 881 or 882 or 883 or 884 or 885 or 886 or 887 or 888 or 889 or 890 or 891 or 892 or 893 or 894 or 895 or 896 or 897 or 898 or 899 or 900 or 901 or 902 or 903 or 904 or 905 or 906 or 907 or 908 or 909 or 910 or 911 or 912 or 913 or 914 or 915 or 916 or 917 or 918 or 919 or 920 or 921 or 922 or 923 or 924 or 925 or 926 or 927 or 928 or 929 or 930 or 931 or 932 or 933 or 934 or 935 or 936 or 937 or 938 or 939 or 940 or 941 or 942 or 943 or 944 or 945 or 946 or 947 or 948 or 949 or 950 or 951 or 952 or 953 or 954 or 955 or 956 or 957 or 958 or 959 or 960 or 961 or 962 or 963 or 964 or 965 or 966 or 967 or 968 or 969 or 970 or 971 or 972 or 973 or 974 or 975 or 976 or 977 or 978 or 979 or 980 or 981 or 982 or 983 or 984 or 985 or 986 or 987 or 988 or 989 or 990 or 991 or 992 or 993 or 994 or 995 or 996 or 997 or 998 or 999 or 1000

Sunpower (E246423)- Gen 3 or Gen 5 frame models SPR-YYY-### where YY represents any number from 365 to 310 and 274 to 233; Gen 3 or Gen 5 frame models SP numbers 18, 19, 20 or 21, and ### represents any number from 345 to 285 and 250 to 225.

Talesun Solar (E359349) - TP660P-XXX where XXX is 235 to 285; TP660M-XXX where XXX is 240 to 300; TP672P-XXX where XXX is 280 to 345; TP672M-XXX where XXX is 290 to 360.

Trina Solar Ltd (E306515) - TSM-XXXPA05, TSM-XXXPA05.05, TSM-XXXPA05.08, where XXX is 215 to 260; TSM-XXXPD05, TSM-XXXPD05.05, TSM-XXXPD05.08 where XXX is 240 to 280; TSM-XXXPD05.08D where XXX is 245 to 275; TSM-XXXDD05A(II), TSM-XXXDD05A.05(II), TSM-XXXDD05A.08(II) where XXX is 260 to 300. All may be followed by Black or White.

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Yingli Energy (China) Co Ltd (E320066) - YLXXXP-29b where XXX is 215 to 260; YLXXXA-29b where XXX is 220 to 255.

### NRTL Listed PV Modules:

Boviet Solar: Models BVM6610P-XXX where XXX is 225 to 275; BVM6610M-XXX where XXX is 235 to 280; BVM6612P-XXX where XXX is 270 to 330; BVM6612M-XXX where XXX is 280 to 340.

Canadian Solar: Models CS6P-XXX-P, CS6P-XXX-M where XXX is 200 to 300; CS6P-XXX-P-SD, CS6K-XXX-P-SD where XXX is 240 to 300; CS6K-XXX-M, CS6K-XXX-MS, CS6K-XXX-M-SD where XXX is 240 to 305; CS6K-XXX-P where XXX is 220 to 300; CS6X-XXX-P where XXX is 250 to 360; CS6V-XXX-M where XXX is 215 to 225; CS6V-XXX-P where XXX is 250 to 255; CS3K-XXX-P where XXX is 250 to 310; CS3K-XXX-MS where XXX is 280 to 330; CS1K-XXX-MS where XXX is 285 to 345.

ET Solar: ET-P660XXXBB where XXX is 200 to 265; ET-P660XXXWB where XXX is 200 to 265; ET-P660XXXWW where XXX is 200 to 265; ET-P660XXXWWG where XXX is 235 to 265; P660XXXWB/WW where XXX is 200 to 265 and may be followed by WB or WW; P660XXXWWG where XXX is 240 to 250; M660XXXBB where XXX is 250 to 265; M660XXXWW where XXX is 200 to 270.

Hanwha Q Cells: B.LINE PLUS BFR-G4.1-XXX, B.LINE PRO BFR-G4.1-XXX, Q.BASE GY-XXX, Q.PEAK G4-XXX, Q.PLUS BFR-G3.1-XXX, Q.PLUS BFR-G4-XXX, Q.PLUS BFR-G4.1-XXX, Q.PLUS BFR-G4.1/TAA-XXX, Q.PLUS BRG-GY-XXX, Q.PLUS GY-XXX, Q.PLUS G4-XXX, Q.PRO BFR-G4-XXX, Q.PRO BFR-G4.1-XXX, Q.PRO BFR-G4.3-XXX, Q.PRO BFR-GY-XXX, Q.PRO BLK-GY-XX, Q.PRO G4-XXX, Q.PRO GY-XXX, Q.PRO GY/SC-XXX, where XXX is 245 to 295; Q.PEAK BLK-G3.1-XXX, Q.PEAK BLK-G4.1-XXX, Q.PEAK BLK-G4.1/TAA-XXX, Q.PEAK G3.1-XXX, Q.PEAK G4.1-XXX, Q.PEAK G4.1/MAX-XXX, Q.PEAK G4.1/TAA-XXX where XXX is 270 to 325; Q.PEAK DUO BLK-G5-XXX, Q.PEAK DUO G5-XXX where XXX is 290 to 325.

Hanwha SolarOne: Models HSL60P6-PB-X-YYYQ where X is 2 or 4, and YYY is 230 to 270, may be followed by additional suffixes.

JA Solar: Models JAP6-60-XXX/3BB where XXX is 235 to 265; JAM6-60-XXX/SI where XXX is 250 to 270; JAP72S01-XXX/SC where XXX is 315 to 335; JAP6(k)-72-XXX/4BB where XXX is 305 to 325.

LG Electronics Inc.: Models LGXXXS1C-G4 where XXX is 250 to 300; LGXXN1K-G4 where XXX is 280 to 300; LGXXN1C-G4 where XXX is 280 to 340; LGXXN2C-G4, LGXXN2W-G4, where XXX is 360 to 395; LGXXN2K-G4, where XXX is 360 to 385; LGXXS2C-G4, LGXXS2W-G4, where XXX is 300 to 360; LGXXN2C-B3, LGXXN2W-B3, where XXX is 330 to 400; LGXXS1C-A5 where XXX is 280 to 320; LGXXN1C-A5 where XXX is 320 to 345; LGXXN1K-A5 where XXX is 310 to 335.

Longi Green Energy Technology Co., Ltd.: LR6-60-XXXM, LR6-60BK-XXXM, LR6-60HV-XXXM, where XXX is 270 to 300; LR6-60PB-XXXM, LR6-60PE-XXXM, LR6-60PH-XXXM, where XXX is 280 to 310.

Mission Solar: Models MSEXXS05T where XXX is 260 to 290; MSEXXS05K where XXX is 270 to 290; MSEXXSQ5T where XXX is 280 to 300; MSEXXSQ5K where XXX is 285 to 305; MSEXXM4J and MEXXXM4J where XXX is 285 to 305; MSEXXS06W where XXX is 320 to 340; MSEXXS04J and MEXXS06J where XXX is 320 to 340; MSEXXSQ6S where XXX is 345 to 365.

REC Solar PTE. LTD.: Models RECXXXPE where the XXX is 214 to 280; RECXXTP where XXX is 260 to 300; RECXXTP IQ where XXX is 260 to 300; All may be followed by PE72, PE72BLK, PE72 where XXX is 330 to 345; RECXXX, where XXX is 285 to 325, followed by PE72, PE72BLK, PE72 where XXX is 295 to 325, followed by PE72 XV, PE72 XV Q2 or PE72 XV Q3.

Silfab: SLAXXX-M, where XXX is 280 to 300; SLGXXX-M, where XXX is 335 to 360; SLAXXX-P, where XXX is 300 to 315; SSAXXX-M, where XXX is 280 to 300; SSGXXX-M, where XXX is 250 to 260; SSGXXX-P, where XXX is 300 to 315.

