

## MONTGOMERY COUNTY HISTORIC PRESERVATION COMMISSION

|                   |   |                       |               |
|-------------------|---|-----------------------|---------------|
| <b>Address:</b>   | 7112 Maple Avenue, Takoma Park                                | <b>Meeting Date:</b>  | 9/9/2020      |
| <b>Resource:</b>  | Contributing Resource<br><b>Takoma Park Historic District</b> | <b>Report Date:</b>   | 9/2/2020      |
| <b>Applicant:</b> | Jim Douglas   | <b>Public Notice:</b> | 8/26/2020     |
| <b>Review:</b>    | HAWP  | <b>Tax Credit:</b>    | n/a           |
| <b>Case No.:</b>  | 37/03-20PPP   | <b>Staff:</b>         | Dan Bruechert |
| <b>Proposal:</b>  | Solar Panel Installation                                      |                       |               |

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### RECOMMENDATION

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

### PROPERTY DESCRIPTION

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



*Figure 1: 7112 Maple Avenue has a large front-gable roof.*

## **PROPOSAL**

The applicant proposes to install 31 (thirty-one) solar panels on the roof of the house.

## **APPLICABLE GUIDELINES**

When reviewing alterations and new construction within the Takoma Park Historic District several documents are to be utilized as guidelines to assist the Commission in developing their decision. 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)*, and the *Secretary of the Interior's Standards for Rehabilitation (Standards)*. The work proposed is additionally covered by the adopted policy on solar panels, *Historic Preservation Commission Policy No. 20-01: ADDRESSING EMERGENCY CLIMATE MOBILIZATION THROUGH THE INSTALLATION OF ROOF-MOUNTED SOLAR PANELS*. The pertinent information in these documents is outlined below.

### ***Montgomery County Code, Chapter 24A Historic Resources Preservation***

(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 insure conformity with the purposes and requirements of this chapter, if it finds that:

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

### ***Takoma Park Historic District Guidelines***

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

The design review emphasis will be restricted to changes that are at 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 district.

Contributing Resources should receive a more lenient review than those structures that have been classified as Outstanding. This design review should emphasize the importance of the resource to the overall streetscape and its compatibility with existing patterns rather than focusing on a close scrutiny of architectural detailing. In general, however, changes to Contributing Resources should respect the predominant architectural style of the resource. As stated above, the design review emphasis will be restricted to changes that are *at all visible from the public right-of-way*, irrespective of landscaping or vegetation.

Some of the factors to be considered in reviewing HAWPs on Contributing Resources include:

- All exterior alterations, including those to architectural features and details, should be generally consistent with the predominant architectural style and period of the resource and should preserve the predominant architectural features of the resource; exact

replication of existing details and features is, however, not required

- Minor alterations to areas that do not directly front on a public right-of-way such as vents, metal stovepipes, air conditioners, fences, skylights, etc. – should be allowed as a matter of course; alterations to areas that do not directly front on a public way-of-way which involve the replacement of or damaged to original ornamental or architectural features are discouraged, but may be considered and approved on a case-by-case basis
- Some non-original building materials may be acceptable on a case-by-case basis; artificial siding on areas visible to the public right-of-way is discouraged where such materials would replace or damage original building materials that are in good condition
- Alterations to features that are not visible from the public right-of-way should be allowed as a matter of course
- All changes and additions should respect existing environmental settings, landscaping, and patterns of open space.

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

2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.
9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportions, and massing to protect the integrity of the property and its environment.
10. New additions and adjacent or related new construction will 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.

***Chapter 24A***

(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 insure conformity with the purposes and requirements of this chapter, if it finds that:

- (1) The proposal will not substantially alter the exterior features of an historic site or historic resource within an historic district; or
- (2) The proposal is compatible in character and nature with the historical, archeological, architectural or cultural features of the historic site or the historic district in which an historic resource is located and would not be detrimental thereto or to the achievement of the purposes of this chapter; or
- (3) The proposal would enhance or aid in the protection, preservation and public or private utilization of the historic site or historic resource located within an historic district in a manner compatible with the historical, archeological, architectural or cultural value of the historic site or historic district in which an historic resource is located.
- (6) In balancing the interests 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.

(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.)

***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**

The subject property is a two-story, front gable house. There are no accessory structures on the site. The applicant proposes to install a total of 31 (thirty-one) solar panels on the roof. Seventeen panels will be installed on the left (southwest-facing) roof slope and the remaining 14 (fourteen) will be installed on the

right (northeast-facing) roof slope.



Figure 2: Front elevation of 7112 Maple Ave.

The preferred locations for solar panels on designated historic properties within the county are either: on the rear roof slope, a building addition, on and accessory structure, or on a ground-mounted array. The subject property does not have a ‘rear’ roof slope or building addition. The site does not have an accessory structure and cannot accommodate a ground-mounted array. Staff further finds that the roof is not historically or architecturally significant. Under the HPC Policy on Roof-Mounted Solar Panels, installing solar panels that are highly visible from the right-of-way is appropriate. Staff recommends the HPC approve the HAWP under 24A-(b)(1) and (6), Standards 2, 9, 10, and the *Design Guidelines*.

### **STAFF RECOMMENDATIONS**

Staff recommends that the Commission approve the HAWP application under the Criteria for Issuance in Chapter 24A-8(b)(1), (6), and (d), having found that the proposal, is consistent with and compatible in character with the purposes of Chapter 24A; The Takoma Park Historic District Design Guidelines; the HPC Policy on Roof-Mounted Solar Panels;

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

and with the general condition that the applicant shall present the **3 permit sets 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 [dan.bruechert@montgomeryplanning.org](mailto:dan.bruechert@montgomeryplanning.org) to schedule a follow-up site visit.



FOR STAFF ONLY:  
HAWP# 924044  
DATE ASSIGNED \_\_\_\_\_

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

**APPLICANT:**

Name: \_\_\_\_\_

E-mail: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ Zip: \_\_\_\_\_

Daytime Phone: \_\_\_\_\_

Tax Account No.: \_\_\_\_\_

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

Name: \_\_\_\_\_

E-mail: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ Zip: \_\_\_\_\_

Daytime Phone: \_\_\_\_\_

Contractor Registration No.: MHIC # 126720, Moco License # 13228

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

Is the Property Located within an Historic District? ☒ Yes/District Name \_\_\_\_\_  
☐ No/Individual Site Name \_\_\_\_\_

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

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

Building Number: \_\_\_\_\_ Street: \_\_\_\_\_

Town/City: \_\_\_\_\_ Nearest Cross Street: \_\_\_\_\_

Lot: \_\_\_\_\_ Block: \_\_\_\_\_ Subdivision: \_\_\_\_\_ Parcel: \_\_\_\_\_

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

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

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

\_\_\_\_\_  
Signature of owner or authorized agent

\_\_\_\_\_  
Date

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

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

Work Item 1: \_\_\_\_\_

Description of Current Condition:

Proposed Work:

Work Item 2: \_\_\_\_\_

Description of Current Condition:

Proposed Work:

