HISTORIC PRESERVATION COMMISSION

Marc Elrich
County Executive

Robert K. Sutton
Chairman

Date: September 23, 2022

MEMORANDUM

TO: Mitra Pedoeem
Department of Permitting Services
FROM: Michael Kyne
Historic Preservation Section
Maryland-National Capital Park & Planning Commission
SUBJECT: Historic Area Work Permit #1004874: Solar panels

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 21, 2022 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: Eric Lindblom (Anthony Colella, Agent)
Address: 49 Elm Avenue, Takoma Park

This HAWP approval is subject to the general condition that the applicant will obtain all other applicable Montgomery County or local government agency permits. After the issuance of these permits, the applicant must contact this Historic Preservation Office if any changes to the approved plan are made. Once work is complete the applicant will contact Michael Kyne at 301.563.3403 or michael.kyne@montgomeryplanning.org to schedule a follow-up site visit.

FOR STAFF ONLY:
HAWP# 1004874
DATE ASSIGNED

APPLICATION FOR HISTORIC AREA WORK PERMIT

HISTORIC PRESERVATION COMMISSION
301.563.3400

APPLICANT:

Name: Eric Lindblom E-mail: enl7@verizon.net

Address: 49 Elm Ave. City: Takoma Park Zip: 20912

Daytime Phone: (301) 270-4359 Tax Account No.: 01065056

AGENT/CONTACT (if applicable):

Name: Anthony Colella E-mail: permits@edge-gogreen.com

Address: 6854 Distribution Dr City: Beltsville Zip: 20705

Daytime Phone: 434-568-7220 Contractor Registration No.: DPS Customer # 1278257 MHIC # 126720 ~~Moco License # 13228~~

LOCATION OF BUILDING/PREMISE: MIHP # of Historic P M 37-10

APPROVED
Montgomery County
Historic Preservation Commission

Is the Property Located within an Historic District? x Yes/ No/

Is th ere an Historic Preservation/Land Trust/Environmenta include a map of the easement, and documentation from the Easen on. NO

REVIEWED
By Michael Kyne at 1:50 pm, Sep 23, 2022

Are other Planning and/or Hearing Examiner Approvals /R ication? (Conditional Use, Variance, Record Plat, etc.?) If YES, inclu supplemental information.

Building Number: 49 Street: Elm Avenue

Town/City: Takoma Park Nearest Cross Street: Westmoreland Avenue

Lot: 22 Block: 18 Subdivision: 0025 Parcel: 0000

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

- ☐ New Construction
- ☐ Addition
- ☐ Demolition
- ☐ Grading/Excavation
- ☐ Deck/Porch
- ☐ Fence
- ☐ Hardscape/Landscape
- ☐ Roof
- ☐ Shed/Garage/Accessory Structure
- ☑ Solar
- ☐ Tree removal/planting
- ☐ Window/Door
- ☐ 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 8-24-2022 Date

Adjacent and Confronting Properties:

Takoma Park, MD 20912

51 Elm Avenue

6811 Westmoreland Avenue

6812 Westmoreland Avenue

6814 Westmoreland Avenue

61 Walnut Avenue

50 Elm Avenue

REVIEWED
By Michael Kyne at 1:50 pm, Sep 23, 2022

APPROVED

Montgomery County

Historic Preservation Commission

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

2-Story Property with shingle roof. Old growth of surronding trees with medium amount of landscaping. White siding with Brown widow shutters. White fence in the front of house, natural wood fence around the whole back side of the property, fully enlcosed. Medium size detached shed in the back of property. Roofs are at a 3:12 pitch.

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

Install (24) SunPower 420-watt AC solar panels to roof (None on front -- 5 panels on left, 9 panels on rear, 10 panels on detached shed at back of property, all behind fence). Panels are black-frame with black cells, and black low-profile racking held approx 5" above the shingles not easily seen from street view given the pitch of the roof. Panels will be installed more than 3' feet back from the front edge of the roof. Fence encloses the rear of the property to limit view.

REVIEWED

By Michael Kyne at 1:50 pm, Sep 23, 2022

APPROVED

Montgomery County

Historic Preservation Commission

Work Item 1: Solar Panels

Description of Current Condition:	Proposed Work:
Roof is gray shingle	Install (24) SunPower 420-watt AC solar panels to roof (None on front -- 5 panels on left, 9 panels on rear, 10 panels on detached shed at back of property, all behind fence). Panels are black-frame with black cells, and black low-profile racking held approx 5" above the shingles not easily seen from street view given the pitch of the roof. Panels will be installed more than 3' feet back from the front edge of the roof. Fence encloses the rear of the property to limit view.