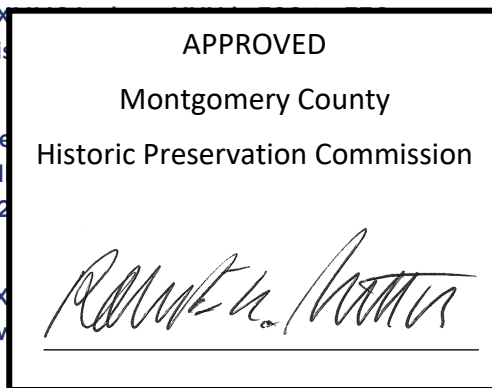
Solar World: Models SWXXX-Mono where XXX is 200 to 300; SWXXX-Mono XL where XXX is 320 to 350. All may be followed by Black.

Suniva Inc - OPTXXX-60-4-YYY where XXX is 240 to 300 and YYY is 100; OPTXXX-60-4-YYY where XXX is 235 to 300 and YYY is 1B0.

\*Trina Solar Ltd: Models TSM-XXXPD05.002, TSM-XXXPD05.082, TSM-XXXPD05.05S, TSM-XXXPD05.08S where XXX is 215 to 275; TSM-XXXDD05A.082(II) where XXX is 260 to 315; all may be followed by Black.

**REVIEWED**

By Chris Berger at 9:25 pm, Aug 19, 2024



# Mechanical Loading Specifications

The following components have been evaluated for mechanical loading:

Ultra Rail, Mid Clamp, X End Clamp, Universal End Clamp, Ultra Rail Splice, Ultra Rail Composition Mount Kits, Standard Standoff for Ultra Rail, Four Hole Standoff for Ultra Rail, Heavy Duty Standoff for Ultra Rail, Metal Roof Base Standoff for Ultra Rail, Ultra Rail Corrugated Block, Standard Base Seam Clamp for Ultra Rail, Wide Base Seam Clamp for Ultra Rail, Ultra Rail Universal Tile Hook, Ultra Rail Flat Tile Hook, Flat Tile Replacement Kit for Ultra Rail, S Tile Replacement Kit for Ultra Rail, W Tile Replacement Kit for Ultra Rail.

The UL Listing covers mechanical load ratings for the following span lengths, module orientations and downforce, uplift, and down-slope ratings:

Span	Orientation	Direction	Load Rating (lb/ft <sup>2</sup> )
4 or 6 feet	Long Side or Short Side Mounting	Downforce	10
		Uplift	5
		Down-Slope	5

**Ultra Rail has been tested with the following UL Listed modules:**

The Ultra Rail System has been evaluated for mechanical loading for its top-down clamps with the specific modules listed below. The UL file number is included in parentheses below. *(The following modules were also evaluated for bonding. Please see Grounding Specifications section.)*

Hyundai Heavy Industries Co Ltd (E325005): HiS-MXXXRG where XXX is 235 to 275; HiS-SXXXRG where xxx is 245 to 295; HiS-SXXXRW where xxx is 250 to 265.

JA Solar (E328263): JAP6-60-XXX/3BB where XXX is 235 to 250.

Jinko Solar (E362479): JKMXXXP-60, JKMXXXPP-60, JKMXXXP-60-J4, JKMXXXP-60B-14 where XXX is 200 to 290; JKMXXXM-60 where XXX is 200 to 305

Panasonic (E181540) - VBHNXXXSA16 where XXX is 320 to 335; VBHNXXXSA17 and VBHNXXXSA18 where XXX is 325 to 335; VBHNXXXKA03 and VBHNXXXKA04 where XXX is 310 to 325; VBHNXXXSA17 and VBHNXXXSA18 where XXX is 325 to 335.

ReneSola (E312637): Models JCXXXM-24/Bbh where XXX is 235 to 270.

Trina Solar (E306515): TSM-XXXPD05, TSM-XXXPD05.05 and TSM-XXXPD05.08, where XXX is 260 to 300; TSM-XXXDD05A.05(II), TSM-XXXDD05A.08(II) where XXX is 260 to 300.

Yingli Solar (E357540): Models YLXXXP-29b where XXX is 215 to 265.

**NRTL Listed PV Modules:**

Boviet Solar: Models BVM6610P-XXX where XXX is 225 to 275; BVM6610M-XXX where XXX is 225 to 275

Canadian Solar: Models CS6P-XXX-P, CS6P-XXX-M where XXX is 200 to 300; CS6P-XXX-P-SD, CS6K-XXX-P-SD where XXX is 240 to 300; CS6K-XXX-M, CS6K-XXX-M-SD where XXX is 240 to 305; CS6K-XXX-P where XXX is 220 to 300.

ET Solar: Models ET-P660XXXBB where XXX is 200 to 265; ET-P660XXXWB where XXX is 200 to 265; ET-P660XXXWW where XXX is 200 to 265; ET-P660XXXWWG where XXX is 235 to 265.

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Hanwha Q Cells: Q.PRO BFR-G4-XXX, Q.PRO BFR-G4.1-XXX; Q.PLUS BFR-G4-XXX; Q.PLUS BFR-G4.1-XXX, Q.PLUS BFR-G3.1-XXX where XXX is 245 to 295; Q.PEAK-G3.1-XXX and Q.PEAK BLK-G3.1-XXX where XXX is 270 to 325.

LG Electronics: Models LGXXXN1C-G4 where XXX is 280 to 340; LGXXXS1C-G4 where XXX is 250 to 300; LGXXXN1K-G4 where xxx is 280 to 330; LGXXXN1K-A5 where XXX is 310 to 350.

Longi Green Energy Technology Co., Ltd.: LR6-60-XXXM, LR6-60BK-XXXM, LR60-HV-XXXM, where XXX is 270 to 300.

REC Solar PTE, LTD: Models RECxxxPE or RECXXXPE-BLK Series where XXX is 214 to 270; RECxxxTP RECXXTP-BLK Series, where the xxx is 260 to 300; RECXXTP2 or RECXXTP2-BLK Series where XXX is 260 to 300.

SolarWorld: Models SW XXX mono where XXX is 200 to 300, may additionally be followed by “black”.

Talesun: Models TP660P-XXX where XXX is 215 to 285; TP660M-XXX where XXX is 210 to 300.

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*By Chris Berger at 9:25 pm, Aug 19, 2024*

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# Hi-MO 5

## LR5-54HABB 390~415M

- Suitable for distributed projects
- Advanced module technology delivers superior module efficiency
  - M10 Gallium-doped Wafer • Integrated Segmented Ribbons • 9-busbar Half-cut Cell
- Globally validated bifacial energy yield
- High module quality ensures long-term reliability

**25** 25-year Warranty for Materials and Processing

**30** 30-year Warranty for Extra Linear Power Output



### Complete System and Product Certifications

IEC 61215, IEC 61730, UL 61730  
 ISO9001:2015: ISO Quality Management System  
 ISO14001: 2015: ISO Environment Management System  
 ISO45001: 2018: Occupational Health and Safety  
 IEC62941: Guideline for module design qualification and type approval

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 By Chris Berger at 9:25 pm, Aug 19, 2024