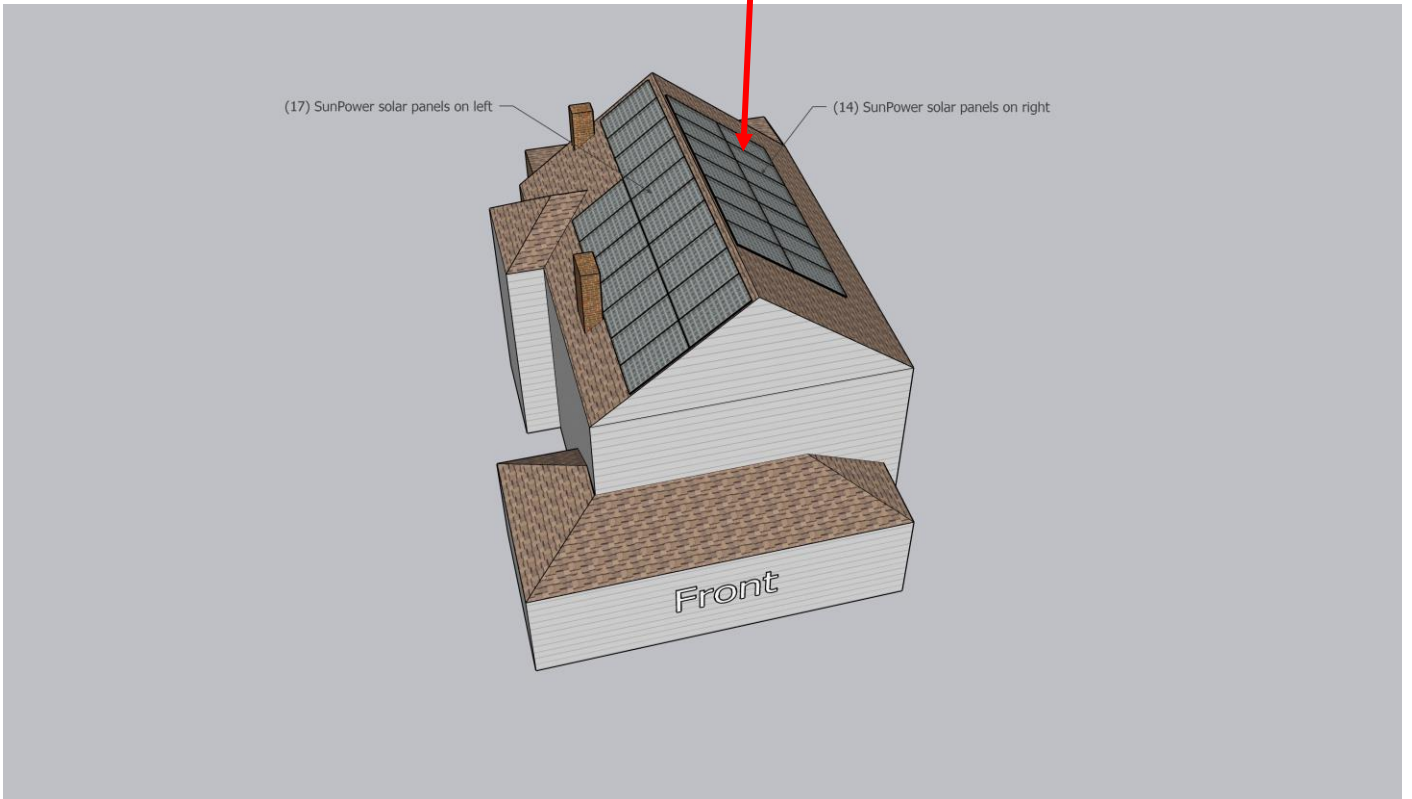
Work Item 3: \_\_\_\_\_

Description of Current Condition:

Proposed Work:



