



HISTORIC PRESERVATION COMMISSION

Marc Elrich
County Executive

Sandra I. Heiler
Chairman

Date: September 11, 2020

MEMORANDUM

TO: Mitra Pedoeem
Department of Permitting Services

FROM: Dan Bruechert
Historic Preservation Section
Maryland-National Capital Park & Planning Commission

SUBJECT: Historic Area Work Permit # 924046 - Solar Installation

The Montgomery County Historic Preservation Commission (HPC) has reviewed the attached application for a Historic Area Work Permit (HAWP). This application was **approved** at the September 9, 2020 HPC meeting.

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

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

Applicant: Rohit Rao
Address: 114 Park Ave., Takoma Park

This HAWP approval is subject to the general condition that the applicant will obtain all other applicable Montgomery County or local government agency permits. After the issuance of these permits, the applicant must contact this Historic Preservation Office if any changes to the approved plan are made. Once work is complete the applicant will contact Dan Bruechert at 301.563.3400 or dan.bruechert@montgomeryplanning.org to schedule a follow-up site visit.



SOLAR PV PROJECT, RAO

114 PARK AVE. TAKOMA PARK, MD 20912


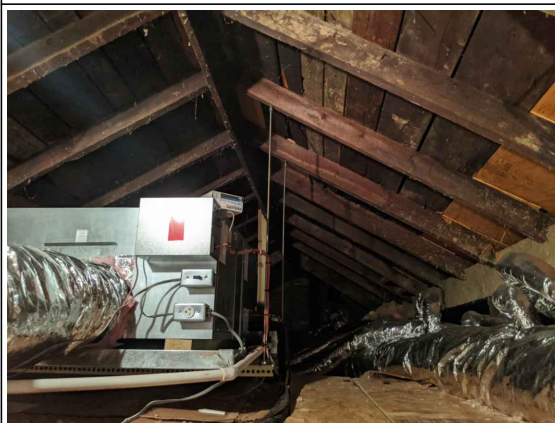
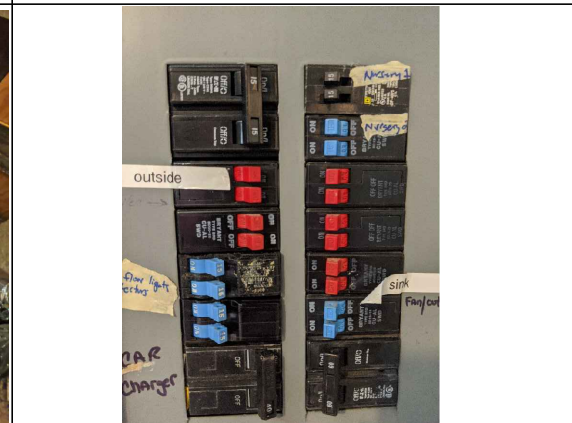
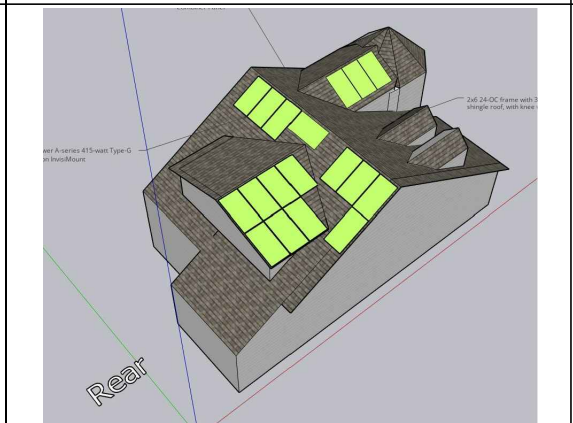
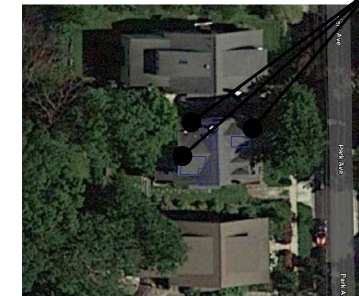

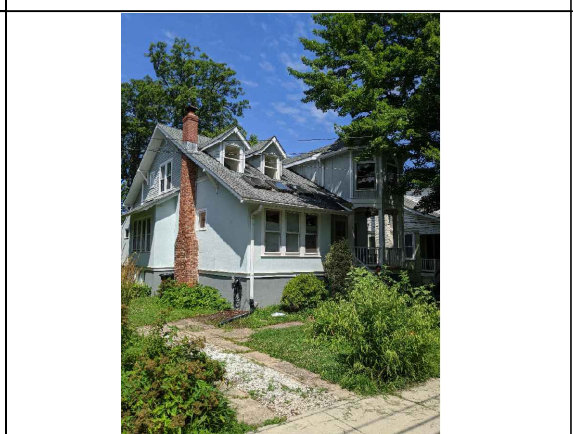
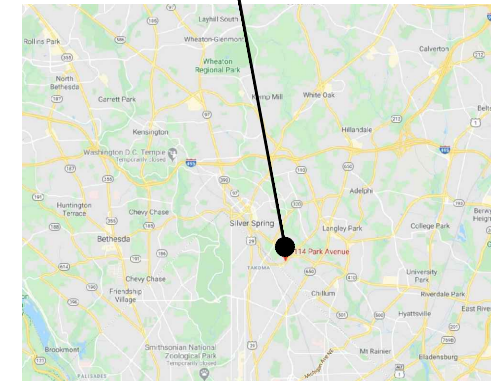
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 Montgomery County
 Historic Preservation Commission
Sandra L. Heiler

