

MONTGOMERY COUNTY HISTORIC PRESERVATION COMMISSION

Address:	114 Park Avenue, Takoma Park	Meeting Date:	9/9/2020
Resource:	Non-Contributing Resource Takoma Park Historic District	Report Date:	9/2/2020
Applicant:	Rohit Rao	Public Notice:	8/26/2020
Review:	HAWP	Tax Credit:	n/a
Case No.:	37/03-20RRR	Staff:	Dan Bruechert
Proposal:	Solar Panel Installation		

RECOMMENDATION

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

PROPERTY DESCRIPTION

SIGNIFICANCE: Non-Contributing Resource to the Takoma Park Historic District
 STYLE: Craftsman
 DATE: c.1915-1925

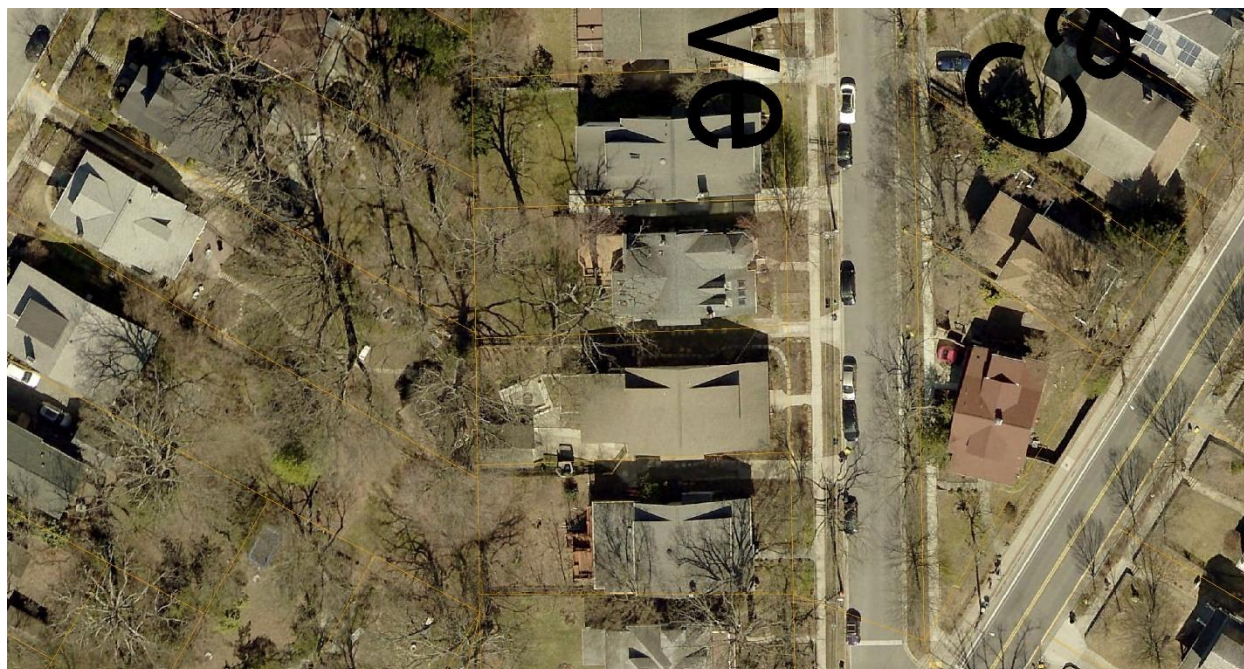


Figure 1: 114 Park Avenue.

PROPOSAL

The applicant proposes to install 18 (eighteen) 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.

Non-Contributing/Out-of-Period Resources should receive the most lenient level of design review. Most alterations and additions to Non-Contributing/Out-of-Period Resources should be approved as a matter of course. The only exceptions would be major additions and alterations to the scale and massing of Non-Contributing/Out-of-Period Resources which affect the surrounding streetscape and/or landscape and could impair character of the district as a whole.

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 one-and-a-half story, side-gable bungalow with an expanded, non-historic dormer in the right-front corner of the house. The applicant proposes to install a total of 18 (eighteen) solar panels. Fifteen panels will be on the rear gable slope and rear dormer, while the remaining three panels will be installed flush to the expanded non-historic dormer. All of the panels will be flush mounted to the wall and will project approximately 4" (four inches) from the roof surface.



Figure 2: Oblique view of 114 Park Avenue.

Staff finds that the proposed solar panels will not impact the scale or massing of the Non-Contributing resource and recommends the HPC approve the HAWP under the *Design Guidelines*. Staff additionally recommends the HPC approve the proposal under the HPC Policy on Roof-Mounted Solar Panels, 24A-(b)(1) and (6), Standards 2, 9, 10.