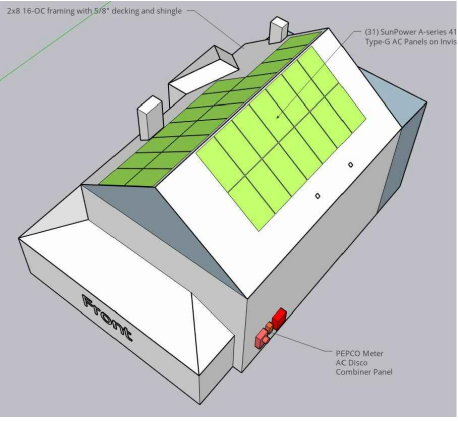

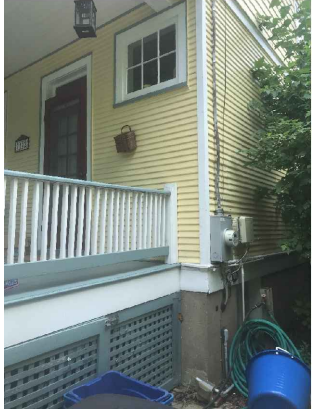

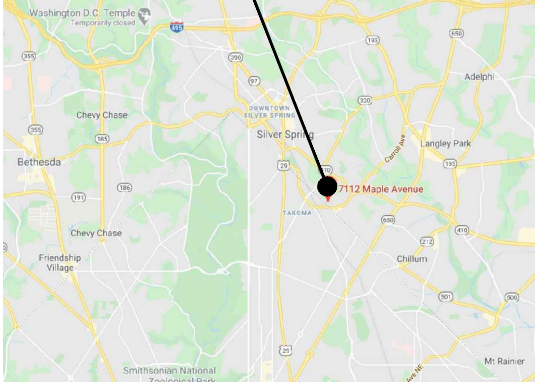
# HISTORIC AREA WORK PERMIT CHECKLIST OF APPLICATION REQUIREMENTS

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



SOLAR PV PROJECT, DOUGLAS

7112 MAPLE AVE. TAKOMA PARK, MD 20912

| PV SOLAR SYSTEM NOTES   | ABBREVIATIONS & LEGEND  | SEAL  | PROJECT DATA  | DRAWING INDEX   |
|---|---|---|---|---|
| <p>A) SOLAR MODULE INSTALLED IAW SOLAR MODULE MANUFACTURERS INSTRUCTIONS</p> <p>B) SOLAR MODULE CLAMPS INSTALLED IAW SOLAR MOUNT INSTALLATION INSTRUCTIONS</p> <p>C) EXISTING ROOF, KNOWN BY OWNER AND PRIME CONTRACTOR TO BE IN SOUND CONDITION AND IAW WITH BUILDING CODES</p> <p>D) ALL ELECTRICAL WORK SHALL COMPLY WITH THE 2017 NATIONAL ELECTRIC CODE (NEC)</p> <p>E) DC CONDUCTORS INSIDE BUILDING SHALL BE IN METALLIC RACEWAY IN ACCORDANCE WITH (IAW) ART 690.3(E).</p> <p>F) GROUNDING: ALL EXPOSED METAL PARTS (BOXES AND MOUNTING RAILS) SHALL BE BONDED WITH EQUIPMENT GROUNDING CONDUCTORS (EGC) AND GROUNDED AT THE MAIN ELECTRICAL PANEL.</p> <p>G) PROVIDE A PLACARD ON THE AC CUT OFF SWITCH (SW) WITH THE FOLLOWING INFORMATION IN 1/2" HIGH LETTERING PER NEC 690.54: "CAUTION - POSSIBLE BACKFEED PHOTOVOLTAIC POWER SYSTEM"</p> <p>H) RESERVED</p> <p>I) PROVIDE A PLACARD ON THE MAIN SERVICE PANEL WITH THE FOLLOWING INFORMATION IN 1/2" HIGH LETTERING PER NEC 690.17: "WARNING: ELECTRICAL SHOCK HAZARD. DO NOT TOUCH TERMINALS. TERMINALS ON LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION"</p> <p>GENERAL INSTALLATION NOTES</p> <p>1: THE DETAILS AND SPECIFICATIONS CONTAINED IN THESE DRAWINGS ARE CONSIDERED TO BE THE MINIMUM BY THE AHJ AND INSTALLERS.</p> <p>2: THIS PLAN SPECIFIES THE STRUCTURAL AND ELECTRICAL REQUIREMENTS FOR INSTALLATION OF SOLAR PHOTOVOLTAICS PANELS ON ROOF SURFACE AS SHOWN.</p> <p>3: USE COMMON SENSE AND OSHA REGULATIONS UNTIL INSTALLATION IS COMPLETED.</p> | <p>AHJ AUTHORITY HAVING JURISDICTION</p> <p>AC ALTERNATING CURRENT</p> <p>CB CIRCUIT BREAKER</p> <p>FT FOOT</p> <p>JB JUNCTION BOX</p> <p>OC ON CENTER</p> <p>LBS POUNDS</p> <p>FT FOOT</p> <p>IAW IN ACCORDANCE WITH</p> <p>LBS POUNDS</p> <p>MPH MILES PER HOUR</p> <p>PSF POUNDS PER SQUARE FOOT</p> | <div></div> <p>I HEREBY CERTIFY THAT THIS DOCUMENT WAS APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, MEMBERS LICENSE NO. <u>41066</u>, EXPIRATION DATE: <u>2021-09-08</u></p> | <p>PROJECT NAME</p> <p>SEE TITLE ABOVE</p> <p>SCOPE OF WORK</p> <p>SOLAR PV PANELS INSTALLATION ON EXISTING ROOF STRUCTURE BY MANUFACTURER'S SPECIFICATIONS</p> | <p>0001 COVER SHEET</p> <p>A001 ARRAY PLAN</p> <p>S001 ELEVATION/TRUSS AND FRAMING, STRUCTURAL CALCULATIONS, DETAIL</p> <p>E001 ELECTRICAL SCHEMATIC</p> <p>E002 ELECTRICAL CALCULATIONS</p> <p>E003 ELECTRICAL MODULE SPECS</p> <p>M001 HARDWARE MOUNTING DETAILS/SPEC</p> |
|   |   | EXISTING SERVICE PANEL  | MODEL VIEW  | SITE VIEW   |
|   |   |    |    | <p>NEW ARRAYS ON MULTI-ROOF</p>    |
|   |   | EXISTING METER  | EXISTING EXTERIOR   | VICINITY LOCATION   |
|   |   |    |    | <p>SITE LOCATION</p>   |



HELIOS SOLAR SYSTEMS, LLC  
ASHBURN VA, USA  
WWW.HELIOSOLARSYS.COM  
703 577 2178

DOUGLAS  
RESIDENCE  
PV SOLAR INSTALLATION  
7112 MAPLE AVE.  
TAKOMA PARK, MD 20912

PROJECT FILE

20912-01

REVISION LEVEL

DATE

REV-1

DATE

DRAWN BY:

GDC

CHECKED BY:

TR

SCALE

AS NOTED

DRAWING TITLE

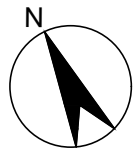
COVER SHEET

DRAWING NUMBER

0001

12

SHEET 1 OF 8



EXISTING  
EXHAUST

SECT A-A  
SEE SHT  
S001

ELEC.  
METER

LOAD CENTER  
AND AC DISCO.



ASPHALT ROOF, WITH  
3/4" DECKING ON  
2"X8" WOOD FRAMING  
@ 16" O.C.

NEW PV 5.810 KW ARRAY.  
(14) SUNPOWER A-SERIES  
415 WATT AC PANELS

RAKE

RIDGE

SLOPE  
9:12

REAR

FRONT

CHIMNEY

SLOPE  
9:12

CHIMNEY

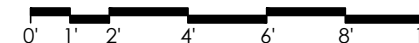
EAVE

EAVE

ASPHALT ROOF, WITH  
3/4" DECKING ON  
2"X8" WOOD FRAMING  
@ 16" O.C.

NEW PV 7.055 KW ARRAY.  
(17) SUNPOWER A-SERIES  
415 WATT AC PANELS

SCALE: 1/2" = 1'-0"



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PROJECT FILE

20912-01

REVISION LEVEL DATE  
REV-1 DATE

DRAWN BY:  
GDC  
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SCALE AS NOTED