REVIEWED
 By Dan.Bruechert at 2:37 pm, Sep 11, 2020

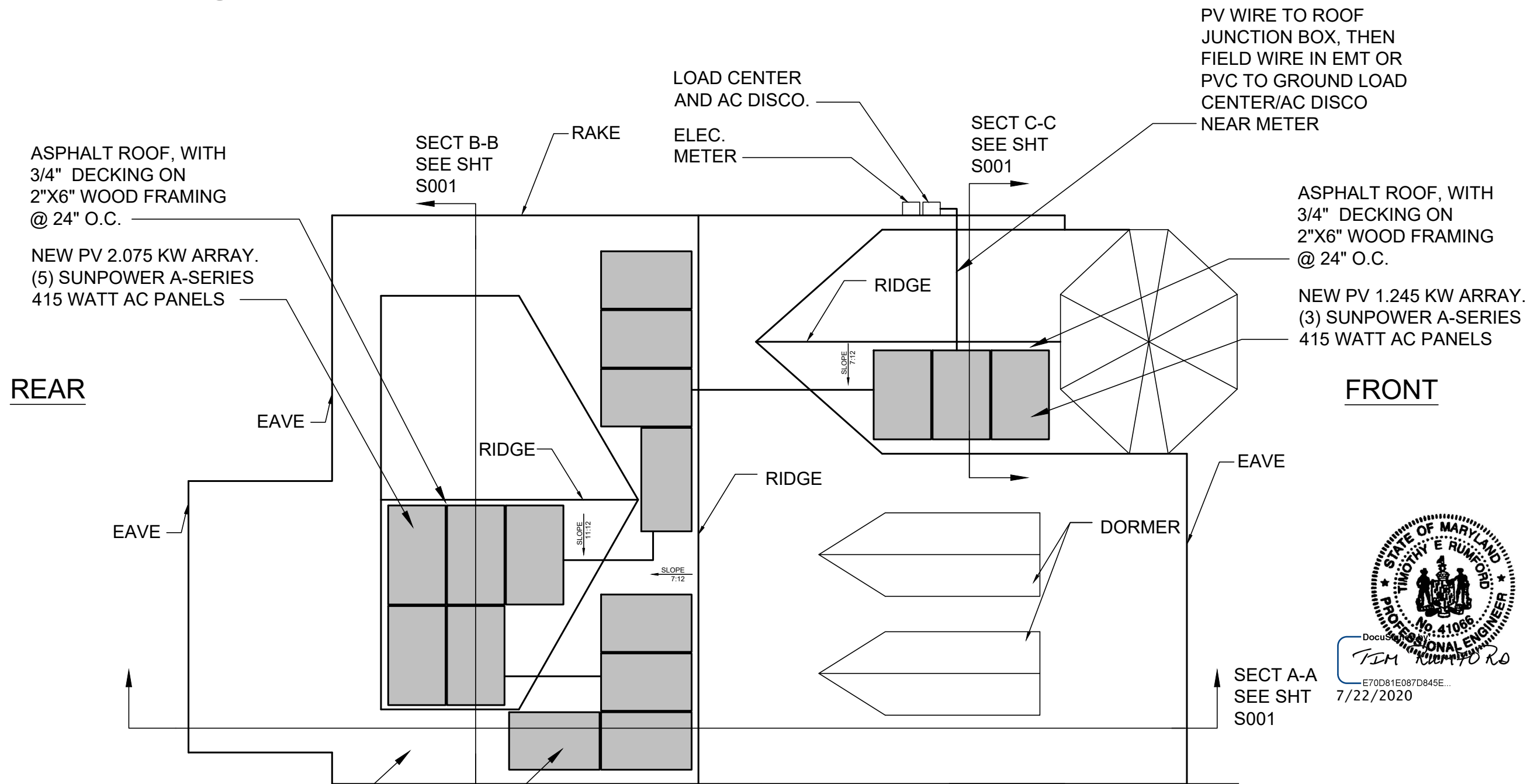
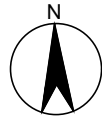
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 PV SOLAR INSTALLATION
 114 PARK AVE.
 TAKOMA PARK, MD 20912