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 to schedule a follow-up site visit.



FOR STAFF ONLY:
HAWP# 924046
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: _____

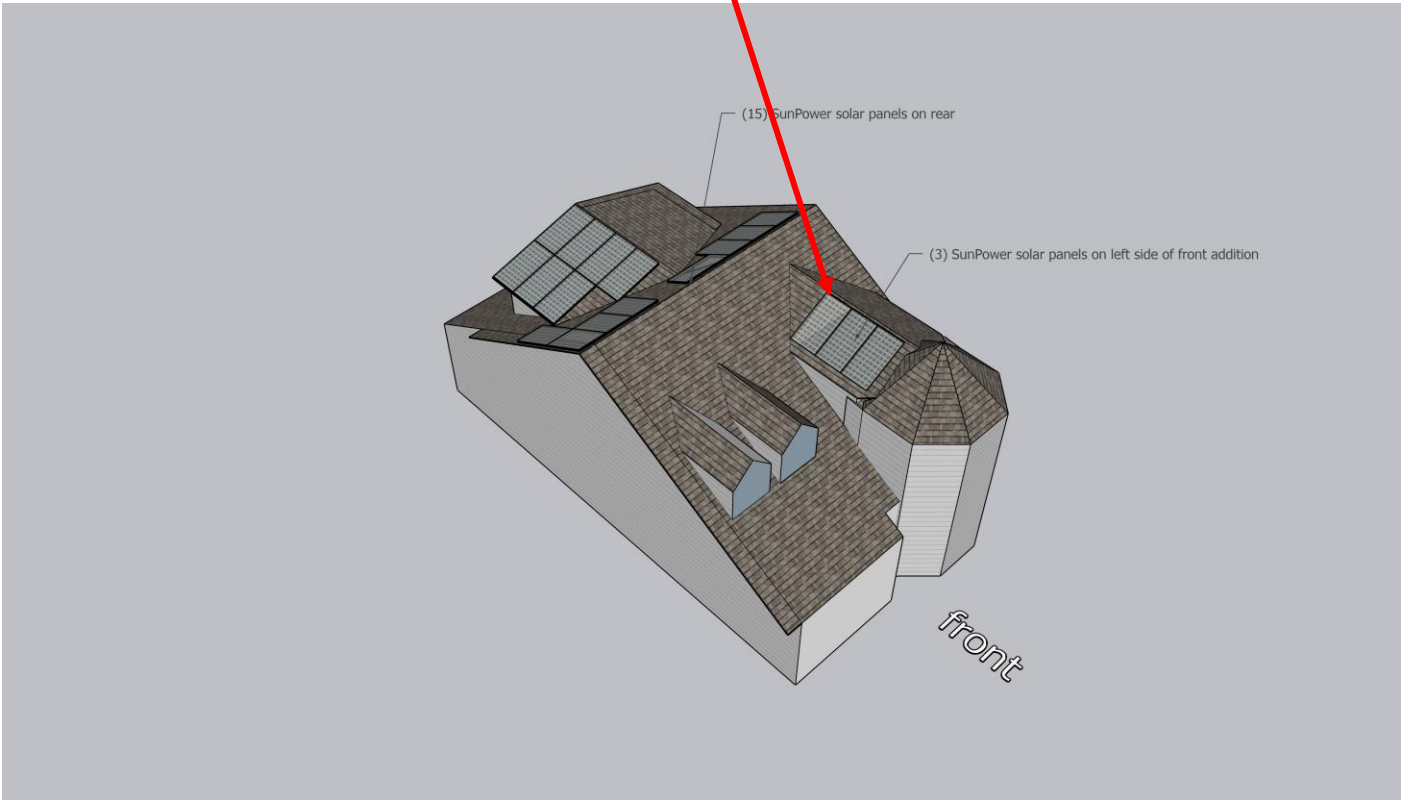
Description of Current Condition:

Proposed Work:

Work Item 3: _____

Description of Current Condition:

Proposed Work:



114 PARK AVE. TAKOMA PARK, MD 20912


The logo for Helios Solar Systems features the word "Helios" in a large, bold, green sans-serif font, with a stylized yellow sun icon to its right. Below "Helios" is the word "SolarSystems" in a smaller, bold, yellow sans-serif font.