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*Robert H. [Signature]*



# Hi-MO 5

# LR5-54HABB 390~415M

**21.3%**  
MAX MODULE  
EFFICIENCY

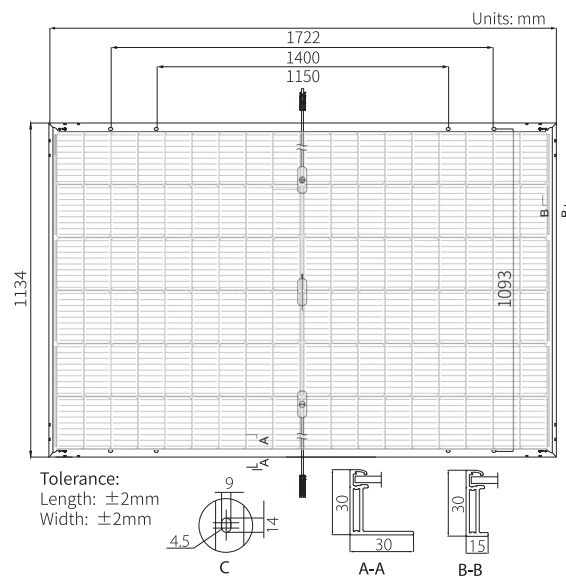
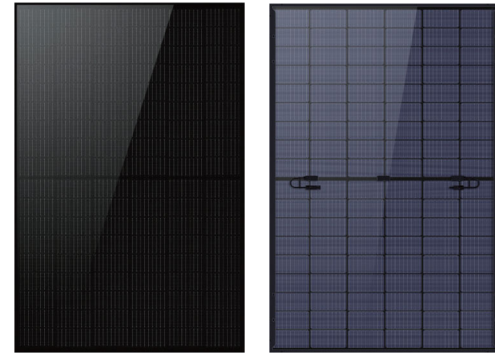
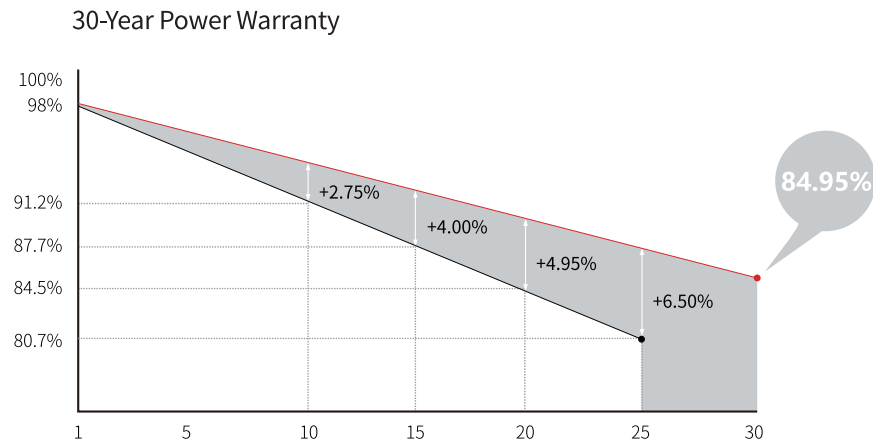
**0~3%**  
POWER  
TOLERANCE

**<2%**  
FIRST YEAR  
POWER DEGRADATION

**0.45%**  
YEAR 2-30  
POWER DEGRADATION

**HALF-CELL**  
Lower operating temperature

## Additional Value



## Mechanical Parameters

Cell Orientation	108 (6×18)
Junction Box	IP68, three diodes
Output Cable	4mm <sup>2</sup> , ±1200mm length can be customized
Glass	Dual glass, 2.0+1.6mm heat strengthened glass
Frame	Anodized aluminum alloy frame
Weight	22.5kg
Dimension	1722×1134×30mm
Packaging	36pcs per pallet / 216pcs per 20' GP / 936pcs or 792pcs(Only for USA) per 40' HC

## Electrical Characteristics

STC : AM1.5 1000W/m<sup>2</sup> 25°C    NOCT : AM1.5 800W/m<sup>2</sup> 20°C 1m/s    Test uncertainty for Pmax: ±3%

Module Type	LR5-54HABB-390M		LR5-54HABB-395M		LR5-54HABB-400M		LR5-54HABB-405M		LR5-54HABB-410M		LR5-54HABB-415M	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Testing Condition												
Maximum Power (Pmax/W)	390	291.5	395	295.2	400	299.0	405	302.7	410	306.5	415	310.2
Open Circuit Voltage (Voc/V)	36.58	34.39	36.81	34.61	37.05	34.84	37.29	35.06	37.53	35.29	37.77	35.51
Short Circuit Current (Isc/A)	13.57	10.95	13.65	11.01	13.72	11.07	13.79	11.13	13.87	11.19	13.94	11.25
Voltage at Maximum Power (Vmp/V)	30.47	28.43	30.70	28.64	30.94	28.86	31.18	29.09	31.42	29.31	31.66	29.54
Current at Maximum Power (Imp/A)	12.80	10.26	12.87	10.31	12.93	10.36	12.99	10.41	13.05	10.45	13.11	10.50
Module Efficiency(%)	20.0		20.2		20.5		20.7		21.0		21.3	

## Electrical characteristics with different rear side power gain (reference to 400W front)

Pmax /W	Voc/V	Isc /A	Vmp/V	Imp /A	Pmax gain
420	37.05	14.41	30.94	13.58	5%
440	37.05	15.09	30.94	14.22	10%
460	37.15	15.78	31.04	14.87	15%
480	37.15	16.46	31.04	15.52	20%
500	37.15	17.15	31.04	16.16	25%

## Operating Parameters

Operational Temperature	-40°C ~ +85°C
Power Output Tolerance	0 ~ 3%
Voc and Isc Tolerance	±3%
Maximum System Voltage	DC1500V (IEC/UL)
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Bifaciality	70±5%
Fire Rating	UL Similar type 38 * IEC Class C

\*Reference Standard: UL61730 Second Edition, Dated October 28, 2022

**REVIEWED**

By Chris Berger at 9:25 pm, Aug 19, 2024

Mechanical Loading	
Maximum Static Loading	5400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s



Temperature Coefficient (Pmax)	+0.050%/°C
Temperature Coefficient (Voc)	-0.265%/°C
Temperature Coefficient (Isc)	-0.340%/°C



No.8369 Shangyuan Road, Xi'an Economic and Technological Development Zone, Xi'an, Shaanxi, China.  
Web: www.longi.com

Specifications included in this datasheet are subject to change without notice. LONGI reserves the right of final interpretation.  
(20230115V17) Only for North America

**REVIEWED**

By Chris Berger at 9:25 pm, Aug 19, 2024



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Historic Preservation Commission



## IQ8 and IQ8+ 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 using advanced 55-nm 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-and-play MC4 connectors.



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

### Easy to install

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

### High productivity and reliability

- 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

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

### NOTE:

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

\*Meets UL 1741 only when installed with IQ System Controller 2 or 3.  
\*\*IQ8 and IQ8+ support split-phase, 240 V installations only.

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# IQ8 and IQ8+ Microinverters



INPUT DATA (DC)		UNITS	IQ8-60-2-US	
Commonly used module pairings <sup>1</sup>	W		235-350	
Module compatibility	—		To meet compatibility, PV modules must be within maximum voltage range listed below. Module compatibility can be checked at <a href="https://www.enphase.com/support/compatibility-checker">https://www.enphase.com/support/compatibility-checker</a> .	
MPPT voltage range	V		27-37	
Operating range	V		16-48	
Minimum/Maximum start voltage	V		22/48	22/58
Maximum input DC voltage	V		50	60
Maximum continuous input DC current	A		10	12
Maximum input DC short-circuit current	A		25	
Maximum module ( $I_{sc}$ )	A		20	
Overtoltage class DC port	—		II	
DC port backfeed current	mA		0	
PV array configuration	—		Ungrounded array; no additional DC side protection required; AC side protection requires maximum 20 A per branch circuit.	
OUTPUT DATA (AC)		UNITS	IQ8-60-2-US	IQ8PLUS-72-2-US
Peak output power	VA		245	300
Maximum continuous output power	VA		240	290
Nominal grid voltage (L-L)	V		240, split-phase (L-L), 180°	
Minimum and Maximum grid voltage <sup>2</sup>	V		211-264	
Maximum continuous output current	A		1.0	1.21
Nominal frequency	Hz		60	
Extended frequency range	Hz		47-68	
AC short-circuit fault current over three cycles	Arms		2	
Maximum units per 20 A (L-L) branch circuit <sup>3</sup>	—		16	13
Total harmonic distortion	%		<5	
Overtoltage 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	%		97.7	
CEC weighted efficiency	%		97	
Nighttime power consumption	mW		23	25
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 × W × D)			212 mm (8.3 in) × 175 mm (6.9 in) × 30.2 mm (1.2 in)	
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	
Environmental category/UV exposure rating			NEMA Type 6/Outdoor	

(1) No enforced DC/AC ratio.