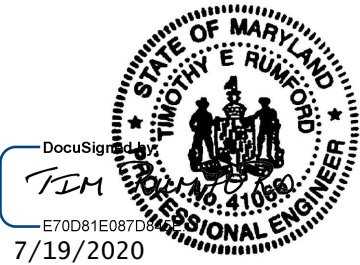
DRAWING TITLE

ARRAY MAP

DRAWING NUMBER

A001

13  
SHEET 2 OF 8

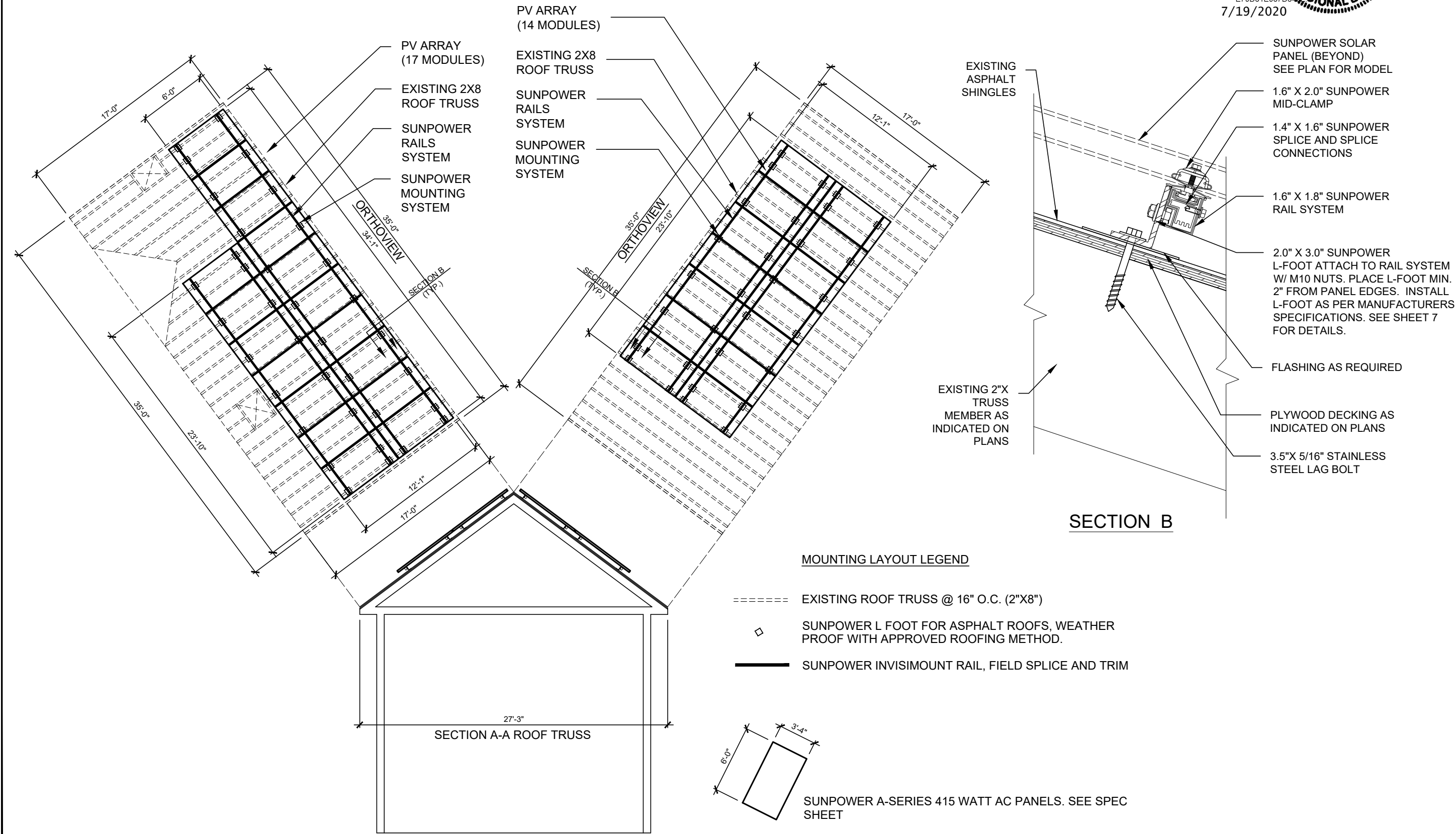


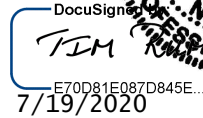
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TAKOMA PARK, MD 20912

|                             |              |
|-----------------------------|--------------|
| PROJECT FILE                |              |
| 20912-01                    |              |
| REVISION LEVEL              | DATE         |
| REV-1                       | DATE         |
| DRAWN BY:                   |              |
| GDC                         |              |
| CHECKED BY:                 |              |
| TR                          |              |
| SCALE                       | AS NOTED     |
| DRAWING TITLE               |              |
| ELEVATION/TRUSS AND FRAMING |              |
| DRAWING NUMBER              |              |
| S001                        |              |
| 14                          | SHEET 3 OF 8 |





|               |  |
|---------------|--|
| Project Name: | <b>Jim Douglas - Montgomery County (Takoma Park Historic District)</b><br><b>7112 Maple Ave. Takoma Park, MD 20912</b> |
| Address:      |  |
| Description:  | Pitched roof, 31 SunPower A-Series 415-watt Type-G AC panels   |

| Load/Structure Assumptions (1) |                 |                  |                       |               |                |
|--------------------------------|-----------------|------------------|-----------------------|---------------|----------------|
| Wind Speed (mph)               | Snow load (psf) | Roof Height (ft) | Importance factor Cat | Wind Exposure | Roof Wind Zone |
| 115                            | 30              | <30              | II                    | B             | 3              |

| <u>Present Conditions and Structure Info</u> |   |
|--|---|
|  | Framing is 2x8 16-OC with 5/8" deck and shingle roof. |

**Wind Loading**

Pnet = Net Design Wind Pressure  
(psf)

From ASCE 7-10, 100sf eff wind area, 27 to 45 deg, zone 3

| Down                          | Up   |         |
|-------------------------------|------|---------|
| 19.8                          | 23.8 | 115 mph |
| Module Areas (sf):            |      | 20.1    |
|                               |      | Pnet *  |
| Wind Force (lbs), Per module: |      | Area=   |

| Down                            | Up    |         |
|---------------------------------|-------|---------|
| 397.1                           | 477.3 |         |
| Array number of fasteners       |       | 65      |
| Array Number of Modules:        |       | 31      |
| Number of fasteners per module: |       | 2.1 AVE |
| Force per fastener: (lbs)       |       |         |

| Down                                  | Up    |  |
|---------------------------------------|-------|--|
| 189.4                                 | 227.6 |  |
| Pull out Force per fastener, lbs (2): |       |  |

5/16" x 3.5" SS Lag. Assumes worst case wood  
681 species

Design Margin (Capability/Exposure). >2 required

| Down | Up  |
|------|-----|
| 3.6  | 3.0 |
| OK   | OK  |

>2

Uplift wind loads well below pull out force on fasteners. Down Force, since modules are flush, array not likely to affect forces compared to existing bare roof deflection. Uplift psf < negative snow load. Side wind loads negligible.

| <b>Snow Load</b> |   |
|------------------|---|
| OK               | Modules are flush and not likely to affect snow drift |

|                     |                     | <u>Dead Load</u> |
|---------------------|---------------------|------------------|
| Module Weight (lbs) | 46.5                |                  |
|                     | 2.3                 | psf              |
| OK                  | (negligible effect) |                  |

|   |  |
|---|--|
| <b>Seismic</b>  |  |
| Seismic criteria were not considered per provisions of ASCE 7-10 Section 13.1.4 |  |
| OK  |  |

NOTES

(1) ASCE 7-10

(2) NACBEP Guide on withdrawal loads for lag bolts per inch based on lag bolt size and wood type. Since wood type is not known, used the worst case which is white spruce, 227 lbs per inch for 5/16" lags. 3.5" bolt gives 3 inch penetration. 227 x 3.