1
SHEET 1 OF 8

1



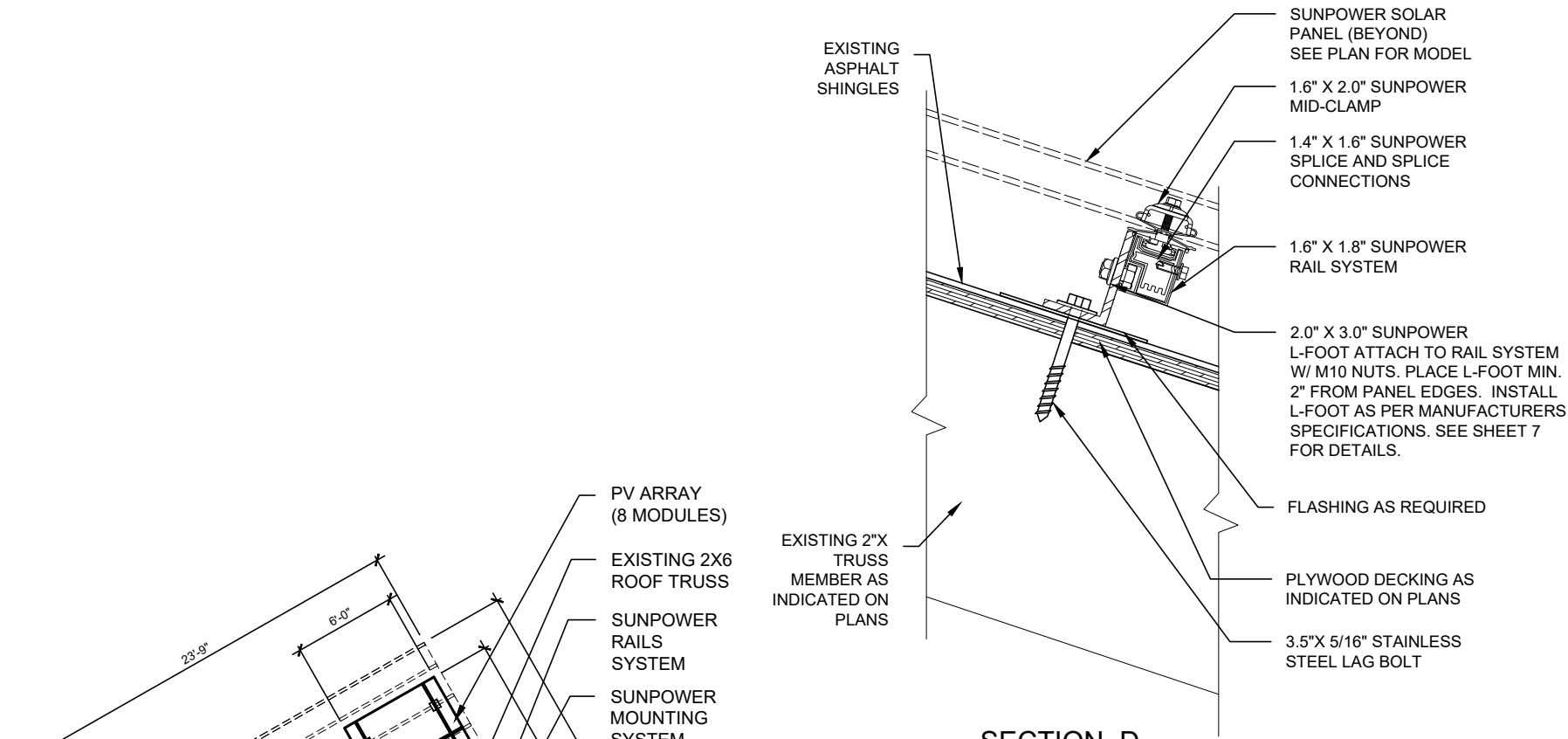
SCALE: $3/8" = 1'-0"$



A horizontal scale bar with vertical tick marks at 0', 1', 2', 4', 6', 8', and 10'. The segments between 0' and 1', 1' and 2', 2' and 4', 4' and 6', 6' and 8', and 8' and 10' are all of equal length, representing 2 feet each.