(2) Nominal voltage range can be extended beyond nominal if required by the utility.

(3) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

COMPLIANCE

Certifications

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

**REVIEWED**

*By Chris Berger at 9:25 pm, Aug 19, 2024*

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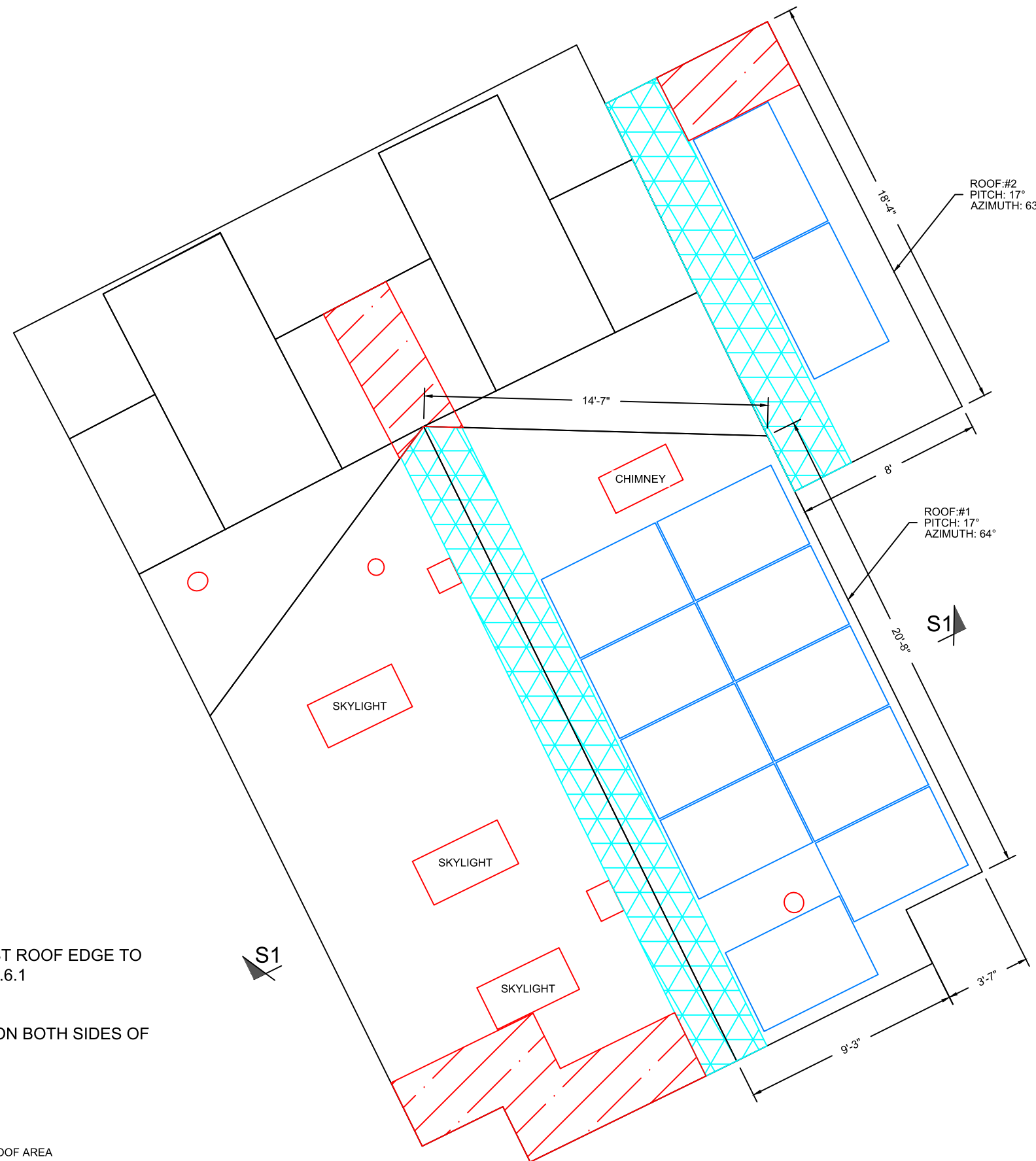
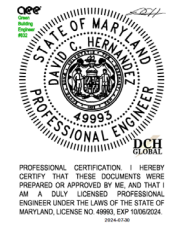
# Revision history

REVISION	DATE	DESCRIPTION
DSH-00207-3.0	February 2024	Updated the information about IEEE 1547 interconnection standard requirements.
DSH-00207-2.0	October 2023	Included NEC 2023 specification in the "Compliance" section.
DSH-00207-1.0	September 2023	Updated module compatibility specification.

**REVIEWED**  
By Chris Berger at 9:25 pm, Aug 19, 2024

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**REVIEWED**  
By Chris Berger at 9:30 pm, Aug 19, 2024

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**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 115 MPH	Snow Load 30 PSF
-----------------------	---------------------

Modules  
(12) LONGi LR5-54HABB-400M

Inverter(s)  
(12) IQ8+-72-2-US

DC System Size 4.800 kW	AC System Size 3.480 kW
----------------------------	----------------------------

Customer Information  
Anne Fothergill  
33 Columbia Ave  
Takoma Park, MD 20912

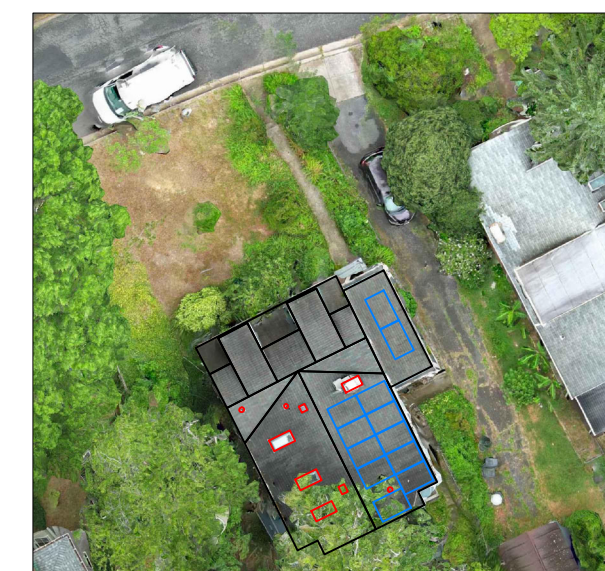
Payment/Lender  
None

City Montgomery County	Utility Peppo
---------------------------	------------------

