MONTGOMERY COUNTY HISTORIC PRESERVATION COMMISSION
STAFF REPORT

Address:	7013 Poplar Ave., Takoma Park	**Meeting Date:**	3/11/2026
Resource:	Outstanding Resource **Takoma Park Historic District**	**Report Date:**	3/4/2026
Applicant:	Jeremiah Frueauf Tina Crouse (agent)	**Public Notice:**	2/25/2026
Review:	HAWP	**Tax Credit:**	No
Case Number:	1145456	**Staff:**	Devon Murtha
Proposal:	Solar panel installation		

RECOMMENDATION

Staff recommends that the Historic Preservation Commission **approve** the HAWP application

PROPERTY DESCRIPTION

SIGNIFICANCE: Outstanding Resource to the Takoma Park Historic District
STYLE: Queen Anne
DATE: c. 1885-1900

Figure 1: 7013 Poplar Avenue is located within the Takoma Park Historic District, annotated with a yellow star.

PROPOSAL

The subject property is located on a large lot along Poplar Avenue and contains a two-and-a-half-story house executed in the Queen Anne Style. It is an Outstanding Resource within the Takoma Park Historic District. The house features a side-gabled roof and a one-story front porch. A large two-story addition was added to the rear of the property in 1987.[1] There is also a small garage on the rear of the property.

Figure 2: View of subject property from right-of-way along Poplar Avenue.

The applicant proposes to install fourteen (14) solar panels in three (3) arrays on the main roof of the subject property. The Q-TRON BLK M-G2+ series panels will be mounted to the asphalt shingle roof with SnapRack mounts.

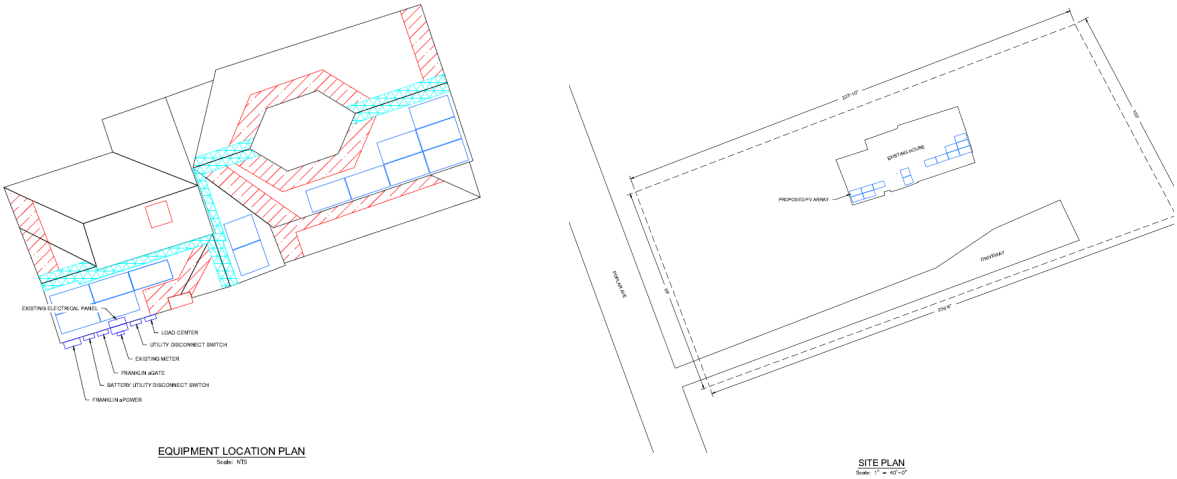
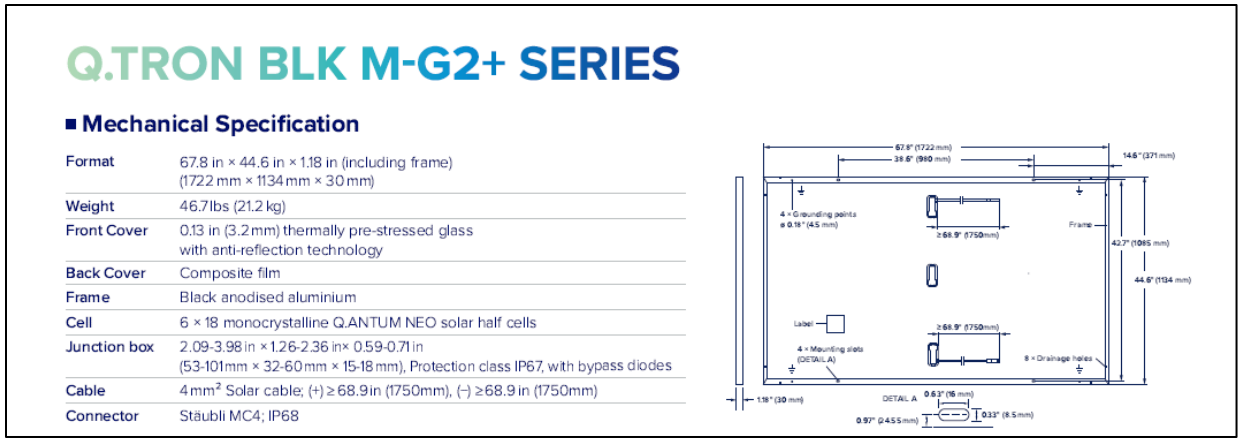


Figure 3: Solar panel layout (left) and site plan (right).

1 See HAWP approval for addition here: https://mcatlas.org/tiles/06_HistoricPreservation_PhotoArchives/Padlock/HAR60640006/Box044/37-3_Takoma%20Park%20Historic%20District_7013%20Poplar%20Avenue_10-02-1987.pdf.

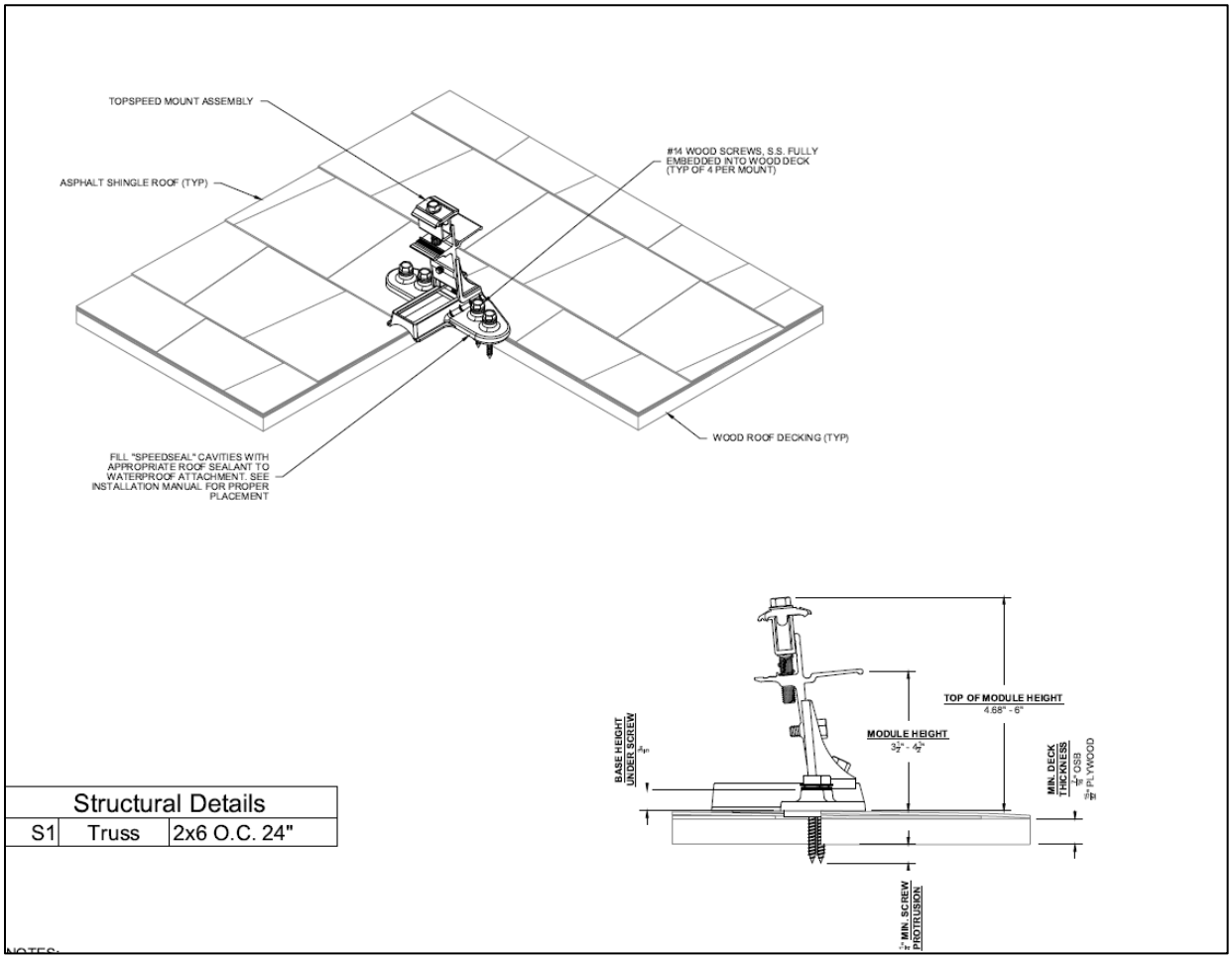


Q.TRON BLK M-G2+ SERIES

■ Mechanical Specification

Format	67.8 in × 44.6 in × 1.18 in (including frame) (1722 mm × 1134 mm × 30 mm)
Weight	46.7 lbs (21.2 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodised aluminium
Cell	6 × 18 monocrystalline Q.ANTUM NEO solar half cells
Junction box	2.09-3.98 in × 1.26-2.36 in× 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), Protection class IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥ 68.9 in (1750 mm), (−) ≥ 68.9 in (1750 mm)
Connector	Stäubli MC4; IP68

Figure 4: Specifications for the solar panels.



Structural Details		
S1	Truss	2x6 O.C. 24"

Figure 5: Installation details for the SnapRack mounts.

APPLICABLE GUIDELINES

The Historic Preservation Office and Historic Preservation Commission (HPC) consult several documents when reviewing alterations and new construction within the Takoma Park Historic District. These documents include the historic preservation review guidelines in the approved and adopted amendment for

the *Takoma Park Historic District (Guidelines)*, *Montgomery County Code Chapter 24A (Chapter 24A)*, the *Secretary of the Interior's Standards for Rehabilitation (Standards),* and the HPC's *Policy No. 20-01: Addressing Emergency Climate Mobilization Through The Installation of Roof-Mounted Solar Panels,* The pertinent information in these four documents is outlined below.

Takoma Park Historic District Guidelines

There are two broad planning and design concepts which apply to all categories. These are:

- The design review emphasis will be restricted to changes that are all visible from the public right-of-way, irrespective of landscaping or vegetation (it is expected that the majority of new additions will be reviewed for their impact on the overall district), and

- The importance of assuring that additions and other changes to existing structures act to reinforce and continue existing streetscape, landscape, and building patterns rather than to impair the character of the historic district.

Outstanding Resources – Residential: These resources have the highest level of architectural and/or historical significance. While they will receive the most detailed level of design review, it is permissible to make sympathetic alterations, changes and additions to Outstanding Resources.

As a set of guiding principles for design review of Outstanding Resources, the Historic Preservation Commission will utilize the Secretary of the Interior's "Standards for Rehabilitation".

Specifically, some of the factors to be considered in reviewing HAWPs on Outstanding Resources:

> Plans for all alterations should be compatible with the resource's original design; additions, specifically, should be sympathetic to existing architectural character, including massing, height, setback, and materials
>
> Preservation of original and distinctive architectural features, such as porches, dormers, decorative details, shutters, etc..is encouraged
>
> All changes and additions should respect existing environmental settings, landscaping, and patterns of open space

Montgomery County Code, Chapter 24A-8

The following guidance which pertains to this project are as follows:

(b) The commission shall instruct the director to issue a permit, or issue a permit subject to such conditions as are found to be necessary to ensure conformity with the purposes and requirements of this chapter, if it finds that:

(1) The proposal will not substantially alter the exterior features of an historic site or historic resource within an historic district; or

(2) The proposal is compatible in character and nature with the historical, archeological, architectural or cultural features of the historic site or the historic district in which an historic resource is located and would not be detrimental thereto or to the achievement of the purposes of this chapter;

(4) The proposal is necessary in order that unsafe conditions or health hazards be remedied

(d) In the case of an application for work on an historic resource located within an historic district, the commission shall be lenient in its judgment of plans for structures of little historical or design significance or for plans involving new construction, unless such plans would seriously impair the historic or architectural value of surrounding historic resources or would impair the character of the historic district. (Ord. No. 9-4, § 1; Ord. No. 11-59.)

Secretary of the Interior's Standards for Rehabilitation

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

2. The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces and spatial relationships that characterize a property will be avoided.

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

10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

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

Now, THEREFORE:

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

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

WHEREAS, the County Council has established a Climate Emergency;

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

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

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

1. The preferred locations for solar panel installation(s) on a designated historic site or an historic resource located within an historic district is a) on the rear of the property, b) on non-historic building additions, c) on accessory structures, or d) in ground-mounted arrays;
2. If it is not feasible to install solar panels in one of the identified preferred locations due to resource orientation or other site limitations; and,
3. The roof is determined to be neither architecturally significant, nor a character-defining feature of the resource, nor is it a slate or tile roof, that unless it can be demonstrated that the solar array will be installed without damaging the historic character of the resource or historic fabric; then
4. The public welfare is better served by approving a Historic Area Work Permit for solar panels on all visible side or front roof slopes under Section 24A-8(b)(6).
5. A Historic Area Work Permit (HAWP) is required for all work referenced in this policy.

STAFF DISCUSSION

Staff supports the proposal and recommends approval.

Staff evaluated the proposed placement of the solar panels on the subject property against the guidance provided by *Historic Preservation Commission Policy No. 20-01*. In determining the most appropriate placement of solar panels, the policy outlines several preferred locations, including (in order of preference), in ground-mounted arrays, on accessory structures, on non-historic building additions, and on the rear of the property. Installation of solar panels on the primary preferred location (ground-mounted array) is not possible for this project due to the lot size and canopy cover. Installation on the secondary preferred location (accessory structure) is also not feasible for this project, as there is limited sunlight to that area due to the extensive tree canopy.

One of the arrays will be installed on the tertiary preferred location (the non-historic building addition; *Figure 6*), consistent with *Policy No. 20-01.*

Figure 6: Solar panels on non-historic addition indicated with red box (left) and arrow (right).

Staff acknowledge that two of the arrays will be installed on the historic main roof, which is a non-preferred location, but only one array will be visible from the right-of-way along Poplar Avenue. Staff finds that this location is still acceptable, as the applicant submitted sufficient justification demonstrating that there are no other feasible locations for the panels. The north-facing roof slopes are not oriented to receive enough sunlight for optimal solar panel operation. The south-facing rear porch is not an option due to the presence of egress windows, which require additional setbacks per DPS requirements. The subject property had an estimated annual usage of roughly 17,420 kWh in 2025, and the proposed system will only generate a fraction of that at 3,689 kWh in annual production. Staff finds that the removal of any panels from this system, or movement to other roof planes, would lessen the production even further, to the detriment of the project feasibility.

Figure 7: olar panels on main roof indicated with red box (left) and arrow (right).

Per the *Guidelines*, Staff finds that the installation of these panels will not impact the existing pattern of the streetscape. Photovoltaic systems are already an established element of the district and the HPC has approved the installation of solar panels in locations visible from the right-of-way, including on the main roof (*Figure 8*). Staff does not find the house's roof shape or asphalt shingles to be architecturally significant and that the solar installation will not damage the house's historic character.

Figure 8: Solar panels installed on properties that are visible from the right-of-way along the 7000 Block of Poplar Avenue include 7004 Poplar (annotated with a red box, left), 7101 Poplar (annotated with a red box, right), and 7112 Poplar (not pictured). The subject property is annotated with a blue box.

The application indicates that a tree in the front yard is to be removed by the homeowner. Staff notes that tree removals require approval from the HPC. The applicant must return to the HPC for permission to remove the tree, or submit more information to Staff regarding the tree removal if a tree removal waiver was issued.

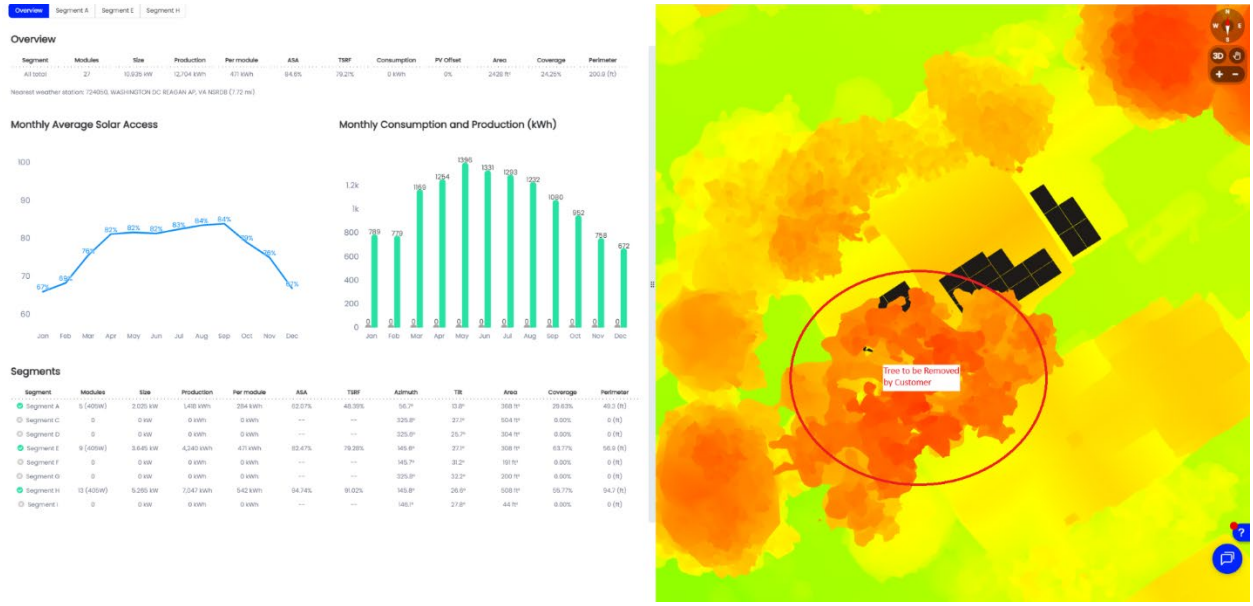


Figure 9: Heat map for the subject property.

After full and fair consideration of the applicant's submission, staff finds the proposal, as modified by the conditions, consistent with the Criteria for Issuance in Chapter 24A-8(b)(1), (2), and (d), having found the proposal is consistent with the *Secretary of the Interior's Standards for Rehabilitation #2*, *9*, and *10*, and *Takoma Park Historic District Guidelines,* and the *HPC's Policy No. 20-01* as outlined above.

STAFF RECOMMENDATION

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

The Takoma Park Historic District Guidelines;

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

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

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

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

application at staff's discretion;

and with the general condition that the applicant shall notify the Historic Preservation Staff if they propose to make **any alterations** to the approved plans. Once the work is completed the applicant will contact the staff person assigned to this application at 301-563-3400 or devon.murtha@montgomeryplanning.org to schedule a follow-up site visit.

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

Property Built in 1895

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

-Install (14) roof mounted solar panels on detached structure

-Micro Inverters to be placed under each panel

-Utility disconnect to be installed next to utility meter along with electrical combiner box for micro inverters

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/Landscaing	*	*		*	*	*	*
Tree Removal	*	*		*	*	*	*
Siding/ Roof Changes	*	*	*	*	*		*
Window/ Door Changes	*	*	*	*	*		*
Masonry Repair/ Repoint	*	*	*	*	*		*
Signs	*	*	*	*	*		*


Front of Home


Back of Home


Right side of Home


Left side of Home

Before Install

After Installation

DAVID C. HERNANDEZ, PE

513-418-8812 4912 Prospect Ave., Blue Ash OH 45242 davehernandezpe@gmail.com

DATE: December 19, 2025

RE: 7013 Poplar 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 attached to the roof decking 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 standards included in the IBC 2021, IRC 2021, 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 system integrity is adequate to support the PV alteration with no modifications or reinforcements required.

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, PE
Date: 2025.12.19 17:37:28 -05:00

aee Green Building Engineer #832

STATE OF MARYLAND · DAVID C. HERNANDEZ · 49993 · PROFESSIONAL ENGINEER

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 10/06/2026.

12/19/25

DAVID C. HERNANDEZ, PE

513-418-8812 4912 Prospect Ave., Blue Ash OH 45242 davehernandezpe@gmail.com

SEISMIC CHECK

Breakdown of Loads		
Asphalt Shingles:	7	psf
Insulation:	1.5	psf
Plywood Sheathing:	1.5	psf
Rafters:	1	psf
Misc:	1	psf
Live load:	20	psf

Existing Roof Seismic Weight			
Element	Unit Weight (psf)	Area (Sq.ft)	Weight (lbs)
Roof DL	12	1893.00	22716
Exterior Walls	8	2032.00	16256
Interior Walls	6	2032.00	12192
Existing Seismic Weight @Roof Level, We =			51164

New PV System Seismic Weight			
Element	Unit Weight (psf)	Area (Sq.ft)	Weight (lbs)
Pv System	3	294.28	882.84
Seismic Weight of New PV System, Wpv =			882.84

% Increase in Lateral (Seismic) Weight @Roof Level Due to PV System Addition, %-increase = Wpv / We	1.73%	< 10% - Pass

	COMPANY	PROJECT
WoodWorks® SOFTWARE FOR WOOD DESIGN	Dec. 19, 2025 09:13	7013 Poplar Ave - Roof 1.wwbu

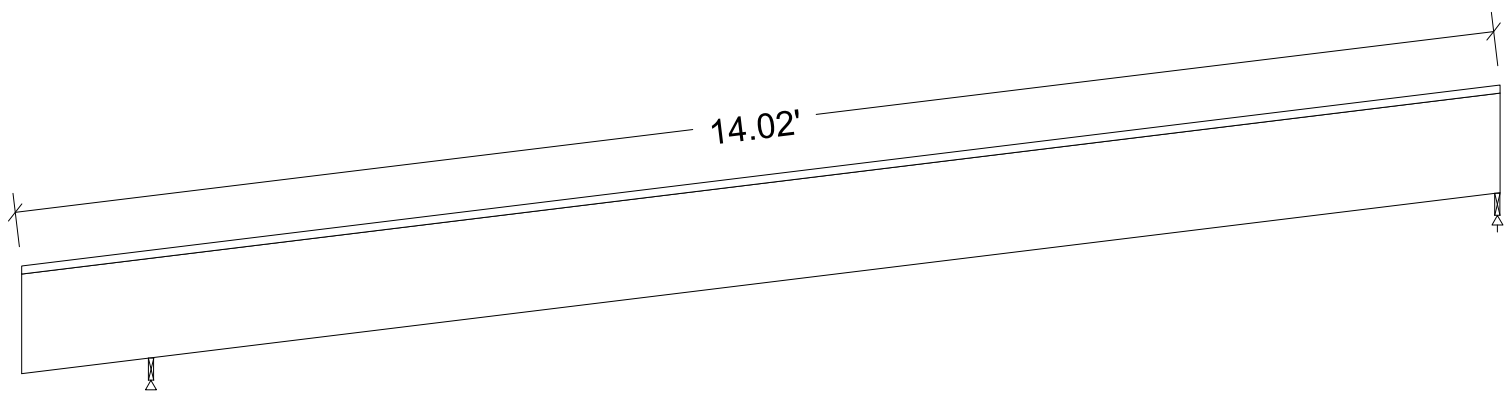
Design Check Calculation Sheet

WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
DL-WOOD	Dead	Full Area	No			12.00(16.0")		psf
DL-PV	Dead	Partial Area	No	0.50	9.00	3.00(16.0")		psf
SL1	Snow	Partial Area	No	0.00	0.50	23.10(16.0")		psf
SL-PV	Snow	Partial Area	No	0.50	9.00	13.48(16.0")		psf
SL2	Snow	Partial Area	No	9.00	11.44	23.10(16.0")		psf
LL1	Roof constr.	Partial Area	No	0.00	0.50	20.00(16.0")		psf
LL2	Roof constr.	Partial Area	No	9.00	11.44	20.00(16.0")		psf

Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :



Unfactored:				
Dead		149		117
Snow		123		121
Roof Live		21		57
Factored:				
Combined		272		238
Bearing:				
F'theta		550		550
Capacity				
Joist		721		412
Support		586		586
Des ratio				
Joist		0.38		0.58
Support		0.46		0.41
Load comb		#3		#3
Length		0.50*		0.50*
Min req'd		0.50*		0.50*
Cb		1.75		1.00
Cb min		1.75		1.00
Cb support		1.25		1.25
Fcp sup		625		625

*Minimum bearing length setting used: 1/2" for end supports and 1/2" for interior supports

Lumber-soft, S-P-F, No.1/No.2, 2x10 (1-1/2"x9-1/4")

Supports: All - Timber-soft Beam, D.Fir-L No.2

Roof joist spaced at 16.0" c/c; Total length: 14.57'; Clear span(horz): 0.979', 10.378'; Volume = 1.4 cu.ft.; Pitch: 8.5/12

Lateral support: top = continuous, bottom = at supports; Repetitive factor: applied where permitted (refer to online help);

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 18	Fv' = 155	psi	fv/Fv' = 0.12
Bending(+)	fb = 323	Fb' = 1273	psi	fb/Fb' = 0.25
Bending(-)	fb = 14	Fb' = 576	psi	fb/Fb' = 0.02
Deflection:				
Interior Live	0.05 = < L/999	0.64 = L/240	in	0.09
Total	0.16 = L/984	0.85 = L/180	in	0.18
Cantil. Live	-0.02 = L/913	0.12 = L/120	in	0.13
Total	-0.05 = L/314	0.16 = L/90	in	0.29

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	135	1.15	1.00	1.00	-	-	-	-	1.00	1.00	3
Fb'+	875	1.15	1.00	1.00	1.000	1.100	-	1.15	1.00	1.00	3
Fb'-	875	1.15	1.00	1.00	0.452	1.100	-	1.15	1.00	1.00	3
Fcp'	425	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.4 million		1.00	1.00	-	-	-	-	1.00	1.00	3
Emin'	0.51 million		1.00	1.00	-	-	-	-	1.00	1.00	3

CRITICAL LOAD COMBINATIONS:

```
 Shear     : LC #3  = D + S
 Bending(+): LC #3  = D + S
 Bending(-): LC #3  = D + S
 Deflection: LC #3  = D + S  (live)
             LC #3  = D + S  (total)
 Bearing   : Support 1 - LC #3 = D + S
             Support 2 - LC #3 = D + S
 Load Types: D=dead S=snow Lr=roof live
 All LC's are listed in the Analysis output
 Load combinations: ASD Basic from ASCE 7-16 2.4
```

CALCULATIONS:

```
 V max = 193, V design = 166 (NDS 3.4.3.1(a)) lbs
 M(+) = 576 lbs-ft; M(-) = 24 lbs-ft
 EI = 138.50e06 lb-in^2
 "Live" deflection is due to all non-dead loads (live, wind, snow…)
 Total deflection = 1.50 permanent + "live"
 Bearing: Allowable bearing at an angle F'theta  calculated for each support
 as per NDS 3.10.3
 Lateral stability(-):  Lu = 12.75'  Le = 20.69'  RB = 32.0; Lu based on full span
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Continuous or Cantilevered Beams: NDS Clause 4.2.5.5 requires that normal grading provisions be extended to the middle 2/3 of 2 span beams and to the full length of cantilevers and other spans.
4. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
5. SLOPED BEAMS: level bearing is required for all sloped beams.
6. The critical deflection value has been determined using maximum back-span deflection. Cantilever deflections do not govern design.

	COMPANY	PROJECT
WoodWorks® SOFTWARE FOR WOOD DESIGN	Dec. 19, 2025 09:12	7013 Poplar Ave - Roof 2 & Roof 3.wwbu

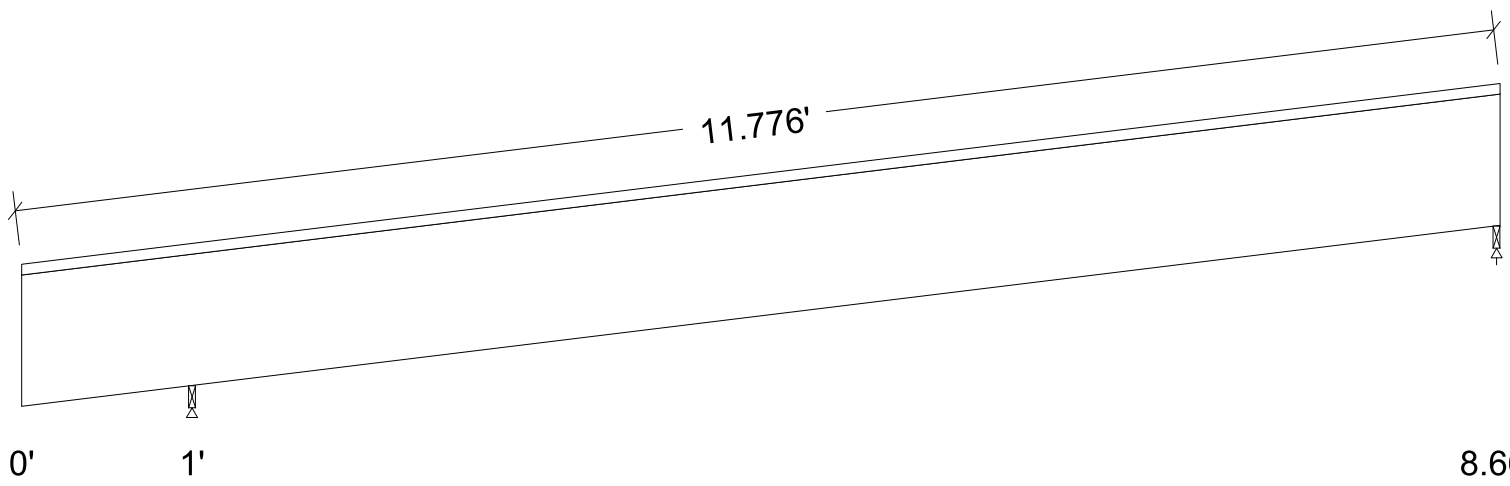
Design Check Calculation Sheet

WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
DL-WOOD	Dead	Full Area	No			12.00(16.0")		psf
DL-PV	Dead	Partial Area	No	0.50	8.00	3.00(16.0")		psf
SL1	Snow	Partial Area	No	0.00	0.50	19.19(16.0")		psf
SL-PV	Snow	Partial Area	No	0.50	8.00	10.40(16.0")		psf
SL2	Snow	Partial Area	No	8.00	8.68	19.19(16.0")		psf
LL1	Roof constr.	Partial Area	No	0.00	0.50	20.00(16.0")		psf
LL2	Roof constr.	Partial Area	No	8.00	8.68	20.00(16.0")		psf

Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :



Unfactored:				
Dead		129		100
Snow		74		60
Roof Live		15		17
Factored:				
Combined		203		160
Bearing:				
F'theta		616		616
Capacity				
Joist		808		462
Support		586		586
Des ratio				
Joist		0.25		0.35
Support		0.35		0.27
Load comb		#3		#3
Length		0.50*		0.50*
Min req'd		0.50*		0.50*
Cb		1.75		1.00
Cb min		1.75		1.00
Cb support		1.25		1.25
Fcp sup		625		625

*Minimum bearing length setting used: 1/2" for end supports and 1/2" for interior supports

Lumber-soft, S-P-F, No.1/No.2, 2x10 (1-1/2"x9-1/4")

Supports: All - Timber-soft Beam, D.Fir-L No.2
Roof joist spaced at 16.0" c/c; Total length: 12.48'; Clear span(horz): 0.979', 7.618'; Volume = 1.2 cu.ft.; Pitch: 11/12
Lateral support: top = continuous, bottom = at supports; Repetitive factor: applied where permitted (refer to online help);
This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 11	Fv' = 155	psi	fv/Fv' = 0.07
Bending(+)	fb = 163	Fb' = 1273	psi	fb/Fb' = 0.13
Bending(-)	fb = 13	Fb' = 679	psi	fb/Fb' = 0.02
Deflection:				
Interior Live	0.01 = < L/999	0.52 = L/240	in	0.03
Total	0.05 = < L/999	0.69 = L/180	in	0.08
Cantil. Live	-0.01 = < L/999	0.14 = L/120	in	0.04
Total	-0.02 = L/752	0.18 = L/90	in	0.12

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	135	1.15	1.00	1.00	-	-	-	-	1.00	1.00	3
Fb'+	875	1.15	1.00	1.00	1.000	1.100	-	1.15	1.00	1.00	3
Fb'-	875	1.15	1.00	1.00	0.534	1.100	-	1.15	1.00	1.00	3
Fcp'	425	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.4 million		1.00	1.00	-	-	-	-	1.00	1.00	3
Emin'	0.51 million		1.00	1.00	-	-	-	-	1.00	1.00	3

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #3  = D + S
Bending(+): LC #3  = D + S
Bending(-): LC #3  = D + S
Deflection: LC #3  = D + S  (live)
            LC #3  = D + S  (total)
Bearing   : Support 1 - LC #3 = D + S
            Support 2 - LC #3 = D + S
Load Types: D=dead S=snow Lr=roof live
All LC's are listed in the Analysis output
Load combinations: ASD Basic from ASCE 7-16 2.4
```