**Helios**  
Solar Systems

DOUGLAS  
RESIDENCE  
PV SOLAR INSTALLATION  
7112 MAPLE AVE.  
TAKOMA PARK, MD 20912

PROJECT FILE  
20912-01

| REVISION LEVEL | DATE |
|----------------|------|
| REV-1          | DATE |
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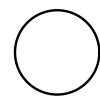
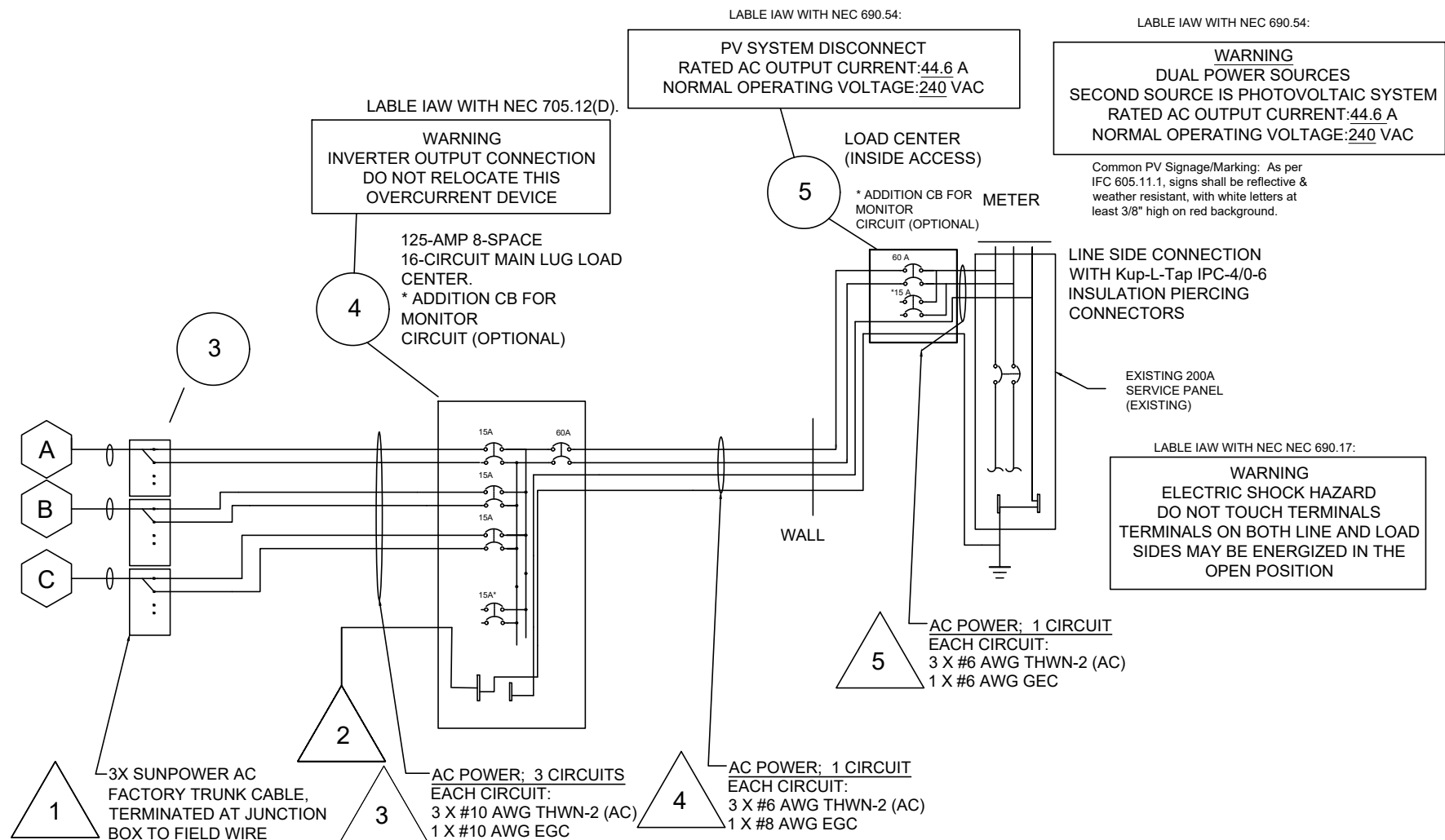
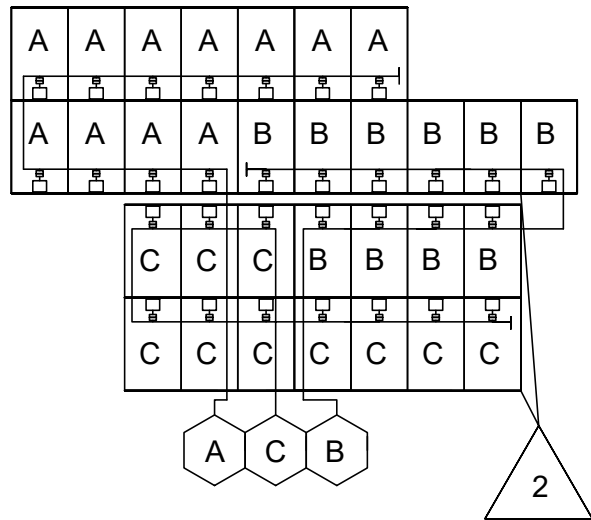
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SHEET 4 OF 8

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## EQUIPMENT SCHEDULE

| TAG | NAME           | P/N   | QTY | NOTES                               |
|-----|----------------|---|-----|-------------------------------------|
| 1   | SOLAR MODULES  | SunPower A-Series 415-watt Type-G AC panels               | 31  | 3 CIRCUIT                           |
| 2   | MicroInverters | SUNPOWER FACTORY ul                                       | 31  | Mounted to modules at factory       |
| 3   | JUNCTION BOX   | Field determined  | 3   | JUNCTION BOX, LOCATED ON ROOF       |
| 4   | LOAD CENTER    | 125-AMP 8-SPACE 16-CIRCUIT MAIN LUG LOAD CENTER. OR EQUIV | 1   | WITH 60 CB SERVING OUTSIDE AC DISCO |
| 5   | AC Disco       | AC LOAD CENTER, TWO SPACE, 60A OCPD                       | 1   | For INSIDE access. 240VAC, 70A.     |



## WIRE SCHEDULE (EACH CIRCUIT)

| TAG | DESCRIPTION  | GAUGE                    | QTY | CONDUIT, DISTANCE   |
|-----|--|--------------------------|-----|---|
| 1   | SUNPOWER AC Cable, 1-Ph (3-Wire) , CAP UNUSED CONNECTORS, CAP AS SHOWN   | #10 (REF)                | 1   | FACTORY CABLE, WITH INTEGRATED CONNECTORS. TIE TO MOUNTING RAILS. LENGTH OF ARRAY   |
| 2   | CONTINUOUS EGC #10 COPPER RACKING SYSTEM TO EARTH GROUND -   | #10                      | 1   | ROUTED WITH PV WIRE, THEN IN CONDUIT AFTER JUNCTION BOX   |
| 3   | AC POWER FROM ROOF JB's TO AC LOAD CENTER THWN-2 (240 VAC) MAX DERATING CURRENT (SEE CALCS PAGE); MAX VOLTAGE (SEE CALCS PAGE)         | #10 (L1, L2), #10 (EGC)  | 3   | ROUTES ACROSS ROOF AND DOWN SIDE OF BUILDING to LOAD CENTER/ SWITCH NEAR METER, IN EMT. APPROX. 100 FEET. IF ROUTED INDOORS, NM CABLE PERMISSIBLE |
| 4   | LOAD CENTER TO AC DISCO AND TO MAIN SERVICE PANEL THWN-2 (240 VAC) MAX DERATING CURRENT (SEE CALCS PAGE); MAX VOLTAGE (SEE CALCS PAGE) | #6 (L1, L2, N), #8 (EGC) | 4   | ROUTES ACROSS SIDE OF BUILDING to AC Disco FEET, EMT  |
| 5   | LOAD CENTER TO AC DISCO AND TO MAIN SERVICE PANEL THWN-2 (240 VAC) MAX DERATING CURRENT (SEE CALCS PAGE); MAX VOLTAGE (SEE CALCS PAGE) | #6 (L1, L2, N), #6 (GEC) | 4   | ROUTES ACROSS SIDE OF BUILDING to AC Disco FEET, EMT  |