Sheet Name  
Solar Panel Layout

Drawn By AMP	Date July 30, 2024
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Scale AS NOTED	Job Number MD20226	Sheet A-1
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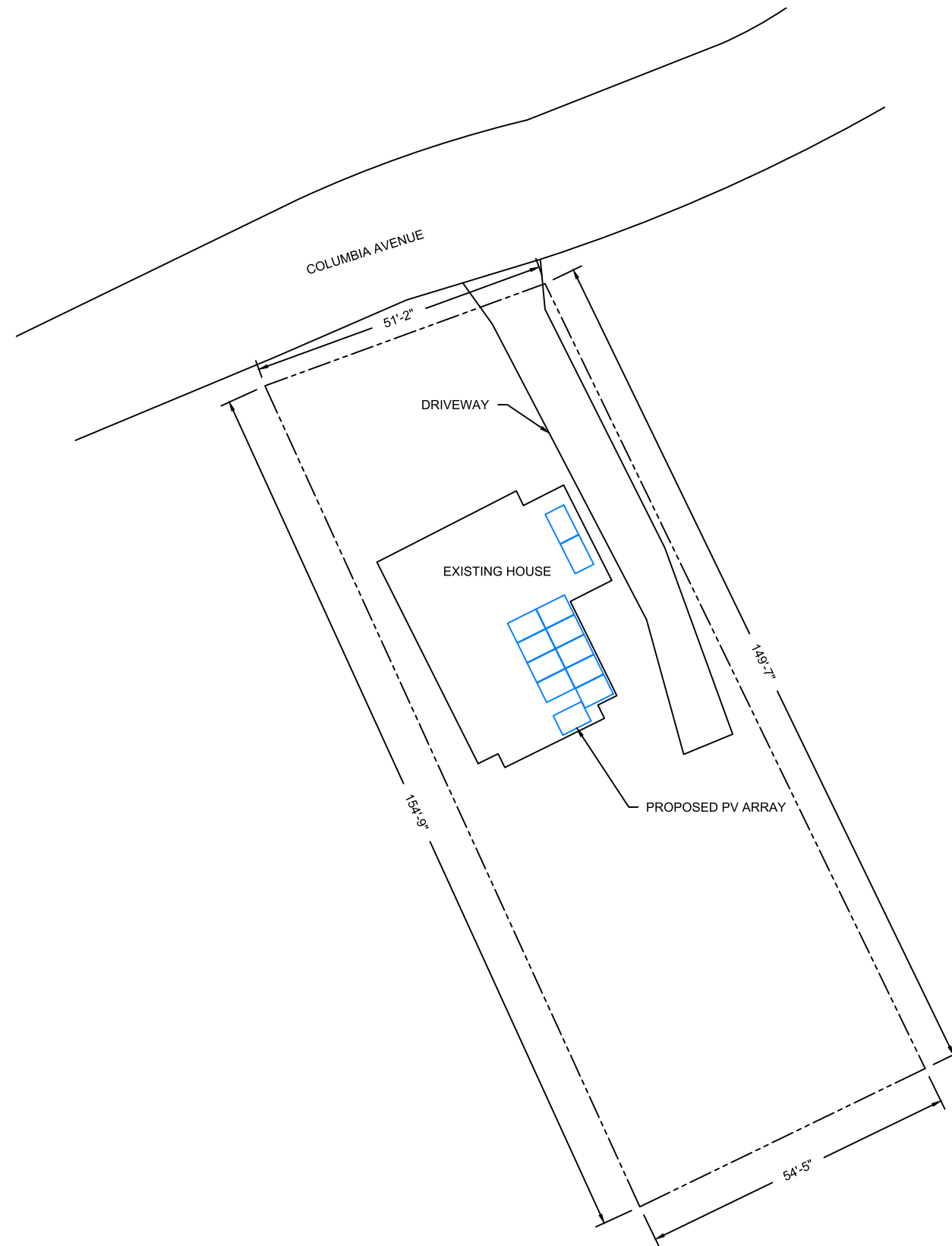
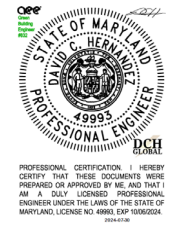
- KEY**
- FIRE SAFETY ZONE
  - 3' PATHWAYS FROM LOWEST ROOF EDGE TO RIDGE PROVIDED PER R324.6.1
  - 1'6" PATHWAYS PROVIDED ON BOTH SIDES OF RIDGE PER R324.6.2

PLAN VIEW TOTAL ROOF AREA: 1407 SQFT  
SOLAR ARRAY AREA: 252.24 SQFT  
THE SOLAR ARRAY IS 17.9% OF THE PLAN VIEW TOTAL ROOF AREA

- NOTES:**
- THE SYSTEM SHALL INCLUDE (12) LONGI LR5-54HABB-400M.
  - SNAPNRACK TOPSPEED WILL BE INSTALLED IN ACCORDANCE WITH SNAPNRACK INSTALLATION MANUAL.
  - REFER TO STRUCTURAL DRAWING FOR SECTIONS MARKED AND ADDITIONAL NOTES.

**SOLAR PANEL LAYOUT**  
Scale: 3/16" = 1'-0"

David C. Hernandez  
 Digitally signed by David C. Hernandez  
 Date: 2024.07.30 10:30:26 -04:00





**SITE PLAN**  
 Scale: 1" = 25'-0"



**REVIEWED**  
 By Chris Berger at 9:30 pm, Aug 19, 2024

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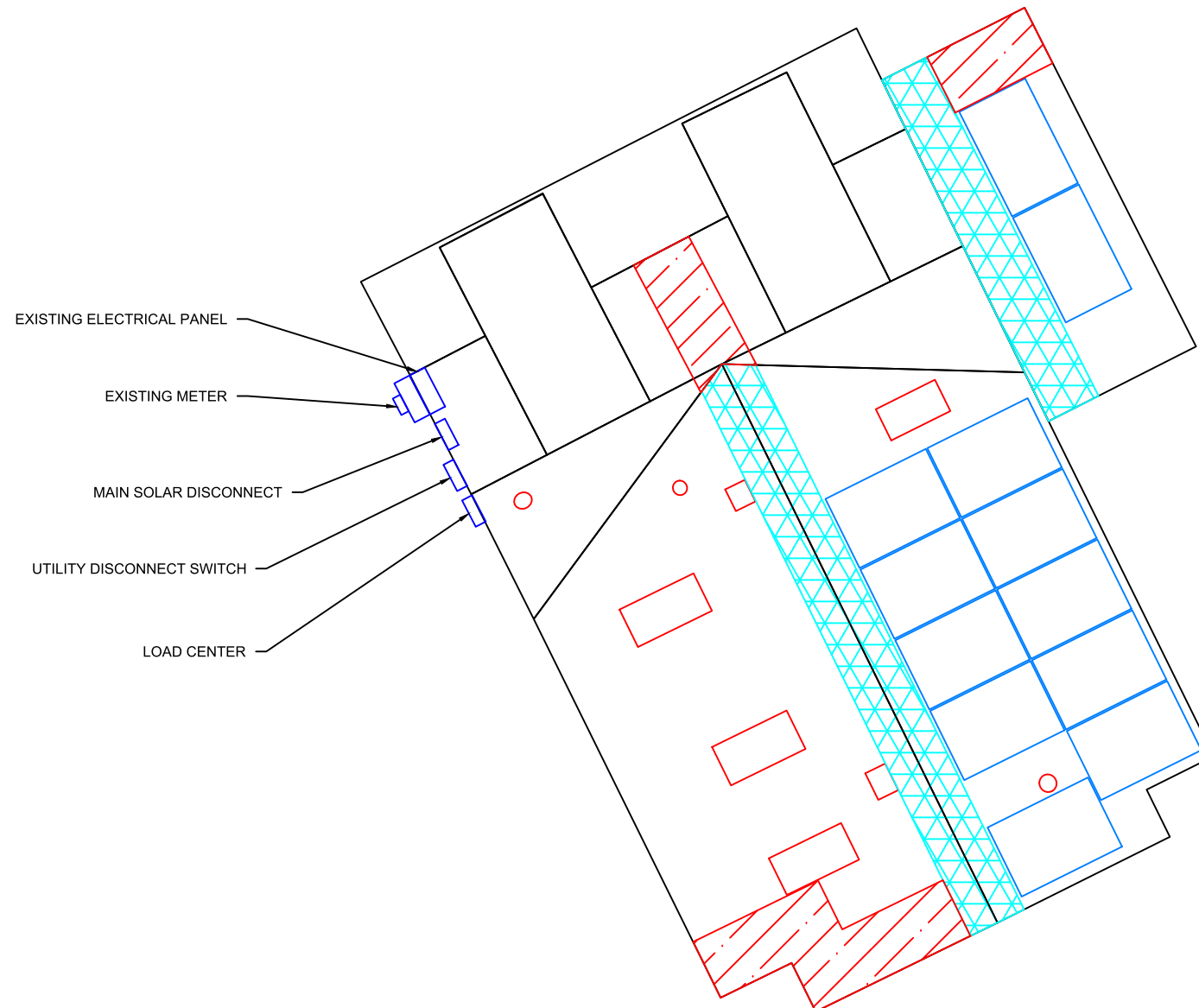
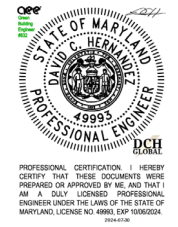
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 14880 Sweitzer Lane  
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Building Code International Residential Code (IRC) 2018	
Electrical Code National Electrical Code (NEC) 2017	
Wind Speed 115 MPH	Snow Load 30 PSF
Modules (12) LONGi LR5-54HABB-400M	
Inverter(s) (12) IQ8+-72-2-US	
DC System Size 4.800 kW	AC System Size 3.480 kW
Customer Information Anne Fothergill 33 Columbia Ave Takoma Park, MD 20912	
Payment/Lender None	
AHJ Montgomery County	Utility Pepco
Sheet Name Site Plan	
Drawn By AMP	Date July 30, 2024
Scale AS NOTED	Job Number MD20226
Sheet A-2	