PV SOLAR SYSTEM NOTES	ABBREVIATIONS & LEGEND	SEAL	PROJECT DATA	DRAWING INDEX
<p>A) SOLAR MODULE INSTALLED IAW SOLAR MODULE MANUFACTURERS INSTRUCTIONS B) SOLAR MODULE CLAMPS INSTALLED IAW SOLAR MOUNT INSTALLATION INSTRUCTIONS C) EXISTING ROOF, KNOWN BY OWNER AND PRIME CONTRACTOR TO BE IN SOUND CONDITION AND IAW WITH BUILDING CODES D) ALL ELECTRICAL WORK SHALL COMPLY WITH THE 2017 NATIONAL ELECTRIC CODE (NEC) E) DC CONDUCTORS INSIDE BUILDING SHALL BE IN METALLIC RACEWAY IN ACCORDANCE WITH (IAW) ART 690.3(E). 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. G) PROVIDE A PLACARD ON THE AC CUT OFF SWITCH (SW) WITH THE FOLLOWING INFORMATION IN 1/4" HIGH LETTERING PER NEC 690.54: "CAUTION - POSSIBLE BACKFEED PHOTOVOLTAIC POWER SYSTEM" H) RESERVED I) PROVIDE A PLACARD ON THE MAIN SERVICE PANEL WITH THE FOLLOWING INFORMATION IN 1/4" 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" GENERAL INSTALLATION NOTES 1: THE DETAILS AND SPECIFICATIONS CONTAINED IN THESE DRAWINGS ARE CONSIDERED TO BE THE MINIMUM BY THE AHJ AND INSTALLERS. 2: THIS PLAN SPECIFIES THE STRUCTURAL AND ELECTRICAL REQUIREMENTS FOR INSTALLATION OF SOLAR PHOTOVOLTAICS PANELS ON ROOF SURFACE AS SHOWN. 3: USE COMMON SENSE AND OSHA REGULATIONS UNTIL INSTALLATION IS COMPLETED.</p>	<p>AHJ AUTHORITY HAVING JURISDICTION AC ALTERNATING CURRENT CB CIRCUIT BREAKER FT FOOT JB JUNCTION BOX OC ON CENTER LBS POUNDS FT FOOT IAW IN ACCORDANCE WITH LBS POUNDS MPH MILES PER HOUR PSF POUNDS PER SQUARE FOOT</p>	 <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. 41066, EXPIRATION DATE: 2021-09-08</p>	<p>PROJECT NAME SEE TITLE ABOVE</p> <p>SCOPE OF WORK SOLAR PV PANELS INSTALLATION ON EXISTING ROOF STRUCTURE BY MANUFACTURER'S SPECIFICATIONS</p>	<p>0001 COVER SHEET A001 ARRAY PLAN S001 ELEVATION/TRUSS AND FRAMING, STRUCTURAL CALCULATIONS, DETAIL S002 E001 ELECTRICAL SCHEMATIC E002 ELECTRICAL CALCULATIONS E003 ELECTRICAL MODULE SPECS M001 HARDWARE MOUNTING DETAILS/SPEC</p>
	EXISTING ROOF ATTIC	EXISTING SERVICE PANEL	MODEL VIEW	SITE VIEW
				<p>NEW ARRAYS ON MULTI-ROOF</p>  <p>114 PARK AVE. TAKOMA PARK, MD 20912</p>
		EXISTING METER	EXISTING EXTERIOR	VICINITY LOCATION
				<p>SITE LOCATION</p> 

PROJECT FILE	20912-01
REVISION LEVEL	DATE
REV-1	
DRAWN BY:	GDC
CHECKED BY:	TR
SCALE	AS NOTED
DRAWING TITLE	COVER SHEET
DRAWING NUMBER	0001
SHEET	1 OF 8



ASPHALT ROOF, WITH 3/4" DECKING ON 2"X6" WOOD FRAMING @ 24" O.C.

NEW PV 2.075 KW ARRAY. (5) SUNPOWER A-SERIES 415 WATT AC PANELS

REAR

ASPHALT ROOF, WITH 3/4" DECKING ON 2"X6" WOOD FRAMING @ 24" O.C.

NEW PV 1.245 KW ARRAY. (3) SUNPOWER A-SERIES 415 WATT AC PANELS

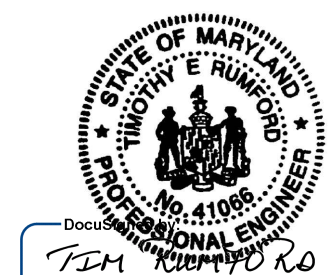
FRONT

ASPHALT ROOF, WITH 3/4" DECKING ON 2"X6" WOOD FRAMING @ 24" O.C.