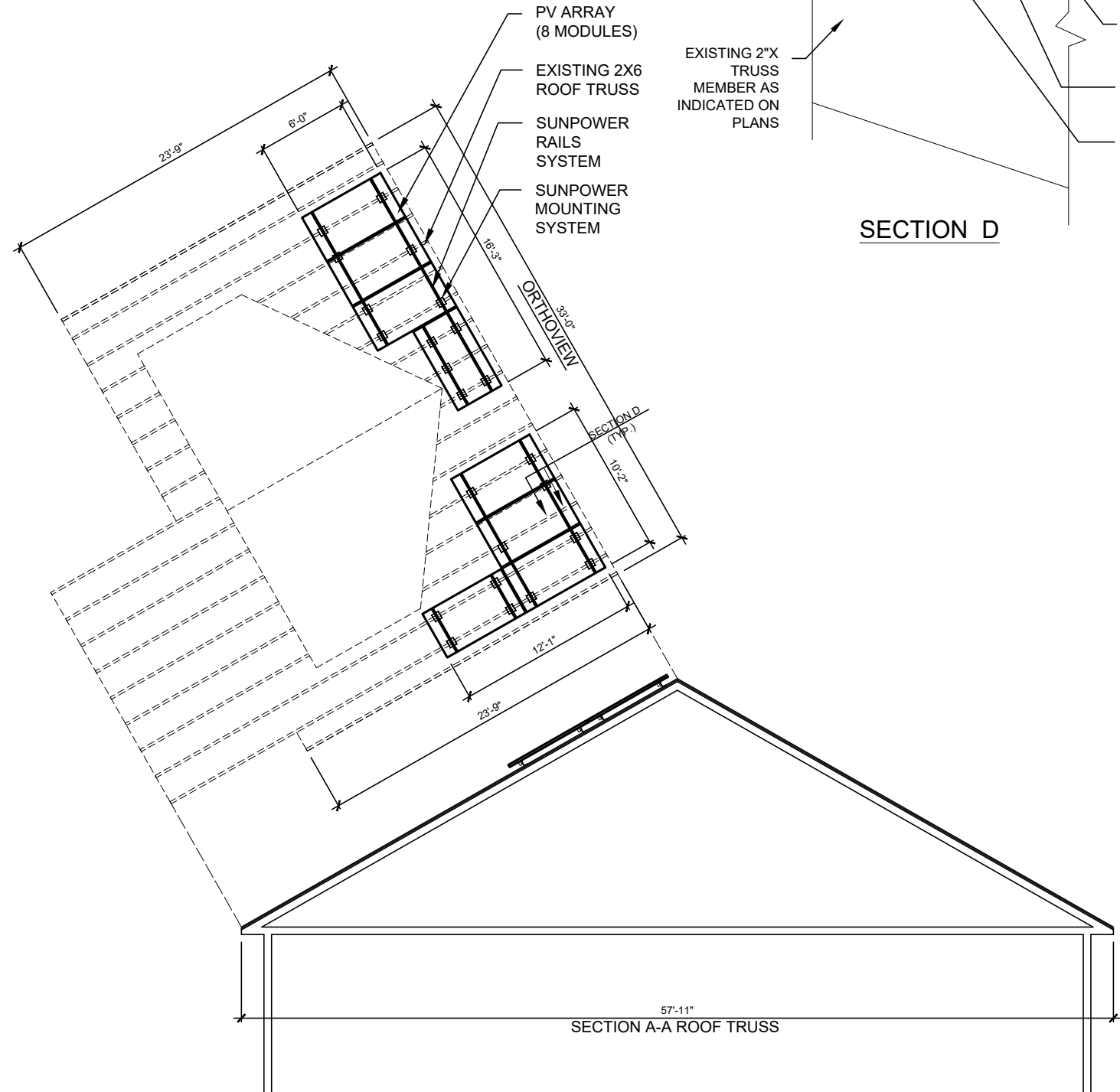
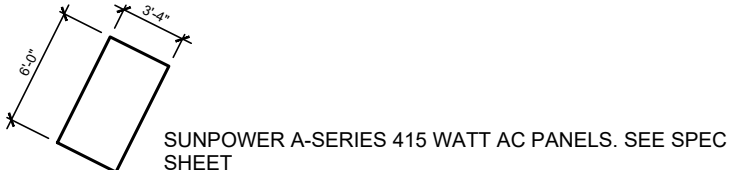
RAO
RESIDENCE
PV SOLAR INSTALLATION
114 PARK AVE.
TAKOMA PARK, MD 20912

PROJECT FILE	
20912-01	
REVISION LEVEL	DATE
REV-1	DATE
DRAWN BY:	
GDC	
CHECKED BY:	
TR	
SCALE	AS NOTED
DRAWING TITLE	
ARRAY MAP	
DRAWING NUMBER	
A001	
12	SHEET 2 OF 8