David C. Hernandez  
 Digitally signed by David C. Hernandez  
 Date: 2024.07.30 10:30:26 -04:00



EXISTING ELECTRICAL PANEL  
 EXISTING METER  
 MAIN SOLAR DISCONNECT  
 UTILITY DISCONNECT SWITCH  
 LOAD CENTER

**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.

**REVIEWED**  
 By Chris Berger at 9:30 pm, Aug 19, 2024

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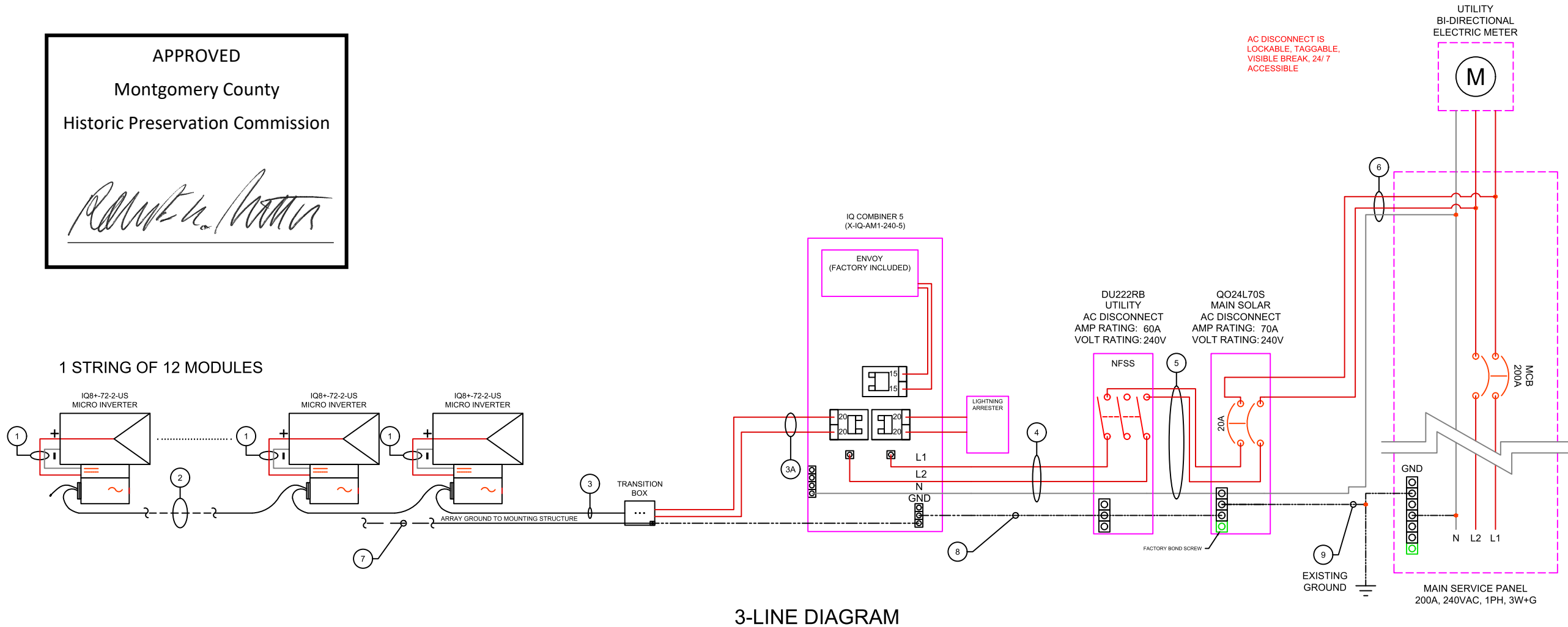
Building Code		International Residential Code (IRC) 2018	
Electrical Code		National Electrical Code (NEC) 2017	
Wind Speed	Snow Load	115 MPH	30 PSF
Modules			
(12) LONGi LR5-54HABB-400M			
Inverter(s)			
(12) IQ8+-72-2-US			
DC System Size	AC System Size	4.800 kW	3.480 kW
Customer Information			
Anne Fothergill 33 Columbia Ave Takoma Park, MD 20912			
Payment/Lender			
None			
City	Utility	Montgomery County	Pepco
Sheet Name			
Equipment Location Plan			
Drawn By	Date	AMP	July 30, 2024
Scale	Job Number	AS NOTED	MD20226
			Sheet
			E-1



**REVIEWED**

By Chris Berger at 9:30 pm, Aug 19, 2024

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3-LINE DIAGRAM

MODULE SPECIFICATIONS	
MODEL NUMBER	LR5-54HABB-400M
PEAK POWER	400 W
RATED VOLTAGE (V <sub>mpp</sub> )	30.94 V
RATED CURRENT (I <sub>mp</sub> )	12.93 A
OPEN CIRCUIT VOLTAGE (V <sub>oc</sub> )	37.05 V
SHORT CIRCUIT CURRENT (I <sub>sc</sub> )	13.72 A
MAXIMUM SYSTEM VOLTAGE	1000VDC

INVERTER SPECIFICATIONS	
MODEL NUMBER	IQ8PLUS-72-2-US
MAXIMUM DC VOLTAGE	60 V
MAXIMUM POWER OUTPUT	290 W
NOMINAL AC VOLTAGE	240 VAC
MAXIMUM AC CURRENT	1.21 A
CEC EFFICIENCY	97.0%


  

ARRAY DETAILS	
NO. OF MODULES PER STRING	12
NO. OF STRINGS	1
ARRAY WATTS AT STC	4800
MAX. VOLTAGE	240 V

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 AC Disconnect	#10 Cu THHN/THWN-2	
6	AC Disconnect to Interconnection Point	#6 Cu THHN/THWN-2	
7	Equipment Grounding Conductor	#8 Cu Bare Copper Wire	
8	Equipment Grounding Conductor	#8 Cu THHN/THWN-2	
9	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