NEW PV 3.320 KW ARRAY. (5) SUNPOWER A-SERIES 415 WATT AC PANELS

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Historic Preservation Commission

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7/22/2020

SECT A-A
SEE SHT
S001

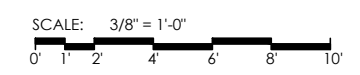
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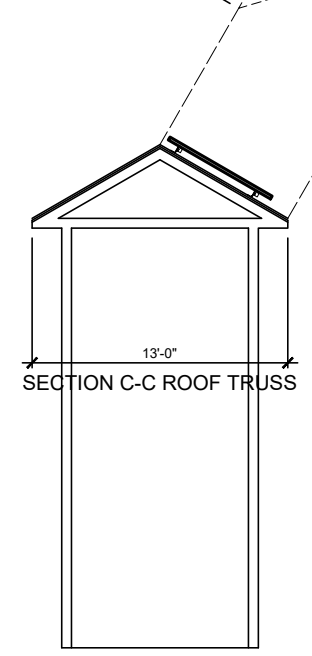
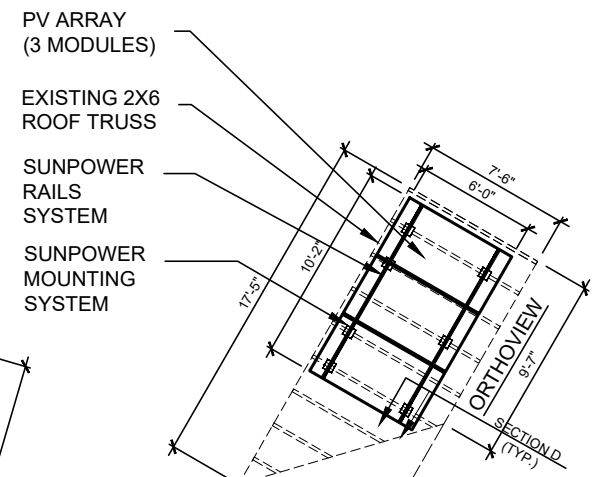