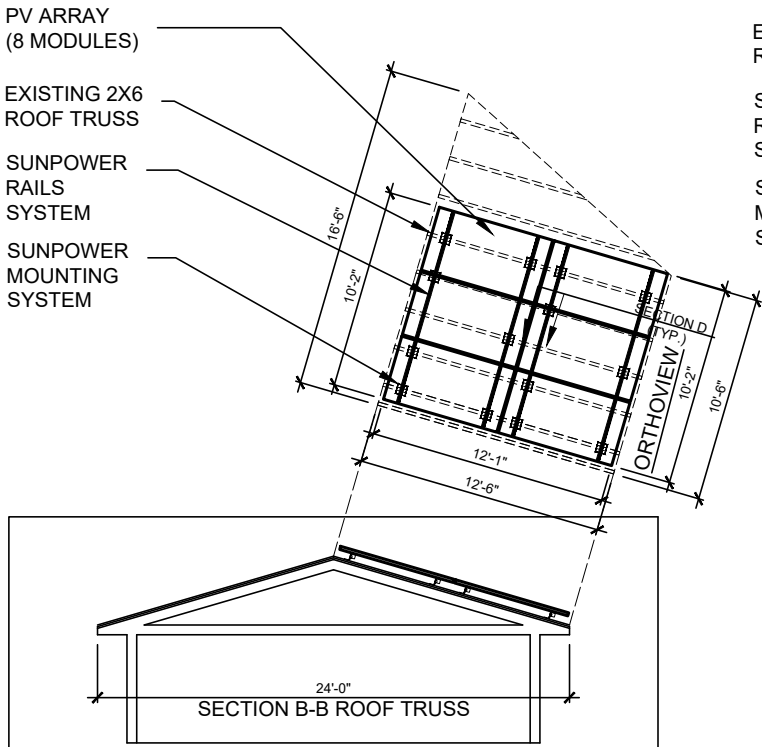


SECTION D

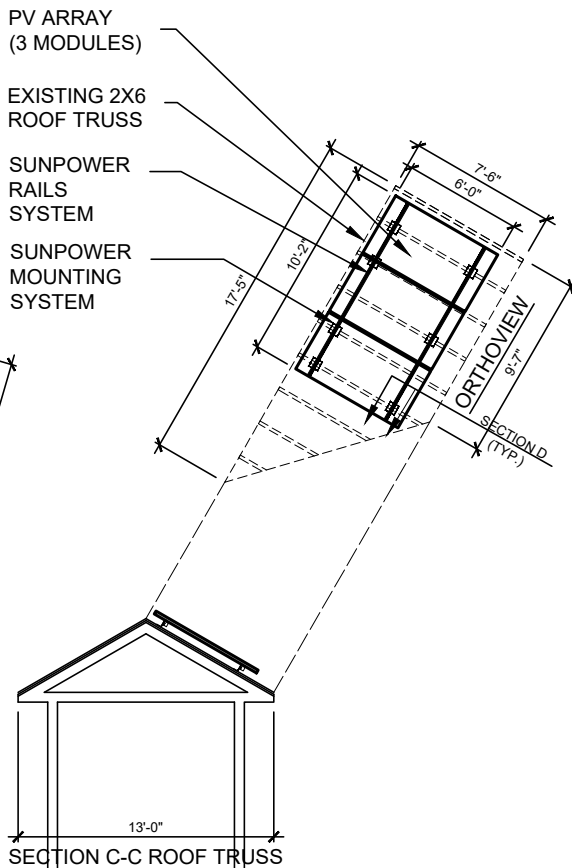
- MOUNTING LAYOUT LEGEND**
- ===== EXISTING ROOF TRUSS @ 16" O.C. (2"x8")
 - ◊ SUNPOWER L FOOT FOR ASPHALT ROOFS, WEATHER PROOF WITH APPROVED ROOFING METHOD.
 - SUNPOWER INVISIMOUNT RAIL, FIELD SPLICE AND TRIM