CALCULATIONS:

```
V max = 118, V design = 100 (NDS 3.4.3.1(a)) lbs
M(+) = 290 lbs-ft; M(-) = 23 lbs-ft
EI = 138.50e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Bearing: Allowable bearing at an angle F'theta  calculated for each support
as per NDS 3.10.3
Lateral stability(-):  Lu = 10.38'  Le = 17.25'  RB = 29.2; Lu based on full span
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Continuous or Cantilevered Beams: NDS Clause 4.2.5.5 requires that normal grading provisions be extended to the middle 2/3 of 2 span beams and to the full length of cantilevers and other spans.
4. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
5. SLOPED BEAMS: level bearing is required for all sloped beams.
6. The critical deflection value has been determined using maximum back-span deflection. Cantilever deflections do not govern design.

ASCE 7 - 16 WIND CALCULATION FOR: Roof 1

Project Address: 7013 Poplar Ave, Takoma Park, MD 20912, USA

DESIGN CRITERIA

Ultimate Wind Speed: 115 mph

Exposure Category: B

a: 3 ft

Velocity Pressure Exposure Coefficient, *Kz*: 0.59

Topographic Factor, *Kzt*: 1

Wind Directionality Factor, *Kd*: 0.85

Ground Elevation Factor, *Ke*: 1

Solar Array Pressure Equalization Factor, *ya*: 0.61

Array Edge Factor, γE: 1

Solar Array Dead Load: 3 psf

Mean Roof Height: 16 ft

Roof Pitch: 35°

Roof Type: Gable

Module Name, Dimensions, Area: LONGI LR5-54HPB-405M, 44.6in X 67.8in, 3023.88 sqin

CALCULATION

Velocity Pressure Due to Wind: $q_h = 0.00256(Kz)(Kzt)(Kd)(I)(V^2)$ $(Ch\ 26. Eq\ 26.10-1)$

Actual Uplift Pressure: $\mathrm{p} = 0.6D + 0.6W$ $(Ch\ 2.4.1\ LC\ \#7/a)$

Wind Uplift Pressure: $p = qh\ (GCp)(yE\ )(ya\ )$ $(Ch\ 29. Eq\ 29.4-7)$

Landscape / Portrait Panels

Roof Zone	1	2e	2n	2r	3e	3r
Mount Spacing	67.8”	67.8”	67.8”	67.8”	67.8”	67.8”
External Pressure Coefficient (GCp)	-1.78	-1.78	-1.98	-1.78	-2.47	-1.98
Actual Uplift Pressure (p)	-16 psf	-16 psf	-16 psf	-16 psf	-16 psf	-16 psf
Tributary Area (AT)	10.5 sqft	10.5 sqft	10.5 sqft	10.5 sqft	10.5 sqft	10.5 sqft
Uplift Force (P)	-167.99 lbs	-167.99 lbs	-167.99 lbs	-167.99 lbs	-167.99 lbs	-167.99 lbs

Uplift Capacity

Attachment Type = 4 pcs of #14 Wood Screw TopSpeed Mount Assembly

Embedment Depth = 0.5 in

Hardware Pullout Capacity = 258 lbs

Safety Factor = 1.5

Duration Factor = 1.6

Maximum Uplift Force = 167.993 lbs

Allowable Pullout Capacity = 258 lbs

Allowable Pullout Capacity = 258 lbs > Uplift Force per Bolt = 167.99 lbs, Therefore OK.

ASCE 7 - 16 WIND CALCULATION FOR: Roof 2 & Roof 3

Project Address: 7013 Poplar Ave, Takoma Park, MD 20912, USA

DESIGN CRITERIA

Ultimate Wind Speed: 115 mph

Exposure Category: B

a: 3 ft

Velocity Pressure Exposure Coefficient, *Kz*: 0.59

Topographic Factor, *Kzt*: 1

Wind Directionality Factor, *Kd*: 0.85

Ground Elevation Factor, *Ke*: 1

Solar Array Pressure Equalization Factor, *ya*: 0.61

Array Edge Factor, γE: 1

Solar Array Dead Load: 3 psf

Mean Roof Height: 16 ft

Roof Pitch: 43°

Roof Type: Gable

Module Name, Dimensions, Area: LONGI LR5-54HPB-405M, 44.6in X 67.8in, 3023.88 sqin

CALCULATION

Velocity Pressure Due to Wind: $q_h = 0.00256(Kz)(Kzt)(Kd)(I)(V^2)$ $(Ch\ 26. Eq\ 26.10-1)$

Actual Uplift Pressure: $\mathrm{p} = 0.6D + 0.6W$ $(Ch\ 2.4.1\ LC\ \#7/a)$

Wind Uplift Pressure: $p = qh\ (GCp)(yE\ )(ya\ )$ $(Ch\ 29. Eq\ 29.4-7)$

Landscape / Portrait Panels

Roof Zone	1	2e	2n	2r	3e	3r
Mount Spacing	67.8”	67.8”	67.8”	67.8”	67.8”	67.8”
External Pressure Coefficient (GCp)	-1.78	-1.78	-1.98	-1.78	-2.47	-1.98
Actual Uplift Pressure (p)	-16 psf	-16 psf	-16 psf	-16 psf	-16 psf	-16 psf
Tributary Area (AT)	10.5 sqft	10.5 sqft	10.5 sqft	10.5 sqft	10.5 sqft	10.5 sqft
Uplift Force (P)	-167.99 lbs	-167.99 lbs	-167.99 lbs	-167.99 lbs	-167.99 lbs	-167.99 lbs

Uplift Capacity

Attachment Type = 4 pcs of #14 Wood Screw TopSpeed Mount Assembly

Embedment Depth = 0.5 in

Hardware Pullout Capacity = 258 lbs

Safety Factor = 1.5

Duration Factor = 1.6

Maximum Uplift Force = 167.993 lbs

Allowable Pullout Capacity = 258 lbs

Allowable Pullout Capacity = 258 lbs > Uplift Force per Bolt = 167.99 lbs, Therefore OK.

EXACTUS ENERGY
NEW AGE ENGINEERING

Solar Energy World
Because Tomorrow Matters

Project Roof Mounted Solar PV Installation Property Owner Jeremiah Frueauf

Address 7013 Poplar 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 (14) panels supported by the rack system, as shown on the drawings prepared for the above referenced address. I certify that the configurations and design criteria meet the standards and requirements of the International Residential Code (IRC) in COMCOR 08.00.02.

☑ 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 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, 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, adopted by Montgomery County in COMCOR 08.00.02.

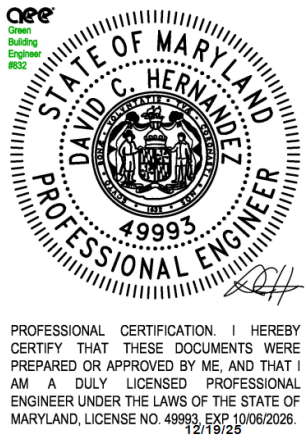
☑ I prepared or approved the construction documents for the mounting equipment, rack system, roof structure for this project.

Re-installations:
□ I certify that the reinstallation of the photovoltaic system (PV) as shown on the approved drawings for permit _____ (show original permit #) does not alter the approval under the permit or make the PV system, attachment to the building, and roof framing unsafe.

49993
Maryland PE License Number

Date December 19, 2025

Seal



Signature David C. Hernandez, PE Digitally signed by David C. Hernandez, Date: 2025.12.19 17:37:28 -05:00

Updated 11/14/2024

SolarEnergyWorld
Because Tomorrow Matters

Property Owners Name: Jeremiah Frueauf

Property Owners Address: 7013 Poplar Avenue, Takoma Park, MD 20912

Address of Installation if different than owner's address:

I certify that:

☑ I prepared or approved the electrical drawings and related documents for the photovoltaic (PV) system at the above location.

☑ The design of the PV System, and all the electrical Installations and equipment, meets the standards and requirements of the National Electrical Code as adopted by Montgomery County in COMCOR 17.02.01

☑ I reviewed and completed the Worksheet for PV System, which was attached to the permit application for the PV system at the above location.

40780-State of MD Master Electrician License

Santos M. Andrade

Signature: _____

Date: 01//06/2026

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

MUNICIPALITY LETTER

January 07, 2026

To: Jeremiah Frueauf
7013 Poplar Avenue, Takoma Park, MD 20912
fru1shop@gmail.com 703-919-6064

To: Department of Permitting Services
2425 Reedie Drive, 7th floor
Wheaton, Maryland 20902

From: Planning and Development Services Division

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: Tina Crouse-SEW tcrouse@solarenergyworld.com 410-570-4157
Location of Project: 7013 Poplar Avenue, Takoma Park, MD 20912
Proposed Scope of Work: Install (14) roof mounted solar panels, 5.67 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.

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 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 not 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 request a Fence Agreement. 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/services/permits/ 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 a Stop Work Order and other administrative actions within the provisions of the law.

eSigned via GovOS.com
Tina Crouse
Key: 38bf2056622713c0bf979ea7ee94776a

Tina Crouse 01-06-2026

eSigned via GovOS.com
Takoma Park Planning Division
Key: 19fe84f123e68a3ff4576219059d5fbe

01-07-2026

UL Product iQ®

Mounting Systems, Mounting Devices, Clamping Devices and Ground Lugs for Use with Photovoltaic Modules and Panels

COMPANY

SUNRUN SOUTH LLC, DBA SNAPNRACK
775 Fiero Ln
Suite 200
San Luis Obispo, CA 93401 United States

E359313

Cat. No.	Investigated for Bonding	Investigated for Mechanical Loading	System Fire Classification (A, B or C)	Tested in Combination With
Photovoltaic mounting system				

Series 200 - Consisting of the Following Components: Kee Klamp Tee, Speed Rail Tee, Speed Rail Single Swivel, Threaded Pipe Coupler, Pipe Clamp Assembly, Ground Rail, Mid Clamp, X End Clamp, Universal End Clamp, Speed Rail Tee – 2″ Posts, Speed Rail Single Swivel – 2″ Posts, Speed Rail Cross Assembly for 2″ Posts, Ground Rail Splice Clamp	Y*	Y – Minimum mechanical load ratings defined by UL 2703 for all modules listed	N	Listed PV Modules, where XXX is the wattage value. All wattage values are covered: Aptos Solar: DNA-120-MF23-XXX DNA-120-BF23-XXX DNA-144-MF23-XXX DNA-144-BF23-XXX DNA-120-MF26-XXXW, DNA-120-MF26-XXXW, DNA-144-MF26-XXXW DNA-120-BF26-XXXW DNA-144-BF26-XXXW Boviet Solar: BVM6610P-XXX BVM6610M-XXX BVM6612P-XXX BVM6612M-XXX BVM7612M-XXX-H-HC-BF-DG Canadian Solar: CS6K-XXX-M CS6K-XXX-M-SD CS6K-XXX-P CS6K-XXX-P-SD CS6K-XXX-MS CS6P-XXX-M CS6P-XXX-P CS6P-XXX-P-SD CS6V-XXX-M CS3W-XXX-P CS6V-XXX-P CS6X-XXX-P CS3K-XXX-P CS3K-XXX-MS CS3U-XXX-MS CS3U-XXX-P CS1K-XXX-MS CS1H-XXX-MS CS1H-XXX-MS-AB CS3N-XXX-MS CS1Y-XXX-MS CS6.1-54TM-XXXH CS3W-XXXMB-AG CS3Y-XXXMB-AG CS6W-XXXMB-AG CS6R-XXXMS-HL CS3W-xxxMS CS3W-xxxP, where xxx is 385 to 450 CertainTeed - CTXXXHC11-06, CTXXXHC11-06, CTM10XXXHC11-06 Chint Solar: CHSM6612M-XXX CHSM6612M/HV-XXX CHSM6612M(BL)-XXX **CHSM72M-HC-XXX (Astro 4) **CHSM72M-HC-XXX (Astro 5)

				Crossroads Solar: Crossroads Solar xxx Dehui Solar: DH-M760B-XXXW DH-M760W-XXXW DH-M772W-XXXW DH-M760F-XXXW DH-M772F-XXXW ET Solar: ET-P660XXXBB ET-P660XXXWB ET-P660XXXWW ET-P660XXXWWG P660XXXWB/WW P660XXXWWG M660XXXBB M660XXXWW Freedom Forever Procurement: FF-MP-BBB-xxx, where xxx is 365 to 410. Hansol Technics HAXXXAA-NNEA0 where XXX is 420 to 440 Hanwha/Q Cells: Q.PEAK BLK-G3.1-XXX Q.PEAK G3.1-XXX Q.PLUS BFR-G3.1-XXX B.LINE PLUS BFR-G4.1-XXX B.LINE PRO BFR-G4.1-XXX Q.BASE GY-XXX Q.PEAK BFR-G4-XXX Q.PEAK BFR-G4.1-XXX Q.PEAK BLK-G4.1-XXX Q.PEAK BLK-G4.1/TAA-XXX Q.PEAK G4-XXX Q.PEAK G4.1-XXX Q.PEAK G4.1/MAX-XXX Q.PEAK G4.1/TAA-XXX Q.PLUS BFR-G4-XXX Q.PLUS BFR-G4.1-XXX Q.PLUS BFR-G4.1/TAA-XXX Q.PLUS G4-XXX Q.PLUS GY-XXX Q.PLUS BFR-GY-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-XXX Q.PRO G4-XXX Q.PRO GY-XXX Q.PRO GY/SC-XXX Q.PEAK DUO-G6+-XXX Q.PEAK DUO-BLK-G6+-XXX Q.PEAK DUO-G6-XXX Q.PEAK DUO-BLK-G6-XXX Q.PEAK DUO-G8+-XXX Q.PEAK DUO-BLK-G8+-XXX

UR-40 Mounting and Bonding Systems for use with Photovoltaic Modules, consisting of the following components: UR-40 Rail, Mid Clamp, X End Clamp, Universal End Clamp, UR-40 Splice, UR-40 Composition Mount Kits, SpeedSeal Foot Mount Kit, SpeedSeal Deckfoot Mount Kit for UR-40, Standard Standoff for UR-40, Four Hole Standoff for UR-40, Heavy Duty Standoff for UR-40, OmniBase Standoff for UR-40, Metal Roof Base Standoff for UR-40, UR-40 Corrugated Block, Standard Base Seam Clamp for UR-40, Wide Base Seam Clamp for UR-40, UR-40 Universal Tile Hook, UR-40 Flat Tile Hook, UR-40 Tile Hook F, UR-40 Tile Hook WS, Flat Tile Replacement Kit for UR-40, S Tile Replacement Kit for UR-40, W Tile Replacement Kit for UR-40, UR-40 Hanger Bolt Clamp, UR-40 Tilt Kits, SnapNrack Ground Lug Models 242-02101 or 242-92202, Ilsco Ground Lug Models GBL-4DBT or SGB-4, UR-40 Skirt Assembly, MLPE Frame Attachment Kit, MLPE Rail Attachment Kit, Smart Clips, Tilt Kits, Seam Clamp Simple Tilt Kits, Adjustable Tile Hook, OmniShield	Y*	Y – Minimum mechanical load ratings defined by UL 2703 for all modules listed	Y – Class A with and without skirt assembly for Type 1, Type 2 and Type 29 modules	Q.PEAK DUO-G8-XXX Q.PEAK DUO-BLK-G8-XXX Q.PLUS L-G4-XXX Q.PLUS L-G4.1-XXX Q.PLUS L-G4.2-XXX Q.PEAK L-G4.1-XXX Q.PEAK L-G4.2-XXX Q.PLUS DUO-L-G5-XXX Q.PLUS DUO-L-G5.1-XXX Q.PLUS DUO-L-G5.2-XXX Q.PLUS DUO-L-G5.3-XXX Q.PEAK DUO-L-G5.2-XXX Q.PEAK DUO-L-G5.3-XXX Q.PEAK DUO-L-G7-XXX Q.PEAK DUO-L-G7.1-XXX Q.PEAK DUO-L-G7.2-XXX Q.PEAK DUO-L-G7.3-XXX Q.PEAK DUO-L-G6-XXX Q.PEAK DUO-L-G6.2-XXX Q.PEAK DUO-L-G6.3-XXX Q.PEAK DUO-L-G8-XXX Q.PEAK DUO-L-G8.1-XXX Q.PEAK DUO-G5-XXX Q.PEAK DUO-BLK-G5-XXX Q.PLUS DUO-G5-XXX Q.PEAK DUO-G7-XXX Q.PEAK DUO-BLK-G7-XXX Q.PEAK DUO-G7.2-XXX Q.PEAK DUO BLK-G6+/AC-XXX Q.PEAK DUO-ML-G9-XXX Q.PEAK DUO BLK-G5/TS-XXX Q.PEAK DUO G6+/TS-XXX Q.PEAK DUO BLK-G6+/TS-XXX Q.PEAK DUO XL-G9.3-XXXQ.PEAK DUO-L-G8.2-XXX Q.PEAK DUO-L-G8.3-XXX Q.PEAK DUO-G5/SC-XXX Q.PEAK DUO-BLK-G5/SC-XXX Q.PEAK DUO-G6+/SC-XXX Q.PEAK DUO-BLK-G6+/SC-XXX Q.PEAK DUO-BLK-ML-G9-XXX Q.PEAK DUO-G5/TS-XXX Q.PEAK DUO-G6/TS-XXX Q.PEAK DUO BLK-G6/TS-XXX Q.PEAK DUO XL-G9.2-XXX Q.PEAK DUO BLK-G9-XXX Q.PEAK DUO ML-G9+-XXX Q.PEAK DUO BLK-G9+-XXX Q.PEAK DUO BLK ML-G9+-XXX Q.PEAK DUO XL-G10.2-XXX Q.PEAK DUO XL-G10.3-XXX Q.PEAK DUO XL-G10.d-XXX Q.PEAK DUO L-G8.3/BGT-XXX Q.PEAK DUO BLK ML-G10+-XXX Q.PEAK DUO BLK ML-G10-XXX Q.PEAK DUO BLK ML-G10.a+-XXX Q.PEAK DUO BLK ML-G10.a-XXX Q.PEAK DUO XL-G9.3/BFG-XXX Q.PEAK DUO XL-G10.3/BFG-XXX Q.PEAK DUO XL-G10.c-XXX Q.PEAK DUO L-G8.3/BFG-XXX Q.TRON_XL-G2.3/BFG-XXX