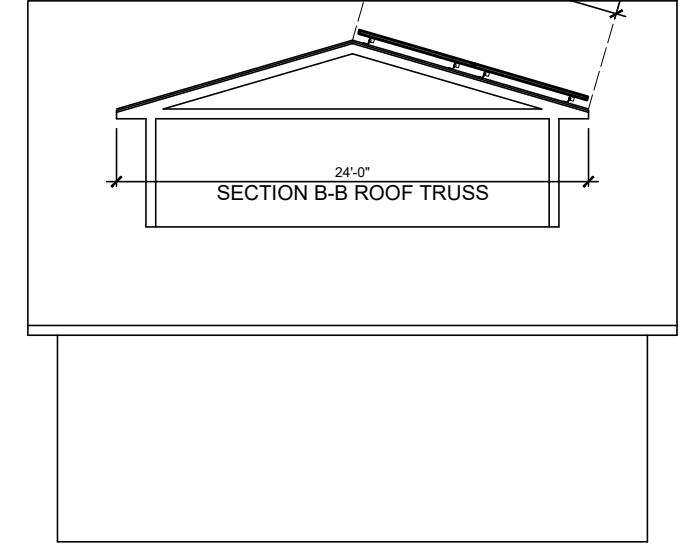
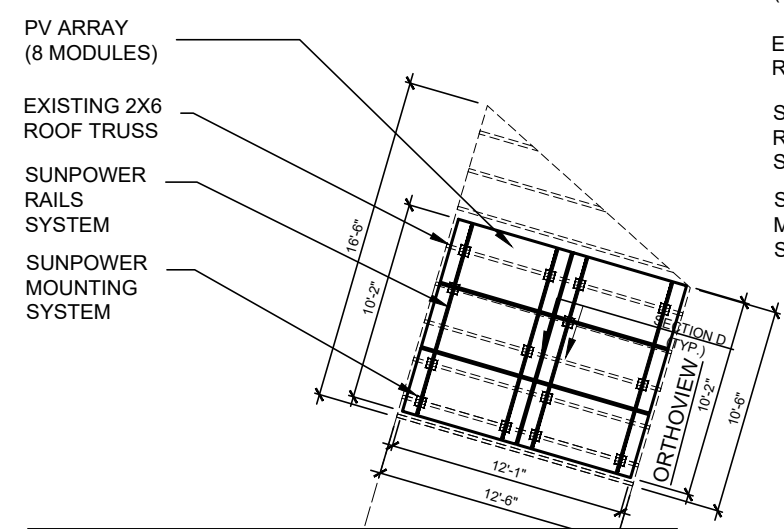
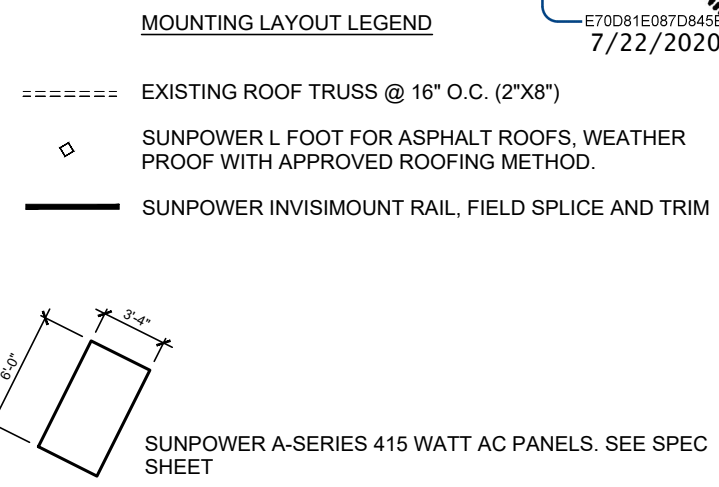
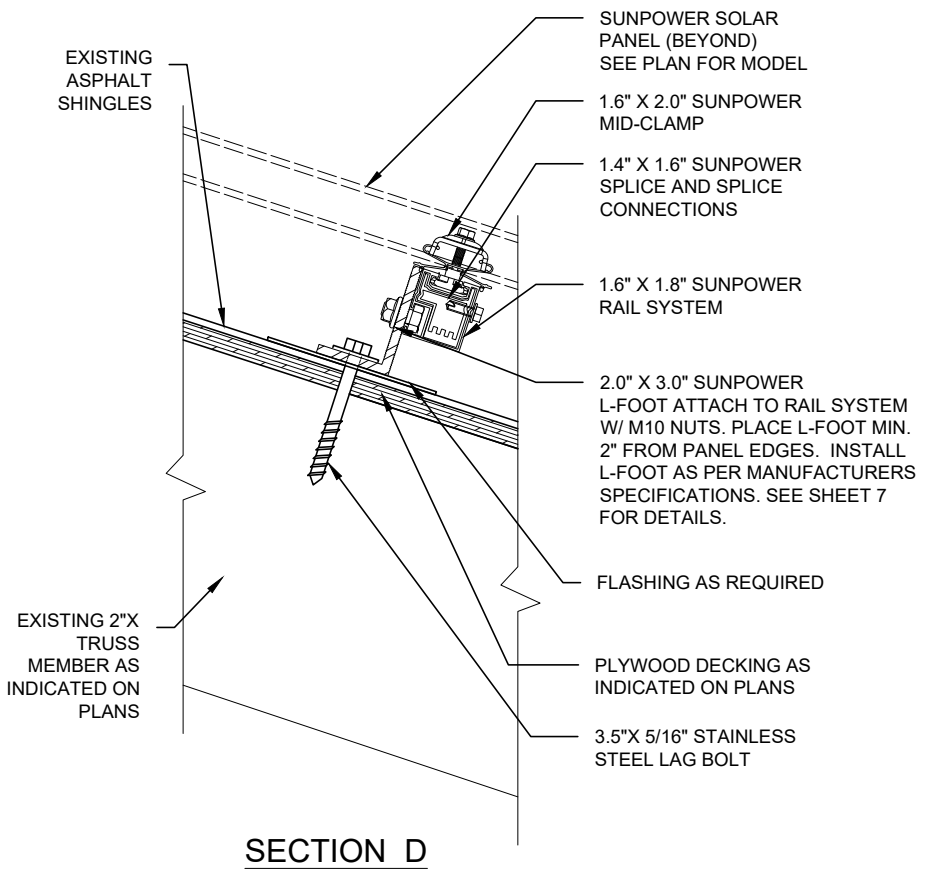
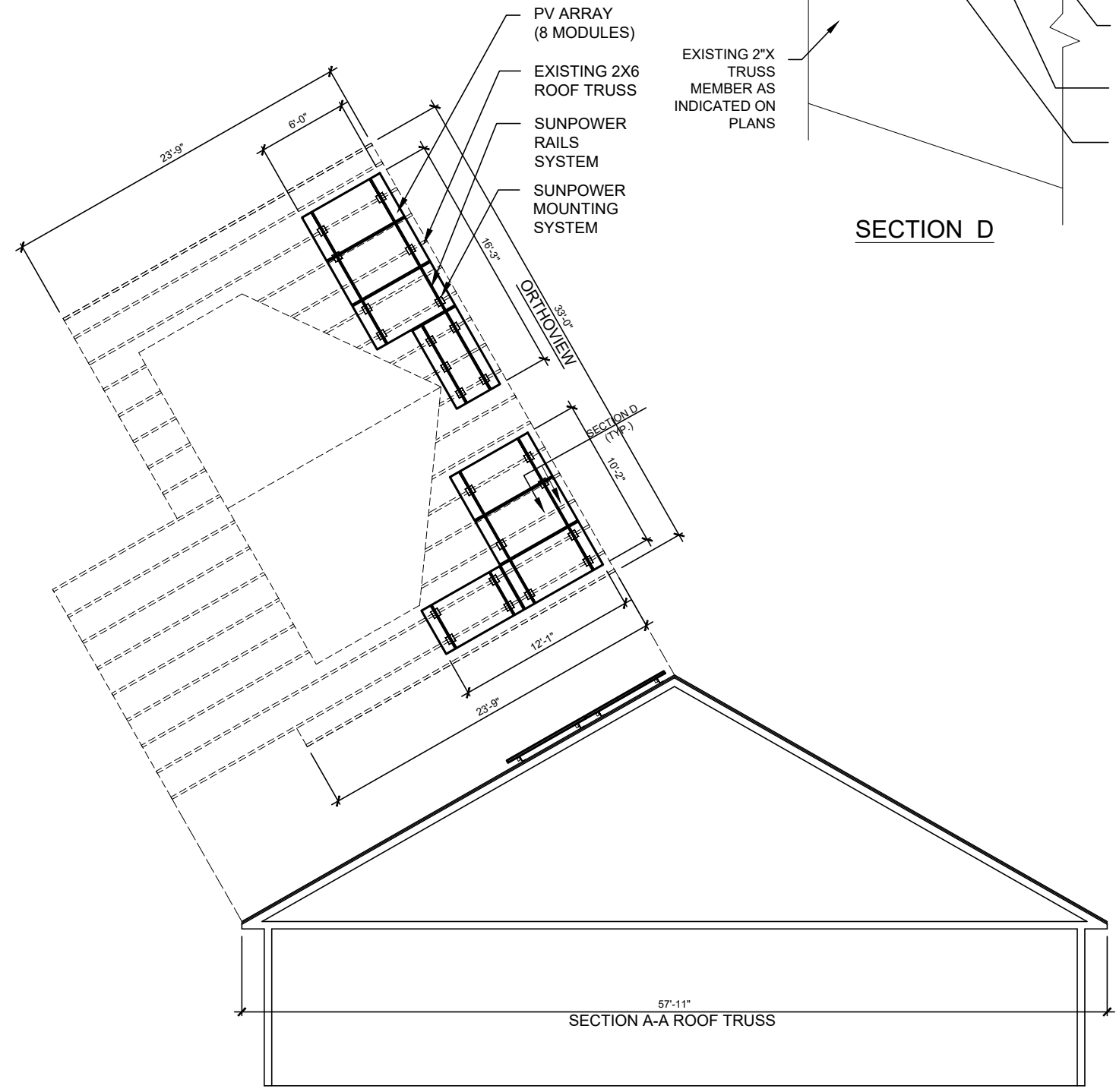
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REV-1	DATE
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CHECKED BY:	TR
SCALE	AS NOTED
DRAWING TITLE	ARRAY MAP
DRAWING NUMBER	A001