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| NOTE NO. | ELECTRICAL NOTES  |
|----------|---|
| 1        | ALL ELECTRICAL WORK SHALL COMPLY WITH THE 2014 NATIONAL ELECTRIC CODE (NEC) 2017 NEC  |
| 2        | DC CONDUCTORS INSIDE BUILDING SHALL BE IN METALLIC RACEWAY IN ACCORDANCE WITH (IAW) ART 690.3(E).   |
| 3        | GROUNDING: ALL EXPOSED METAL PARTS (BOXES AND MOUNTING RAILS) SHALL BE BONDED WITH EQUIPMENT GROUNDING CONDUCTORS (EGC) AND GROUNDED AT THE MAIN                                      |
| 4        | PROVIDE A PLACARD ON EACH AC CUT OFF SWITCH (SW) WITH THE FOLLOWING INFORMATION IN ¼" HIGH LETTERING PER NEC 690.54:  |
|          | <div>Solar Disconnect</div> <div>WARNING - Electric Shock Hazard<br/>DO NOT TOUCH TERMINALS<br/>Terminals on both Line and Load sides<br/>may be energized in the Open Position</div> |
| 5        | RESERVED  |
| 6        | PROVIDE A PLACARD ON THE MAIN SERVICE PANEL WITH THE FOLLOWING INFORMATION IN ¼" HIGH LETTERING PER NEC 690.17:   |
|          | <div>WARNING - DUAL POWER SOURCE<br/>SECOND SOURCE IS PV SYSTEM</div>   |



|  |  | ELECTRICAL CALCULATIONS  |                     |   |  |                       |                                   |       |  |
|--|--|--|---------------------|---|--|-----------------------|-----------------------------------|-------|--|
|  |  | Jim Douglas - Montgomery County (Takoma Park Historic District)<br>7112 Maple Ave. Takoma Park, MD 20912 |                     |   |  |                       |                                   |       |  |
| 1. Conductor Sizing per Art. 690.8(B)(1)   |  | Module   | 31                  | SunPower A-Series 415-watt Type-G AC panels | 415                                    | 12865                 | W                                 | STC   |  |
| a. Conductor must have 30 deg. C ampacity >= 125% of continuous current per Art 215.2(A)(1).   |  | Inverter   | 31                  | SUNPOWER FACTORY ul                         |  | 349                   | W                                 | max   |  |
|  |  |  |                     |   |  | 10819                 |                                   |       |  |
| b. Conductor must have (after corrections for conditions of use) >= continuous current per Table 310.16  |  | Photovoltaic Module AC Electrical Specifications (REF):  |                     |   |  |                       |                                   |       |  |
| c. Evaluate conductor temperature at termination per Art 110.14(C). Ampacity of wire derated for conditions of termination must be >= continuous current * 1.25. All string terminations are rated at 90 degrees C.              |  | Pnim (DC)=   | 415                 | W   |  |                       |                                   |       |  |
|  |  | AC Electrical Data   |                     |   |  |                       |                                   |       |  |
|  |  | Output @ 240 (min/nom/max);  |                     |   | 211/240/264 V                          |                       |                                   |       |  |
|  |  | Operating Frequency (min./nom./max.)   |                     |   | 59.3/60.0/60.5 Hz                      |                       |                                   |       |  |
|  |  | Output Power Factor (min.)   |                     |   | 1                                      |                       |                                   |       |  |
| 2. OOP Sizing per Art. 690.8(B)(1)   |  | AC Max. Continuous Output Current @ 240 V  |                     |   | 1.49 A                                 |                       |                                   |       |  |
| a. Round up to next size per Art 240.4(B)  |  | Inverter Specifications:   |                     |   | SUNPOWER FACTORY ul                    |                       |                                   |       |  |
|  |  |  |                     |   |  |                       |                                   |       |  |
| 3. Conductor Sizing per Art. 690.8(B)(1)   |  |  |                     |   |  | OUTPUT                |                                   |       |  |
| a. Conductor must have 30 deg. C ampacity >= 125% of continuous current per Art 215.2(A)(1).   |  | Input Recom. (W)   | FACTORY             | OK  |  | Rated output (W)      |                                   | 349   |  |
|  |  | Max in DC Voltage  | FACTORY             | OK  |  | Peak output (W)       |                                   | 366   |  |
| b. Conductor must have (after corrections for conditions of use) >= continuous current per Table 310.16  |  | Max In Current (A)   | FACTORY             | OK  |  | Nom. output Cur (A)   |                                   | 1.45  |  |
|  |  |  |                     |   |  | max number in series: |                                   | 11    |  |
| c. Evaluate conductor temperature at termination per Art 110.14(C). Ampacity of wire derated for conditions of termination must be >= continuous current * 1.25. All string terminations are rated at 75 degrees C min.          |  |  |                     |   |  |                       | ok                                |       |  |
|  |  | Conductor Sizing, Inverter Input   |                     |   |  | 1-way length (ft)     |                                   | na    |  |
|  |  | NA, inverter input wiring is factory cable, designed for the purpose.                                    |                     |   |  |                       |                                   |       |  |
|  |  | Verify Max numbers of inverters per strings is equal/less than 11  |                     |   |  |                       |                                   |       |  |
| 4. OOP Sizing  |  | max string:  | A                   | 11  | ok <=11                                | and                   | B, C = 10 & 10                    |       |  |
|  |  | Conductor sizing, Inverter Output (each circuit- -BOUNDING/WORST CASE)                                   |                     |   |  | 1-way leng            |                                   | 100   |  |
| a. Round up to next size per Art 240.4(B)  |  | Icont=   | 15.95               | A   | (1.45 A x number of inverters per ckt) |                       |                                   |       |  |
|  |  | Icont*1.25+  | 19.94               | A   | OCP                                    | 20 A                  | 20A FOR CIRCS A, C ALSO           |       |  |
|  |  | Wire   | #10 AWG THWN-2      |   | 40 A                                   | NEC TABLE 310.16      |                                   |       |  |
| 5. Conductor Sizing per Art. 690.8(B)(1)   |  |  | Temp derate factor  |   | 0.58                                   | unitless              | 67 C PER NEC TBL 310.15(B)(2)(.c) |       |  |
| a. Conductor must have 30 deg. C ampacity >= 125% of continuous  |  | derated:   |                     |   | 23.2                                   | A                     | OK>                               | 19.94 |  |
|  |  | Conductor sizing, Combined Output from Load Center via ac disco/cut off switch                           |                     |   |  |                       |                                   | 25.00 |  |
|  |  | Icont=   | 44.95               | A   | (1.45A x number of inverters)          |                       |                                   |       |  |
|  |  | Icont*1.25+  | 56.19               | A   |  |                       |                                   |       |  |
|  |  | Wire   | #6 AWG THWN-2       |   | 75 A                                   | NEC TABLE 310.16      |                                   |       |  |
|  |  |  | Temp derate factor  |   | 0.87                                   | unitless              | 45 C                              |       |  |
|  |  |  | Conduit Fill factor |   | 1                                      | unitless              | Table 310.15(B)(20(a)             |       |  |
|  |  |  | Derated             |   | 65.25                                  | A                     | OK>                               | 56.19 |  |
|  |  |  | use                 |   | OCP                                    | 60 A                  |                                   |       |  |
| 7. Conductor Sizing per Art. 690.8(B)(1)   |  | Voltage Drop = (Amp*2*ft*ohm/ft)/V   |                     |   |  |                       |                                   |       |  |
| a. Conductor must have 30 deg. C ampacity >= 125% of continuous current per Art 215.2(A)(1).   |  |  | Amp                 | ft  | ohm/ft                                 | V                     | Note                              |       |  |
|  |  | Inverter output=   | 15.95               | 100   | 0.00126                                | 240                   | #10                               |       |  |
| b. Conductor must have (after corrections for conditions of use) >= continuous current per Table 310.16  |  | Inverter output=   | 1.67%               | ok  | <3%                                    | ok                    |                                   |       |  |
|  |  | Load center output=  | 56.19               | 25.00                                       | 0.00050                                | 240                   | #6                                |       |  |
| c. Evaluate conductor temperature at termination per Art 110.14(C). Ampacity of wire derated for conditions of termination must be >= continuous current * 1.25. All inverter output terminations are rated at 75 degrees C min. |  | Load center output=  | 0.59%               | ok  | <3%                                    | ok                    |                                   |       |  |