					Q.PEAK DUO ML-G10-XXX Q.PEAK DUO ML-G10+-XXX Q.PEAK DUO ML-G10.a+-XXX Q.PEAK DUO ML-G10.a-XXX Q.PEAK DUO BLK ML-G10.a+/TS-XXX, Q.PEAK DUO G10-XXX, Q.PEAK DUO BLK-G10-XXX, Q.PEAK DUO G10+-XXX, Q.PEAK DUO BLK-G10+-XXX Q.TRON-G1+ XXX Q.TRON BLK-G1+ XXX Q.PEAK DUO BLK G10+/AC XXX Q.PEAK DUO BLK G10+/HL XXX Q.PEAK DUO XL-G11.3 XXX Q.PEAK DUO XL-G11.3 BFG XXX Q.Tron BLK M-G2+ XXX, Q.Tron M-G2+ XXX, Q.PEAK DUO BLK ML-G10+/t XXX Q.PEAK DUO XL-G10.d/BFG Q.TRON BLK M-G2+/AC XXX HT-SAAE: HT60-166M-XXX where XXX is 340-390; HT60-182M-XXX Hanwha Solar One: HSL60P6-PB-2-XXXQ HSL60P6-PB-4-XXXQ Heliene: 60M-XXX 60P-XXX 72M-XXX 72P-XXX Runergy: HY-DH108N8 HY-DH108P8-XXX(Y) HY-DH144N8 HY-DH144P8 Hyundai: HiS-MXXXRG HiS-SXXXRG HiS-SXXXRW HiA-SXXXMS HiS-MXXXMG HiS-SXXXMG HiD-SXXXRG HiS-SXXXXY HiS-SXXXYI HiS-SxxxYH HiN-SxxxXG(BK) All may be followed by (BK) JA Solar: JAM6-60-XXX/SI JAP6-60-XXX/3BB JAM60S09-XXX/PR JAM60S10-XXX/MR JAM60S10-XXX/PR JAM60S12-XXX/PR JAM60S17-XXX/MR	

					JAP72S01-XXX/SC JAM72S09-XXX/PR JAM72S10-XXX/MR JAM72S10-XXX/PR JAM72S12-XXX/PR JAP6(k)-72-XXX/4BB JAM54S30-XXX/MR where XXX is 400-410, JAM54S31-XXX/MR JAM72D30-XXX/MB JAM72D10-XXX/MB Jinko Solar: JKMXXXM-60 JKMXXXP-60 JKMXXXP-60-J4 JKMXXXP-60-V JKMXXXP-60B-J4 JKMXXXPP-60 JKMXXXPP-60-V JKMXXXM-60HL JKMXXXM-60L JKMXXXM-60HBL JKMXXXM-72 JKMXXXP-72 JKMXXXP-72-V JKMXXXPP-72 JKMXXXPP-72-V JKMSXXXP-72 JKMXXXM-72HL-V JKMXXXM-72HL-TV JKMXXXM-72L-V JKMXXXM-72HBL JKMXXXM-6TL3-B JKMXXXM-6RL3-B JKMXXXM-7RL3-V JKMXXXM-7RL3-TV JKMXXXM-72HL4-V JKMXXXM-72HL4-TV JKMXXXN-54HL4-B KB Solar LLC: MODULE-KBS-375-MONO MODULE-KBS-375-MONO-BF MODULE-KBS-450-MONO MODULE-KBS-450-MONO-BF Kyocera: KUXXX-6YYY KUXXX-8YYY LG: LGXXXN1C-A5 LGXXXN1K-A5 LGXXXQ1C-A5 LGXXXQ1K-A5 LGXXXS1C-A5 LGXXXN2C-B3 LGXXXN2W-B3 LGXXXN1C-G4 LGXXXN1K-G4 LGXXXS1C-G4 LGXXXN2C-G4	

					LGXXXN2K-G4 LGXXXN2W-G4 LGXXXS2C-G4 LGXXXS2W-G4 LGXXXN1C-V5 LGXXXN1W-V5 LGXXXN2T-V5 LGXXXN2T-J5 LGXXXN1T-V5 LGXXXA1C-V5 LGXXXM1C-L5 LGXXXN1C-N5 LGXXXM1K-L5 LGXXXN1K-L5 LGXXXN1C-A6 LGXXXQ1C-A6 LGXXXM1K-A6 LGXXXA1C-A6 LGXXXA1C-A6 LGXXXN1K-A6 LGXXXN1W-A6 LGXXXQ1K-A6 LGXXXM1C-A6 LGXXXQAK-A6 LGXXXN2W-E6 LGXXXN1K-E6 LGXXXQAC-A6 LGXXXN1K-B6 LGXXXN2T-E6 LGXXXN3K-V6 Longi: LR6-60-XXXM LR6-60BK-XXXM LR6-60HV-XXXM LR6-60PB-XXXM LR6-60PE-XXXM LR6-60PH-XXXM LR6-60HPB-XXXM LR6-60HPH-XXXM LR4-72HPH-XXXM LR4-60HIB-XXXM LR4-60HIH-XXXM LR4-60HPB-XXXM LR4-60HPH-XXXM LR6-60HIB-XXXM LR6-60HIH-XXXM LR5-54HPB-XXXM LR5-54HABB-XXXM Maxeon Solar Technologies, LTD. SPR-MAX3-XXX-BLK-R where xxx is 395-420 Meyer Burger: Meyer Burger Black ** Meyer Burger White ** Mission Solar: MSEXXXSO5T MSEXXXSO5K MSEXXXSQ5T MSEXXXSQ5K

				MSEXXXMM4J MSEXXXMM6J MSEXXXSO6W MSEXXXSO4J MSEXXXSO6J MSEXXXSQ6S MSEXXXSQ4S MSEXXXSR8K MSEXXXSR8T MSEXXXSR9S MSE60AXXX MSEXXXTS60 MSEXXXSX5K MSEXXXSX5T MSEXXXSX6S MSEXXXSX6W TXI6-XXX120BB MSExxxSX5R, where xxx is 375 to 390 TXI10-XXX108BB MSEXXXHT0B where XXX is 390 to 410 MSEXXXSX9R where XXX is 380 to 400

Mitrex Inc:
Mxxx-I3H
M390-A1F

Next Energy Alliance:
USNEA-XXXM3-60
USNEA-XXXM3B-60
USNEA-XXXM3-72
USNEA-XXXM3B-72

Panasonic:
VBHNXXXKA01
VBHNXXXKA02
VBHNXXXSA16
VBHNXXXKA03
VBHNXXXKA04
VBHNXXXSA17
VBHNXXXSA18
VBHNXXXSA17E
VBHXXXRA18N
VBHXXXRA03K
EVPVXXXPK
EVPVXXXHK
EVPVXXXHK2 where XXX is 420 to 430

Phono Solar:
PSXXXM-20/U
PSXXXMH-20/U
PSxxxM8GF-24/TH where xxx is 520 to 550,
PSxxxM8GFH-24/TH, where xxx is 520 to 550,
PSxxxM8GF-18/VH, where xxx is 390 to 410,
PSxxxM8GFH-18/VH, where xxx is 390 to 410,
PSxxxM6-24/TH, where xxx is 510 to 550.

REC:
RECXXXPE

UR-60 Mounting and Bonding Systems for use with Photovoltaic Modules, consisting of the following components: UR-60 Rail, Mid Clamp, X End Clamp, Universal End Clamp, UR-60 Splice, UR-60 Composition Mount Kits, SpeedSeal Foot Mount Kit, Standard Standoff for UR-60, Four Hole Standoff for UR-60, Heavy Duty Standoff for UR-60, OmniBase Standoff for UR-60, Metal Roof Base Standoff for UR-60, UR-60 Corrugated Block, Standard Base Seam Clamp for UR-60, Wide Base Seam Clamp for UR-60, UR-60 Universal Tile Hook, UR-60 Flat Tile Hook, UR-60 Tile Hook F, UR-60 Tile Hook WS, Flat Tile Replacement Kit for UR-60, S Tile Replacement Kit for UR-60, W Tile Replacement Kit for UR-60, UR-60 Hanger Bolt Clamp, UR-60 Tilt Kits, SnapNrack Ground Lug Models 242-02101 or 242-92202, Ilsco Ground Lug Models GBL-4DBT or SGB-4, UR-40 Skirt Assembly, MLPE Frame Attachment Kit, MLPE Rail Attachment Kit, Smart Clips, Tilt Kits, Adjustable Tile Hook.	Y*	Y – Minimum mechanical load ratings defined by UL 2703 for all modules listed	Y – Class A with and without skirt assembly for Type 1, Type 2 and Type 29 modules	RECXXXPE-BLK RECXXXTP RECXXXTP-BLK RECXXXTP IQ RECXXXTP2 RECXXXTP2-BLK RECXXXNP RECXXXTP2M RECXXXTP72 RECXXXPE72 RECXXXPE72XV RECXXXTP2M 72 RECXXXTP2M 72 BLK RECXXXTP2M 72 BLK2 RECXXXTP2SM 72 RECXXXTP2SM 72 BLK RECXXXTP2SM 72 BLK2 RECXXXAA RECXXXTP3 RECXXXTP3M RECXXXTP4 RECXXXAA Pure RECXXXNP2 RECxxxAA PURE 2 RECxxxAA PURE-RX - All may be followed by BLK or BLACK Renesola: JCXXXM-24/Bb JCXXXM-24/BBh SEG Solar: SEG-XXX-BMB-HV, SEG-xxx-BMB-TB SEG-xxx-BMD-HV & SEG-xxx-BMD-TB, where xxx can be 370-425 SEG-XXX-BTD-BG where xxx is 420-435 Silfab: SLAXXX-M SLAXXX-P SSAXXX-M SSAXXX-P SLGXXX-M SLGXXX-P SSGXXX-M SSGXXX-P SILXXXBL SILXXXML SILXXXNT SILXXXHL SILXXXNL SILXXXBK SILXXXNX SILXXXNU SILXXXHC SILXXXHN SILXXXBG SILXXXQD SILXXXQM

					SIL-xxxHC+, SIL-xxxHM. S-Energy: SL65-54BGJ-XXXV SL65-54BHJ-XXXV Solaria: Solaria PowerXT-XXXR-PX Solaria PowerXT-XXXR-BX Solaria PowerXT-XXXR-AC Solaria PowerXT-XXXR-PM Solaria PowerXT-XXXR-PM-AC SolarJuice (Solar4America) S4AXXX72H5BB, S4AXXX72H5BW, S4AXXX72M5BB, S4AXXX72M5BW, where XXX is 375-420. S4AXXX60M5BB, S4AXXX60M5BW, S4AXXX60H5BB, S4AXXX60H5BW, where XXX is 320-345. S4AXXX-108MH10SB, S4AXXX-108MH10SW, S4AXXX-108MH10BB, S4AXXX-108MH10BW, Where XXX is 385-410. S4AXXX-108TH10BB where XXX is 425 to 440 S4AXXX-144MH10STT, S4AXXX-144MH10BTT, where XXX is 530-565. S4AXXX-144TH10STT S4AXXX-144TH16STT where XXX is 565 to 590 SolarWorld: SWXXX-Mono SWXXX-Mono XL Suniva: MVX-XXX-60-5-701 MVX-XXX-60-5-7B1 OPT-XXX-60-4-100 OPT-XXX-60-4-1B0 OPT-XXX-60-4-800 OPT-XXX-60-4-8B0 Sunpower: SPR-EYY-XXX SPR-EYY-XXX SPR-XYY-XXX SPR-XYY-XXX SPR-AXXX-G-AC SPR-AXXX SPR-AXXX-BLK-G-AC SPR-AXXX-BLK SPR-MXXX-H-AC SPR-MXXX

					SPR-MXXX-BLK-H-AC SPR-MXXX-BLK SunSpark: SST-XXXM3-60 SST-XXXM3B-60 SST-XXXM3-72 SST-XXXM3B-72 Talesun: TP660M-XXX TP660P-XXX TP672M-XXX TP672P-XXX Tesla: TXXXS TXXXH Trina: TSM-XXXDD05(II) TSM-XXXDD05A.05(II) TSM-XXXDD05A.08(II) TSM-XXXDD05A.082(II) TSM-XXXPA05 TSM-XXXPA05.05 TSM-XXXPA05.08 TSM-XXXPD05 TSM-XXXPD05.002 TSM-XXXPD05.05 TSM-XXXPD05.05S TSM-XXXPD05.08 TSM-XXXPD05.082 TSM-XXXPD05.08D TSM-XXXPD05.08S TSM-XXXDD05H.05(II) TSM-XXXDD06M.05(II) TSM-XXXDE15H(II) TSM-XXXDE15M(II) TSM-XXXDE06X.05(II) TSM-XXXDE09.05 TSM-XXXDE15V(II) TSM-XXXDE19 TSM-XXXDEG15VC.20(II) TSM-XXXDEG18MC.20(II) TSM-XXXDEG19C.20 TSM-XXXDEG21C.20 TSM-XXXDE09C.05 TSM-XXXDE09C.07 URECO FAMxxxE7G-BB FBMxxxMFG-BB Vikram Solar: Somera VSMHBB.60.XXX.05 SOMERA VSMH.72.XXX.05 PREXOS VSMDHT.60.XXX.05 PREXOS VSMDHT.72.XXX.05 VSUN Solar: VSUNXXX-144BMH-DG,

				VSUNXXX-120BMH, VSUNXXX-108BMH VSUNXXX-132BMH where xxx is 475-520 Yingli: YLXXXA-29b YLXXXP-29b ZNShine: ZXM6-60-XXX/M ZXM6-NH120-XXXM, ZXM6-NH144-XXXM ZXM7-SH108-XXX/M **ZXM7-SHLDD144-XXX/M REC Solar, model RECxxxAA Pure-R, where xxx can be 390-430 REC Solar, model RECxxxNP3, where xxx can be 380-410 Trina Solar, model TSM-xxxNE09RC.05, where xxx can be 365-430 Aptos Solar, model DNA-108-MF10-xxxW, where xxx can be 390-415 NRTL Listed Module Level Power Electronics: Rapid Shutdown Devices: AP Smart: Model RSD-S-PLC Celestica International: DG-006-F001201x DG-006-F001401x Delta Electronics: GPI00010105 Ginlong Technologies: Solis-RSD-1G Solis-MLRSD-R1-1G Solis-MLRSD-R2-1G SMA: RSB-2S-US-10 Microinverters: Enphase: M250 M215 C250 IQ6-60-2-US IQ6PLUS-72-2-US IQ7-60-2-US

UR-45 Mounting and Bonding System for use with Photovoltaic Modules. All components are interchangeable between the UR-40 and UR-45 except for the UR-45 specific UR-45 Rail.	Y*	Y – Minimum mechanical load ratings defined by UL 2703 for all modules listed	Y – Class A with and without skirt assembly for Type 1, Type 2 and Type 29 modules	IQ7-60-B-US IQ7PLUS-72-2-US IQ7PLUS-72-B-US IQ8-60 IQ8PLUS-72 IQ8A-72 IQ8H-208-72 IQ8H-240-72 Optimizers: Generac – Optimizer model S2502 Lunar Energy – Lunar Optimizer SolarEdge: P300-5NC4ARS P320-5NC4ARS P370-5NC4AFS P400-5NC4AFS P320 P340 P370 P400 P401 P405 P485 P505 P730 P800p P850 P860 P950 S440 S500 P1100 P1101 Monitoring Devices: Tigo: TS4-R-F TS4-R-M TS4-R-O TS4-R-S TS4-R-M-DUO TS4-R-O-DUO TS4-R-S-DUO TS4-A-F TS4-A-2F TS4-A-O TS4-A-S Philadelphia Solar: **PS-M144(HCBF)-XXXW PS-M108(HCBF)0XXXW PS-M108(HC)-XXXW PS-M144(HC)-XXXW Thornova:	

TS-BB54(XXX)
TS-BB60(XXX)
**TS- BG54(XXX)
TS-BG60(XXX)
**TS-BG72(XXX)

MightyMount Comp-S consisting of the following: Comp-S Track, Ultra Rail Mid Clamp, Ultra Rail End Clamp, Wire Management Clips, Ground Lugs, MLPE Rail Attachment Kit and MLPE Frame Attachment Kit.	Y	N	Y – Class A with and without skirt assembly for Type 1, Type 2 and Type 29 modules

MightyMount – Metal-T consisting of the following: Track, Short Leg, Tall Leg, Pinned Channel Nut, Ultra Rail Mid Clamp, Ultra Rail End Clamp, Wire Management Clips, Ground Lugs, MLPE Rail Attachment Kit and MLPE Frame Attachment Kit, OmniShield.	Y	N	Y – Class A when mounted with Type 1, 2 or 3 modules per Exception of 11.1 of UL 2703	Listed PV Modules, where XXX is the wattage value. All wattage values are covered: Aptos Solar: DNA-120-MF23-XXX DNA-120-BF23-XXX DNA-144-MF23-XXX DNA-144-BF23-XXX DNA-120-MF26-XXXW, DNA-120-MF26-XXXW, DNA-144-MF26-XXXW DNA-120-BF26-XXXW DNA-144-BF26-XXXW Boviet Solar: BVM6610P-XXX BVM6610M-XXX BVM6612P-XXX BVM6612M-XXX BVM7612M-XXX-H-HC-BF-DG Canadian Solar: CS6K-XXX-M CS6K-XXX-M-SD CS6K-XXX-P CS6K-XXX-P-SD CS6K-XXX-MS CS6P-XXX-M CS6P-XXX-P CS6P-XXX-P-SD CS6V-XXX-M CS3W-XXX-P CS6V-XXX-P CS6X-XXX-P CS3K-XXX-P CS3K-XXX-MS CS3U-XXX-MS CS3U-XXX-P CS1K-XXX-MS CS1H-XXX-MS CS1H-XXX-MS-AB CS3N-XXX-MS CS1Y-XXX-MS CS6.1-54TM-XXXH CS3W-XXXMB-AG CS3Y-XXXMB-AG CS6W-XXXMB-AG CS6R-XXXMS-HL CS3W-xxxMS CS3W-xxxP, where xxx is 385 to 450 CertainTeed - CTXXXHC11-06, CTXXXHC11-06, CTM10XXXHC11-06 Chint Solar: CHSM6612M-XXX CHSM6612M/HV-XXX CHSM6612M(BL)-XXX **CHSM72M-HC-XXX (Astro 4) **CHSM72M-HC-XXX (Astro 5)

					Crossroads Solar: Crossroads Solar xxx Dehui Solar: DH-M760B-XXXW DH-M760W-XXXW DH-M772W-XXXW DH-M760F-XXXW DH-M772F-XXXW ET Solar: ET-P660XXXBB ET-P660XXXWB ET-P660XXXWW ET-P660XXXWWG P660XXXWB/WW P660XXXWWG M660XXXBB M660XXXWW Freedom Forever Procurement: FF-MP-BBB-xxx, where xxx is 365 to 410. Hansol Technics HAXXXAA-NNEA0 where XXX is 420 to 440 Hanwha/Q Cells: Q.PEAK BLK-G3.1-XXX Q.PEAK G3.1-XXX Q.PLUS BFR-G3.1-XXX B.LINE PLUS BFR-G4.1-XXX B.LINE PRO BFR-G4.1-XXX Q.BASE GY-XXX Q.PEAK BFR-G4-XXX Q.PEAK BFR-G4.1-XXX Q.PEAK BLK-G4.1-XXX Q.PEAK BLK-G4.1/TAA-XXX Q.PEAK G4-XXX Q.PEAK G4.1-XXX Q.PEAK G4.1/MAX-XXX Q.PEAK G4.1/TAA-XXX Q.PLUS BFR-G4-XXX Q.PLUS BFR-G4.1-XXX Q.PLUS BFR-G4.1/TAA-XXX Q.PLUS G4-XXX Q.PLUS GY-XXX Q.PLUS BFR-GY-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-XXX Q.PRO G4-XXX Q.PRO GY-XXX Q.PRO GY/SC-XXX Q.PEAK DUO-G6+-XXX Q.PEAK DUO-BLK-G6+-XXX Q.PEAK DUO-G6-XXX Q.PEAK DUO-BLK-G6-XXX Q.PEAK DUO-G8+-XXX Q.PEAK DUO-BLK-G8+-XXX

					Q.PEAK DUO-G8-XXX
					Q.PEAK DUO-BLK-G8-XXX
					Q.PLUS L-G4-XXX
					Q.PLUS L-G4.1-XXX
					Q.PLUS L-G4.2-XXX
					Q.PEAK L-G4.1-XXX
					Q.PEAK L-G4.2-XXX
					Q.PLUS DUO-L-G5-XXX
					Q.PLUS DUO-L-G5.1-XXX
					Q.PLUS DUO-L-G5.2-XXX
					Q.PLUS DUO-L-G5.3-XXX