REVIEWED
By Dan.Bruechert at 2:37 pm, Sep 11, 2020



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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

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 Historic Preservation Commission

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 By Dan.Bruechert at 2:37 pm, Sep 11, 2020

Structural Analysis					
Project Name:		Rohit Rao 114 Park Ave. Takoma Park, MD 20912			
Address:					
Description:		Pitched roof, 18 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
Present Conditions and Structure Info					
Asphalt shingle roof, Framing is 2x6 24-OC with 3/4" deck and knee wall beam supports.					
Wind Loading					
Pnet = Net Design Wind Pressure (psf) From ASCE 7-10, 100sf eff wind area, 7 to 27deg, zone 3					
Down	Up				
9.7	44	115 mph			
Module Areas (sf):		20.1			
Wind Force (lbs), Per module:		Pnet * Area=			
Down	Up				
194.5	882.4				
Array number of fasteners		46			
Array Number of Modules:		18			
Number of fasteners per module:		2.6 AVE			
Force per fastener: (lbs)					
Down	Up				
76.1	345.3				
Pull out Force per fastener, lbs (2):		681 5/16" x 3.5" SS Lag. Assumes worst case wood species			
Design Margin (Capability/Exposure). >2 required					
Down	Up				
8.9	2.0	x margin			
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.					
Snow Load					
OK	Modules are flush and not likely to affect snow drift				
Dead Load					
Module Weight (lbs)		46.5			
		2.3 psf			
OK	(negligible effect)				
Seismic					
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.					