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SUNPOWER®

400–425 W Residential AC Module

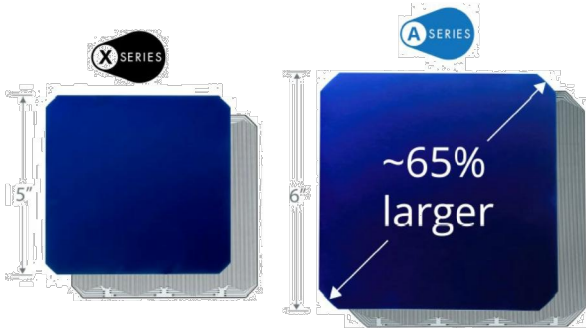
SunPower® Maxeon® Technology

Built specifically for use with the SunPower Equinox™ system, the only fully integrated solution designed, engineered and warranted by one manufacturer.



Highest Power Density Available.

SunPower's new Maxeon® Gen 5 cell is 65% larger than prior generations, delivering the most powerful cell and highest-efficiency panel in residential solar. The result is more power per square meter than any commercially available solar.



Fundamentally Different. And Better.



SunPower® Maxeon® Technology

- Most powerful cell in home solar <sup>2</sup>
- Delivers unmatched reliability <sup>3</sup>
- Patented solid metal foundation prevents breakage and corrosion



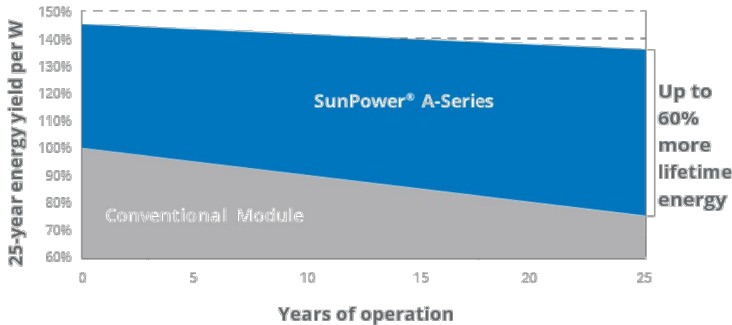
Factory-integrated Microinverter

- Highest-power integrated AC module in solar
- 60% lighter than prior SunPower AC modules
- Engineered and calibrated by SunPower for SunPower AC modules



Highest Lifetime Energy and Savings.

Designed to deliver 60% more energy over 25 years in real-world conditions like partial shade and high temperatures.<sup>1</sup>



Best Reliability. Best Warranty.

With more than 25 million modules deployed around the world, SunPower technology is proven to last. That's why we stand behind our module and microinverter with the industry's best 25-year Combined Power and Product Warranty, including the highest Power Warranty in solar.



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07/19/2020

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A-Series: A425 | A415 | A400 SunPower® Residential AC Module

| AC Electrical Data                                    |                      |
|---|----------------------|
| Inverter Model: SPWR-A4                               | @240 VAC             |
| Peak Output Power                                     | 366 VA               |
| Max. Continuous Output Power                          | 349 VA               |
| Nom. (L–L) Voltage/Range <sup>2</sup> (V)             | 240 / 211–264        |
| Max. Continuous Output Current (A)                    | 1.45                 |
| Max. Units per 20 A (L–L) Branch Circuit <sup>3</sup> | 11                   |
| CEC Weighted Efficiency                               | 97.0%                |
| Nom. Frequency  | 60 Hz                |
| Extended Frequency Range                              | 47–68 Hz             |
| AC Short Circuit Fault Current Over 3 Cycles          | 5.8 A rms            |
| Overvoltage Class AC Port                             | III                  |
| AC Port Backfeed Current                              | 18 mA                |
| Power Factor Setting                                  | 1.0                  |
| Power Factor (adjustable)                             | 0.7 lead. / 0.7 lag. |

| DC Power Data                               |   |               |               |
|---|---|---------------|---------------|
|   | SPR-A425-G-AC                                     | SPR-A415-G-AC | SPR-A400-G-AC |
| Nom. Power <sup>5</sup> (P <sub>nom</sub> ) | 425 W   | 415 W         | 400 W         |
| Power Tol.                                  | +5/–0%  | +5/–0%        | +5/–0%        |
| Module Efficiency                           | 22.8  | 22.3          | 21.5          |
| Temp. Coef. (Power)                         | –0.29%/°C   |               |               |
| Shade Tol.                                  | Integrated module-level max. power point tracking |               |               |

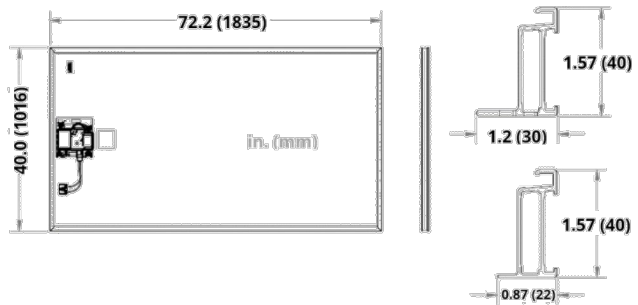
| Tested Operating Conditions |  |
|-----------------------------|--|
| Operating Temp.             | –40°F to +140°F (–40°C to +60°C)   |
| Max. Ambient Temp.          | 122°F (50°C)   |
| Max. Load                   | Wind: 62 psf, 3000 Pa, 305 kg/m <sup>2</sup> front & back<br>Snow: 125 psf, 6000 Pa, 611 kg/m <sup>2</sup> front |
| Impact Resistance           | 1 inch (25 mm) diameter hail at 52 mph (23 m/s)  |

| Mechanical Data                 |   |
|---------------------------------|---|
| Solar Cells                     | 66 Monocrystalline Maxeon Gen 5                               |
| Front Glass                     | High-transmission tempered glass with anti-reflective coating |
| Environmental Rating            | Outdoor rated   |
| Frame                           | Class 1 black anodized (highest AAMA rating)                  |
| Weight                          | 46.5 lbs (21.1 kg)  |
| Recommended Max. Module Spacing | 1.3 in. (33 mm)   |