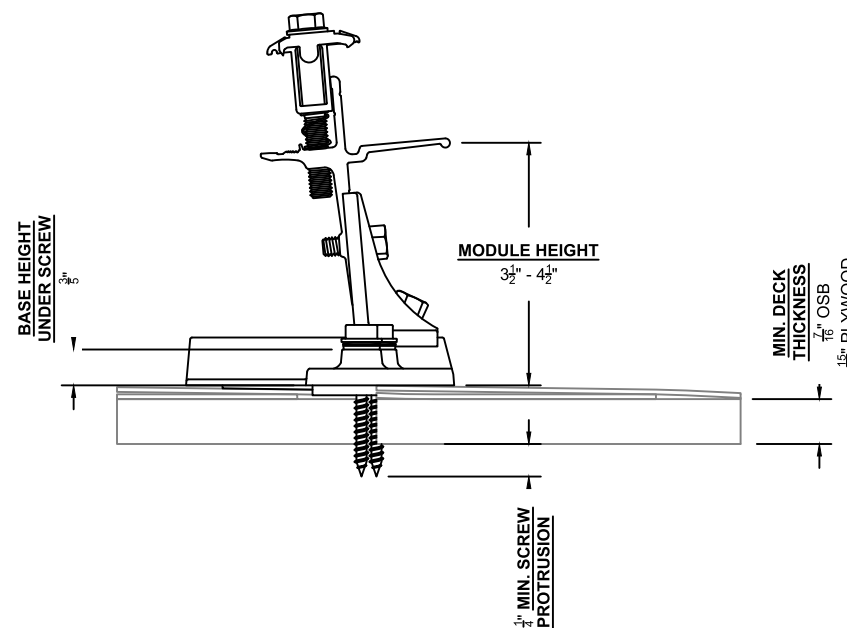
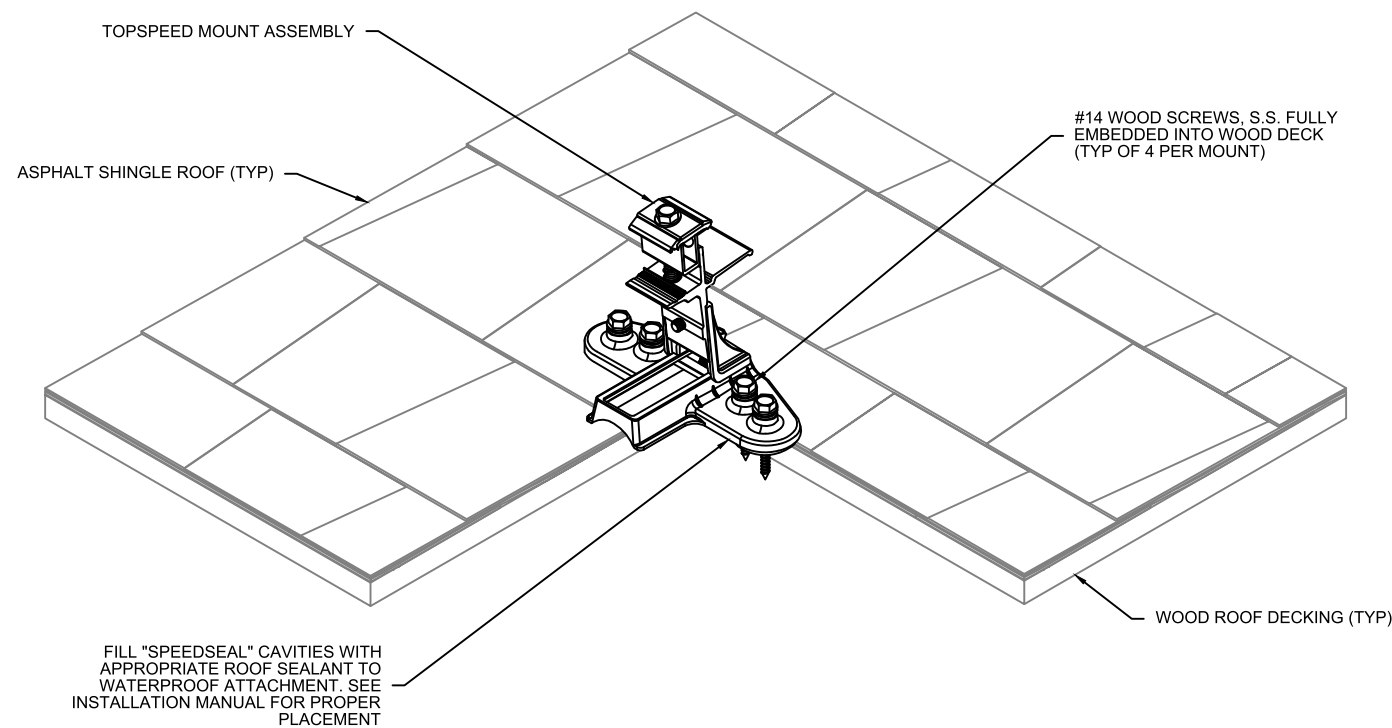
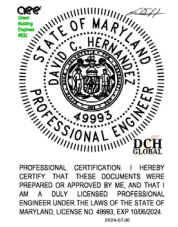


**Solar Energy World**  
 Because Tomorrow Matters

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

**Disclaimer:**  
 This drawing is the property of Solar Energy World Inc. The information herein contained shall be used for the sole benefit of Solar Energy World. It shall not be disclosed to others outside the recipient's organization, in whole or in part, without the written permission of Solar Energy World, except in connection with the sale and use of the respective Solar Energy equipment.

Building Code		International Residential Code (IRC) 2018
Electrical Code		National Electrical Code (NEC) 2017
Wind Speed	Snow Load	
115 MPH	30 PSF	
Modules		(12) LONGi LR5-54HABB-400M
Inverter(s)		(12) IQ8+-72-2-US
DC System Size	AC System Size	
4.800 kW	3.480 kW	
Customer Information		Anne Fothergill 33 Columbia Ave Takoma Park, MD 20912
Permit/Lender		None
AHJ	Utility	
Montgomery County	Peppo	
Sheet Name		Electrical 3-Line Diagram
Drawn By	Date	
AMP	July 30, 2024	
Scale	Job Number	Sheet
AS NOTED	MD20226	E-2



**STRUCTURAL ATTACHMENT DETAIL**

Structural Details		
S1	Truss	2x4 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.

**REVIEWED**  
 By Chris Berger at 9:30 pm, Aug 19, 2024

APPROVED  
 Montgomery County  
 Historic Preservation Commission





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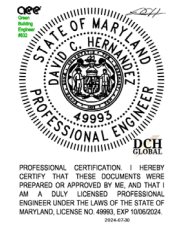
Building Code International Residential Code (IRC) 2018	
Electrical Code National Electrical Code (NEC) 2017	
Wind Speed 115 MPH	Snow Load 30 PSF
Modules (12) LONGi LR5-54HABB-400M	
Inverter(s) (12) IQ8+-72-2-US	
DC System Size 4.800 kW	AC System Size 3.480 kW
Customer Information Anne Fothergill 33 Columbia Ave Takoma Park, MD 20912	
Permit/Lender None	
City Montgomery County	Utility Peppo
Sheet Name Structural Attachment Details	
Drawn By AMP	Date July 30, 2024
Scale AS NOTED	Job Number MD20226
Sheet <b>S-1</b>	



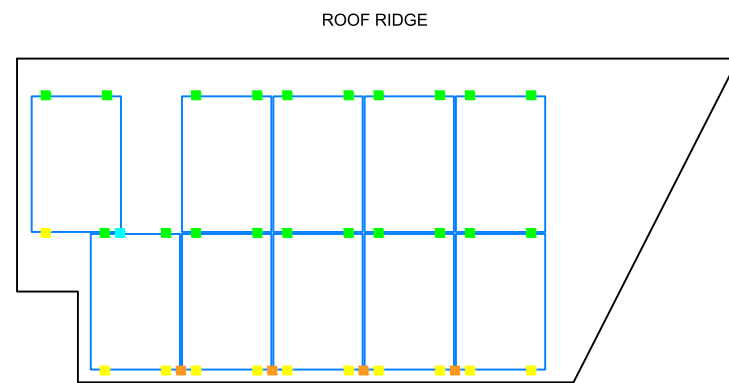
**REVIEWED**

By Chris Berger at 9:30 pm, Aug 19, 2024

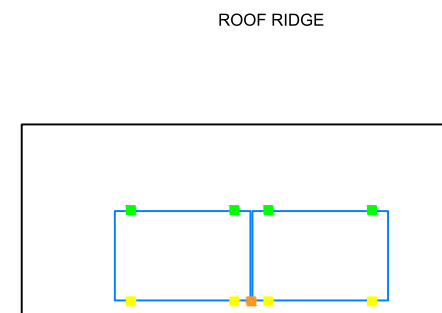
David C. Hernandez  
Digitally signed by David C. Hernandez  
Date: 2024.07.30 10:30:26 -04:00



APPROVED  
Montgomery County  
Historic Preservation Commission  
*[Signature]*



**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. SNAPNRACK TOPSPEED SHALL BE INSTALLED IN ACCORDANCE WITH SNAPNRACK 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