					Q.PEAK DUO-L-G5.2-XXX
					Q.PEAK DUO-L-G5.3-XXX
					Q.PEAK DUO-L-G7-XXX
					Q.PEAK DUO-L-G7.1-XXX
					Q.PEAK DUO-L-G7.2-XXX
					Q.PEAK DUO-L-G7.3-XXX
					Q.PEAK DUO-L-G6-XXX
					Q.PEAK DUO-L-G6.2-XXX
					Q.PEAK DUO-L-G6.3-XXX
					Q.PEAK DUO-L-G8-XXX
					Q.PEAK DUO-L-G8.1-XXX
					Q.PEAK DUO-G5-XXX
					Q.PEAK DUO-BLK-G5-XXX
					Q.PLUS DUO-G5-XXX
					Q.PEAK DUO-G7-XXX
					Q.PEAK DUO-BLK-G7-XXX
					Q.PEAK DUO-G7.2-XXX
					Q.PEAK DUO BLK-G6+/AC-XXX
					Q.PEAK DUO-ML-G9-XXX
					Q.PEAK DUO BLK-G5/TS-XXX
					Q.PEAK DUO G6+/TS-XXX
					Q.PEAK DUO BLK-G6+/TS-XXX
					Q.PEAK DUO XL-G9.3-XXX
					Q.PEAK DUO-L-G8.2-XXX
					Q.PEAK DUO-L-G8.3-XXX
					Q.PEAK DUO-G5/SC-XXX
					Q.PEAK DUO-BLK-G5/SC-XXX
					Q.PEAK DUO-G6+/SC-XXX
					Q.PEAK DUO-BLK-G6+/SC-XXX
					Q.PEAK DUO-BLK-ML-G9-XXX
					Q.PEAK DUO-G5/TS-XXX
					Q.PEAK DUO-G6/TS-XXX
					Q.PEAK DUO BLK-G6/TS-XXX
					Q.PEAK DUO XL-G9.2-XXX
					Q.PEAK DUO BLK-G9-XXX
					Q.PEAK DUO ML-G9+-XXX
					Q.PEAK DUO BLK-G9+-XXX
					Q.PEAK DUO BLK ML-G9+-XXX
					Q.PEAK DUO XL-G10.2-XXX
					Q.PEAK DUO XL-G10.3-XXX
					Q.PEAK DUO XL-G10.d-XXX
					Q.PEAK DUO L-G8.3/BGT-XXX
					Q.PEAK DUO BLK ML-G10+-XXX
					Q.PEAK DUO BLK ML-G10-XXX
					Q.PEAK DUO BLK ML-G10.a+-XXX
					Q.PEAK DUO BLK ML-G10.a-XXX
					Q.PEAK DUO XL-G9.3/BFG-XXX
					Q.PEAK DUO XL-G10.3/BFG-XXX
					Q.PEAK DUO XL-G10.c-XXX
					Q.PEAK DUO L-G8.3/BFG-XXX
					Q.TRON_XL-G2.3/BFG-XXX

					Q.PEAK DUO ML-G10-XXX Q.PEAK DUO ML-G10+-XXX Q.PEAK DUO ML-G10.a+-XXX Q.PEAK DUO ML-G10.a-XXX Q.PEAK DUO BLK ML-G10.a+/TS-XXX, Q.PEAK DUO G10-XXX, Q.PEAK DUO BLK-G10-XXX, Q.PEAK DUO G10+-XXX, Q.PEAK DUO BLK-G10+-XXX Q.TRON-G1+ XXX Q.TRON BLK-G1+ XXX Q.PEAK DUO BLK G10+/AC XXX Q.PEAK DUO BLK G10+/HL XXX Q.PEAK DUO XL-G11.3 XXX Q.PEAK DUO XL-G11.3 BFG XXX Q.Tron BLK M-G2+ XXX, Q.Tron M-G2+ XXX, Q.PEAK DUO BLK ML-G10+/t XXX Q.PEAK DUO XL-G10.d/BFG Q.TRON BLK M-G2+/AC XXX HT-SAAE: HT60-166M-XXX where XXX is 340-390; HT60-182M-XXX Hanwha Solar One: HSL60P6-PB-2-XXXQ HSL60P6-PB-4-XXXQ Heliene: 60M-XXX 60P-XXX 72M-XXX 72P-XXX Runergy: **HY-DH108N8 HY-DH108P8-XXX(Y) **HY-DH144N8 **HY-DH144P8 Hyundai: HiS-MXXXRG HiS-SXXXRG HiS-SXXXRW HiA-SXXXMS HiS-MXXXMG HiS-SXXXMG HiD-SXXXRG HiS-SXXXXY HiS-SXXXYI HiS-SxxxYH HiN-SxxxXG(BK) All may be followed by (BK) JA Solar: JAM6-60-XXX/SI JAP6-60-XXX/3BB JAM60S09-XXX/PR JAM60S10-XXX/MR JAM60S10-XXX/PR JAM60S12-XXX/PR

					JAM60S17-XXX/MR JAP72S01-XXX/SC JAM72S09-XXX/PR JAM72S10-XXX/MR JAM72S10-XXX/PR JAM72S12-XXX/PR JAP6(k)-72-XXX/4BB JAM54S30-XXX/MR where XXX is 400-410, JAM54S31-XXX/MR JAM72D30-XXX/MB JAM72D10-XXX/MB Jinko Solar: JKMXXXM-60 JKMXXXP-60 JKMXXXP-60-J4 JKMXXXP-60-V JKMXXXP-60B-J4 JKMXXXPP-60 JKMXXXPP-60-V JKMXXXM-60HL JKMXXXM-60L JKMXXXM-60HBL JKMXXXM-72 JKMXXXP-72 JKMXXXP-72-V JKMXXXPP-72 JKMXXXPP-72-V JKMSXXXP-72 JKMXXXM-72HL-V JKMXXXM-72HL-TV JKMXXXM-72L-V JKMXXXM-72HBL JKMXXXM-6TL3-B JKMXXXM-6RL3-B JKMXXXM-7RL3-V JKMXXXM-7RL3-TV JKMXXXM-72HL4-V JKMXXXM-72HL4-TV JKMXXXN-54HL4-B KB Solar LLC: MODULE-KBS-375-MONO MODULE-KBS-375-MONO-BF MODULE-KBS-450-MONO MODULE-KBS-450-MONO-BF Kyocera: KUXXX-6YYY KUXXX-8YYY LG: LGXXXN1C-A5 LGXXXN1K-A5 LGXXXQ1C-A5 LGXXXQ1K-A5 LGXXXS1C-A5 LGXXXN2C-B3 LGXXXN2W-B3 LGXXXN1C-G4 LGXXXN1K-G4

LGXXXS1C-G4
LGXXXN2C-G4
LGXXXN2K-G4
LGXXXN2W-G4
LGXXXS2C-G4
LGXXXS2W-G4
LGXXXN1C-V5
LGXXXN1W-V5
LGXXXN2T-V5
LGXXXN2T-J5
LGXXXN1T-V5
LGXXXA1C-V5
LGXXXM1C-L5
LGXXXN1C-N5
LGXXXM1K-L5
LGXXXN1K-L5
LGXXXN1C-A6
LGXXXQ1C-A6
LGXXXM1K-A6
LGXXXA1C-A6
LGXXXN1K-A6
LGXXXN1W-A6
LGXXXQ1K-A6
LGXXXM1C-A6
LGXXXQAK-A6
LGXXXN2W-E6
LGXXXN1K-E6
LGXXXQAC-A6
LGXXXN1K-B6
LGXXXN2T-E6
LGXXXN3K-V6

Longi:
LR6-60-XXXM
LR6-60BK-XXXM
LR6-60HV-XXXM
LR6-60PB-XXXM
LR6-60PE-XXXM
LR6-60PH-XXXM
LR6-60HPB-XXXM
LR6-60HPH-XXXM
LR4-72HPH-XXXM
LR4-60HIB-XXXM
LR4-60HIH-XXXM
LR4-60HPB-XXXM
LR4-60HPH-XXXM
LR6-60HIB-XXXM
LR6-60HIH-XXXM
LR5-54HPB-XXXM
LR5-54HABB-XXXM

Maxeon Solar Technologies, LTD.
SPR-MAX3-XXX-BLK-R where xxx is 395-420
Meyer Burger:
Meyer Burger Black **
Meyer Burger White **

Mission Solar:
MSEXXXSO5T
MSEXXXSO5K
MSEXXXSQ5T

TopRail Mounting System USL/CNL - Photovoltaic Mounting System: Model "TopRail" Mounting and Bonding Systems for use with Photovoltaic Modules, consisting of the following components: UR-40/45/60 Rail, Ultra Rail End Clamp, Ultra Rail Mid Clamp, RL RL Universal Link Assembly, Ground Lug, and MLPE Frame Attachment Kit.	Y	N	Y – Class A for Type 1, Type 2, and Type 29 modules.	MSEXXXSQ5K MSEXXXMM4J MSEXXXMM6J MSEXXXSO6W MSEXXXSO4J MSEXXXSO6J MSEXXXSQ6S MSEXXXSQ4S MSEXXXSR8K MSEXXXSR8T MSEXXXSR9S MSE60AXXX MSEXXXTS60 MSEXXXSX5K MSEXXXSX5T MSEXXXSX6S MSEXXXSX6W TXI6-XXX120BB MSExxxSX5R, where xxx is 375 to 390 TXI10-XXX108BB MSEXXXHT0B where XXX is 390 to 410 MSEXXXSX9R where XXX is 380 to 400 Mitrex Inc: Mxxx-I3H Next Energy Alliance: USNEA-XXXM3-60 USNEA-XXXM3B-60 USNEA-XXXM3-72 USNEA-XXXM3B-72 Panasonic: VBHNXXXKA01 VBHNXXXKA02 VBHNXXXSA16 VBHNXXXKA03 VBHNXXXKA04 VBHNXXXSA17 VBHNXXXSA18 VBHNXXXSA17E VBHXXXRA18N VBHXXXRA03K EVPVXXX(K) EVPKXXXPK EVPVXXXHK EVPVXXXHK2 where XXX is 420 to 430 Phono Solar: PSXXXM-20/U PSXXXMH-20/U PSxxxM8GF-24/TH where xxx is 520 to 550, PSxxxM8GFH-24/TH, where xxx is 520 to 550, PSxxxM8GF-18/VH, where xxx is 390 to 410, PSxxxM8GFH-18/VH, where xxx is 390 to 410, PSxxxM6-24/TH, where xxx is 510 to 550. REC:

					RECXXXPE RECXXXPE-BLK RECXXXTP RECXXXTP-BLK RECXXXTP IQ RECXXXTP2 RECXXXTP2-BLK RECXXXNP RECXXXTP2M RECXXXTP72 RECXXXPE72 RECXXXPE72XV RECXXXTP2M 72 RECXXXTP2M 72 BLK RECXXXTP2M 72 BLK2 RECXXXTP2SM 72 RECXXXTP2SM 72 BLK RECXXXTP2SM 72 BLK2 RECXXXTP2SM 72 BLK2 RECXXXAA RECXXXTP3 RECXXXTP3M RECXXXTP4 RECXXXAA Pure RECXXXNP2 RECxxxAA PURE 2 RECxxxAA PURE-RX - All may be followed by BLK or BLACK Renesola: JCXXXM-24/Bb JCXXXM-24/BBh SEG Solar: SEG-XXX-BMB-HV, SEG-xxx-BMB-TB SEG-xxx-BMD-HV & SEG-xxx-BMD-TB, where xxx can be 370-425 SEG-XXX-BTD-BG where xxx is 420-435 Silfab: SLAXXX-M SLAXXX-P SSAXXX-M SSAXXX-P SLGXXX-M SLGXXX-P SSGXXX-M SSGXXX-P SILXXXBL SILXXXML SILXXXNT SILXXXHL SILXXXNL SILXXXBK SILXXXNX SILXXXNU SILXXXHC SILXXXHN SILXXXBG SILXXXQD

					SILXXXQM SIL-xxxHC+, SIL-xxxHM. S-Energy: SL65-54BGJ-XXXV SL65-54BHJ-XXXV SL65-54TEP-XXXV Solaria: Solaria PowerXT-XXXR-PX Solaria PowerXT-XXXR-BX Solaria PowerXT-XXXR-AC Solaria PowerXT-XXXR-PM Solaria PowerXT-XXXR-PM-AC SolarWorld: SWXXX-Mono SWXXX-Mono XL SolarJuice (Solar4America) S4AXXX72H5BB, S4AXXX72H5BW, S4AXXX72M5BB, S4AXXX72M5BW, where XXX is 375-420. S4AXXX60M5BB, S4AXXX60M5BW, S4AXXX60H5BB, S4AXXX60H5BW, where XXX is 320-345 S4AXXX-108MH10SB, S4AXXX-108MH10SW, S4AXXX-108MH10BB, S4AXXX-108MH10BW, Where XXX is 385-410. S4AXXX-108TH10BB, where XXX is 425 to 440. S4AXXX-144MH10STT, S4AXXX-144MH10BTT, where XXX is 530-565. S4AXXX-144TH10STT, S4AXXX-144TH16STT, where XXX is 565 to 590. Suniva: MVX-XXX-60-5-701 MVX-XXX-60-5-7B1 OPT-XXX-60-4-100 OPT-XXX-60-4-1B0 OPT-XXX-60-4-800 OPT-XXX-60-4-8B0 Sunpower: SPR-EYY-XXX SPR-EYY-XXX SPR-XYY-XXX SPR-XYY-XXX SPR-AXXX-G-AC SPR-AXXX SPR-AXXX-BLK-G-AC SPR-AXXX-BLK

					SPR-MXXX-H-AC SPR-MXXX SPR-MXXX-BLK-H-AC SPR-MXXX-BLK SunSpark: SST-XXXM3-60 SST-XXXM3B-60 SST-XXXM3-72 SST-XXXM3B-72 Talesun: TP660M-XXX TP660P-XXX TP672M-XXX TP672P-XXX Tesla: TXXXS TXXXH Trina: TSM-XXXDD05(II) TSM-XXXDD05A.05(II) TSM-XXXDD05A.08(II) TSM-XXXDD05A.082(II) TSM-XXXPA05 TSM-XXXPA05.05 TSM-XXXPA05.08 TSM-XXXPD05 TSM-XXXPD05.002 TSM-XXXPD05.05 TSM-XXXPD05.05S TSM-XXXPD05.08 TSM-XXXPD05.082 TSM-XXXPD05.08D TSM-XXXPD05.08S TSM-XXXDD05H.05(II) TSM-XXXDD06M.05(II) TSM-XXXDE15H(II) TSM-XXXDE15M(II) TSM-XXXDE06X.05(II) TSM-XXXDE09.05 TSM-XXXDE15V(II) TSM-XXXDE19 TSM-XXXDEG15VC.20(II) TSM-XXXDEG18MC.20(II) TSM-XXXDEG19C.20 TSM-XXXDEG21C.20 TSM-XXXDE09C.05 TSM-XXXDE09C.07 URECO FAMxxxE7G-BB FBMxxxMFG-BB Vikram Solar: Somera VSMHBB.60.XXX.05 SOMERA VSMH.72.XXX.05 PREXOS VSMDHT.60.XXX.05 PREXOS VSMDHT.72.XXX.05

					VSUN Solar: VSUNXXX-144BMH-DG, VSUNXXX-120BMH, VSUNXXX-108BMH Yingli: YLXXXA-29b YLXXXP-29b ZNShine: ZXM6-60-XXX/M ZXM6-NH120-XXXM, ZXM6-NH144-XXXM ZXM7-SH108-XXX/M **ZXM7-SHLDD144-XXX/M REC Solar, model RECxxxAA Pure-R, where xxx can be 390-430 REC Solar, model RECxxxNP3, where xxx can be 380-410 Trina Solar, model TSM-xxxNE09RC.05, where xxx can be 365-430 Aptos Solar, model DNA-108-MF10-xxxW, where xxx can be 390-415 NRTL Listed Module Level Power Electronics: Rapid Shutdown Devices: AP Smart: Model RSD-S-PLC Celestica International: DG-006-F001201x DG-006-F001401x Delta Electronics: GPI00010105 Ginlong Technologies: Solis-RSD-1G Solis-MLRSD-R1-1G Solis-MLRSD-R2-1G SMA: RSB-2S-US-10 Microinverters: Enphase: M250 M215 C250 IQ6-60-2-US IQ6PLUS-72-2-US

IQ7-60-2-US
IQ7-60-B-US
IQ7PLUS-72-2-US
IQ7PLUS-72-B-US
IQ8-60
IQ8PLUS-72
IQ8A-72
IQ8H-208-72
IQ8H-240-72

Optimizers:

Generac – Optimizer model S2502

Lunar Energy – Lunar Optimizer

SolarEdge:
P300-5NC4ARS
P320-5NC4ARS
P370-5NC4AFS
P400-5NC4AFS
P320
P340
P370
P400
P401
P405
P485
P505
P730
P800p
P850
P860
P950
S440
S500
P1100
P1101

Monitoring Devices:

Tigo:
TS4-R-F
TS4-R-M
TS4-R-O
TS4-R-S
TS4-R-M-DUO
TS4-R-O-DUO
TS4-R-S-DUO
TS4-A-F
TS4-A-2F
TS4-A-O
TS4-A-S

Philadelphia Solar:
**PS-M144(HCBF)-XXXW
PS-M108(HCBF)0XXXW

PS-M108(HC)-XXXW
PS-M144(HC)-XXXW

					Thornova: TS-BB54(XXX) TS-BB60(XXX) **TS- BG54(XXX) TS-BG60(XXX) **TS-BG72(XXX)

RL Universal Mounting System USL - Mounting and Bonding Systems for use with Photovoltaic Modules, consisting of the following components: Mount Assembly, Ridge Mount Assembly, Umbrella Flashing Assembly, SpeedSeal Track Assembly, SpeedSeal Decktrack Assembly, Link Assembly, Wire Management Clips, Ground Lugs, MLPE Rail Attachment Kit and MLPE Frame Attachment Kit.	Y*	N	Y – Class A with and without skirt assembly for Type 1, Type 2 and Type 29 modules	Aptos Solar: DNA-120-MF23-XXX DNA-120-BF23-XXX DNA-144-MF23-XXX DNA-144-BF23-XXX DNA-120-MF26-XXXW, DNA-120-MF26-XXXW, DNA-144-MF26-XXXW DNA-120-BF26-XXXW DNA-144-BF26-XXXW DNA-120-BF10-xxx, where xxx is 435 to 455, DNA-108-BF10-xxx, where xxx is 385 to 410 Boviet Solar: BVM7612M-XXX-H-HC-BF-DG Canadian Solar: CS6K-XXX-M CS6K-XXX-M-SD CS6K-XXX-P CS6K-XXX-P-SD CS6K-XXX-MS CS3K-XXX-P CS3W-XXX-P CS3N-XXX-MS CS3K-XXX-MS CS3U-XXX-MS CS3U-XXX-P CS1K-XXX-MS CS1H-XXX-MS CS1H-XXX-MS-AB CS1Y-XXX-MS CS6.1-54TM-XXXH CS3W-XXXMB-AG CS3Y-XXXMB-AG CS6W-XXXMB-AG CS6R-XXXMS-HL CS3W-xxxMS CS3W-xxxP, where xxx is 385 to 450 CertainTeed CTXXXHC11-06, CTXXXHC11-06, CTXXXHC11-06 Chint Solar: CHSM6612M-XXX CHSM6612M/HV-XXX CHSM6612M(BL)-XXX **CHSM72M-HC-XXX (Astro 4) **CHSM72M-HC-XXX (Astro 5) Crossroads Solar: Crossroads Solar xxx Dehui Solar: DH-M760B-XXXW DH-M760W-XXXW DH-M772W-XXXW DH-M760F-XXXW DH-M772F-XXXW

					Freedom Forever Procurement: FF-MP-BBB-xxx, where xxx is 365 to 410. Hansol Technics HAXXXAA-NNEA0 where XXX is 420 to 440 Hanwha/Q Cells: Q.PEAK DUO-G5-XXX Q.PEAK DUO-BLK-G5-XXX Q.PLUS DUO-G5-XXX Q.PEAK DUO-G7-XXX Q.PEAK DUO-BLK-G7-XXX Q.PEAK DUO-G7.2-XXX Q.PEAK DUO-G6+-XXX Q.PEAK DUO-BLK-G6+-XXX Q.PEAK DUO-G6-XXX Q.PEAK DUO-XL-G9.3-XXX Q.PEAK DUO-BLK-G6-XXX Q.PEAK DUO-G8+-XXX Q.PEAK DUO-BLK-G8+-XXX Q.PEAK DUO-G8-XXX Q.PEAK DUO-BLK-G8-XXX Q.PEAK DUO BLK-G6+/AC-XXX Q.PEAK DUO-ML-G9-XXX Q.PEAK DUO-BLK-ML-G9-XXX 365-385 Q.PEAK DUO XL-G9.2-XXX Q.PEAK DUO BLK-G9-XXX Q.PEAK DUO ML-G9+-XXX Q.PEAK DUO BLK-G9+-XXX Q.PEAK DUO BLK ML-G9+-XXX Q.PEAK DUO XL-G10.2-XXX Q.PEAK DUO XL-G10.3-XXX Q.PEAK DUO XL-G10.d-XXX Q.PEAK DUO L-G8.3/BGT-XXX Q.PEAK DUO BLK ML-G10+-XXX Q.PEAK DUO BLK ML-G10-XXX Q.PEAK DUO BLK ML-G10.a+-XXX Q.PEAK DUO BLK ML-G10.a-XXX Q.PEAK DUO XL-G9.3/BFG-XXX Q.PEAK DUO XL-G10.3/BFG-XXX Q.PEAK DUO XL-G10.c-XXX Q.PEAK DUO L-G8.3/BFG-XXX Q.TRON_XL-G2.3/BFG-XXX Q.PEAK DUO ML-G10-XXX Q.PEAK DUO ML-G10+-XXX Q.PEAK DUO ML-G10.a+-XXX Q.PEAK DUO ML-G10.a-XXX, Q.PEAK DUO G10-XXX, Q.PEAK DUO BLK-G10-XXX, Q.PEAK DUO G10+-XXX, Q.PEAK DUO BLK-G10+-XXX Q.TRON-G1+ XXX Q.TRON BLK-G1+ XXX Q.PEAK DUO BLK G10+/AC XXX Q.PEAK DUO BLK G10+/HL XXX Q.PEAK DUO XL-G11.3 XXX Q.PEAK DUO XL-G11.3 BFG XXX Q.Tron BLK M-G2+ XXX, Q.Tron M-G2+ XXX, Q.PEAK DUO BLK ML-G10+/t XXX Q.PEAK DUO XL-G10.d/BFG