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PROJECT FILE	
20912-01	
REVISION LEVEL	DATE
REV-1	DATE
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SCALE	AS NOTED
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STRUCTURAL CALCULATIONS, DETAIL	
DRAWING NUMBER	
S002	
14	SHEET 4 OF 8

1 2 x18 **7,470 Wdc**

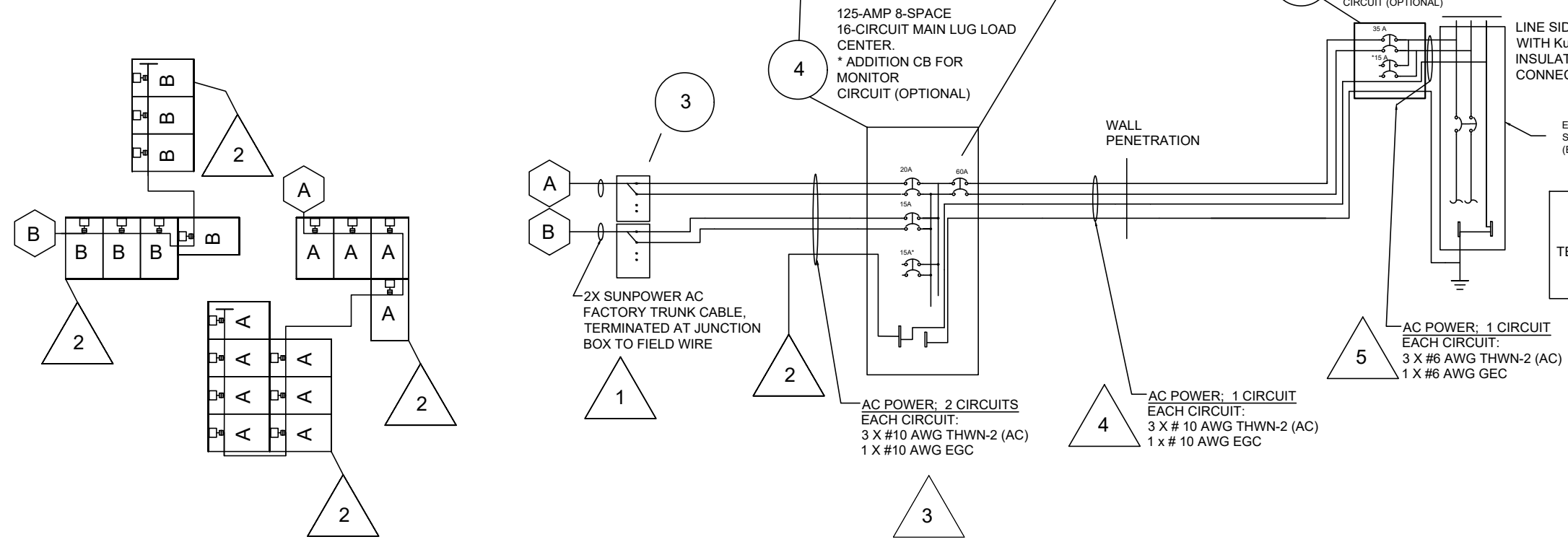


TABLE IAW WITH NEC 690.54:
PV SYSTEM DISCONNECT
RATED AC OUTPUT CURRENT: 26.1 A
NORMAL OPERATING VOLTAGE: 240 VAC

TABLE IAW WITH NEC 690.54:
WARNING
DUAL POWER SOURCES
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM
RATED AC OUTPUT CURRENT: 26.1 A
NORMAL OPERATING VOLTAGE: 240 VAC

TABLE IAW WITH NEC 705.12(D).
WARNING
INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS
OVERCURRENT DEVICE

Common PV Signage/Marking: As per IFC 605.11.1, signs shall be reflective & weather resistant, with white letters at least 3/8" high on red background.



DocuSigned by:
Tim Rufford
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7/22/2020

LINE SIDE CONNECTION WITH Kup-L-Tap IPC-4/0-6 INSULATION PIERCING CONNECTORS

EXISTING 200A SERVICE PANEL (EXISTING)

TABLE IAW WITH NEC 690.17:
WARNING
ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

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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

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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



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TIM RUFFORD
9/22/2020

SUNPOWER®

400-425 W Residential AC Module

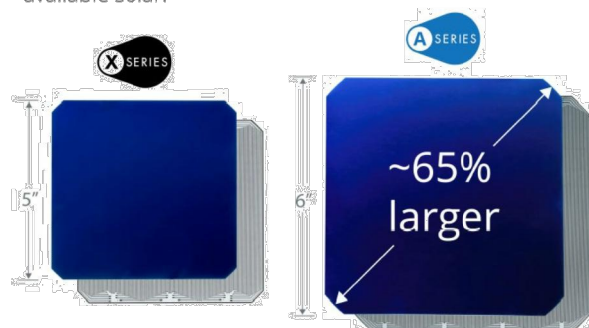
SunPower® Maxeon® Technology

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



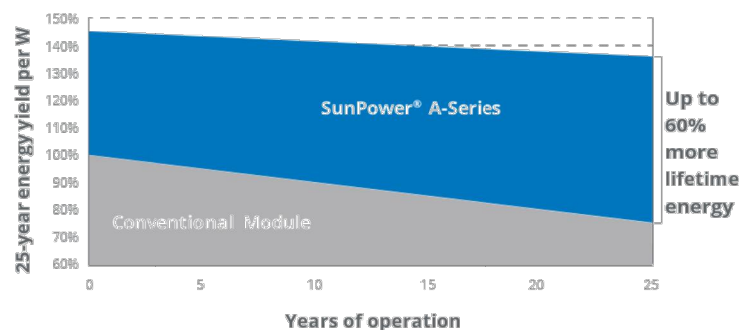
Highest Power Density Available.