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Building Code International Residential Code (IRC) 2018	
Electrical Code National Electrical Code (NEC) 2017	
Wind Speed 115 MPH	Snow Load 30 PSF
Modules (12) LONGi LR5-54HABB-400M	
Inverter(s) (12) IQ8+-72-2-US	
DC System Size 4.800 kW	AC System Size 3.480 kW
Customer Information Anne Fothergill 33 Columbia Ave Takoma Park, MD 20912	
Payment/Lender None	
City Montgomery County	Utility Pepco
Sheet Name Solar Panel Footing Plan	
Drawn By AMP	Date July 30, 2024
Scale AS NOTED	Job Number MD20226
Sheet <b>S-2</b>	

# City of Takoma Park

Housing and Community Development Department

Main Office 301-891-7119  
Fax 301-270-4568  
www.takomaparkmd.gov



7500 Maple Avenue  
Takoma Park, MD 20912

**REVIEWED**

By Chris Berger at 9:25 pm, Aug 19, 2024

## MUNICIPALITY LETTER

July 31, 2024

**To:** Anne Fothergill  
33 Columbia Avenue, Takoma Park, MD 20912  
anneandjake@hotmail.com

(202) 550-7892

**To:** Department of Permitting Services  
2425 Reedie Drive, 7<sup>th</sup> floor  
Wheaton, Maryland 20902

**From:** Planning and Development Services Division

APPROVED

Montgomery County

Historic Preservation Commission

**THIS IS NOT A PERMIT – For Informational Purposes Only**

VALID FOR ONE YEAR FROM DATE OF ISSUE

The property owner is responsible for obtaining all required permits from Montgomery County and the City of Takoma Park. If this property is in the **Takoma Park Historic District**, it is subject to Montgomery County Historic Preservation requirements.

**Representative Name:** Solar Energy World-Tina Crouse

tcrouse@solarenergyworld.com 410-579-2009

**Location of Project:** 33 Columbia Avenue

**Proposed Scope of Work:** Install (12) roof mounted solar panels, 4.80 kW

The purpose of this municipality letter is to inform you that the City of Takoma Park has regulations and city permit requirements that may apply to your project. This municipality letter serves as notification that, in addition to all Montgomery County requirements, you are required to comply with all City permitting requirements, including:

- Tree Impact Assessment/Tree Protection Plan
- Stormwater management
- City Right of Way

Failure to comply with these requirements could result in the issuance of a Stop Work Order and other administrative actions within the provisions of the law. Details of Takoma Park's permit requirements are attached on page 2.

The issuance of this letter does not indicate approval of the project nor does it authorize the property owner to proceed with the project. The City retains the right to review and comment on project plans during the Montgomery County review process.

# City Of Takoma Park

## The City of Takoma Park permits for the following issues:

### Tree Impact Assessment/Tree Protection Plan/Tree Removal Application:

Construction activities that occur within 50 feet of any urban forest tree (7 and 5/8" in trunk diameter or greater), located on the project property or on an adjacent property, may require a Tree Impact Assessment and possibly a Tree Protection Plan Permit. Make sure to submit a request for a Tree Impact Assessment and schedule a site visit with the City's Urban Forest Manager if any urban forest tree is in the vicinity of proposed construction activities. See the Tree Permits section of the City website for the specific conditions in which a Tree Impact Assessment is required. Depending on the Urban Forest Manager's conclusion following the Tree Impact Assessment, you may need to prepare a full Tree Protection Plan and apply for a Tree Protection Plan Permit as well. Separately, the removal of any urban forest tree will require a Tree Removal Permit application. The tree ordinance is detailed in the City Code, section 12.12. For permit information check: <https://takomaparkmd.gov/services/permits/tree-permits>. The City's Urban Forest Manager can be reached at 301-891-7612 or [urbanforestmanager@takomaparkmd.gov](mailto:urbanforestmanager@takomaparkmd.gov).

### Stormwater Management:

If you plan to develop or redevelop property, you may be required to provide appropriate stormwater management measures to control or manage runoff, as detailed in City Code section 16.04. All commercial or institutional development in the city must apply for a Stormwater Management Permit regardless of the size of the land disturbance. Additions or modifications to existing detached single-family residential properties do not require a Stormwater Management permit if the project does not disturb more than 5,000 square feet of land area. For more information on visit: <https://takomaparkmd.gov/government/public-works/stormwater-management-program/>. The City Engineer should be contacted to determine if a City permit is required. The City Engineer can be reached at 301-891-7620.

### City Right of Way:

- To place a **construction dumpster or storage container** (temporarily on a City right of way (usually an adjacent road), you will need to obtain a permit. A permit is required if the dumpster is placed in a privately-owned driveway or parking lot.
- If you plan to install a new **driveway apron**, or enlarge or replace an existing driveway apron, you need a Driveway Apron Permit.
- If you plan to construct a **fence** in the City right of way, you need to obtain a permit. If approved, the Agreement will be recorded in the Land Records of Montgomery County.

For more information and applications for City permits, see: <https://takomaparkmd.gov> or contact the Department of Public Works at 301-891-7633.

Failure to comply with the City's permitting requirements could result in the issuance of other administrative actions within the provisions of the law.

**REVIEWED**  
By Chris Berger at 9:25 pm, Aug 19, 2024

APPROVED  
Montgomery County  
Historic Preservation Commission  


eSigned via SeamlessDocs.com  
*Tina Crouse*  
Key: 38bf2056622713c0b979ea7ee94776a

Tina Crouse

07-31-2024


eSigned via SeamlessDocs.com  
*Takoma Park Planning Division*  
Key: 19fe64f123e96a3ff4576219059d5fba

07-31-2024





# DAVID C. HERNANDEZ, PE

513-418-8812 

4912 Prospect Ave., Blue Ash OH 45242 

davehernandezpe@gmail.com 

DATE: July 30, 2024

RE: 33 Columbia Ave, Takoma Park, MD 20912, USA

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, IEBC 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 = 12 psf
- Solar system dead load = 3 psf

Overall, the roof systems 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:

David C. Hernandez, PE Digitally signed by David C. Hernandez,  
Date: 2024.07.30 10:30:26 -04:00

**REVIEWED**  
By Chris Berger at 9:25 pm, Aug 19, 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. 11/06/2024.



# DAVID C. HERNANDEZ, PE

513-418-8812 

4912 Prospect Ave., Blue Ash OH 45242 

davehernandezpe@gmail.com 

## ASCE 7-16

IEBC IMPACT CHECK			
Inputs	Roof 1	Roof 2	Unit
Existing Gravity Loads			
Roof Dead Load (DL <sub>r</sub> )	12	12	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 =	25.6	25.6	psf
(DL <sub>r</sub> +SL <sub>r</sub> )/Cd=	30.52	30.52	psf
Max. Existing Gravity Load	<b>30.52</b>	<b>30.52</b>	psf
Proposed Gravity Loads			
Roof Dead Load with PV Panel Load (DL)	15	15	psf
Roof Live Load (LL)	0	0	psf
Roof Snow Load (SL)	20.56	20.56	psf
(DL+LL)/Cd =	16.67	16.67	psf
(DL+SL)/Cd=	30.92	30.92	psf
Max. Proposed Gravity Load	<b>30.92</b>	<b>30.92</b>	psf
% Change =	<b>1.31</b>	<b>1.31</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.*

### REVIEWED

*By Chris Berger at 9:25 pm, Aug 19, 2024*

APPROVED  
 Montgomery County  
 Historic Preservation Commission

**REVIEWED**  
By Chris Berger at 9:25 pm, Aug 19, 2024

APPROVED  
Montgomery County  
Historic Preservation Commission  


Solar Energy World  
Because Tomorrow Matters

Project Property Owner Anne Fothergill

Address 33 Columbia Ave, Takoma Park, MD 20912, USA

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 (12) 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 July 30, 2024

Signature David C. Hernandez, PE  
Digitally signed by David C. Hernandez,  
Date: 2024.07.30 10:30:26 -04:00

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. 2024-07-30

**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.

**REVIEWED**  
By Chris Berger at 9:25 pm, Aug 19, 2024

15732

State Master Electrician License Number

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

Signature:           Matt Heun          

APPROVED  
Montgomery County  
Historic Preservation Commission  
  
          Robert H. Porter