					Q .TRON BLK M-G2+/AC XXX HT-SAAE: HT60-166M-XXX where XXX is 340-390; HT60-182M-XXX Heliene: 60M-XXX 60P-XXX 72M-XXX 72P-XXX Runergy: HY-DH108N8-XXX HY-DH108P8-XXX(Y) HY-DH144N8-XXX HY-DH144P8-XXX Hyundai: HiA-SXXXMS HiS-SXXXXY HiS-SXXXYI HiS-SxxxYH HiN-SxxxXG(BK) All may be followed by (BK) JA Solar: JAM60S09-XXX/PR JAM72S09-XXX/PR JAM60S10-XXX/MR JAM72S10-XXX/MR JAM60S10-XXX/PR JAM72S10-XXX/PR JAM60S12-XXX/PR JAM72S12-XXX/PR JAM60S17-XXX/MR JAM54S30-XXX/MR where XXX is 400-410, JAM54S31-XXX/MR JAM72D30-XXX/MB JAM72D10-XXX/MB Jinko Solar: JKMXXXM-60 JKMXXXP-60 JKMXXXP-60-J4 JKMXXXP-60-V JKMXXXP-60B-J4 JKMXXXPP-60 JKMXXXPP-60-V JKMXXXM-60HL JKMXXXM-60L JKMXXXM-60HBL JKMXXXM-72 JKMXXXP-72 JKMXXXP-72-V JKMXXXPP-72 JKMXXXPP-72-V JKMSXXXP-72 JKMXXXM-72HL-V JKMXXXM-72HL-TV JKMXXXM-72L-V	

JKMXXXM-72HBL
JKMXXXM-6TL3-B
JKMXXXM-6RL3-B
JKMXXXM-7RL3-V
JKMXXXM-7RL3-TV
JKMXXXM-72HL4-V
JKMXXXM-72HL4-TV
JKMXXXN-54HL4-B

KB Solar LLC:
MODULE-KBS-375-MONO
MODULE-KBS-375-MONO-BF
MODULE-KBS-450-MONO
MODULE-KBS-450-MONO-BF

LG:
LGXXXN1C-A5
LGXXXN1K-A5
LGXXXQ1C-A5
LGXXXQ1K-A5
LGXXXS1C-A5
LGXXXN2C-B3
LGXXXN2W-B3
LGXXXN1C-G4
LGXXXN1K-G4
LGXXXS1C-G4
LGXXXN2C-G4
LGXXXN2K-G4
LGXXXN2W-G4
LGXXXS2C-G4
LGXXXS2W-G4
LGXXXN1C-V5
LGXXXN1W-V5
LGXXXN2T-V5
LGXXXN2T-J5
LGXXXN1T-V5
LGXXXA1C-V5
LGXXXM1C-L5
LGXXXN1C-N5
LGXXXN1C-A6
LGXXXQ1C-A6
LGXXXM1K-A6
LGXXXA1C-A6
LGXXXN1K-A6
LGXXXN1W-A6
LGXXXQ1K-A6
LGXXXM1C-A6
LGXXXQAK-A6
LGXXXN2W-E6
LGXXXN1K-E6
LGXXXQAC-A6
LGXXXN1K-B6
LGXXXN2T-E6
LGXXXN3K-V6

Longi:
LR6-60-XXXM
LR6-60BK-XXXM
LR6-60HV-XXXM
LR6-60PB-XXXM
LR6-60PE-XXXM
LR6-60PH-XXXM

					LR6-60HPB-XXXM LR6-60HPH-XXXM LR4-72HPH-XXXM LR4-60HIB-XXXM LR4-60HIH-XXXM LR6-60HIB-XXXM LR4-60HPB-XXXM LR4-60HPH-XXXM LR6-60HIH-XXXM LR5-54HPB-XXXM LR5-54HABB-XXXM Maxeon Solar Technologies, LTD. SPR-MAX3-XXX-BLK-R where xxx is 395-420 Meyer Burger: **Meyer Burger Black **Meyer Burger White Mission Solar: MSEXXXSO5T MSEXXXSO5K MSEXXXSQ5T MSEXXXSQ5K MSEXXXMM4J MSEXXXMM6J MSEXXXSO6W MSEXXXSO4J MSEXXXSO6J MSEXXXSQ6S MSEXXXSQ4S MSEXXXSR8K MSEXXXSR8T MSEXXXSR9S MSE60AXXX MSEXXXSX5T MSEXXXSX5K MSEXXXSX6W MSEXXXSX6S TXI6-XXX120BB MSExxxSX5R, where xxx is 375 to 390 TXI10-XXX108BB MSEXXXHT0B where XXX is 390 to 410 MSEXXXSX9R where XXX is 380 to 400 Mitrex Inc: Mxxx-I3H Next Energy Alliance: USNEA-XXXM3-60 USNEA-XXXM3B-60 USNEA-XXXM3-72 USNEA-XXXM3B-72 Panasonic: VBHNXXXKA03 VBHNXXXKA04 VBHNXXXSA17 VBHNXXXSA18 VBHNXXXSA17E

				VBHXXXRA18N VBHXXXRA03K EVPVXXX(K) EVPVXXXH EVPVXXXPK EVPVXXXHK EVPVXXXHK2 where XXX is 420 to 430 Phono Solar: PSXXXM-20/U PSXXXMH-20/U PSxxxM8GF-24/TH where xxx is 520 to 550, PSxxxM8GFH-24/TH, where xxx is 520 to 550, PSxxxM8GF-18/VH, where xxx is 390 to 410, PSxxxM8GFH-18/VH, where xxx is 390 to 410, PSxxxM6-24/TH, where xxx is 510 to 550. REC: RECXXXTP2 RECXXXTP2-BLK RECXXXTP2M RECXXXTP2M 72 RECXXXTP2M 72 BLK RECXXXTP2M 72 BLK2 RECXXXTP2SM 72 RECXXXTP2SM 72 BLK RECXXXTP2SM 72 BLK2 RECXXXAA RECXXXTP3M RECXXXNP RECXXXTP4 RECXXXAA Pure RECXXXNP2 RECxxxAA PURE 2 RECxxxAA PURE-RX - All may be followed by BLK or BLACK SEG Solar: SEG-XXX-BMB-HV, SEG-xxx-BMB-TB SEG-xxx-BMD-HV & SEG-xxx-BMD-TB, where xxx can be 370-425 SEG-XXX-BTD-BG where xxx is 420-435 Silfab: SLAXXX-M SLAXXX-P SSAXXX-M SSAXXX-P SLGXXX-M SLGXXX-P SSGXXX-M SSGXXX-P SILXXXBL SILXXXML SILXXXNT SILXXXHL SILXXXNL

TopSpeed Mounting System USL - Mounting and Bonding Systems for use with Photovoltaic Modules, consisting of the following components: Mount, Row Link, Skirt Assembly, Wire Management Clips, Ground Lugs, MLPE Frame Attachment Kit.	Y*	N	Y – Class A with and without skirt assembly for Type 1, Type 2 and Type 29 modules	SILXXXBK SILXXXNX SILXXXNU SILXXXHC SILXXXHN SILXXXBG SILXXXQD SILXXXQM SIL-xxxHC+ SIL-xxxHM S-Energy: SL65-54BGJ-XXXV SL65-54BHJ-XXXV Solaria: Solaria PowerXT-XXXR-PX Solaria PowerXT-XXXR-BX Solaria PowerXT-XXXR-AC Solaria PowerXT-XXXR-PM Solaria PowerXT-XXXR-PM-AC SolarJuice (Solar4America) S4AXXX72H5BB, S4AXXX72H5BW, S4AXXX72M5BB, S4AXXX72M5BW, where XXX is 375-420. S4AXXX60M5BB, S4AXXX60M5BW, S4AXXX60H5BB, S4AXXX60H5BW, where XXX is 320-345 S4AXXX-108MH10SB, S4AXXX-108MH10SW, S4AXXX-108MH10BB, S4AXXX-108MH10BW, Where XXX is 385-410. S4AXXX-108TH10BB, where XXX is 425 to 440. S4AXXX-144MH10STT, S4AXXX-144MH10BTT, where XXX is 530-565 S4AXXX-144TH10STT, S4AXXX-144TH16STT, where XXX is 565 to 590. SunPower: SPR-AXXX-G-AC SPR-AXXX SPR-AXXX-BLK-G-AC SPR-AXXX-BLK SPR-MXXX-H-AC SPR-MXXX SPR-MXXX-BLK-H-AC SPR-MXXX-BLK SunSpark: SST-XXXM3-60 SST-XXXM3B-60 SST-XXXM3-72 SST-XXXM3B-72

					Talesun: TP660M-XXX TP660P-XXX TP672M-XXX TP672P-XXX Trina: TSM-XXXDD05(II) TSM-XXXDD05A.05(II) TSM-XXXDD05A.08(II) TSM-XXXDD05A.082(II) TSM-XXXPA05 TSM-XXXPA05.05 TSM-XXXPA05.08 TSM-XXXPD05 TSM-XXXPD05.002 TSM-XXXPD05.05 TSM-XXXPD05.05S TSM-XXXPD05.08 TSM-XXXPD05.082 TSM-XXXPD05.08D TSM-XXXPD05.08S TSM-XXXDD05H.05(II) TSM-XXXDD06M.05(II) TSM-XXXDE15H(II) TSM-XXXDE15M(II) TSM-XXXDE06X.05(II) TSM-XXXDE09.05 TSM-XXXDE15V(II) TSM-XXXDE19 TSM-XXXDEG15VC.20(II) TSM-XXXDEG18MC.20(II) TSM-XXXDEG19C.20 TSM-XXXDEG21C.20 TSM-XXXDE09C.05 TSM-XXXDE09C.07 URECO FAMxxxE7G-BB FBMxxxMFG-BB Vikram Solar: SOMERA VSMHBB.60.XXX.05 SOMERA VSMH.72.XXX.05 PREXOS VSMDHT.60.XXX.05 PREXOS VSMDHT.72.XXX.05 VSUN Solar: VSUNXXX-144BMH-DG, VSUNXXX-120BMH, VSUNXXX-108BMH ZNShine: ZXM6-60-XXX/M ZXM6-NH120-XXXM, ZXM6-NH144-XXXM, ZXM7-SH108-XXX/M **ZXM7-SHLDD144-XXXM REC Solar, model RECxxxAA Pure-R,

					where xxx can be 390-430 REC Solar, model RECxxxNP3, where xxx can be 380-410 Trina Solar, model TSM-xxxNE09RC.05, where xxx can be 365-430 Aptos Solar, model DNA-108-MF10-xxxW, where xxx can be 390-415 NRTL Listed Module Level Power Electronics: Rapid Shutdown Devices: AP Smart: Model RSD-S-PLC Celestica International: DG-006-F001201x DG-006-F001401x Delta Electronics: GPI00010105 Ginlong Technologies: Solis-RSD-1G Solis-MLRSD-R1-1G Solis-MLRSD-R2-1G SMA: RSB-2S-US-10 Microinverters: Enphase: M250 M215 C250 IQ6-60-2-US IQ6PLUS-72-2-US IQ7-60-2-US IQ7-60-B-US IQ7PLUS-72-2-US IQ7PLUS-72-B-US IQ8-60 IQ8PLUS-72 IQ8A-72 IQ8H-208-72 IQ8H-240-72 Optimizers: Lunar Energy – Lunar Optimizer SolarEdge: P300-5NC4ARS P320-5NC4ARS

P370-5NC4AFS
P400-5NC4AFS
P320
P340
P370
P400
P401
P405
P485
P505
P730
P800p
P850
P860
P950
S440
S500
P1100
P1101

Monitoring Devices:

Tigo:
TS4-R-F
TS4-R-M
TS4-R-O
TS4-R-S
TS4-R-M-DUO
TS4-R-O-DUO
TS4-R-S-DUO
TS4-A-F
TS4-A-2F
TS4-A-O
TS4-A-S

Generac – Optimizer model S2502

Philadelphia Solar:
**PS-M144(HCBF)-XXXW
PS-M108(HCBF)0XXXW

PS-M108(HC)-XXXW
PS-M144(HC)-XXXW

:

Thornova:
TS-BB54(XXX)
TS-BB60(XXX)
**TS- BG54(XXX)
TS-BG60(XXX)
**TS-BG72(XXX)

Photovoltaic Ground Lug - Bolt-through Design - Tested in Combina

Cat. No.	Max OCPD (A)	Standard Mounting Hardware Provided	Investigated for Bonding	Investigated for Mounting	Mounting Surface Min Profile (w x l)	Mounting Surface Min Thk	Mounting Surface Max Thk	Mounting Surface Mtl	Mounting Surface Surface Prep	Mounting Screw Size	Mounting Screw Tightening Torque (lbs-in.)	Mounting-hole Range Min	Mounting-hole Range Max	Field-w Wire Type (Mtl)	Field-w Wir Typ
242-02101	20	Y	Y	N	1.5 in. x 1.5 in.	Mounted on Snapnrack Ground or Standard Rails		AL	Anodized	5/16-18	16	N/A	N/A	CU	Soli
242-92202	20	Y	Y	N	0.5 in. x 0.5 in	Mounted on RL Leverlock Slider Assembly Rails		AL	Anodized	5/16-18	8 ft-lb	N/A	N/A	CU	Soli

Photovoltaic Bonding Device: MLPE Frame Attachment Kit

Cat. No.	Max OCPD (A)	Frame Thickness Anodized AL (mm)	MLPE Thickness AL(mm)	MLPE Thickness SS 304 (mm)	MLPE Slot Width (mm)	Torque Value	Tested in Combination With:
242-02151	20	0.8 - 2.4	2.0 - 3.2	2.0	8.1 - 8.5	10 ft.lb.	PV Modules Described in Mounting Systems noted above with frame thickness limitations.

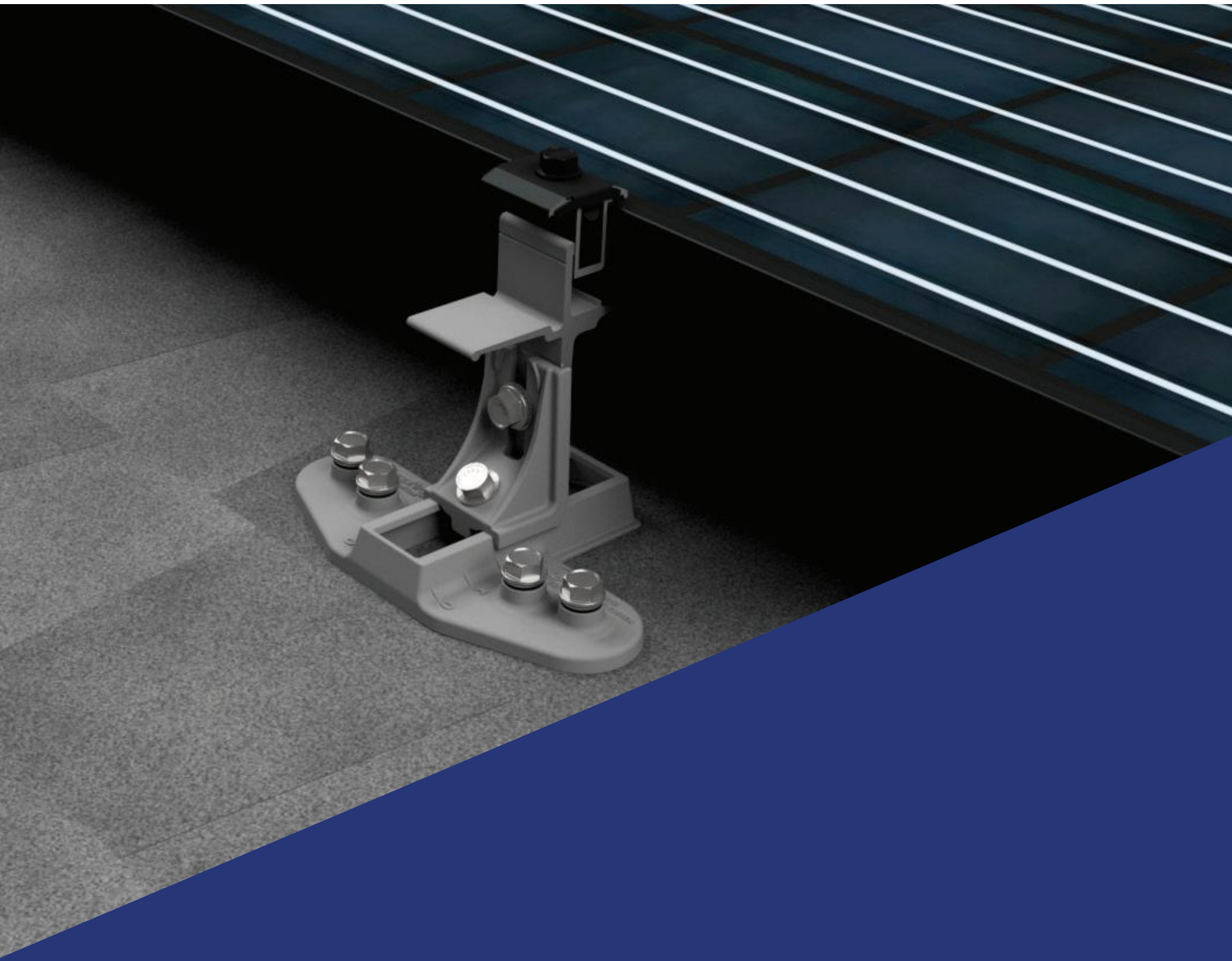
The following components have been tested for roof penetration utilizing the Wind-Driven Rain Test from UL Subject 2582:

Cat. No.	Tested with the Following Securement Means	Tested with the Following Seal/Sealant & Specific Location	Tested with the Following Roof Deck Construction
Photovoltaic mounting system component			
RL Universal Mounting System - Umbrella Bolt Flashing consisting of Composition flashing, Flash Track PRC, Flash Track End Caps, Umbrella Bolt; SpeedSeal Track.	Lag Bolt	No sealant	Asphalt shingles
UR-40 Mounting System - Consisting of the following components: Composition flashing, Umbrella L-foot, Umbrella Bolt; SpeedSeal Foot Assembly kit	Lag Bolt	No sealant	Asphalt shingles
UR-60 Mounting System - Consisting of the following components: Composition flashing, Umbrella L-foot, Umbrella Bolt, and SpeedSeal Foot Assembly kit	Lag Bolt	No sealant	Asphalt shingles

* - Not all components have been evaluated for bonding. See UL report and instruction manual for details.

**- Modules with this mark do not have the correct fire typing to meet system fire classification requirements.

Trademark and/or Tradename: "SNAPNRACK"



SnapNrack™

Solar Mounting Solutions

TopSpeed™ Mounting System

Installation Manual

snapnrack.com

An Intro to SnapNrack TopSpeed™ with SpeedSeal™ Technology

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

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

Advantages of Installing the SnapNrack TopSpeed™ System

Modules are installed with a minimum number of parts

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

Built in Wire Management and Aesthetics

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

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

SnapNrack TopSpeed™ includes SpeedSeal™ Technology

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

TopSpeed™ Mounts attach Directly to the Decking

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

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Certification Details

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

Grounding/Bonding

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

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

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

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

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

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

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

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

An alternate method of grounding, Enphase R/C (QIKH2)(QIMS2) model M250, M215 & C250 is bonded to the Listed PV module frame by the Enphase R/C (QIMS2) Model EFM-XXMM anodization piercing mounting/clamping kit. The total roof-mounted PV system is bonded (modules and microinverters) together and the assembly is bonded to ground through the Enphase R/C (QIMS2) Engage Cables; Model ETXX-240, ETXX-208 or ETXX-277, when properly grounded at the service entrance.
R/C (QIMS2), Dynoraxx (E357716) photovoltaic bonding device cat. no. Dynobond is an optional component that may be used with this system. The Dynobond device has been evaluated to provide module to module bonding. The Dynobond device attaches to the frame flange of adjacent modules Listed (QIMS), SnapNrack MLPE Frame Attachment Kit model 242-02151 has been investigated to bond approved MLPE device back plates to frames of modules.

Fire

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

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

Inspection Practices

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

Component Details

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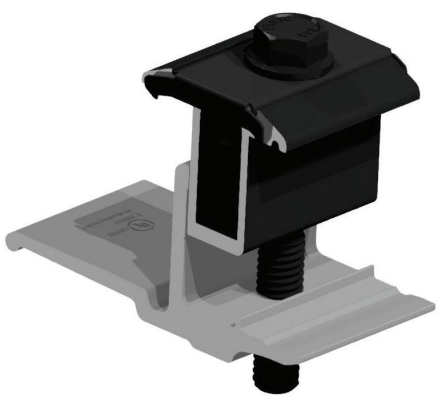
TopSpeed™ Structural Components

TopSpeed™ Mount

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



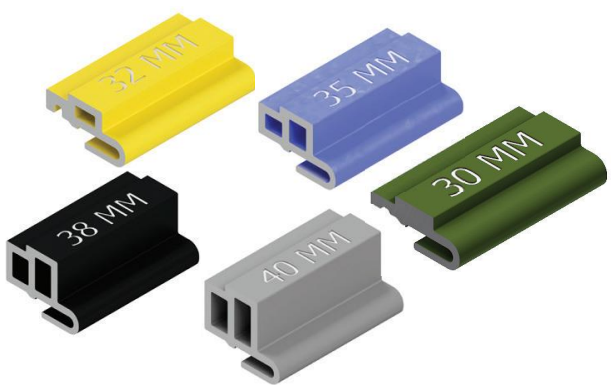
TopSpeed™ Clamp

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

Universal Skirt

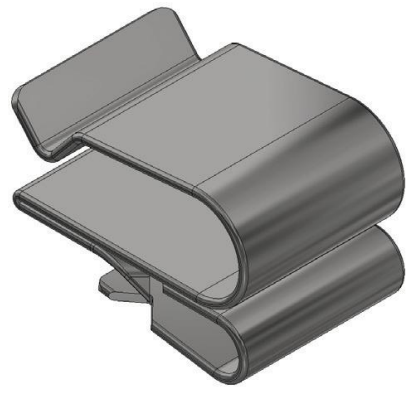
SnapNrack Universal Skirt in double portrait or single landscape lengths.

Wire Managements Components



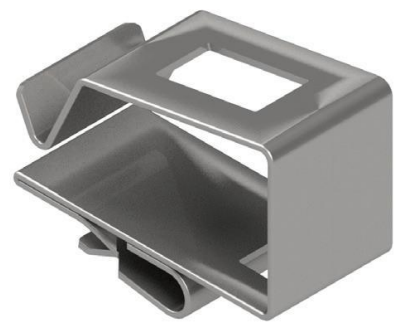
Skirt Spacers

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



Smart Clip

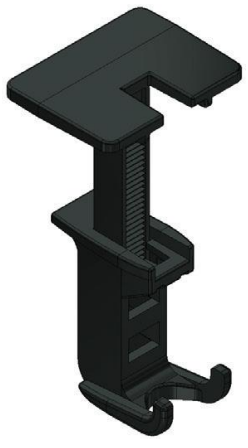
Module frame cable clip, holds two PV wires or Enphase IQ-Cables.



Smart Clip XL

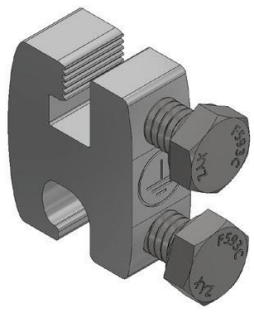
Module frame cable clip, holds six PV wires or four Enphase IQ-Cable.

Grounding/MLPE Components



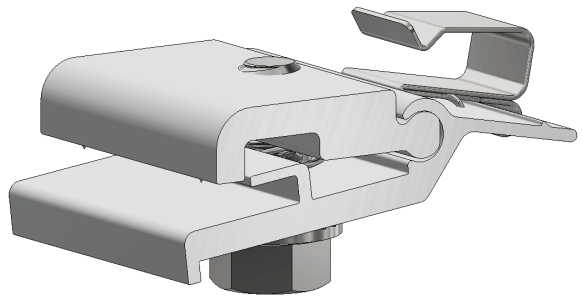
Wire Saver

Designed to secure conductors that become loose and hang below the array, holds one conductor.



Ground Lug