SECTION A-A ROOF TRUSS



SECTION B-B ROOF TRUSS

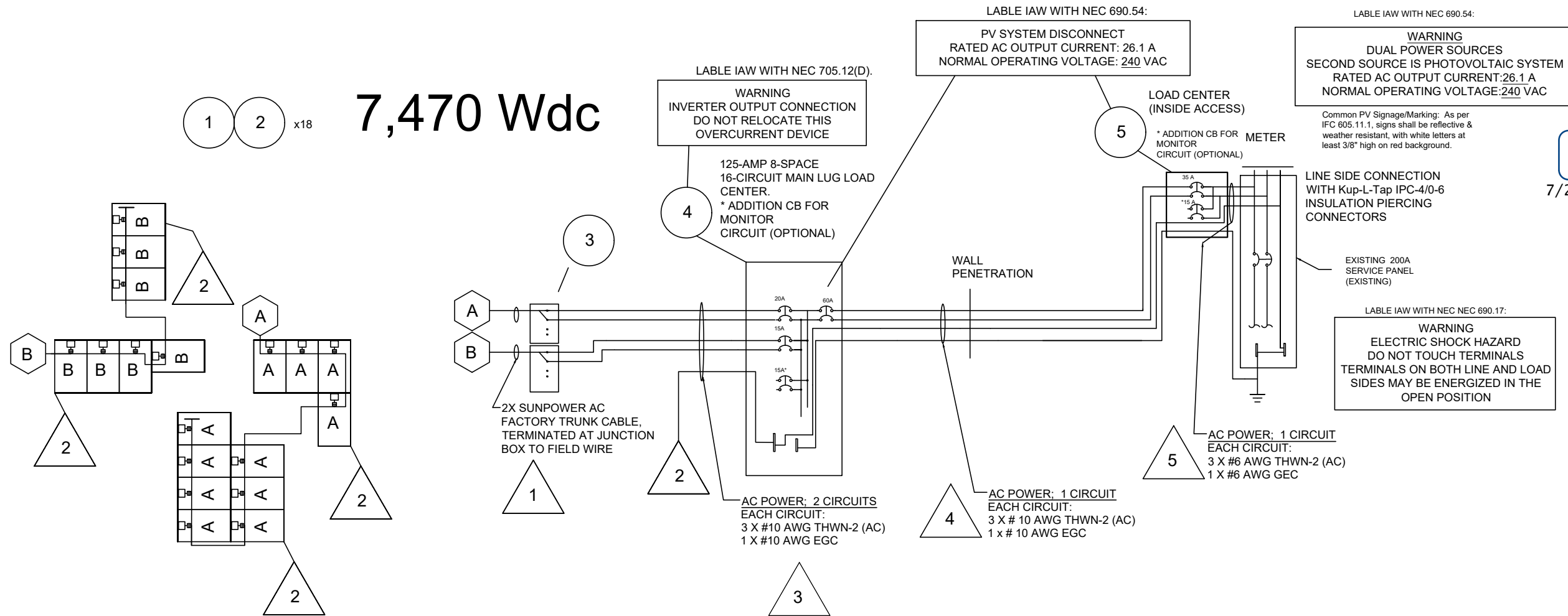


SECTION C-C ROOF TRUSS

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



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	
13	
3 OF 8	



DocuSigned by
TIMOTHY E RUMFORD
E70D81E087D845E...
7/22/2020

STATE OF MARYLAND
TIMOTHY E RUMFORD
No. 41086
PROFESSIONAL ENGINEER

EQUIPMENT SCHEDULE				
TAG	NAME	P/N	QTY	NOTES
1	SOLAR MODULES	SunPower A-Series 415-watt Type-G AC panels	18	2 CIRCUIT
2	MicroInverters	SUNPOWER FACTORY ul	18	Mounted to modules at factory
3	JUNCTION BOX	Field determined	2	JUNCTION BOX, LOCATED ON ROOF
4	LOAD CENTER	125-AMP 8-SPACE 16-CIRCUIT MAIN LUG LOAD CENTER. OR EQUIV	1	Main CB Serves as outside Disco
5	AC Disco	AC LOAD CENTER, TWO SPACE, OUTDOOR RATED, 35A 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 THWN-2 (240 VAC) MAX DERATING CURRENT (SEE CALCS PAGE); MAX VOLTAGE (SEE CALCS PAGE)	#10 (L1, L2, N), #10 (EGC)	4	ROUTES ACROSS SIDE OF BUILDING to AC Disco FEET, EMT
5	AC DISCO 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