- 1 SunPower 415 W, 22.2% efficient, compared to a Conventional Panel on same-sized arrays (260 W, 16% efficient, approx. 1.6 m<sup>2</sup>), 7.9% more energy per watt (based on PVsyst pan files for avg. US climate), 0.5%/yr slower degradation rate (Jordan, et. al. "Robust PV Degradation Methodology and Application," PVSC 2018).
- 2 Based on search of datasheet values from websites of top 10 manufacturers per IHS, as of January 2019.
- 3 #1 rank in "Fraunhofer PV Durability Initiative for Solar Modules: Part 3," PVTech Power Magazine, 2015. Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, 2013.
- 4 Factory set to 1547a-2014 default settings. CA Rule 21 default settings profile set during commissioning. See the Equinox Installation Guide #518101 for more information.
- 5 Standard Test Conditions (1000 W/m<sup>2</sup> irradiance, AM 1.5, 25°C). NREL calibration standard: SOMS current, LACCS FF and voltage. All DC voltage is fully contained within the module.
- 6 This product is UL Listed as PVRSF and conforms with NEC 2014 and NEC 2017 690.12; and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors; when installed according to manufacturer's instructions.

See [www.sunpower.com/facts](http://www.sunpower.com/facts) for more reference information.  
For more details, see extended datasheet [www.sunpower.com/datasheets](http://www.sunpower.com/datasheets) Specifications included in this datasheet are subject to change without notice.  
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| Warranties, Certifications, and Compliance |   |
|--|---|
| Warranties                                 | • 25-year limited power warranty<br>• 25-year limited product warranty  |
| Certifications and Compliance              | • UL 1703<br>• UL 1741 / IEEE-1547<br>• UL 1741 AC Module (Type 2 fire rated)<br>• UL 62109-1 / IEC 62109-2<br>• FCC Part 15 Class B<br>• ICES-0003 Class B<br>• CAN/CSA-C22.2 NO. 107.1-01<br>• CA Rule 21 (UL 1741 SA) <sup>4</sup><br>(Includes Volt/Var and Reactive Power Priority)<br>• UL Listed PV Rapid Shutdown Equipment <sup>6</sup><br><br>Enables installation in accordance with:<br>• NEC 690.6 (AC module)<br>• NEC 690.12 Rapid Shutdown (inside and outside the array)<br>• NEC 690.15 AC Connectors, 690.33(A)–(E)(1)<br><br>When used with InvisiMount racking and InvisiMount accessories (UL 2703):<br>• Module grounding and bonding through InvisiMount<br>• Class A fire rated<br>When used with AC module Q Cables and accessories (UL 6703 and UL 2238) <sup>6</sup> :<br>• Rated for load break disconnect |
| PID Test                                   | Potential-induced degradation free  |



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SunPower® InvisiMount™ | Residential Mounting System

SunPower® InvisiMount™ | Residential Mounting System

Simple and Fast Installation

- Integrated module-to-rail grounding
- Pre-assembled mid and end clamps
- Levitating mid clamp for easy placement
- Mid clamp width facilitates even module spacing
- Simple, pre-drilled rail splice
- UL 2703 Listed integrated grounding

Flexible Design

- Addresses nearly all sloped residential roofs
- Design in landscape and portrait
- Rails enable easy obstacle management

Customer-Preferred Aesthetics

- #1 module and #1 mounting aesthetics
- Best-in-class system aesthetics
- Premium, low-profile design
- Black anodized components
- Hidden mid clamps and end clamps hardware, and capped, flush rails

Part of Superior System

- Built for use with SunPower DC and AC modules
- Best-in-class system reliability and aesthetics
- Combine with SunPower modules and monitoring app

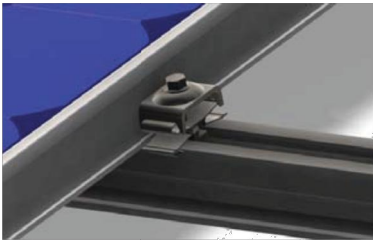


Elegant Simplicity

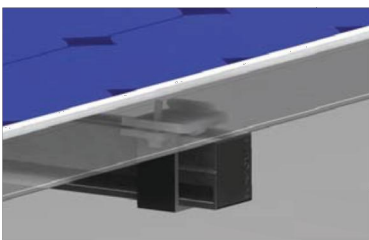
SunPower® InvisiMount™ is a SunPower-designed rail-based mounting system. The InvisiMount system addresses residential sloped roofs and combines faster installation time, design flexibility, and superior aesthetics. The InvisiMount product was specifically envisioned and engineered to pair with SunPower modules. The resulting system-level approach will amplify the aesthetic and installation benefits for both homeowners and installers.

InvisiMount Component Images

Module\* / Mid Clamp and Rail



Module\* / End Clamp and Rail



Mid Clamp



End Clamp



Rail & Rail Splice



Ground Lug Assembly



End Cap



InvisiMount Component Details

| Component           | Material  | Weight              |
|---------------------|---|---------------------|
| Mid Clamp           | Black oxide stainless steel AISI 304              | 63 g (2.2 oz)       |
| End Clamp           | Black anodized aluminum alloy 6063-T6             | 110 g (3.88 oz)     |
| Rail                | Black anodized aluminum alloy 6005-T6             | 830 g/m (9 oz/ft)   |
| Rail Splice         | Aluminum alloy 6005-T5                            | 830 g/m (9 oz/ft)   |
| Ground Lug Assembly | 304 stainless (A2-70 bolt; tin-plated copper lug) | 106.5 g/m (3.75 oz) |
| End Cap             | Black acetal (POM) copolymer                      | 10.4 g (0.37 oz)    |

Roof Attachment Hardware Supported by InvisiMount System Design Tool

|             |   |
|-------------|---|
| Application | <ul style="list-style-type: none"><li>• Composition Shingle Rafter Attachment</li><li>• Composition Shingle Roof Decking Attachment</li><li>• Curved and Flat Tile Roof Attachment</li><li>• Universal Interface for Other Roof Attachments</li></ul> |
|-------------|---|

InvisiMount Operating Conditions

|             |                                     |
|-------------|-------------------------------------|
| Temperature | ~40° C to 90° C (~40° F to 194° F)  |
| Max. Load   | 2400 Pa uplift<br>5400 Pa downforce |

InvisiMount Warranties And Certifications

|                |  |
|----------------|--|
| Warranties     | 25-year product warranty<br>5-year finish warranty   |
| Certifications | UL 2703 Listed<br>Class A fire rating when distance between roof surface and bottom of SunPower module frame is ≤ 3.5" |

Roof Attachment Hardware Warranties

Refer to roof attachment hardware manufacturer's documentation



sunpower.com



\*Module frame that is compatible with the InvisiMount system required for hardware interoperability.

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