SnapNrack Ground Lug assembly used for attaching the Equipment Grounding Conductor on to one module or any TopSpeed™ Mount per array.



MLPE Frame Attachment Kit

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

Component Details

Hardware Torque Specifications

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

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

Pre-Installation Requirements

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Site Survey

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

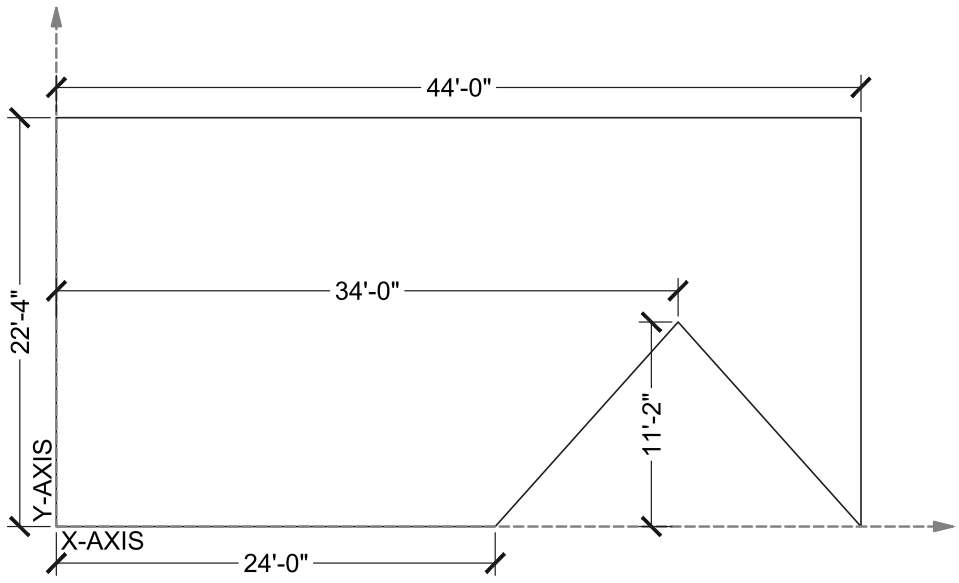
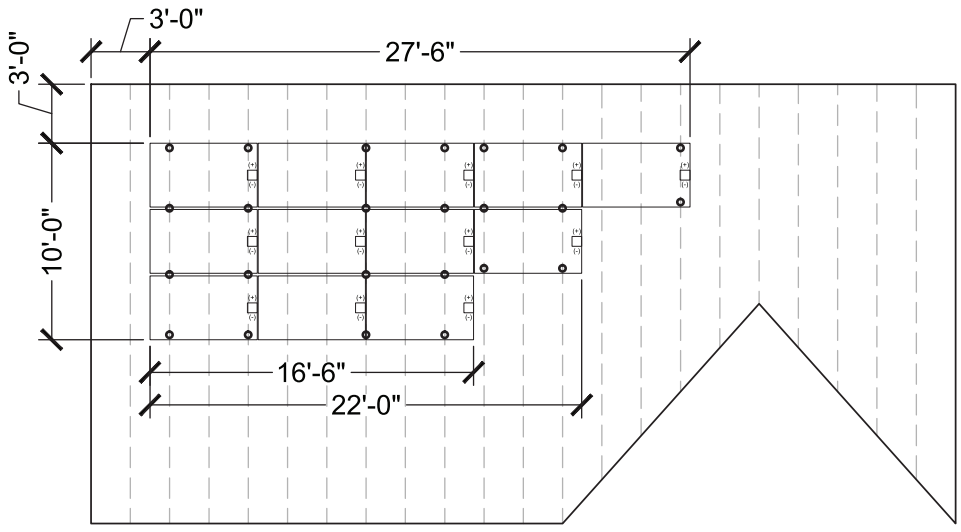


Image note: X-Axis described in this manual is cross-slope on the roof, Y-Axis is in line with the roof slope.

Design Guidance

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



Best Practice:

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

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

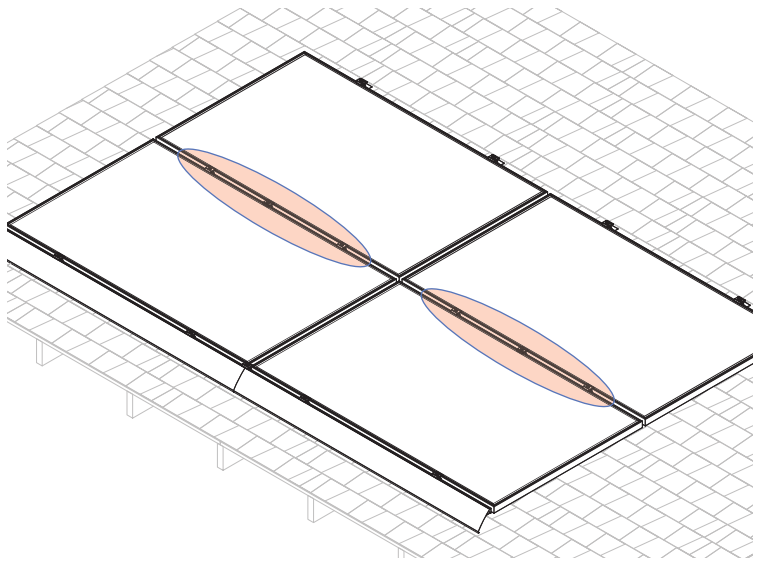


Image note: This four module array is installed in a high load configuration with three attachments per side where two modules share attachments. See highlighted area. As shown, three attachments are never required at the skirt or the top of the array.

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 Guidance Continued

- **Safety equipment should be checked periodically for wear and quality issues.**
- **Always wear proper eye protection when required.**

TopSpeed™ Mount to Module Frame Installation

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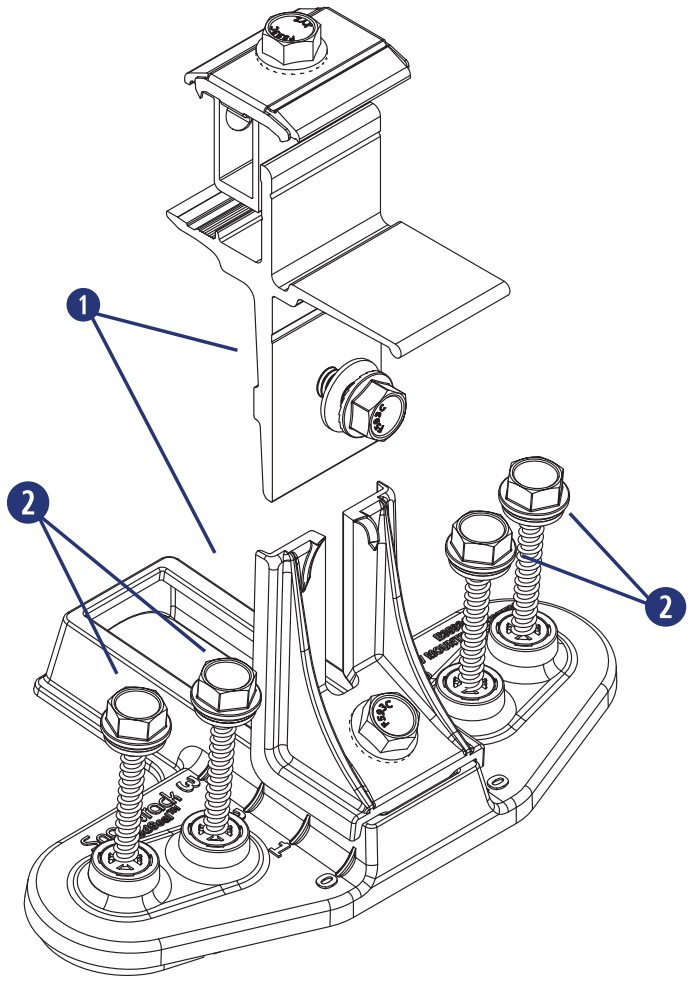
Required Tools

- Socket Wrench/Impact Driver
- Torque Wrench
- 1/2” Socket

Materials Included - TopSpeed™ System with SpeedSeal™ Technology

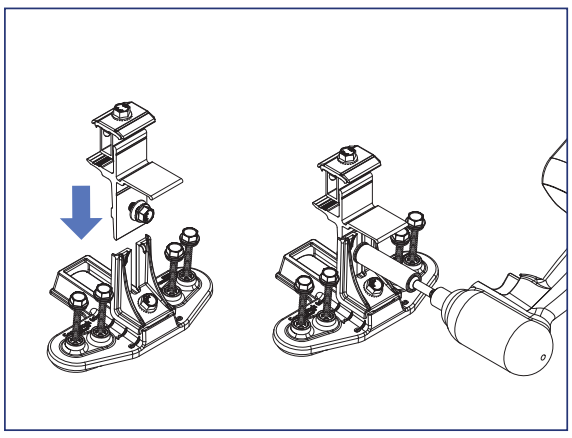
1. (1) SnapNrack TopSpeed™ Mount
2. (4) SnapNrack #14 Wood Screw with 1/2" Hex Head & sealing washer



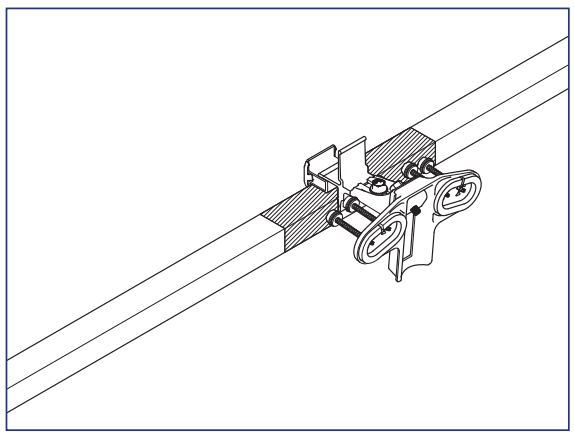
Best Practice:

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

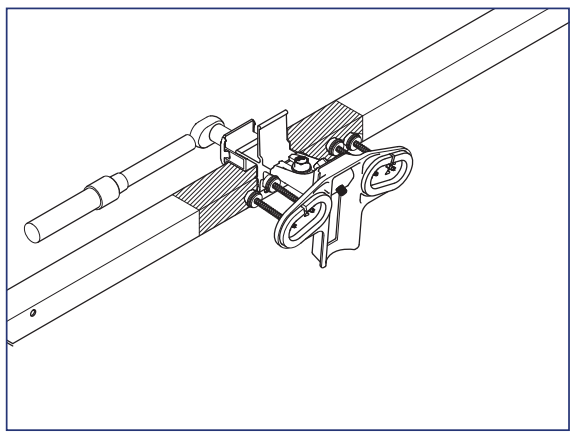
INSTALLATION INSTRUCTIONS



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



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



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

Install Note:

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

TopSpeed™ Universal Skirt Layout

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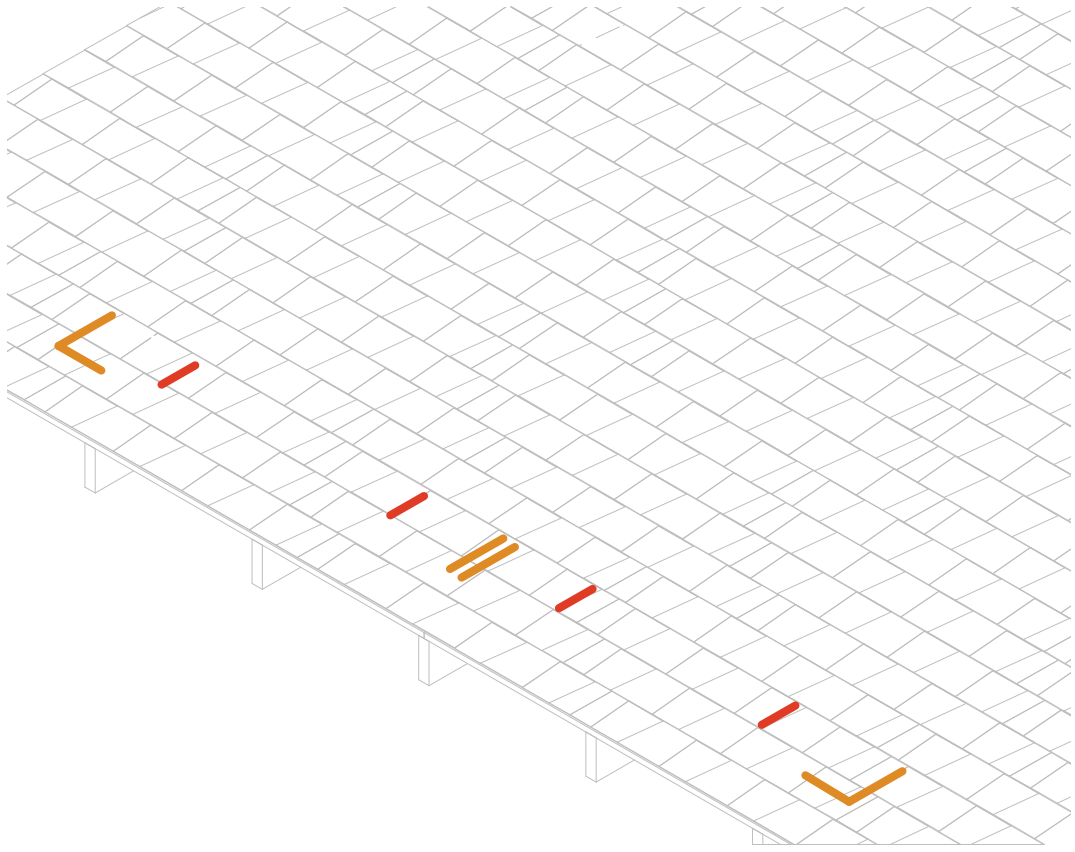
Required Tools

- Roof Marking Crayon or Chalk
- Tape Measure

LAYOUT INSTRUCTIONS

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

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



Install Note:

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

TopSpeed™ Mount: Skirt Installation

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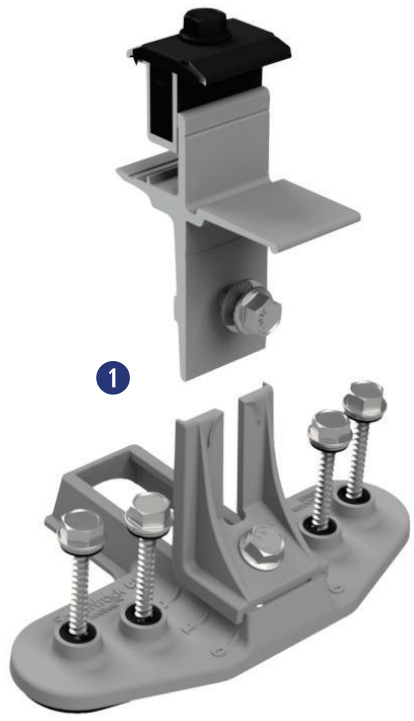
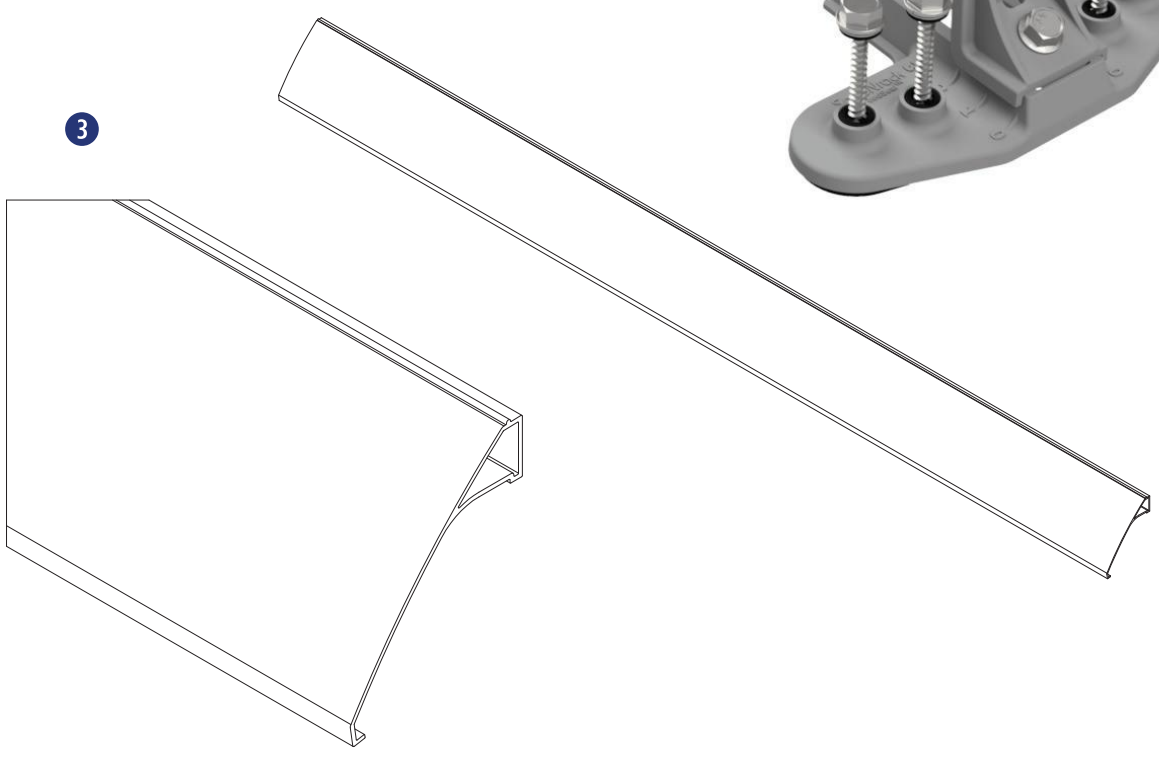
Required Tools

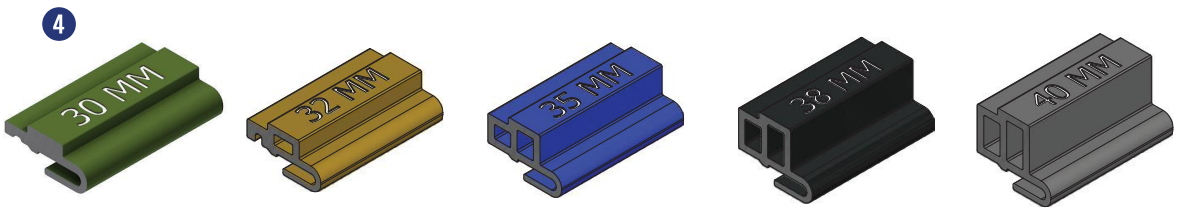
- Socket Wrench/Impact Driver
- Torque Wrench
- 1/2” Socket
- Roofing sealant

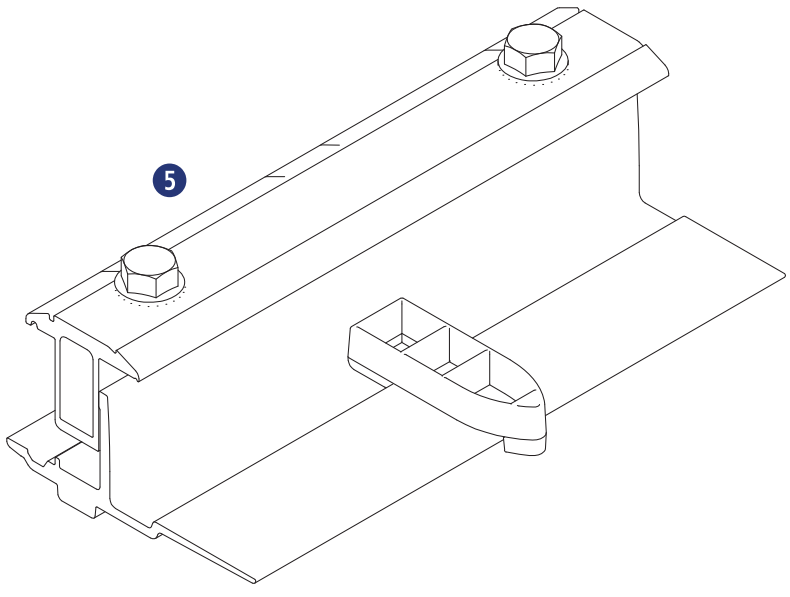
Materials Included - TopSpeed™ Mount with SpeedSeal™ Technology

1. (1) TopSpeed™ Mount
2. (1) TopSpeed™ Clamp
3. (1) Universal Skirt
4. (1) Universal Skirt Spacers
5. (1) *OPTIONAL* - Universal Link









TopSpeed™ Mount Skirt Installation

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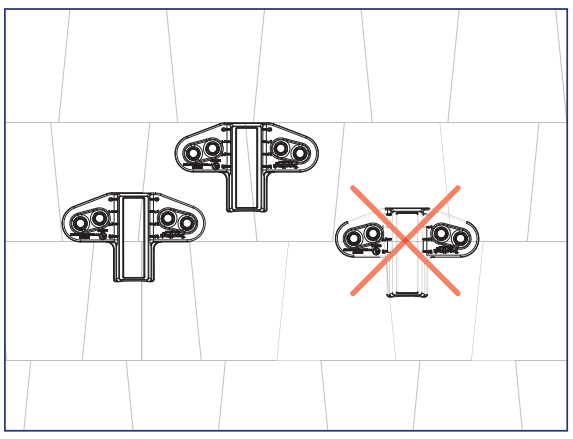
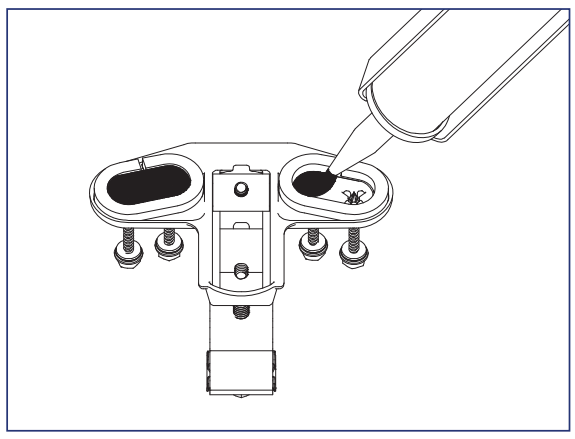
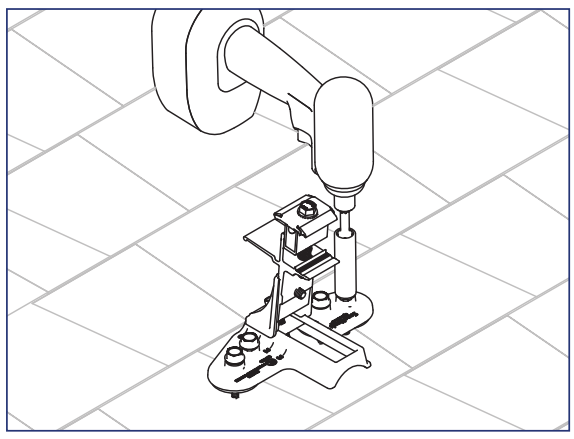
INSTALLATION INSTRUCTIONS



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



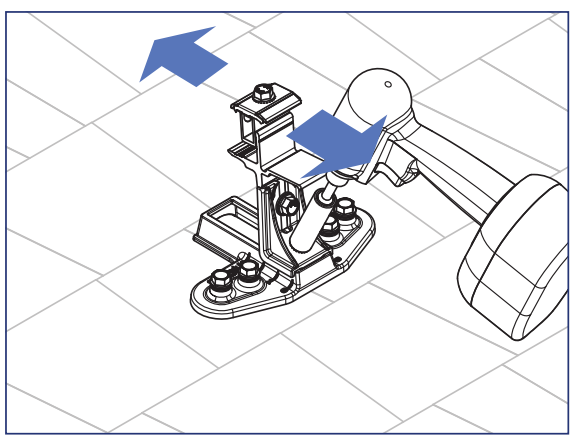
2) Fill both cavities on bottom of TopSpeed™ Mount created by SpeedSeal™ gasket with roof sealant to ensure a watertight seal.



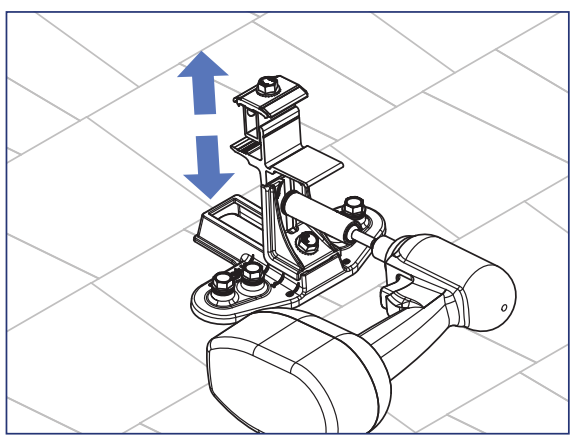
3) Attach TopSpeed™ Mount to roof using the (4) SnapNrack #14 Wood Screws with 1/2" hex head that are captured in the Mount.

Install Note:

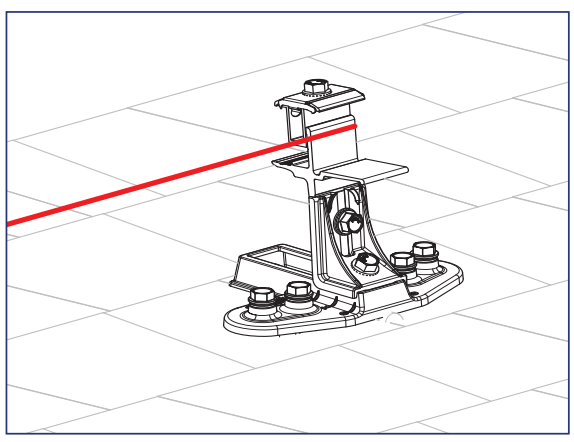
Roof sealant should be expelled from both vents of the TopSpeed™ Mount as it is installed to assure the proper amount of roof sealant has been applied. If sealant is not expelled from all four vents, remove TopSpeed™ Mount, add more sealant to the cavity, then reinstall.



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



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



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

Install Note:

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

TopSpeed™ Mount Skirt Installation

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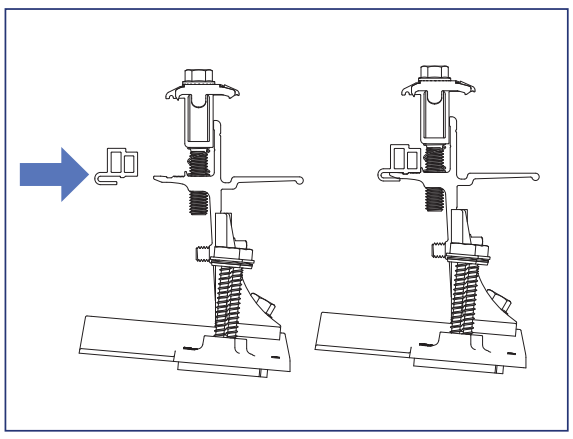
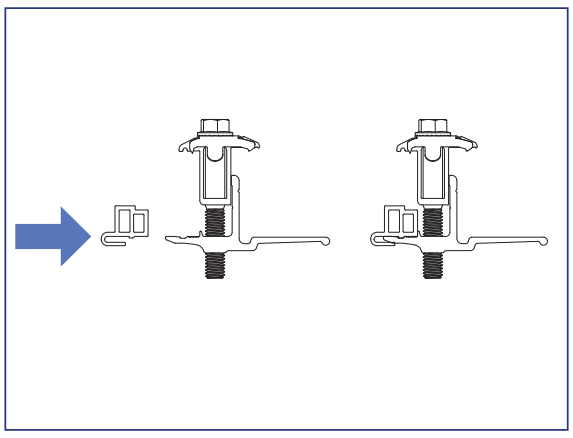
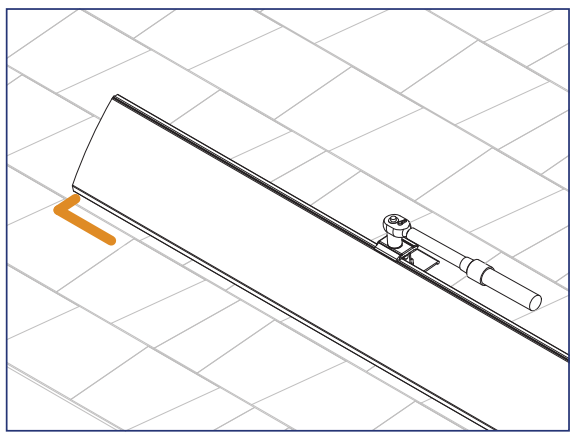
INSTALLATION INSTRUCTIONS

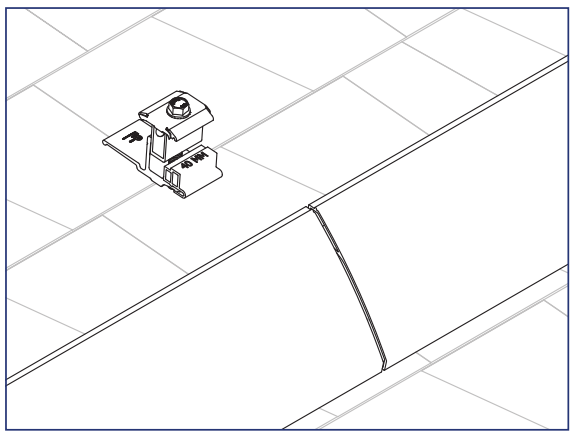


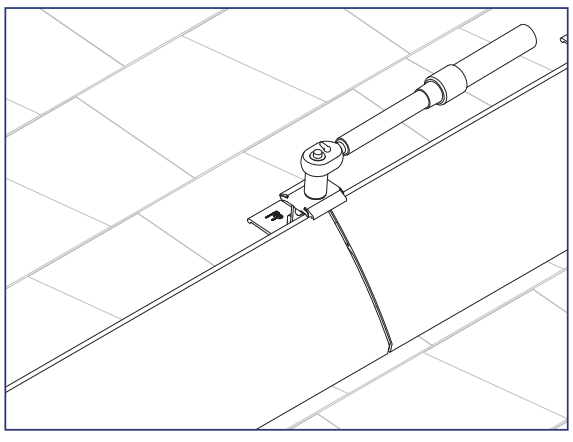




7) Universal Spacers will need to be added to Mounts and Clamps where Skirt will be installed.

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





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

Install Note:

Optionally use Universal Links to connect lengths of Array Skirt.

Wire Management

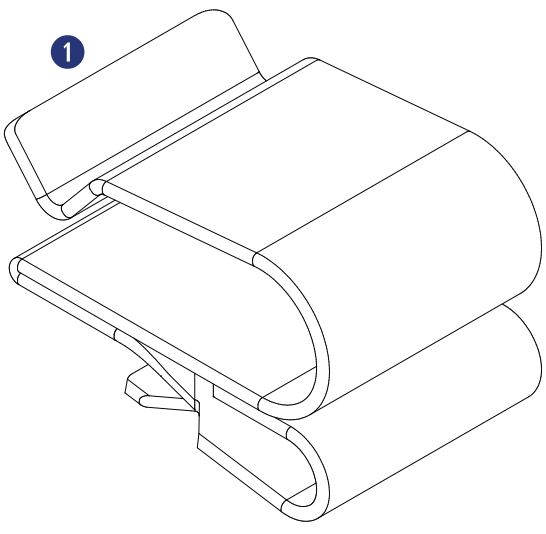
Required Tools

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

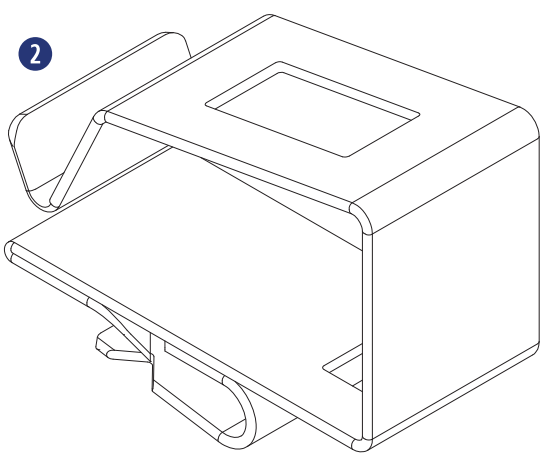
Materials Included

Smart Clips

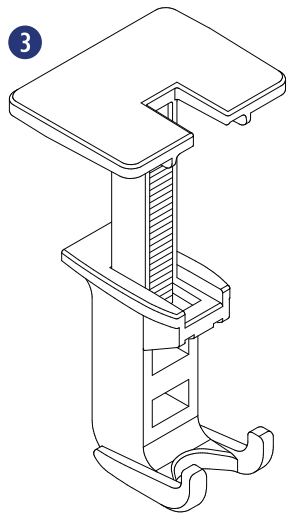
1. (1) Smart Clip [(2) PV Wire, (1) Enphase IQ Cable]
2. (1) Smart Clip XL [(6) PV Wire, (4) Enphase IQ]
3. (1) Wire Saver [(1) PV Wire]



Smart Clip



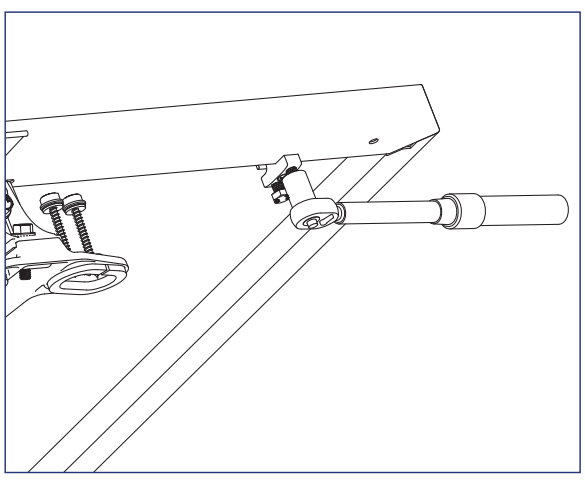
Smart Clip XL



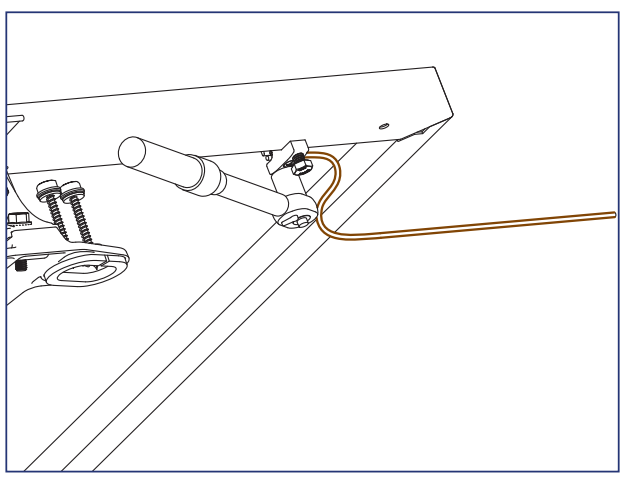
Wire Saver

INSTALLATION INSTRUCTIONS - GROUND LUG

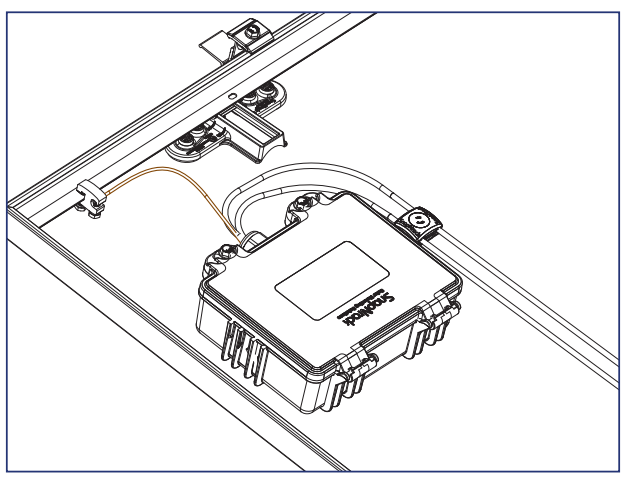
The SnapNrack Ground Lug to be used in accordance with the National Electric Code, ANSI/NFPA 70.



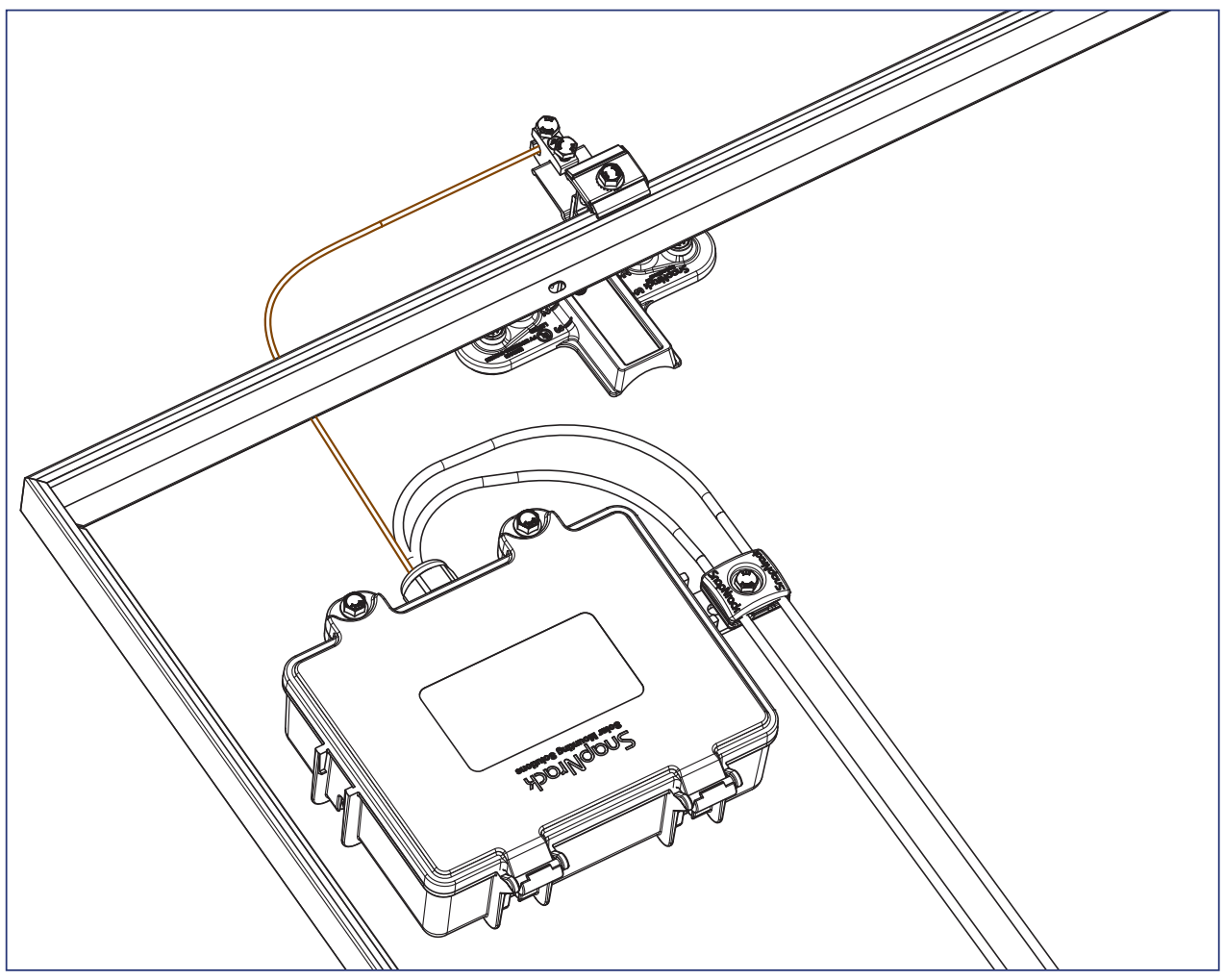
1) Ground Lug (242-92202) can be attached anywhere along the module frame or any TopSpeed™ Mount near the Junction Box. Torque module clamping bolt to 8 ft-lb.



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



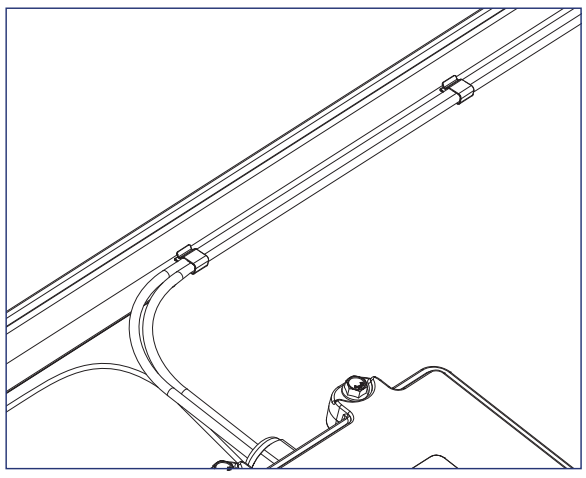
3) Run bare, solid EGC from Ground Lug R to Junction Box, bond bare EGC to stranded EGC in Junction Box. For details on installing the Junction Box reference the **Junction Box Installation Manual.**



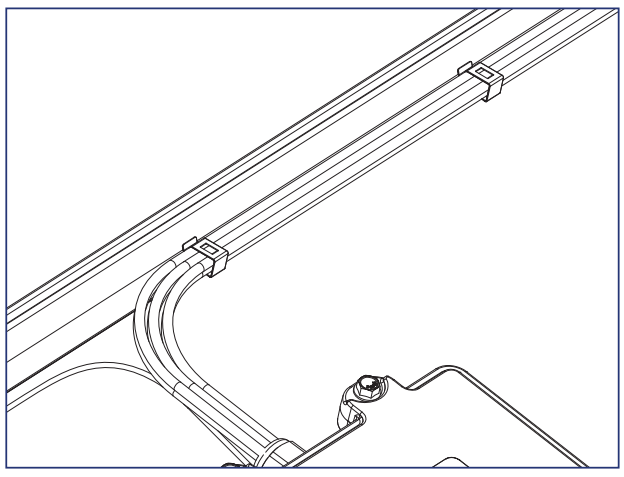
4) Optionally; Install Ground Lug on the Mount Landing Pad at the top of the array. Run bare copper between ground lug and Junction Box.

INSTALLATION INSTRUCTIONS - SMART CLIPS

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



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



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

MLPE & RSD Installation

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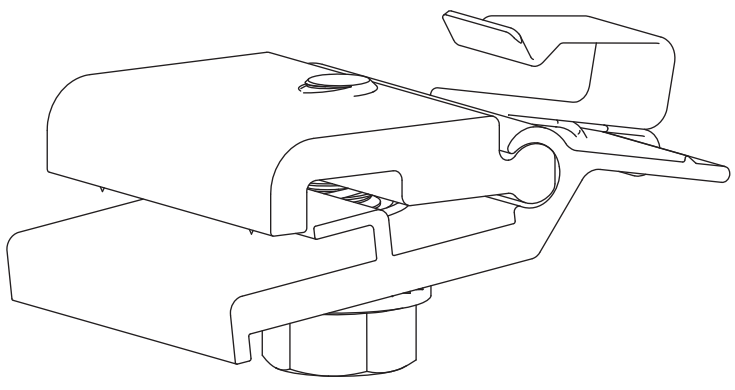
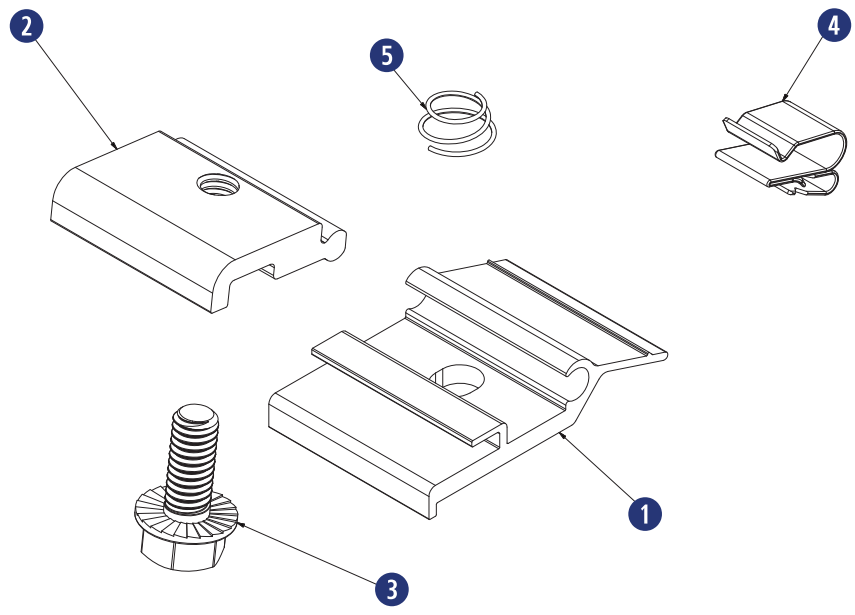
Required Tools

- Socket Wrench
- Torque Wrench
- 1/2” Socket

Materials Included - MLPE Rail Attachment Kit

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

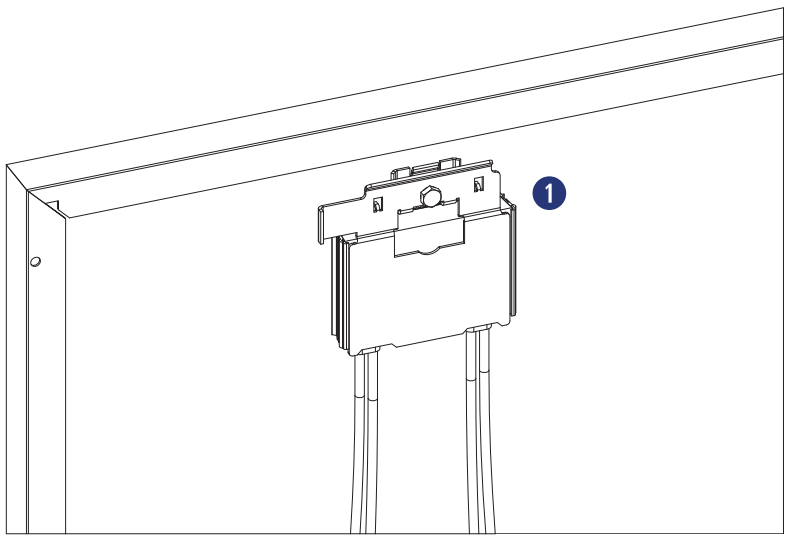




Materials Included

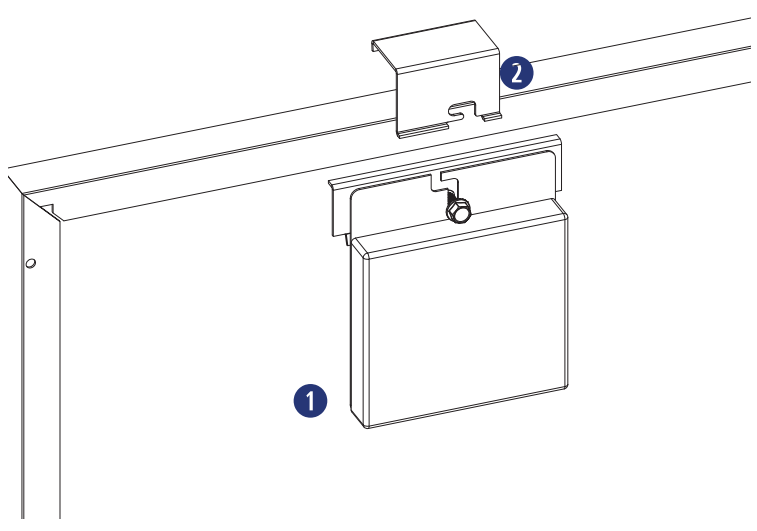
SolarEdge Frame Mount

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



Enphase Frame Mount

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



MLPE & RSD Installation

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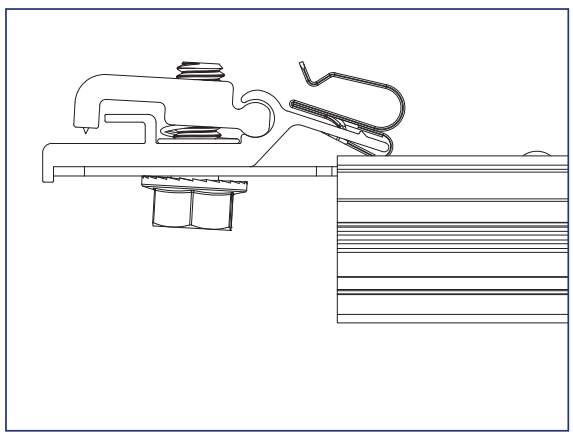
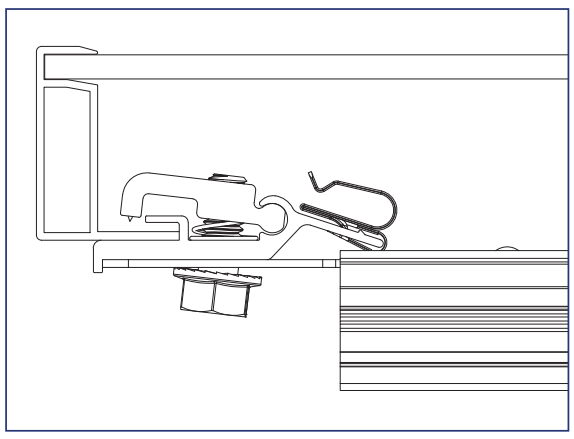
INSTALLATION INSTRUCTIONS - SNAPNRACK MLPE FRAME ATTACHMENT KIT

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



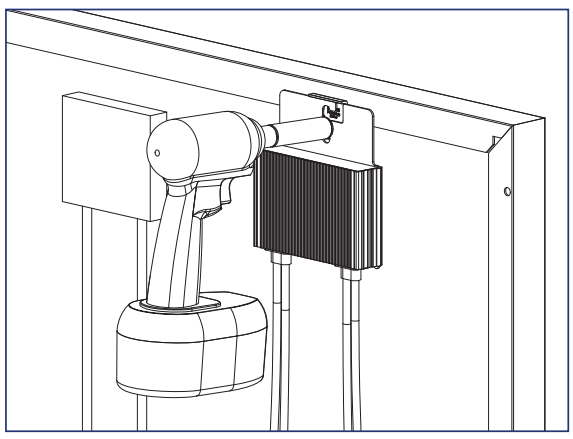
1) Slide the backplate channel of the MLPE device under the MLPE Frame Attachment Kit bolt. The MLPE mounting plate should rest against the MLPE mounting plate backstop on the MLPE Frame Attachment Kit.



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

Install Note:

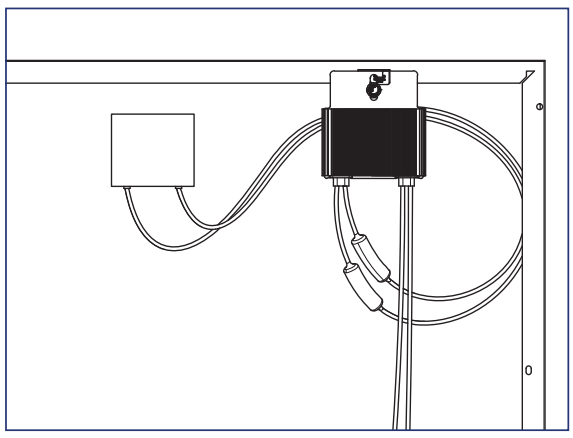
Avoid blocking module frame drainage holes when installing the MLPE Frame Attachment Kit.



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

Install Note:

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



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

MLPE & RSD Installation

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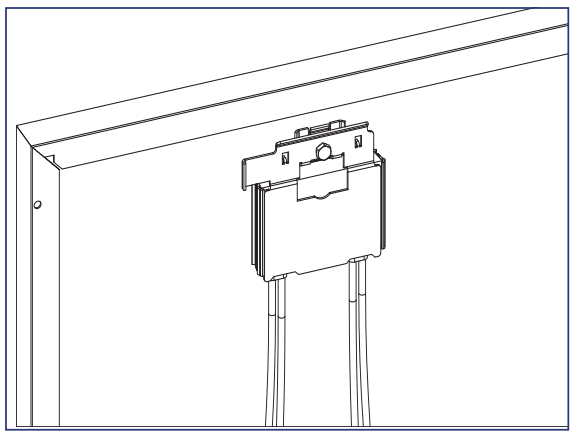
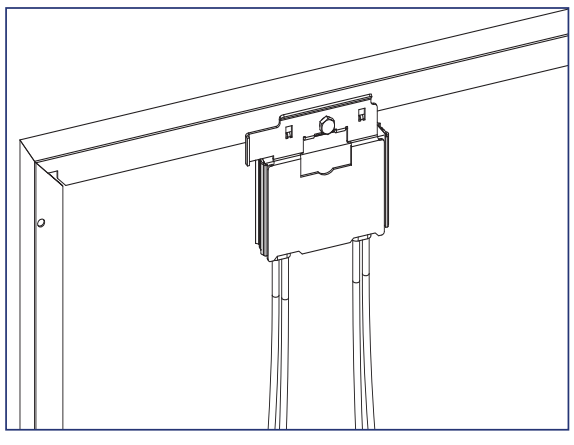
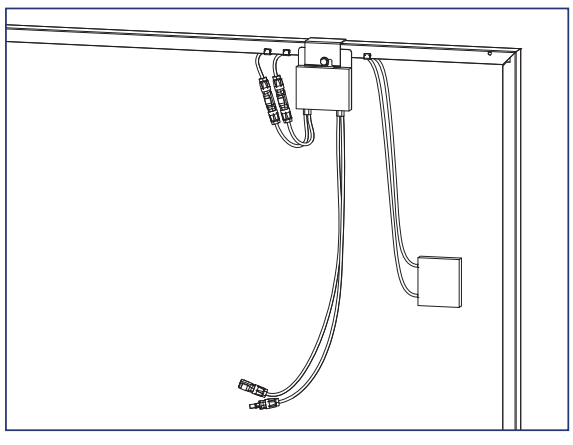
INSTALLATION INSTRUCTIONS - SOLAREDGE FRAME MOUNT



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



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

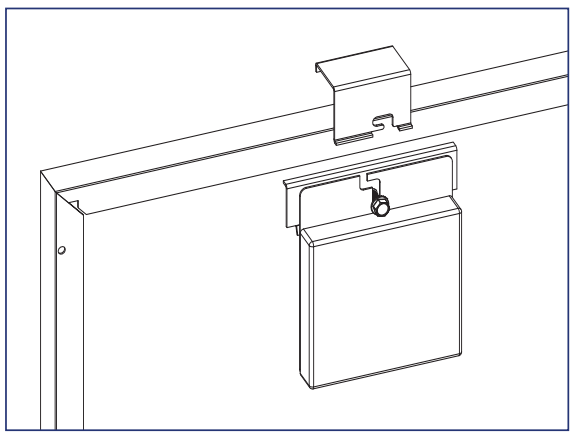


3) Connect the module leads to the input connectors on the optimizer and manage conductors with SnapNrack Smart Clips.

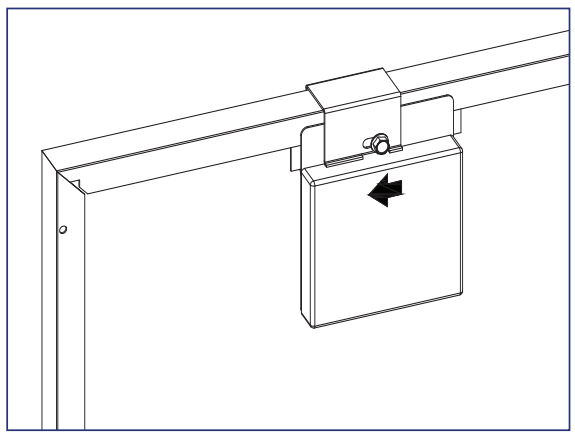
Install Note:

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

INSTALLATION INSTRUCTIONS - ENPHASE FRAME MOUNT



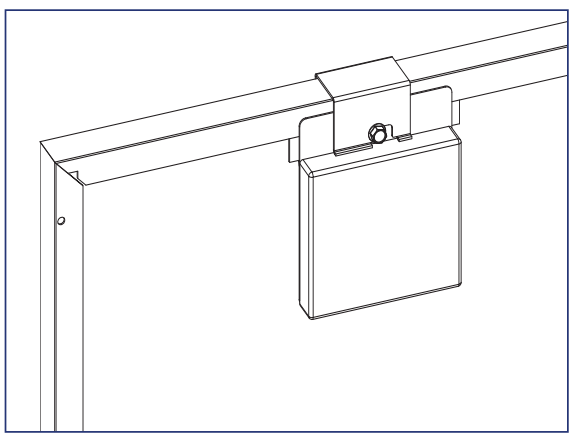
1) Locate the Enphase Frame Mount bracket clamp at a location on the module frame that will not interfere with the TopSpeed™ Mounts.



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

Install Note:

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



3) Tighten the hardware to 13 ft-lbs.

4) Connect module leads to microinverter DC connectors.

Install Note:

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

Module Installation

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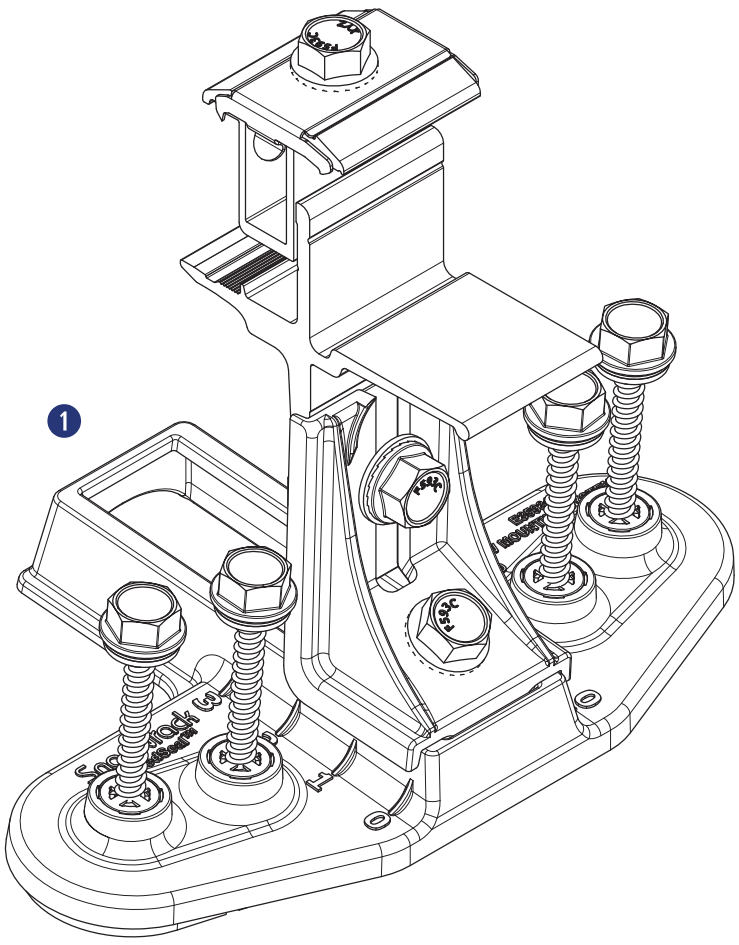
Required Tools

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

Materials Included

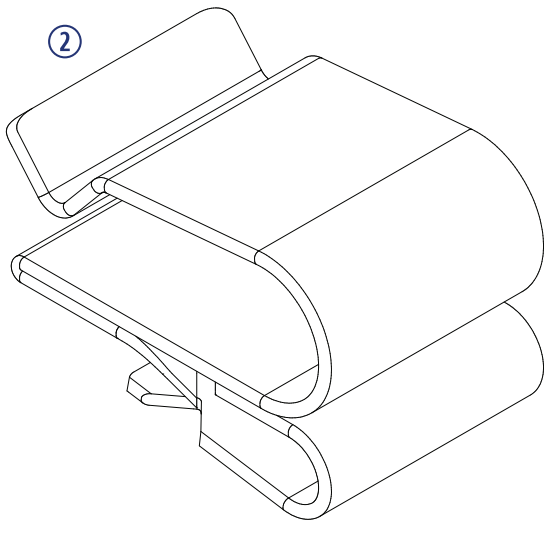
1. SnapNrack TopSpeed™ Mount
2. SnapNrack TopSpeed™ Clamp

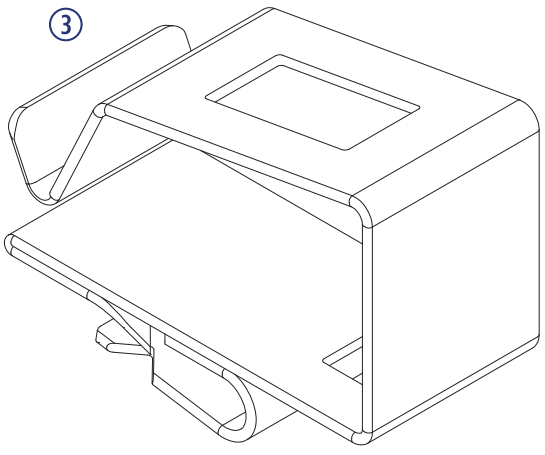


Other Materials Required

② **SnapNrack Smart Clip (2-5 per module)**
See Wire Management section for details

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





Module Installation

INSTALLATION INSTRUCTIONS - BOTTOM ROW

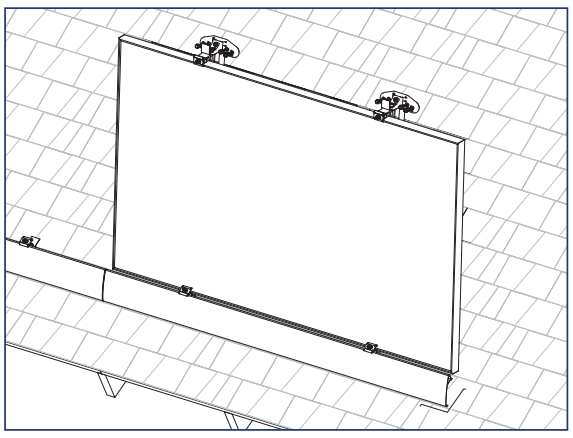
Recommended Best Practice:

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

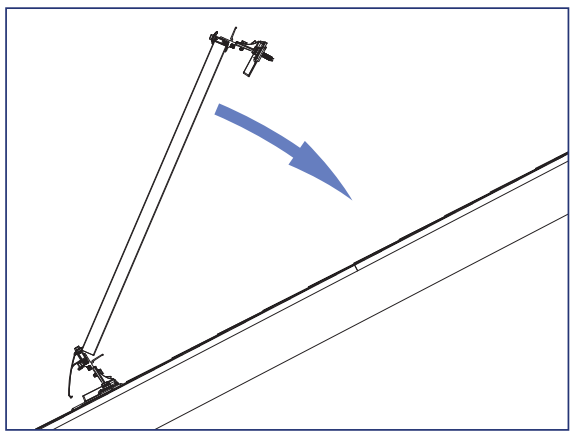
Install Note:

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

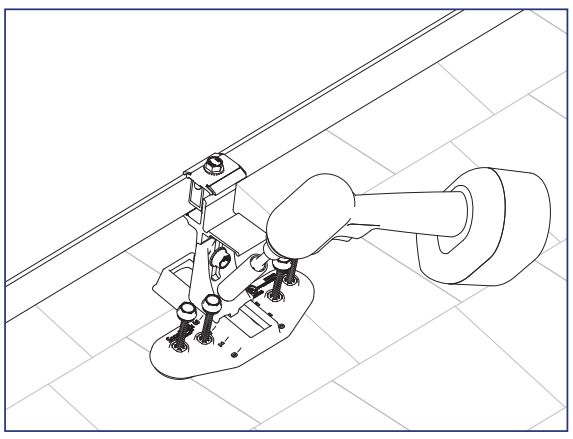
- With no MLPE, secure module leads to module frame to allow access to connectors while modules are installed
- Secure MLPE device to module frame with SnapNrack MLPE Frame Attachment Kit and connect module leads to MLPE, and manage leads by positioning connectors to allow access during installation

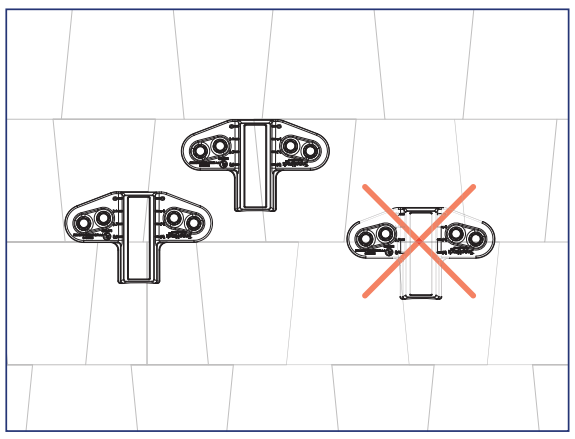


1) Rest downslope edge of module on the Mounts and/or Clamps position module so side edge is flush with marked edge of array layout or Skirt.

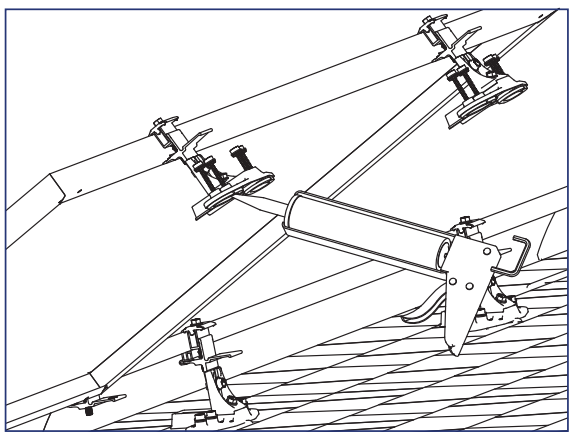


2) Lower upslope edge of module while simultaneously applying slight pressure to seat module into Mounts and/or Clamps.





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



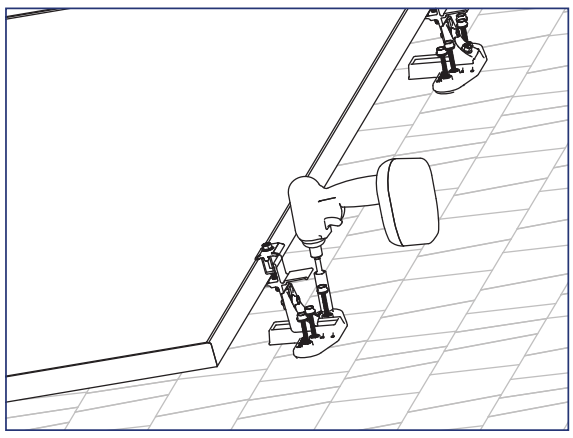
4) Lift the upslope edge of the module and fill the SpeedSeal™ reservoir with roofing sealant.

Install Note:

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

Module Installation

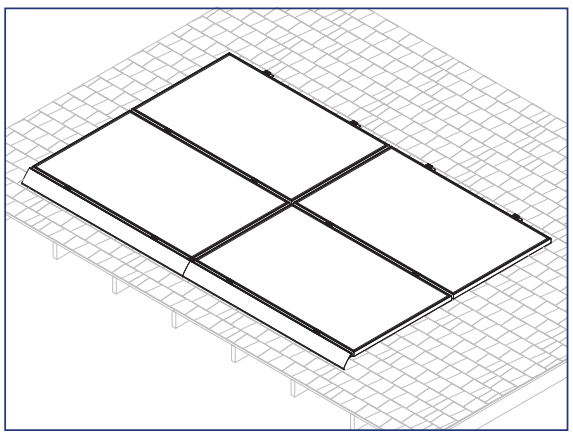
INSTALLATION INSTRUCTIONS - BOTTOM ROW



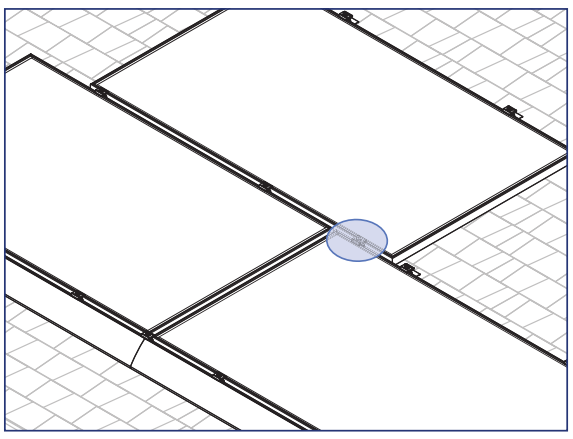
5) Lower the module to the roof and drive the (4) pre installed Snapnrack #14 Wood Screws with 1/2" hex head into the roof sheathing.

Install Note:

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



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



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

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

Grounding Specifications

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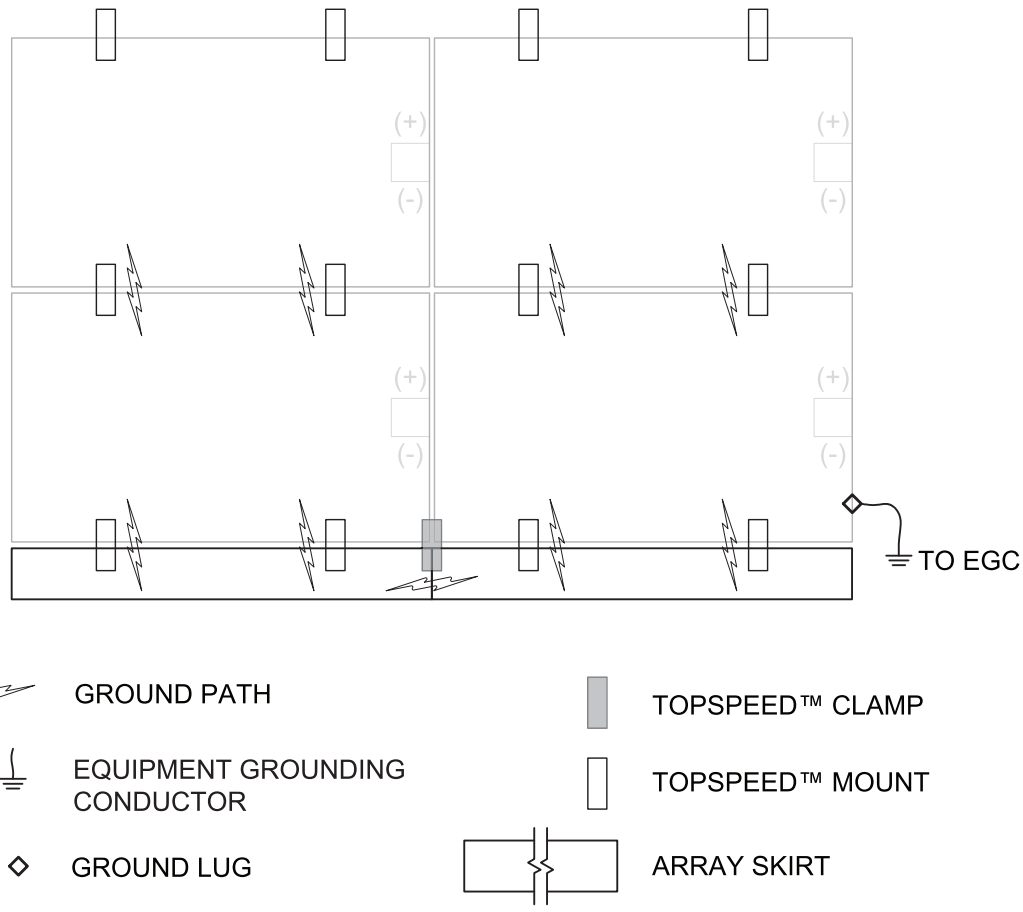
GROUND PATH DETAILS

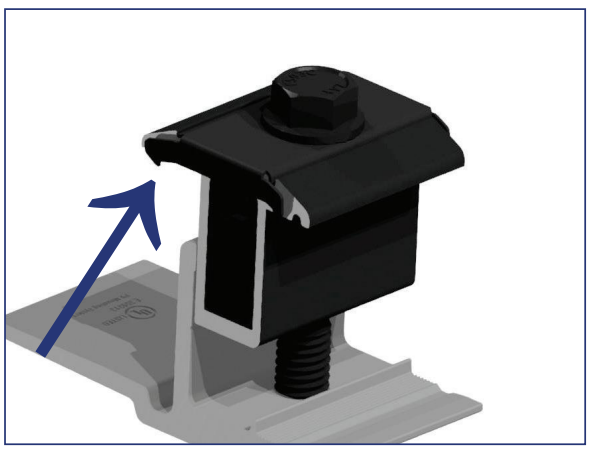
All TopSpeed™ components in the fault current ground path have been Certified to be used multiple times for grounding/bonding. The UL 2703 Listing does not specify a maximum number of uses for the Mount, Link, or Ground Lug. Review the requirements of the National Electrical Code (NEC) Article 250 to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

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

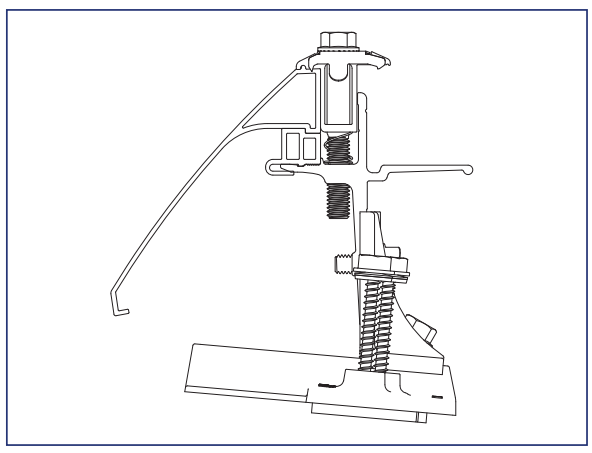