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



RAO
RESIDENCE
PV SOLAR INSTALLATION
114 PARK 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
ELECTRICAL
SCHEMATIC

DRAWING NUMBER
E001

15
SHEET 5 OF 8



DocuSigned by
TIM RUMFORD
E70D81E087D845E...
7/22/2020

1. <u>Conductor Sizing per Art. 690.8(B)(1)</u>		ELECTRICAL CALCULATIONS						
		Rohit Rao 114 Park Ave. Takoma Park, MD 20912						
a. Conductor must have 30 deg. C ampacity >= 125% of continuous current per Art 215.2(A)(1).		Module	18	SunPower A-Series 415-watt Type-G AC panels	415	7470	W STC	
		Inverter	18	SUNPOWER FACTORY ul		349	W max	
b. Conductor must have (after corrections for conditions of use) >= continuous current per Table 310.16						6282		
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.		Photovoltaic Module AC Electrical Specifications (REF):						
		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			
		AC Max. Continuous Output Current @ 240 V			1.49	A		
		Inverter Specifications:			SUNPOWER FACTORY ul			
2. <u>OOP Sizing per Art. 690.8(B)(1)</u>						OUTPUT		
a. Round up to next size per Art 240.4(B)		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. <u>OOP Sizing</u>		max string: A	11	ok <=11	and	7	(CIRCUIT B)	
a. Round up to next size per Art 240.4(B)		Conductor sizing, Inverter Output (each circuit- -BOUNDING/WORST CASE)				1-way len	100	
		Icont=	15.95	A	(1.45 A x number of inverters per ckt)			
		Icont*1.25+	19.94	A	OCP	20	A	15A FOR CIRC B
		Wire	#10 AWG THWN-2	40	A	NEC TABLE 310.16		
5. <u>Conductor Sizing per Art. 690.8(B)(1)</u>		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=	26.10	A	(1.45A x number of inverters)			
		Icont*1.25+	32.63	A				
		Wire	#10 AWG THWN-2	40	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		34.8	A	OK>	32.63	
current per Art 215.2(A)(1).			use	OCP	35	A		
7. <u>Conductor Sizing per Art. 690.8(B)(1)</u>		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=	32.63	25.00	0.00126	240	#10	
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=	0.86%	ok	<3%	ok		

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



RAO
RESIDENCE
PV SOLAR INSTALLATION
114 PARK 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

ELECTRICAL
CALCULATIONS

DRAWING NUMBER

E002
16
SHEET 6 OF 8



DocuSign /22/2020

TIM RUFFORD

E00081-E087D845E...



Fundamentally Different.
And Better.



SunPower® Maxeon® Technology

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



Factory-integrated Microinverter (MI)

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

SUNPOWER®

400–425 W Residential AC Module

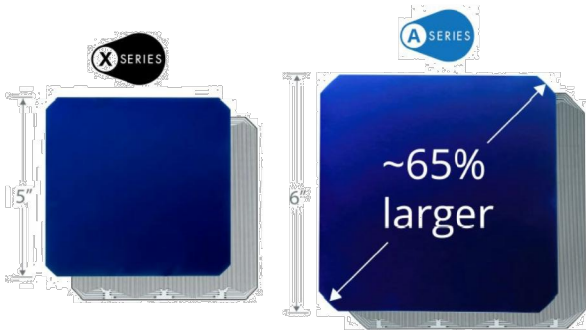
SunPower® Maxeon® Technology

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



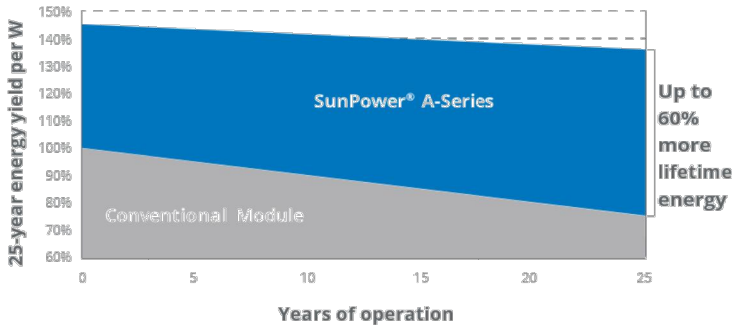
Highest Power Density Available.

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.



Highest Lifetime Energy and Savings.

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



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.



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 ² (V)	240 / 211–264
Max. Continuous Output Current (A)	1.45
Max. Units per 20 A (L–L) Branch Circuit ³	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 ⁵ (P _{nom})	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 ² front & back Snow: 125 psf, 6000 Pa, 611 kg/m ² front
Impact Resistance	1 inch (25 mm) diameter hail at 52 mph (23 m/s)

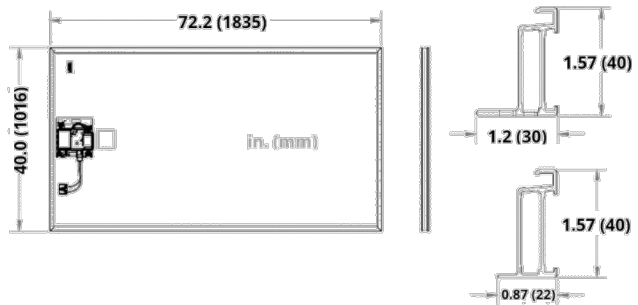
Mechanical Data	
Solar Cells	66 Monocrystalline Maxeon Gen 5
Front Glass	High-transmission tempered glass with anti-reflective coating
Environmental Rating	Outdoor rated
Frame	Class 1 black anodized (highest AAMA rating)
Weight	46.5 lbs (21.1 kg)
Recommended Max. Module Spacing	1.3 in. (33 mm)

- 1 SunPower 415 W, 22.2% efficient, compared to a Conventional Panel on same-sized arrays (260 W, 16% efficient, approx. 1.6 m²), 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/m² 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 for more reference information.
For more details, see extended datasheet www.sunpower.com/datasheets Specifications included in this datasheet are subject to change without notice.
©2019 SunPower Corporation. All Rights Reserved. SUNPOWER, the SUNPOWER logo and MAXEON are registered trademarks of SunPower Corporation in the U.S. and other countries as well. 1-800-SUNPOWER.