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



Fundamentally Different. And Better.



SunPower® Maxeon® Technology

- Most powerful cell in home solar²
- Delivers unmatched reliability³
- 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

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Montgomery County

Historic Preservation Commission

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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 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		

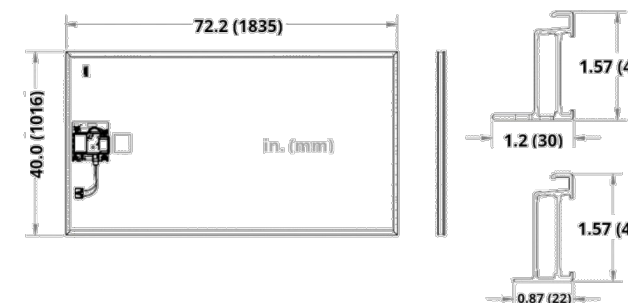
Tested Operating Conditions	
Operating Temp.	-40°F to +140°F (-40°C to +60°C)
Max. Ambient Temp.	122°F (50°C)
Max. Load	Wind: 62 psf, 3000 Pa, 305 kg/m ² front & back Snow: 125 psf, 6000 Pa, 611 kg/m ² front
Impact Resistance	1 inch (25 mm) diameter hail at 52 mph (23 m/s)

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," PV Tech 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 PVRSSE 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.
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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



SUNPOWER®
532618 RevA



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

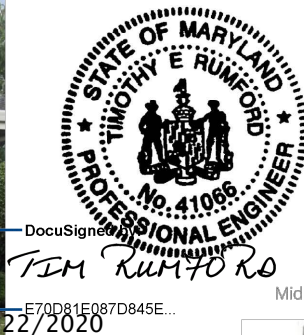
- Addresses nearly all sloped residential roofs
- Design in landscape and portrait
- Rails enable easy obstacle management

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 aesthetic and installers.

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Montgomery County
Historic Preservation Commission

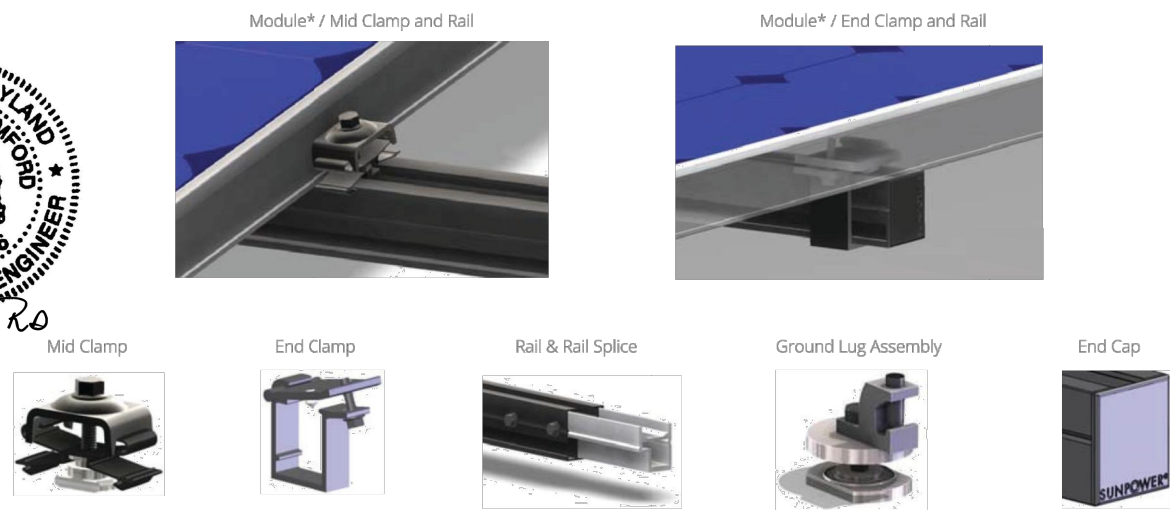
Sandra J. Heiler

REVIEWED

By Dan.Bruechert at 2:38 pm, Sep 11, 2020

SUNPOWER

InvisiMount Component Images



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)

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 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

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.

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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

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SHEET 8 OF 8

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