- SnapNrack, TopSpeed™ Mount
- SnapNrack, TopSpeed™ Clamp



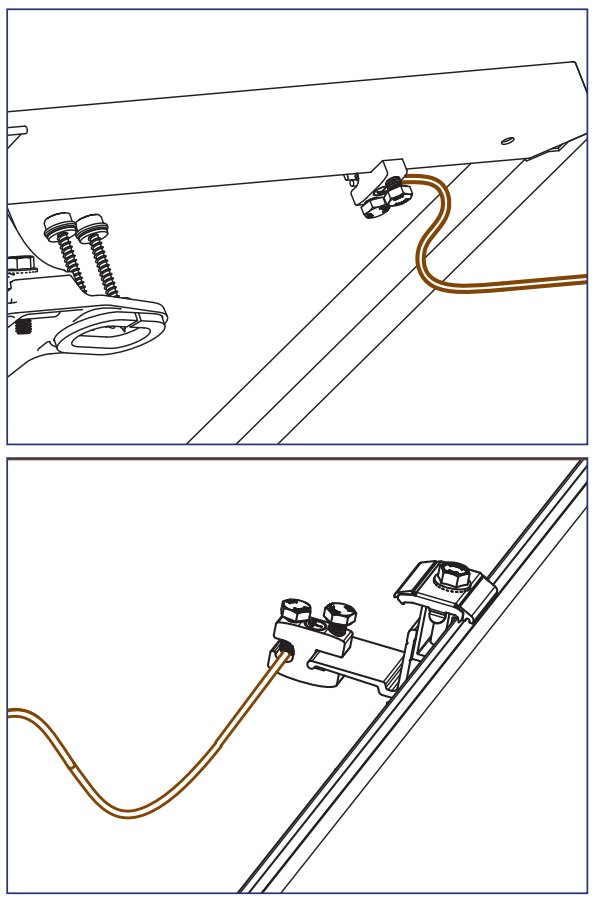
GROUNDING METHOD DETAILS



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

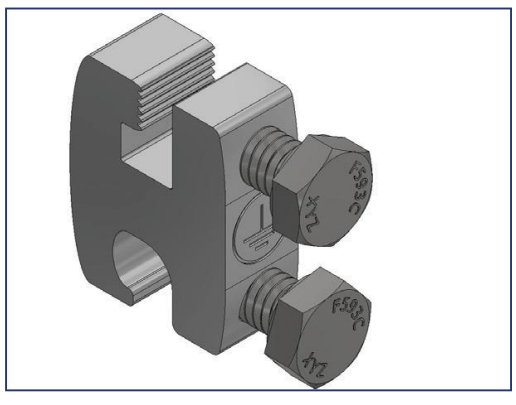


2) Column to column bonding provided by Universal Skirt and bonding clips in the Clamp assembly and/or the RL Universal Link assembly.
Module heights evaluated for bonding with Link Bonding Clamps: 40mm, 38mm, 35mm, 32mm, 30mm



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

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



GROUNDING MARKING DETAILS

The Ground Lug is marked with the ground symbol.

Maintaining the Grounding Bonding When Removing a Module

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

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

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

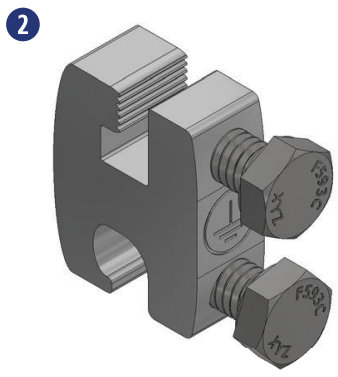
Scenarios that could result in a disruption of the bonding path are described, for example irregularly-shaped arrays, arrays consisting of individual rows, and any other scenario where module removal could disrupt the bonding path. In most cases, the removal of a module for servicing will not disturb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

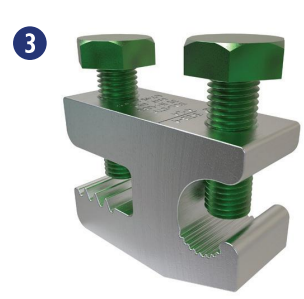
Required Tools

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

Required Materials

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





Maintaining the Grounding Bonding When Removing a Module

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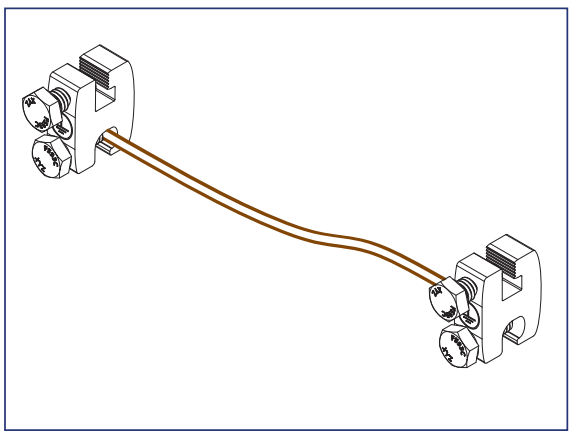
JUMPER ASSEMBLY INSTRUCTION & INSTALLATION

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

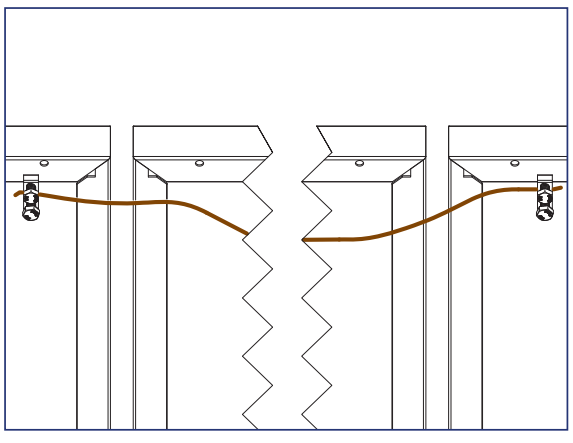
1) Identify the existing ground path at the location of module removal and choose an appropriate length of #10 bare copper to bridge the soon to be broken ground path.



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

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

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



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

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

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

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

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

Appendix A

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APPROVED MODULE & MLPE INFORMATION

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

Module manufacturer approval letters can be found at www.snapnrack.com.

Manufacturer	Model	
Aptos Solar	DNA-120-MF23-XXX	DNA-120-BF26-XXXW
	DNA-120-BF23-XXX	DNA-144-BF26-XXXW
	DNA-144-MF23-XXX	DNA-108-BF10-xxxW
	DNA-144-BF23-XXX	DNA-120-BF10-xxxW
	DNA-120-MF26-XXXW	DNA-108-MF10-xxxW
	DNA-144-MF26-XXXW	
Boviet Solar	BVM7612M-XXX-H-HC-BF-DG	
Canadian Solar	CS6K-XXX-M	CS1H-XXX-MS
	CS6K-XXX-M-SD	CS1H-XXX-MS-AB
	CS6K-XXX-P	CS3W-XXX-P
	CS6K-XXX-P-SD	CS3N-XXX-MS
	CS6K-XXX-MS	CS1Y-XXX-MS
	CS3K-XXX-P	CS3W-MB-AG
	CS3K-XXX-MS	CS3Y-MB-AG
	CS3U-XXX-MS	CS6W-XXXMB-AG
	CS3U-XXX-P	CS6R-XXXMS-HL
	CS1K-XXX-MS	CS3W-XXX-MS
CertainTeed	CTXXXHC11-06	
Chint Solar	CHSM6612M-XXX	CHSM72M-HC-XXX* (Astro 4)
	CHSM6612M(BL)-XXX	CHSM72M-HC-XXX* (Astro 5)
	CHSM6612M/HV-XXX	
Dehui Solar	DH-M760B-XXXW	DH-M760F-XXXW
	DH-M760W-XXXW	DH-M772F-XXXW
	DH-M772W-XXXW	
Freedom Forever	FF-MP-BBB-xxx	
Hanwha Q Cells	Q.PEAK DUO-G5-XXX	Q.PEAK DUO G10-XXX
	Q.PEAK DUO-BLK-G5-XXX	Q.PEAK DUO BLK G10-XXX
	Q.PLUS DUO-G5-XXX	Q.PEAK DUO G10+-XXX
	Q.PEAK DUO-G7-XXX	Q.PEAK DUO BLK G10+-XXX
	Q.PEAK DUO-BLK-G7-XXX	Q.PEAK DUO XL-G10.3-XXX
	Q.PEAK DUO-G7.2-XXX	Q.PEAK DUO XL-G10.c-XXX
	Q.PEAK DUO-G6+-XXX	Q.PEAK DUO XL-G10.d-XXX
	Q.PEAK DUO-BLK-G6+-XXX	Q.PEAK DUO L-G8.3/BFG-XXX
	Q.PEAK DUO-G6-XXX	Q.PEAK DUO L-G8.3/BGT-XXX
	Q.PEAK DUO-BLK-G6-XXX	Q.PEAK DUO ML-G10-XXX
	Q.PEAK DUO-G8+-XXX	Q.PEAK DUO BLK ML-G10+-XXX
	Q.PEAK DUO-BLK-G8+-XXX	Q.PEAK DUO ML-G10+-XXX

Appendix A

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Manufacturer	Model	
Hanwha Q Cells	Q.PEAK DUO-G8-XXX	Q.PEAK DUO BLK ML-G10-XXX
	Q.PEAK DUO-BLK-G8-XXX	Q.PEAK DUO ML-G10.a+-XXX
	Q.PEAK DUO BLK-G6+/AC-XXX	Q.PEAK DUO BLK ML-G10.a+-XXX
	Q.PEAK DUO-ML-G9-XXX	Q.PEAK DUO ML-G10.a-XXX
	Q.PEAK DUO-BLK-ML-G9-XXX	Q.PEAK DUO BLK ML-G10.a-XXX
	Q.PEAK DUO-BLK-G9-XXX	Q.PEAK DUO BLK G10+/AC XXX
	Q.PEAK DUO-BLK-ML-G9+-XXX	Q.PEAK DUO BLK G10+/HL XXX
	Q.PEAK DUO-ML-G9+-XXX	Q.PEAK DUO BLK ML-G10+/t-XXX
	Q.PEAK DUO-BLK-ML-G9+-XXX	Q.PEAK DUO XL-G11.3 XXX
	Q.PEAK DUO XL-G9.2-XXX	Q.PEAK DUO XL-G11.3 BFG XXX
	Q.PEAK DUO XL-G9.3-XXX	Q.TRON-G1+ XXX
	Q.PEAK DUO XL-G9.3/BFG-XXX	Q.TRON BLK-G1+ XXX
	Q.PEAK DUO XL-G10.2-XXX	Q.TRON M-G2+ XXX
	Q.PEAK DUO XL-G10.3/BFG-XXX	Q.TRON BLK M-G2+ XXX
HT-SAAE	HT60-166M-XXX	HT60-182M-XXX
Heliene	60M-XXX	72M-XXX
	60P-XXX	72P-XXX
"Hyundai (All may be followed by “BK”)"	HiA-SXXXMS	HiS-SXXXYI
	HiS-SXXXXY	HiS-SXXXYH(BK)
	HiN-SxxxXG(BK)	
Hyperion/Runergy	HY-DH108P8-XXX(Y)	HY-DH144N8-XXX
	HY-DH144P8-XXX	HY-DH108N8-XXX
JA Solar	JAM60S09-XXX/PR	JAM72S10-XXX/PR
	JAM60S10-XXX/MR	JAM72S12-XXX/PR
	JAM60S10-XXX/PR	JAM60S17-XXX/MR
	JAM60S12-XXX/PR	JAM54S30-XXX/MR
	JAM72S09-XXX/PR	JAM54S31-XXX/MR
	JAM72S10-XXX/MR	JAM72D30-XXX/MB
Jinko Solar	JKMXXXM-60	JKMXXXP-72-V
	JKMXXXM-60L	JKMXXXPP-72
	JKMXXXM-60HL	JKMXXXPP-72-V
	JKMXXXM-60HBL	JKMSXXXP-72
	JKMXXXP-60	JKMXXXM-72HL-V
	JKMXXXP-60-J4	JKMXXXM-72HL-TV
	JKMXXXP-60-V	JKMXXXM-72HBL
	JKMXXXP-60B-J4	JKMXXXM-6TL3-B
	JKMXXXPP-60	JKMXXXM-6RL3-B
	JKMXXXPP-60-V	JKMXXXM-7RL3-V
	JKMXXXM-72	JKMXXXM-7RL3-TV
	JKMXXXM-72L-V	JKMXXXM-72HL4-V
	JKMXXXP-72	JKMXXXM-72HL4-TV
LG	LGXXXN1C-A5	LGXXXA1C-V5
	LGXXXN1K-A5	LGXXXM1C-L5
	LGXXXQ1C-A5	LGXXXM1K-L5
	LGXXXQ1K-A5	LGXXXN1C-N5

Appendix A

Manufacturer	Model	
LG	LGXXXS1C-A5	LGXXXN1K-L5
	LGXXXN2C-B3	LGXXXN1K-A6
	LGXXXN2W-B3	LGXXXN1C-A6
	LGXXXN1C-G4	LGXXXN1W-A6
	LGXXXN1K-G4	LGXXXQ1C-A6
	LGXXXS1C-G4	LGXXXQ1K-A6
	LGXXXN2C-G4	LGXXXM1K-A6
	LGXXXN2K-G4	LGXXXM1C-A6
	LGXXXN2W-G4	LGXXXA1C-A6
	LGXXXS2C-G4	LGXXXQAC-A6
	LGXXXS2W-G4	LGXXXQAK-A6
	LGXXXN1C-V5	LGXXXN1K-B6
	LGXXXN1W-V5	LGXXXN2W-E6
	LGXXXN2T-V5	LGXXXN2T-E6
	LGXXXN2T-J5	LGXXXN1K-E6
	LGXXXN1T-V5	LGXXXN3K-V6
Longi	LR6-60-XXXM	LR4-60HPB-XXXM
	LR6-60BK-XXXM	LR4-60HIB-XXXM
	LR6-60HV-XXXM	LR4-60HPH-XXXM
	LR6-60PB-XXXM	LR4-60HIH-XXXM
	LR6-60PE-XXXM	LR6-60HIH-XXXM
	LR6-60PH-XXXM	LR6-60HIB-XXXM
	LR6-60HPB-XXXM	LR4-72HPH-XXXM
	LR6-60HPH-XXXM	
Meyer Burger	Meyer Burger Black*	Meyer Burger White*
mSolar	TXI6-XXX120BB	
Mission Solar	MSEXXXSO5T	MSEXXXSQ4S
	MSEXXXSO5K	MSEXXXSR8K
	MSEXXXSQ5T	MSEXXXSR8T
	MSEXXXSQ5K	MSEXXXSR9S
	MSEXXXMM4J	MSE60AXXX
	MSEXXXMM4J	MSE60AXXX
	MSEXXXMM6J	MSEXXXSX5K
	MSEXXXSO6W	MSEXXXSX5T
	MSEXXXSO4J	MSEXXXSX6S
	MSEXXXSO6J	MSEXXXSX6W
	MSEXXXSQ6S	MSEXXXSX5R
Next Energy Alliance	USNEA-XXXM3-60	USNEA-XXXM3-72
	USNEA-XXXM3B-60	USNEA-XXXM3B-72
Panasonic	VBHNXXXKA03	VBHXXXRA18N
	VBHNXXXKA04	VBHXXXRA03K
	VBHNXXXSA17	EVPVXXX(K)
	VBHNXXXSA18	EVPVXXXH
	VBHN325SA17E	EVPVXXXPK

Appendix A

Manufacturer	Model	
Philadelphia Solar	PS-M144(HCBF)-XXXW	PS-M108(HC)-XXXW
	PS-M108(HCBF)-XXXW	
Phono Solar	PSXXXM-20/U	PSxxxM8GF-18/VH
	PSXXXMH-20/U	PSxxxM8GFH-18/VH
	PSxxxM8GF-24/TH	PSxxxM6-24/TH
	PSxxxM8GFH-24/TH	
REC (All may be followed by “BLK” or “BLACK”)	RECXXXTP2	RECXXXTP2SM 72 BLK2
	RECXXXTP2-BLK	RECXXXAA
	RECXXXNP	RECXXXTP3M
	RECXXXTP2M	RECXXXTP4
	RECXXXTP2M 72	RECXXXAA Pure
	RECXXXTP2M 72 BLK	RECXXXAA Pure-R
	RECXXXTP2M 72 BLK2	RECXXXNP2
	RECXXXTP2SM 72	RECXXXNP3
	RECXXXTP2SM 72 BLK	
SEG Solar	SEG-400-BMB-HV	SEG-xxx-BMD-HV
	SEG-400-BMB-TB	SEG-xxx-BMD-TB
Silfab	SLAXXX-M	SILXXXNT
	SLAXXX-P	SILXXXHL
	SSAXXX-M	SILXXXBK
	SSAXXX-P	SILXXXNX
	SILXXXBL	SILXXXNU
	SILXXXML	SILXXXHC
	SILXXXNL	SILXXXHN
	SLGXXX-M	SILXXXBG
	SLGXXX-P	SIL-xxxHC+
	SSGXXX-M	SIL-xxxHM
	SSGXXX-P	
Solaria	Solaria PowerXT-XXXR-PX	Solaria PowerXT-XXXR-PM
	Solaria PowerXT-XXXR-BX	Solaria PowerXT-XXXR-PM-AC
	Solaria PowerXT-XXXR-AC	
Sunpower	SPR-AXXX-G-AC	SPR-MXXX-H-AC
	SPR-AXXX	SPR-MXXX
	SPR-AXXX-BLK-G-AC	SPR-MXXX-BLK-H-AC
	SPR-AXXX-BLK	SPR-MXXX-BLK
SunSpark	SST-XXXM3-60	SST-XXXM3-72
	SST-XXXM3B-60	SST-XXXM3B-72
Talesun	TP660M-XXX	TP672M-XXX
	TP660P-XXX	TP672P-XXX
Thornova	TS-BB54(XXX)	TS-BG60(XXX)
	TS-BB60(XXX)	TS-BG72(XXX)
	TS-BG54(XXX)	

Appendix A

Manufacturer	Model	
Trina	TSM-XXXDD05(II)	TSMXXXDD05H.05(II)
	TSM-XXXDD05A.05(II)	TSM-XXXDD06M.05(II)
	TSM-XXXDD05A.08(II)	TSM-XXXDE15H(II)
	TSM-XXXDD05A.082(II)	TSM-XXXDE15M(II)
	TSM-XXXPA05	TSMXXXDE06X.05(II)
	TSM-XXXPA05.05	TSMXXXDE09.05
	TSM-XXXPA05.08	TSM-XXXDE15V(II)
	TSM-XXXPD05	TSM-XXXDEG15VC.20(II)
	TSM-XXXPD05.002	TSM-XXXDEG18MC.20(II)
	TSM-XXXPD05.05	TSM-XXXDEG19C.20
	TSM-XXXPD05.05S	TSM-XXXDEG21C.20
	TSM-XXXPD05.08	TSM-XXXDE09C.05
	TSM-XXXPD05.082	TSM-XXXDE09C.07
	TSM-XXXPD05.08D	TSM-xxxNE09RC.05
	TSM-XXXPD05.08S	
Vikram Solar	SOMERA VSMHBB.60.XXX.05	PREXOS VSMDHT.60.XXX.05
	SOMERA VSMH.72.XXX.05	PREXOS VSMDHT.72.XXX.05
VSUN	VSUNXXX-144BMH-DG	VSUNXXX-108BMH
	VSUNXXX-120BMH	
ZNShine	ZXM6-60-XXX/M	ZXM6-NH144-XXXM
	ZXM6-NH120-XXXM	ZXM7-SH108-XXXM
	ZXM7-SHLDD144-XXXM	

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

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

MLPE Manufacturer	Model	
AP Smart	RSD-S-PLC	
Celestica International	DG-006-F001201x	DG-006-F001401x
Delta Electronics	GPI00010105	
Enphase	C250	IQ7PLUS-72-2-US
	M215	IQ7PLUS-72-B-US
	M250	IQ8-60
	IQ6-60-2-US	IQ8PLUS-72
	IQ6PLUS-72-2-US	IQ8A-72
	IQ7-60-2-US	IQ8H-208-72
	IQ7-60-B-US	IQ8H-240-72
Generec	S2502	
Ginlong Technologies	Solis-RSD-1G	
	Solis-MLRSD-R1-1G	Solis-MLRSD-R2-1G

Appendix A

MLPE Manufacturer	Model	
SolarEdge	P300-5NC4ARS	P320-5NC4ARS
	P370-5NC4AFS	P400-5NC4AFS
	P320	P340
	P370	P400
	P401	P405
	P485	P505
	P730	P800p
	P850	P860
	P950	P1100
	P1101	S440
	S500	
SMA	RSB-2S-US-10	
Tigo	TS4-R-F	TS4-R-M
	TS4-R-O	TS4-R-S
	TS4-R-M-DUO	TS4-R-O-DUO
	TS4-R-S-DUO	TS4-A-F
	TS4-A-2F	TS4-A-O
	TS4-A-S	

Hi-MO 5m

LR5-54HPB
400~420M

- Suitable for distributed projects
- Advanced module technology delivers superior module efficiency
  - M10 Gallium-doped Wafer
  - Integrated Segmented Ribbons
  - 9-busbar Half-cut Cell
- Excellent outdoor power generation performance
- Aesthetic appearance with all black module design

12 12-year Warranty for Materials and Processing

25 25-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

LONGi

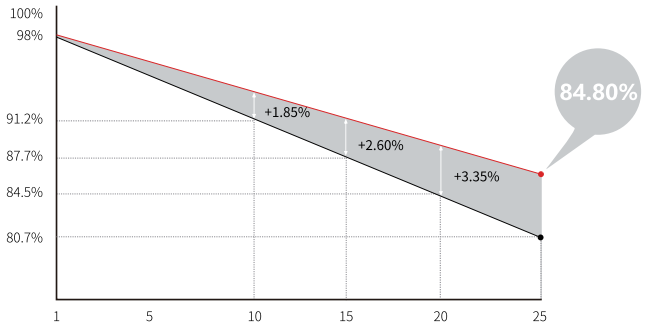
Hi-MO 5m

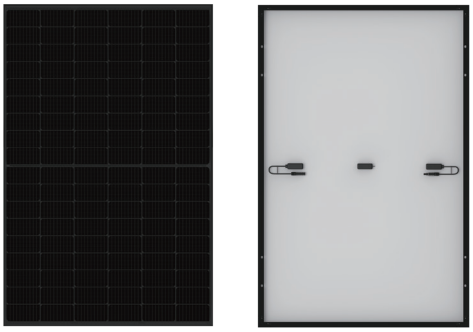
LR5-54HPB 400~420M

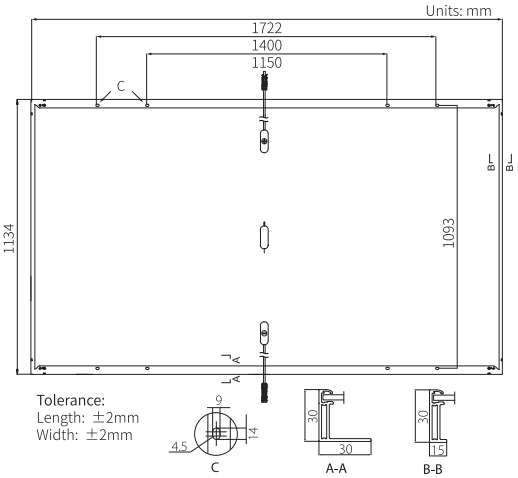
21.5%	0~3%	<2%	0.55%	HALF-CELL
MAX MODULE EFFICIENCY	POWER TOLERANCE	FIRST YEAR POWER DEGRADATION	YEAR 2-25 POWER DEGRADATION	Lower operating temperature

Additional Value

25-Year Power Warranty







Mechanical Parameters

Cell Orientation	108 (6×18)
Junction Box	IP68, three diodes
Output Cable	4mm², ±1200mm length can be customized
Glass	Single glass, 3.2mm coated tempered glass
Frame	Anodized aluminum alloy frame
Weight	20.8kg
Dimension	1722×1134×30mm
Packaging	36pcs per pallet / 216pcs per 20' GP / 936pcs per 40' HC

Electrical Characteristics

STC : AM1.5 1000W/m² 25°C NOCT : AM1.5 800W/m² 20°C 1m/s Test uncertainty for Pmax: ±3%

Module Type	LR5-54HPB-400M		LR5-54HPB-405M		LR5-54HPB-410M		LR5-54HPB-415M		LR5-54HPB-420M	
Testing Condition	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax/W)	400	299.0	405	302.7	410	306.5	415	310.2	420	313.9
Open Circuit Voltage (Voc/V)	36.90	34.70	37.15	34.93	37.40	35.17	37.65	35.40	37.89	35.63
Short Circuit Current (Isc/A)	13.72	11.09	13.78	11.14	13.84	11.19	13.91	11.24	13.97	11.30
Voltage at Maximum Power (Vmp/V)	30.94	28.74	31.18	28.96	31.42	29.19	31.66	29.41	31.90	29.63
Current at Maximum Power (Imp/A)	12.93	10.40	12.99	10.45	13.05	10.50	13.11	10.55	13.17	10.59
Module Efficiency(%)	20.5		20.7		21.0		21.3		21.5	

Operating Parameters

Operational Temperature	-40°C ~ +85°C
Power Output Tolerance	0 ~ 3%
Voc and Isc Tolerance	±3%
Maximum System Voltage	DC1000V (IEC/UL)
Maximum Series Fuse Rating	25A
Nominal Operating Cell Temperature	45±2°C
Protection Class	Class II
Fire Rating	UL type 1 or 2 IEC Class C

Mechanical Loading

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

Temperature Ratings (STC)

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

LONGi

No.8369 Shangyuan Road, Xi'an Economic And Technological Development Zone, Xi'an, Shaanxi, China.

Web: www.longi.com