Warranties, Certifications, and Compliance

Warranties	<ul style="list-style-type: none">• 25-year limited power warranty• 25-year limited product warranty
Certifications and Compliance	<ul style="list-style-type: none">• UL 1703• UL 1741 / IEEE-1547• UL 1741 AC Module (Type 2 fire rated)• UL 62109-1 / IEC 62109-2• FCC Part 15 Class B• ICES-0003 Class B• CAN/CSA-C22.2 NO. 107.1-01• CA Rule 21 (UL 1741 SA)⁴• (Includes Volt/Var and Reactive Power Priority)• UL Listed PV Rapid Shutdown Equipment⁶ <p>Enables installation in accordance with:</p> <ul style="list-style-type: none">• NEC 690.6 (AC module)• NEC 690.12 Rapid Shutdown (inside and outside the array)• NEC 690.15 AC Connectors, 690.33(A)–(E)(1) <p>When used with InvisiMount racking and InvisiMount accessories (UL 2703):</p> <ul style="list-style-type: none">• Module grounding and bonding through InvisiMount• Class A fire rated <p>When used with AC module Q Cables and accessories (UL 6703 and UL 2238)⁶:</p> <ul style="list-style-type: none">• Rated for load break disconnect
PID Test	Potential-induced degradation free



Module Fire Performance: Type 2
Please read the Safety and Installation Instructions 532628 for additional details.

SUNPOWER®
532618 RevA

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

HeliosSolarSystems

RAO
RESIDENCE
PV SOLAR INSTALLATION
114 PARK 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
ELECTRICAL
MODULE
SPECS

DRAWING NUMBER

E003
17
SHEET 7 OF 8



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

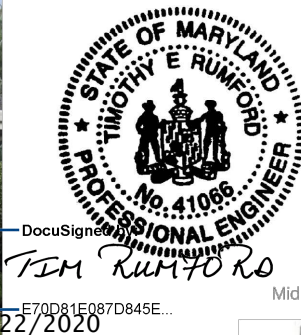
- Addresses nearly all sloped residential roofs
- Design in landscape and portrait
- Rails enable easy obstacle management

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

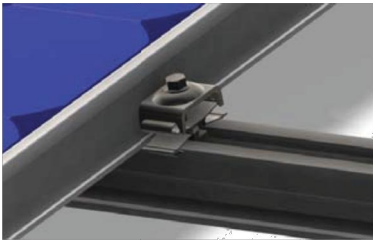
SunPower® InvisiMount™ is a SunPower-designed rail-based mounting system. The InvisiMount system addresses residential sloped roofs and combines faster installation time, design flexibility, and superior aesthetics. The InvisiMount product was specifically envisioned and engineered to pair with SunPower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

sunpower.com

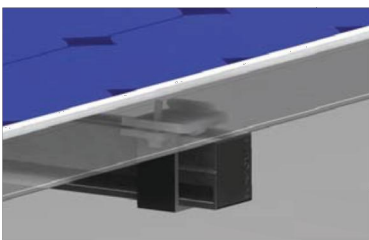


InvisiMount Component Images

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">• Composition Shingle Rafter Attachment• Composition Shingle Roof Decking Attachment• Curved and Flat Tile Roof Attachment• Universal Interface for Other Roof Attachments
-------------	---

InvisiMount Operating Conditions

Temperature	~40° C to 90° C (~40° F to 194° F)
Max. Load	2400 Pa uplift 5400 Pa downforce

InvisiMount Warranties And Certifications

Warranties	25-year product warranty 5-year finish warranty
Certifications	UL 2703 Listed 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

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

© 2015 SunPower Corporation. All Rights Reserved. SUNPOWER, the SUNPOWER logo, and INVISIMOUNT are trademarks or registered trademarks of SunPower Corporation. All other trademarks are the property of their respective owners. Specifications included in this datasheet are subject to change without notice.

sunpower.com
Document #509506 Rev B

SUNPOWER®

SUNPOWER®

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

HeliosSolarSystems

RAO
RESIDENCE
PV SOLAR INSTALLATION
114 PARK 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

HARDWARE
MOUNTING
DETAILS, SPEC

DRAWING NUMBER

M001

18
SHEET 8 OF 8