DATA SHEET

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.

Enphase 25 year limited warranty

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.

UL CERTIFIED SAFETY

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.

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)	UNITS	IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings[1]	W	235–350	235–440
Module compatibility	—	To meet compatibility, PV modules must be within maximum input DC voltage and maximum module I_{sc} listed below. Module compatibility can be checked at https://enphase.com/installers/microinverters/calculator.	
MPPT voltage range	V	27–37	27–45
Operating range	V	16–48	16–58
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	
Overvoltage class DC port	—	II	
DC port backfeed current	mA	0	
PV array configuration	—	Ungrounded array; no additional DC side protection required; AC side protection requires 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[2]	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[3]	—	16	13
Total harmonic distortion	%	<5	
Overvoltage class AC port	—	III	
AC port backfeed current	mA	30	
Power factor setting	—	1.0	
Grid-tied power factor (adjustable)	—	0.85 leading ... 0.85 lagging	
Peak efficiency	%	97.7	
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.

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.

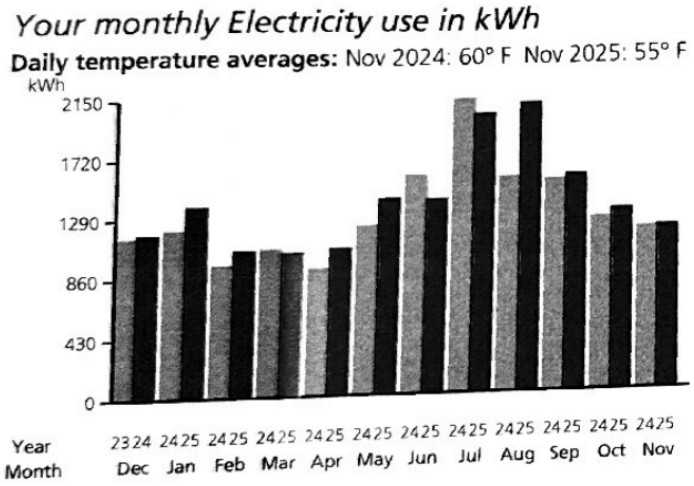
SolarEnergyWorld
Because Tomorrow Matters

01/20/26

To whom it may concern,

- Justification of panels on the front of the house and heat map.

Monthly energy consumption for Address vs the proposed system monthly production



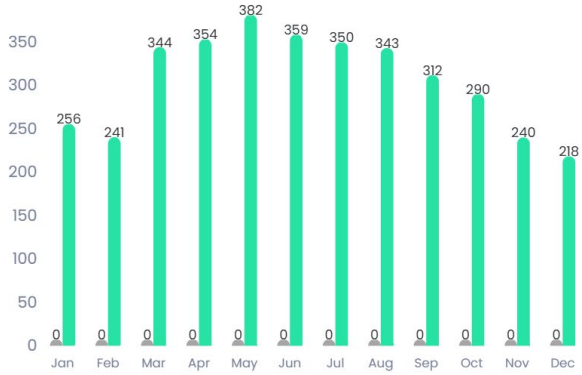
Overview

Segment	Modules	Size	Production	Per module	ASA	TSRF	Consumption	PV Offset	Area	Coverage	Perimeter
All total	14	5.67 kW	3,689 kWh	264 kWh	48.02%	45%	0 kWh	0%	1893 ft²	16.13%	144 (ft)

Nearest weather station: 724050, WASHINGTON DC REAGAN AP, VA NSRDB (7.61 mi)

Monthly Average Solar Access

Monthly Consumption and Production (kWh)



- The home had an estimated annual usage of roughly 17,420 kWh in 2025. Our proposed system is estimated to have 3,689 kWh in annual production.

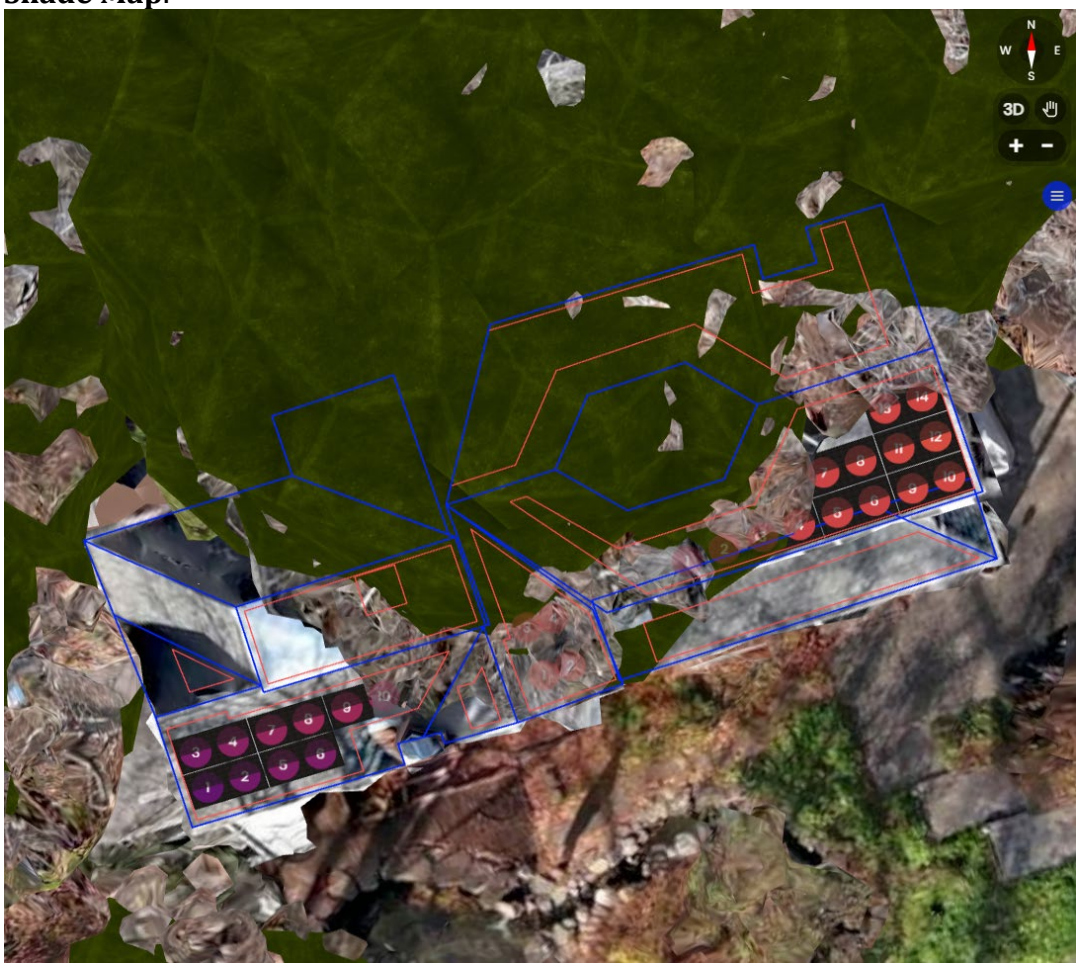
  The panels will vary in production based on their location on the structure, but this estimated production for a **14**-panel system breaks down to roughly 264 kWh per panel annually.

- The 5 panels on the lower south facing roof plane have an average of 206 kWh per panel with an estimated annual production of 1,028 kWh. The 2 panels on the upper east facing roof plane have an average of 219 kWh per panel with an estimated annual production of 439 kWh. The 7 panels on the upper south facing roof plane have an average of 317 kWh per panel with an estimated annual production of 2,222 kWh.

Justification for the Placement of the panels.

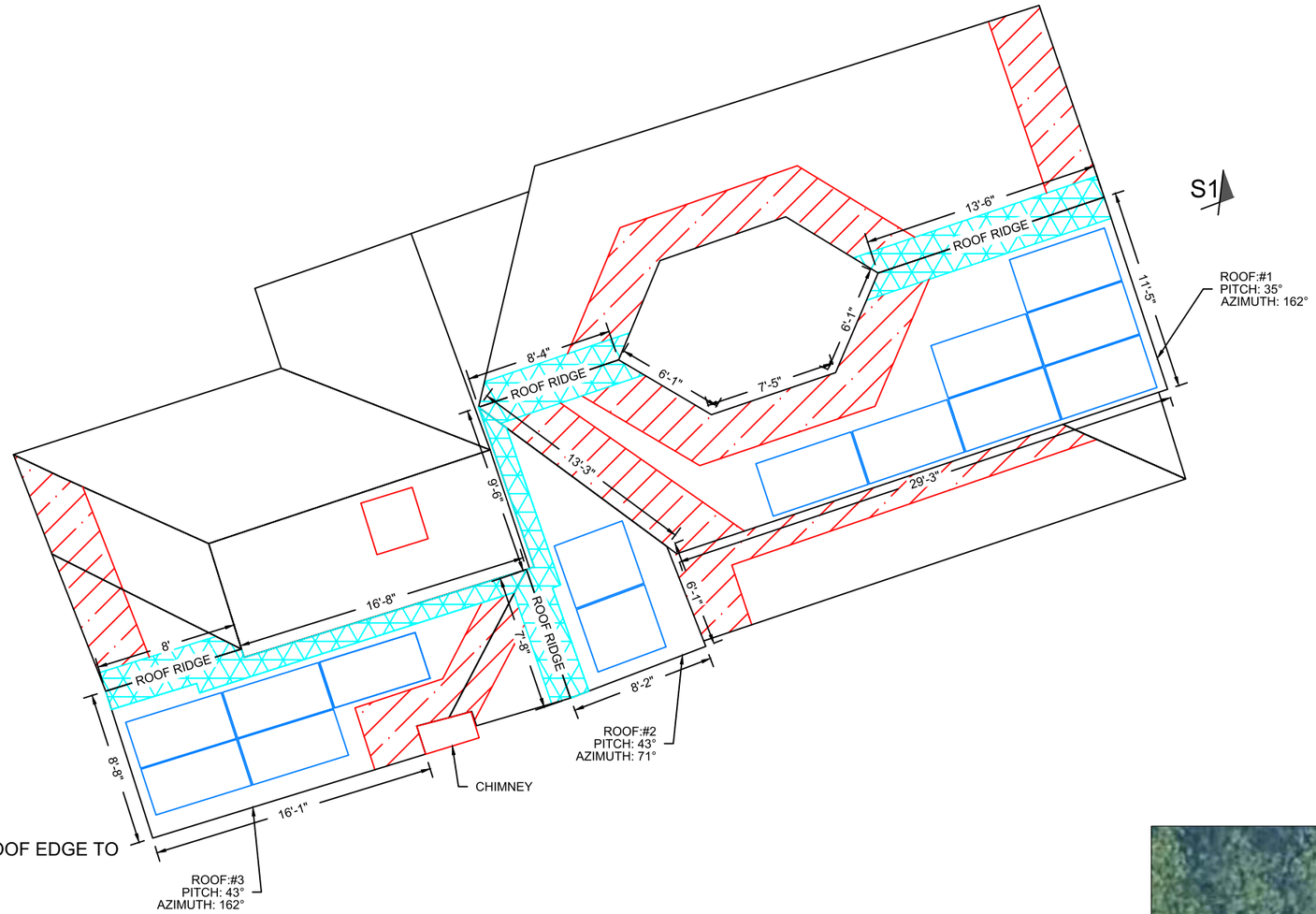
- As noted above, the panels on the upper south of the home have a higher average kWh per module compared to modules on the lower part of the house and on the side of the house.
- There are also trees on the front of the property that would be limiting visibility from the right-of-way

Shade Map.



Thank you,
Andrew Tam
Design Engineer.

Critter Guard



N

S

S1

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: 1893 SQFT

SOLAR ARRAY AREA: 294.28 SQFT

THE SOLAR ARRAY IS 15.5% OF THE PLAN VIEW TOTAL ROOF AREA

NOTES:

1. THE SYSTEM SHALL INCLUDE (14) LONGI LR5-54HPB-405M.
2. SNAPNRACK TOPSPEED WILL BE INSTALLED IN ACCORDANCE WITH SNAPNRACK INSTALLATION MANUAL.
3. REFER TO STRUCTURAL DRAWING FOR SECTIONS MARKED AND ADDITIONAL NOTES.

SOLAR PANEL LAYOUT

Scale: 1/8" = 1'-0"

STATE OF MARYLAND
DAVID C. HERNANDEZ
49993
PROFESSIONAL ENGINEER

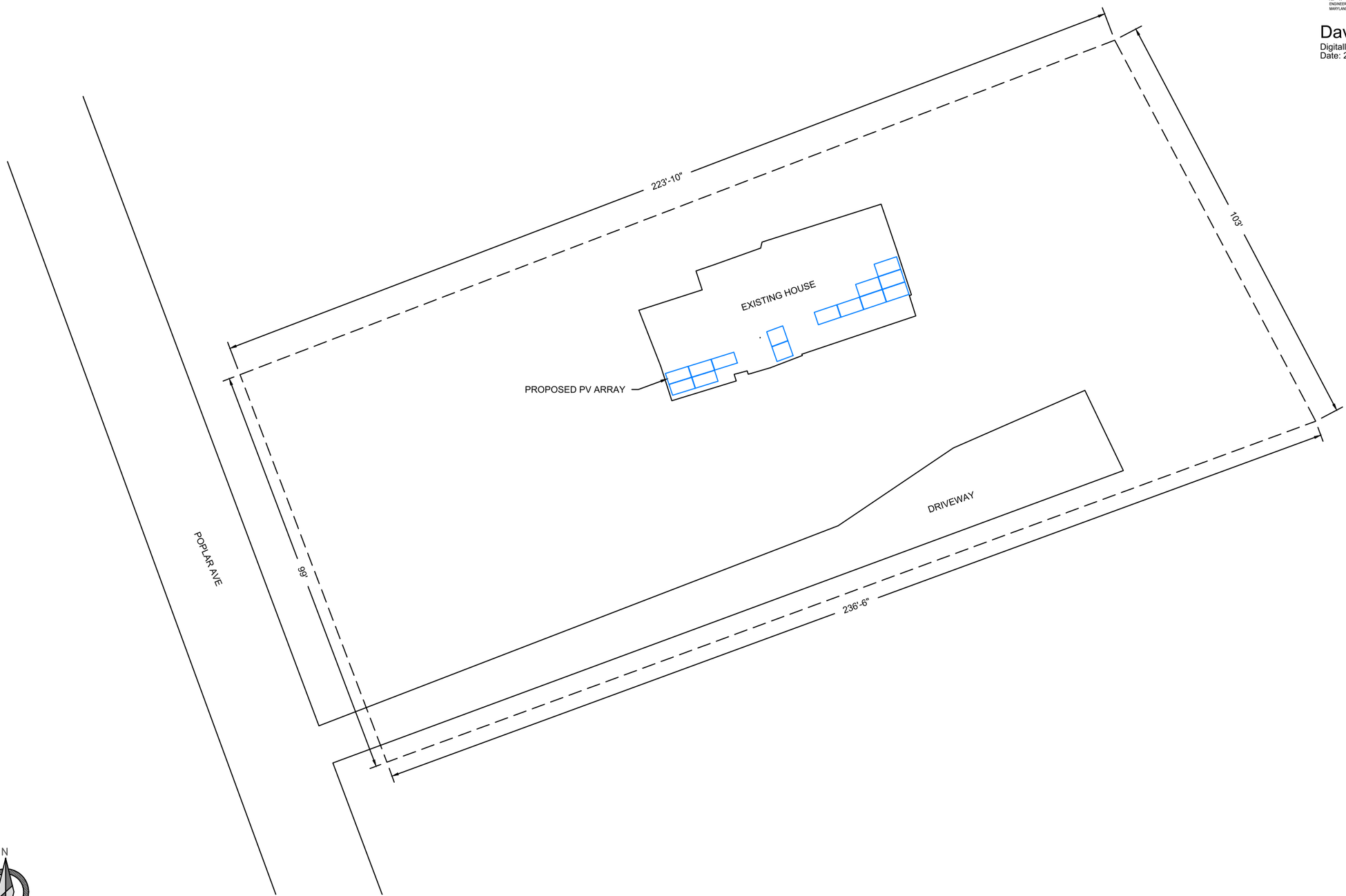
PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 49993 EXP 10/06/2026

David C. Hernandez, PE
Digitally signed by David C. Hernandez, PE
Date: 2025.12.19 17:37:28 -05:00

SolarEnergyWorld
Because Tomorrow Matters

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

Building Code	International Residential Code (IRC) 2021
Electrical Code	National Electrical Code (NEC) 2017
Wind Speed: 115 MPH	Snow Load: 30 PSF
Modules	(14) LONGi LR5-54HPB-405M
Inverter(s)	(14) IQ8+-72-M-US
DC System Size: 5.670 kW	AC System Size: 4.060 kW
Customer Information	Jeremiah Frueauf 7013 Poplar Ave Takoma Park, MD 20912
Partner/Lender	None
AHJ: Montgomery	Utility: Pepco
Sheet Name	Solar Panel Layout
Drawn By: AO	Date: December 18, 2025
Scale: AS NOTED	Job Number: MD29711
Sheet: A-1	



SITE PLAN
Scale: 1" = 40'-0"

STATE OF MARYLAND
DAVID C. HERNANDEZ
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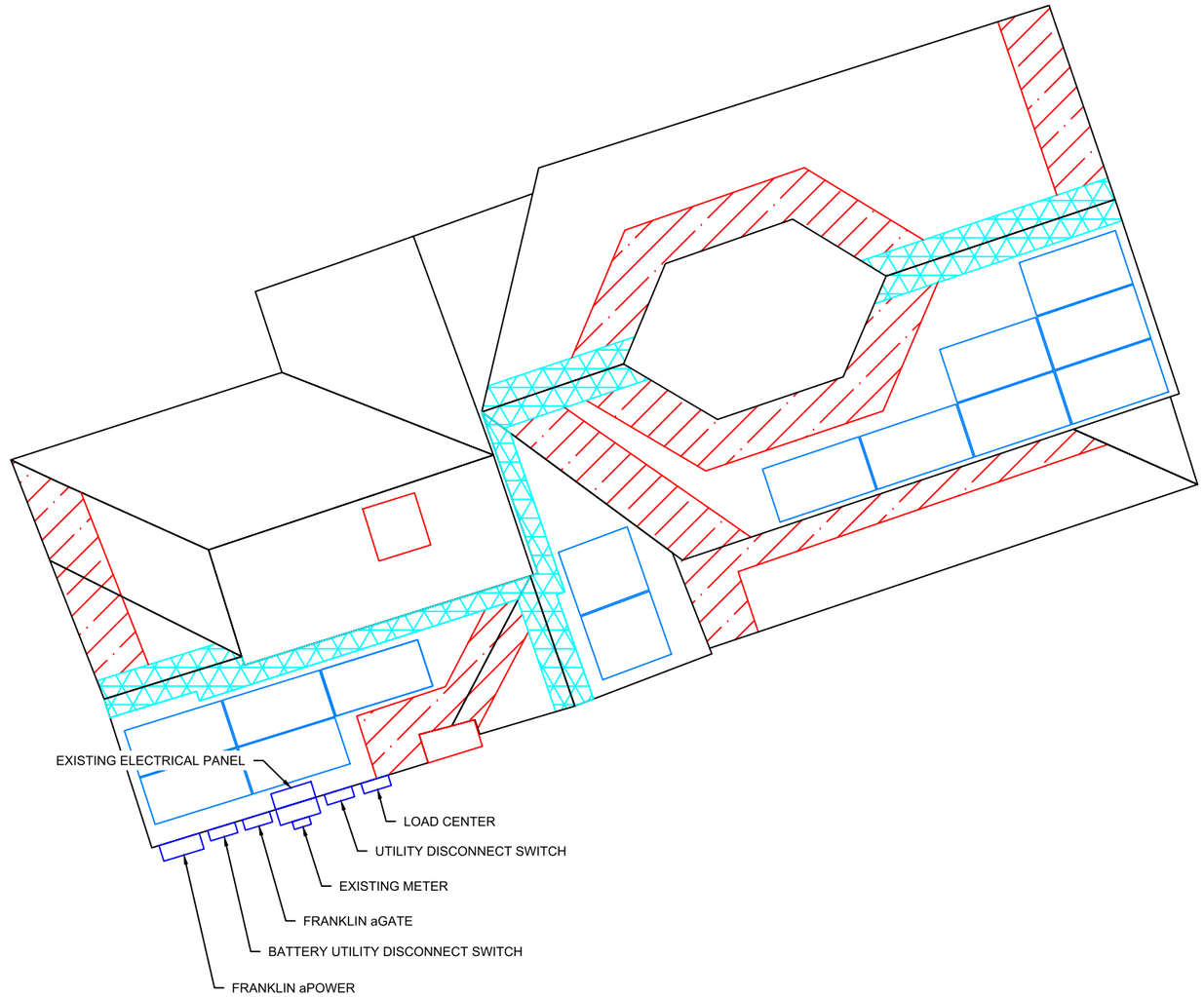
Snow Load	30 PSF
Modules	(14) LONGi LR5-54HPB-405M
Inverter(s)	(14) IQ8+-72-M-US
DC System Size	5.670 kW
AC System Size	4.060 kW
Customer Information	Jeremiah Frueauf 7013 Poplar Ave Takoma Park, MD 20912
Partner/Lender	None
AHJ	Montgomery
Utility	Pepco
Sheet Name	Site Plan
Drawn By	AO
Date	December 18, 2025
Scale	AS NOTED
Job Number	MD29711
Sheet	A-2



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.

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(888) 497-3233

Building Code: International Residential Code (IRC) 2021

Electrical Code: National Electrical Code (NEC) 2017

Wind Speed	Snow Load
115 MPH	30 PSF

Modules: (14) LONGi LR5-54HPB-405M

Inverter(s): (14) IQ8+-72-M-US

DC System Size	AC System Size
5.670 kW	4.060 kW

Customer Information:
Jeremiah Frueauf
7013 Poplar Ave
Takoma Park, MD 20912

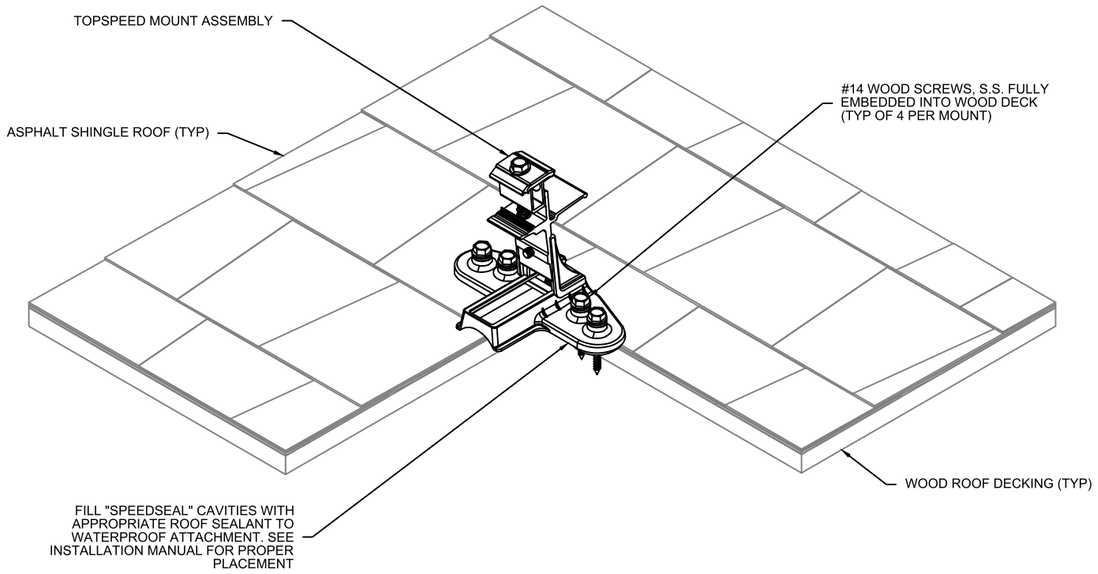
Partner/Lender: None

AHJ	Utility
Montgomery	Pepco

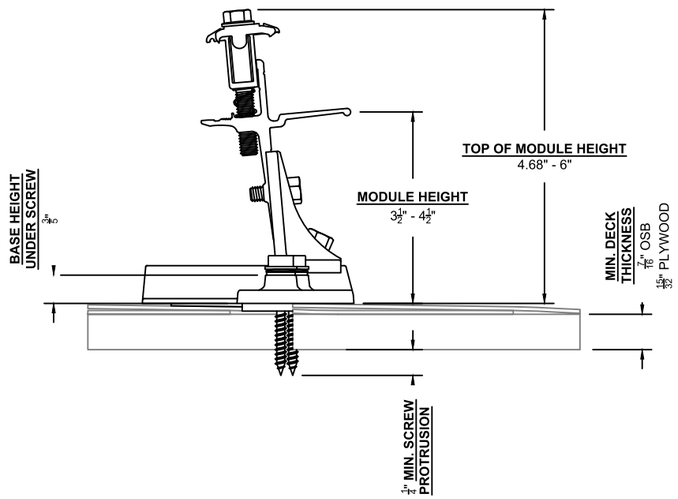
Sheet Name: Equipment Location Plan

Drawn By	Date
AO	December 18, 2025

Scale	Job Number	Sheet
AS NOTED	MD29711	E-1



Structural Details		
S1	Rafter	2x10 O.C. 16"



STRUCTURAL ATTACHMENT DETAIL

NOTES:

1. ALL WORK SHALL COMPLY WITH REQUIREMENTS OF INTERNATIONAL RESIDENTIAL CODE (IRC 2021), LOADING CODE (ASCE 7-16), WOOD DESIGN CODE (NDS 2015), AND LOCAL REQUIREMENTS.
2. LOAD CRITERIA PER :
   - EXPOSURE CATEGORY "B"
   - GROUND SNOW LOAD, Pg = 30 PSF
   - LATERAL LOAD RISK CATEGORY "II"
   - ULTIMATE DESIGN WIND SPEED = 115 MPH
3. SOLAR PANELS AND RACKING SYSTEMS SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATION.
4. FOLLOW ALL LOCAL AND FEDERAL SAFETY REQUIREMENTS.

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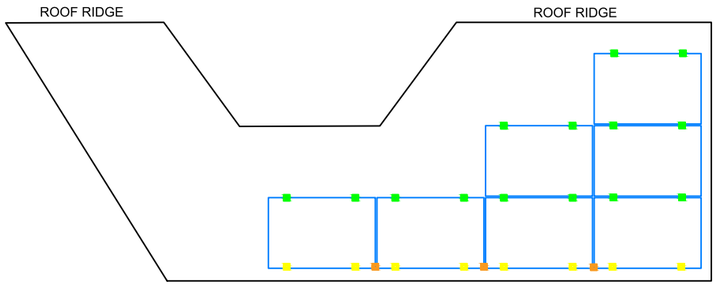
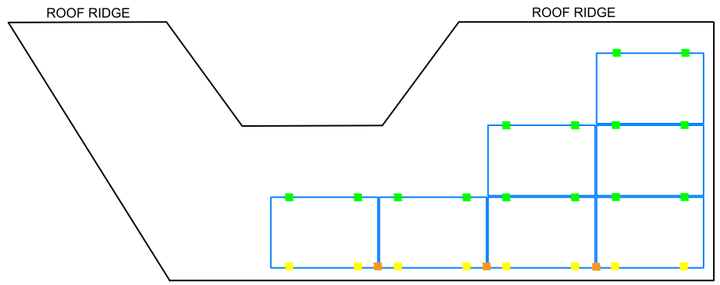
Electrical Code: National Electrical Code (NEC) 2017
Wind Speed: 115 MPH | Snow Load: 30 PSF
Modules: (14) LONGi LR5-54HPB-405M
Inverter(s): (14) IQ8+-72-M-US
DC System Size: 5.670 kW | AC System Size: 4.060 kW
Customer Information: Jeremiah Frueauf, 7013 Poplar Ave, Takoma Park, MD 20912
Partner/Lender: None
AHJ: Montgomery | Utility: Pepco
Sheet Name: Structural Attachment Details
Drawn By: AO | Date: December 18, 2025
Scale: AS NOTED | Job Number: MD29711 | Sheet: S-1



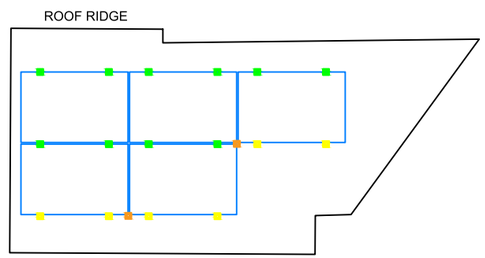
SOLAR PANEL FOOTING PLAN R1

Scale: 1/8" = 1'-0"



SOLAR PANEL FOOTING PLAN R2

Scale: 1/8" = 1'-0"



SOLAR PANEL FOOTING PLAN R3

Scale: 1/8" = 1'-0"

KEY

- MOUNTS WITHOUT SPACERS
- MOUNTS WITH SPACERS
- CLAMPS WITHOUT SPACERS
- CLAMPS WITH SPACERS

Bill Of Materials	
Product	Count
Mounts Without Spacers	28
Mounts With Spacers	18
Clamps Without Spacers	0
Clamps With Spacers	6

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

STATE OF MARYLAND
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(888) 497-3233

Building Code: International Residential Code (IRC) 2021

Electrical Code: National Electrical Code (NEC) 2017

Wind Speed: 115 MPH | Snow Load: 30 PSF

Modules: (14) LONGi LR5-54HPB-405M

Inverter(s): (14) IQ8+-72-M-US

DC System Size: 5.670 kW | AC System Size: 4.060 kW

Customer Information:
Jeremiah Frueauf
7013 Poplar Ave
Takoma Park, MD 20912

Partner/Lender: None

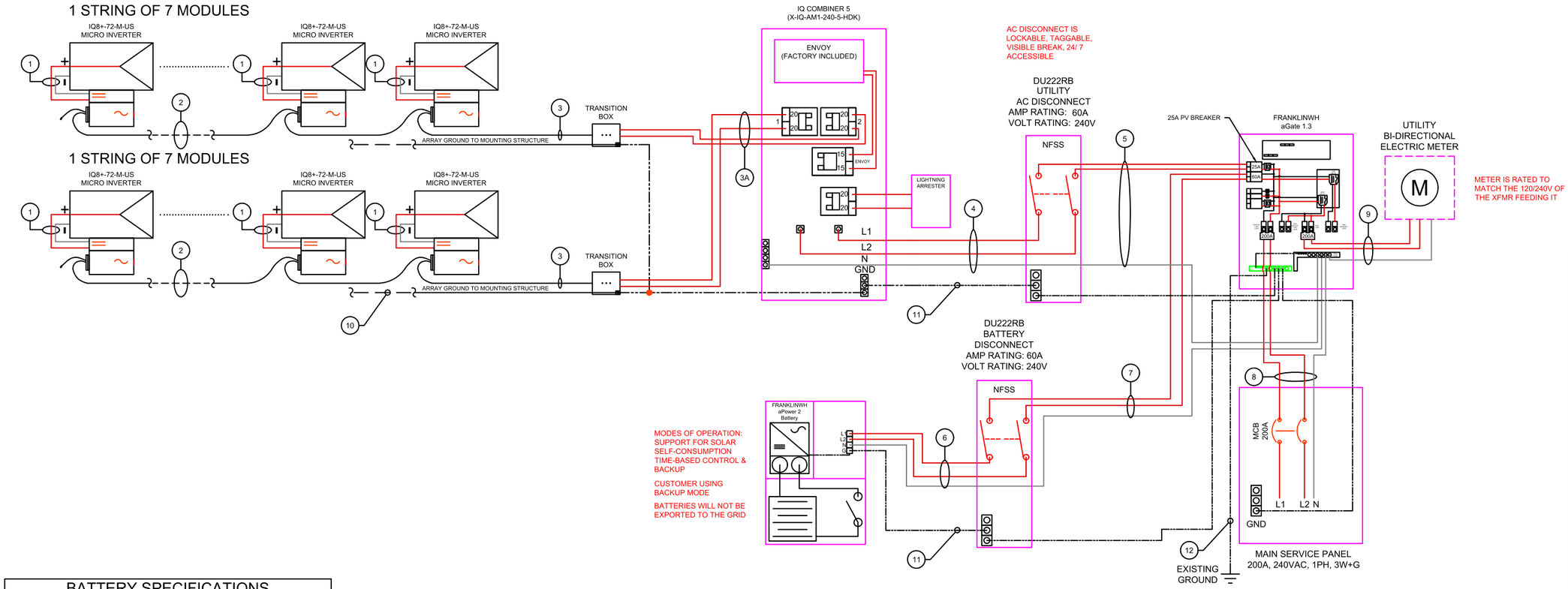
AHJ: Montgomery | Utility: Pepco

Sheet Name: Solar Panel Footing Plan

Drawn By: AO | Date: December 18, 2025

Scale: AS NOTED | Job Number: MD29711 | Sheet: S-2

SMART INVERTERS



BATTERY SPECIFICATIONS		
BATTER MODEL/# OF UNITS	[1] Franklin aPower 2 BATTERY	
	PER UNIT	**TOTAL**
USABLE ENERGY CAPACITY	15 kWh	15 kWh
MAX CONTINUOUS OUTPUT POWER	10000 W	10000 W
MAX CONTINUOUS OUTPUT CURRENT (NOMINAL AC VOLTAGE OF 120/240V)	48 A	48 A
LRA SURGE OUTPUT CURRENT (NOMINAL AC VOLTAGE OF 120/240V)	150 A	150 A
MODULE SPECIFICATIONS		
MODEL NUMBER		LR5-54HPB-405M
PEAK POWER		405 W
RATED VOLTAGE (Vmpp)		31.18 V
RATED CURRENT (Imp)		12.99 A
OPEN CIRCUIT VOLTAGE (Voc)		37.15 V
SHORT CIRCUIT CURRENT (Isc)		13.78 A
MAXIMUM SYSTEM VOLTAGE		1500VDC
INVERTER SPECIFICATIONS		
MODEL NUMBER		IQ8PLUS-72-M-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		7
NO. OF STRINGS		2
ARRAY WATTS AT STC		2835

3-LINE DIAGRAM

WIRE/CONDUIT SCHEDULE ARRAY			
TAG	DESCRIPTION	WIRE SIZE/TYPE	NOTES
1	Panel to Micro Inverter	PV Wire (Factory Made)	INTEGRATED
2	Micro Inverter to Micro Inverter	Pre-Manufactured Cable	
3	Micro Inverter to Transition Box	Pre-Manufactured Cable	
3A	Transition Box to Load Center	#10 THHN/THWN-2	
4	Load Center to Utility Disconnect	#10 Cu THHN/THWN-2	
5	Utility Disconnect to aGate	#10 Cu THHN/THWN-2	
6	aPower 2 to Battery Disconnect	#6 Cu THHN/THWN-2	
7	Battery Disconnect to aGate	#6 Cu THHN/THWN-2	
8	aGate to Main Service Panel	4/0 SER AL	
9	aGate to Meter	4/0 SEU AL	
10	Equipment Grounding Conductor	#8 Cu Bare Copper Wire	
11	Equipment Grounding Conductor	#8 Cu THHN/THWN-2	
12	Grounding Electrode Conductor	#6 Cu	

GENERAL ELECTRIC NOTES: NEC2017

1. EQUIPMENT USED SHALL BE NEW, UNLESS OTHERWISE NOTED.
2. EQUIPMENT USED SHALL BE UL LISTED, UNLESS OTHERWISE NOTED.
3. EQUIPMENT SHALL BE INSTALLED PROVIDING ADEQUATE PHYSICAL WORKING SPACE AROUND THE EQUIPMENT AND SHALL COMPLY WITH NEC.
4. COPPER CONDUCTORS SHALL BE USED AND SHALL HAVE AN INSULATION RATING OF 600V, 90°C, UNLESS OTHERWISE NOTED
5. CONDUCTORS SHALL BE SIZED IN ACCORDANCE TO THE NEC. CONDUCTORS AMPACITY SHALL BE DE-RATED FOR TEMPERATURE INCREASE, CONDUIT FILL AND VOLTAGE DROP.
6. ALL CONDUCTORS, EXCEPT PV WIRE SHALL BE INSTALLED IN APPROVED CONDUITS OR RACEWAY. CONDUITS SHALL BE ADEQUATELY SUPPORTED AS PER NEC.
7. AC DISCONNECT SHOWN IS REQUIRED IF THE UTILITY REQUIRES VISIBLE-BLADE SWITCH.
8. EXPOSED NON-CURRENT CARRYING METAL PARTS SHALL BE GROUNDED AS PER NEC.
9. LINE SIDE INTER-CONNECTION SHALL COMPLY WITH NEC.
10. SMS MONITORING SYSTEM AND IT'S CONNECTION SHOWN IS OPTIONAL. IF USED, REFER TO SMS INSTALLATION MANUAL FOR WIRING METHODS AND OPERATION PROCEDURE.
11. ASHRAE FUNDAMENTAL OUTDOOR DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE U.S. (PHOENIX, AZ OR PALM SPRINGS, CA)
12. FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF MOUNTED SUNLIGHT CONDUIT USING THE OUTDOOR TEMPERATURE OF 47°C
    12.1. 10AWG CONDUCTOR ARE GENERALLY ACCEPTABLE FOR MODULES WITH AN Isc OF 9.6 AMPS WITH A 15 AMP FUSE.

WIRE SIZING FOR OCPD
EX (Isc *(1.25)(1.25)(# OF STRINGS IN PARALLEL) = WIRE AMPACITY OR USING NEC TABLE 690.8

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Wind Speed: 115 MPH | Snow Load: 30 PSF
Modules: (14) LONGi LR5-54HPB-405M
Inverter(s): (14) IQ8+-72-M-US
DC System Size: 5.670 kW | AC System Size: 4.060 kW

Customer Information:
Jeremiah Frueauf
7013 Poplar Ave
Takoma Park, MD 20912

Partner/Lender: None
AHJ: Montgomery | Utility: Pepco
Sheet Name: Electrical 3-Line Diagram
Drawn By: AO | Date: December 18, 2025
Scale: AS NOTED | Job Number: MD29711 | Sheet: E-2

DEPARTMENT OF PERMITTING SERVICES

Marc Elrich
County Executive

Rabbiah Sabbakhan
Director

HISTORIC AREA WORK PERMIT APPLICATION

Application Date: 1/6/2026

Application No: 1145456
AP Type: HISTORIC
Customer No: 1408761

Affidavit Acknowledgement

The Contractor is the Primary applicant authorized by the property owner
This application does not violate any covenants and deed restrictions

Primary Applicant Information

Address	7013 POPLAR AVE TAKOMA PARK, MD 20912
Othercontact	Solar Energy World (Primary)

Historic Area Work Permit Details

Work Type	ALTER
Scope of Work	Install (14) roof mounted solar panels, 5.67 kW