Work Item 2:

Description of Current Condition:	Proposed Work:
REVIEWED **By Michael Kyne at 1:50 pm, Sep 23, 2022**	APPROVED Montgomery County Historic Preservation Commission

Work Item 3:

Description of Current Condition:	Proposed Work:

HISTORIC AREA WORK PERMIT
CHECKLIST OF
APPLICATION REQUIREMENTS

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

REVIEWED

By Michael Kyne at 1:50 pm, Sep 23, 2022

APPROVED

Montgomery County

Historic Preservation Commission

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6854 Distribution Drive Beltsville, MD 20705
www.edge-gogreen.com

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By Michael Kyne at 1:50 pm, Sep 23, 2022

APPROVED
Montgomery County
Historic Preservation Commission

REVIEWED
By Michael Kyne at 1:51 pm, Sep 23, 2022

APPROVED
Montgomery County
Historic Preservation Commission

SOLAR INDIVIDUAL PERM

ERIC LINDBLO

10.08 kW GRID TIED PHOTOVOLTAIC SYSTEM

49 ELM AVENUE
TAKOMA PARK, MD 20912

AHJ: MONTGOMERY COUNTY
UTILITY: PEPCO

CODE INFORMATION

APPLICABLE CODES, LAWS AND REGULATIONS

2018 INTERNATIONAL BUILDING CODE
2018 INTERNATIONAL EXISTING BUILDING CODE
2018 INTERNATIONAL RESIDENTIAL CODE
2018 INTERNATIONAL ENERGY CONSERVATION CODE
2019 WSSC PLUMBING & FUEL GAS CODE
2018 INTERNATIONAL MECHANICAL CODE
2017 NFPA 70 NATIONAL ELECTRICAL CODE

SATELLITE IMAGE

PROJECT LOCATION

JOB NOTES

SCOPE OF WORK:

- (N) 10.08 kW PHOTOVOLTAIC SYSTEM
- (24) SUNPOWER (A-SERIES 420-WATT AC) PV MODULES
- POINT OF INTERCONNECTION AT MAIN SERVICE PANEL WITH LINE SIDE TAP

STATE OF MARYLAND
TIMOTHY E. RUMFORD
No. 41066
PROFESSIONAL ENGINEER

DocuSigned by:
TIM RUMFORD
E70D81E087D845E...

6/11/2022

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: 2023-09-08

DRAWING INDEX

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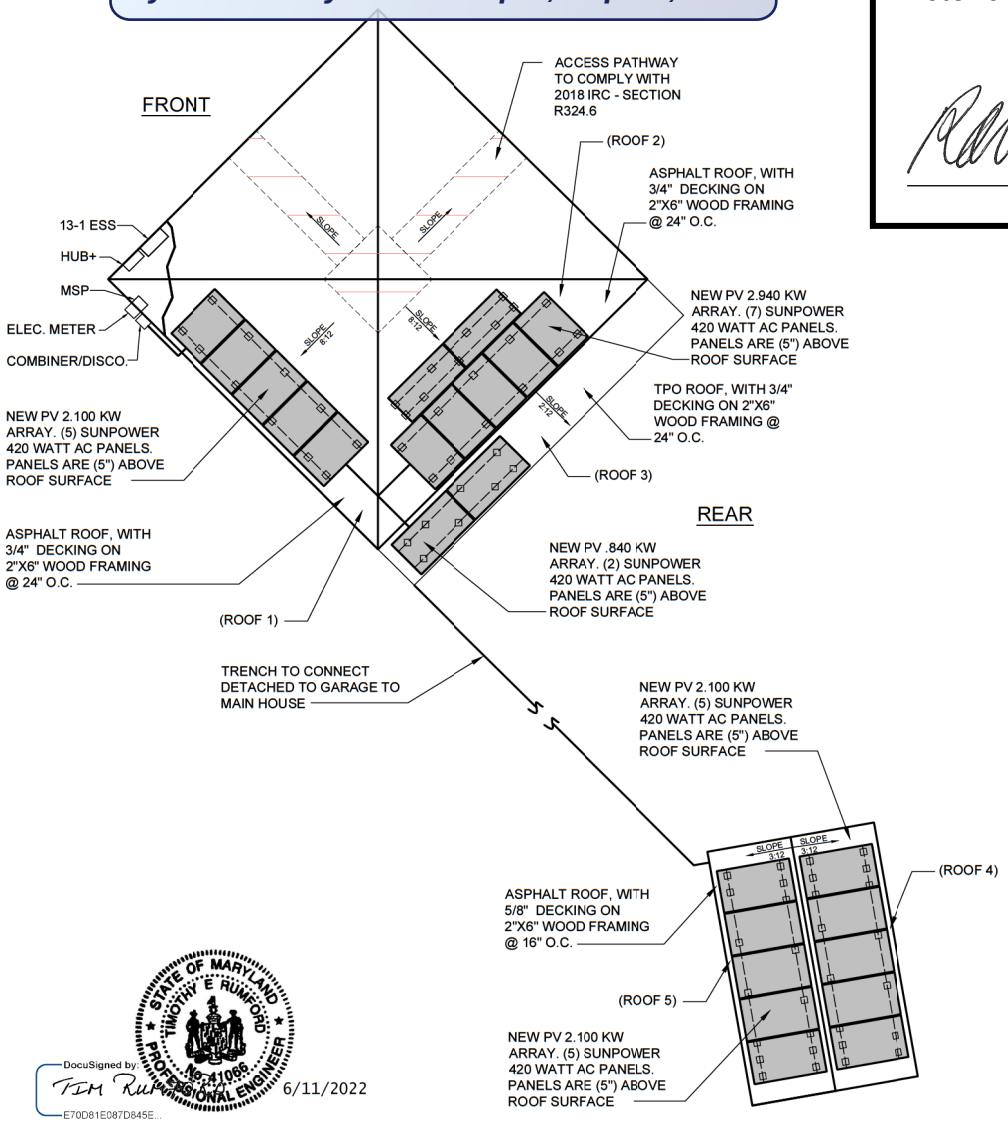
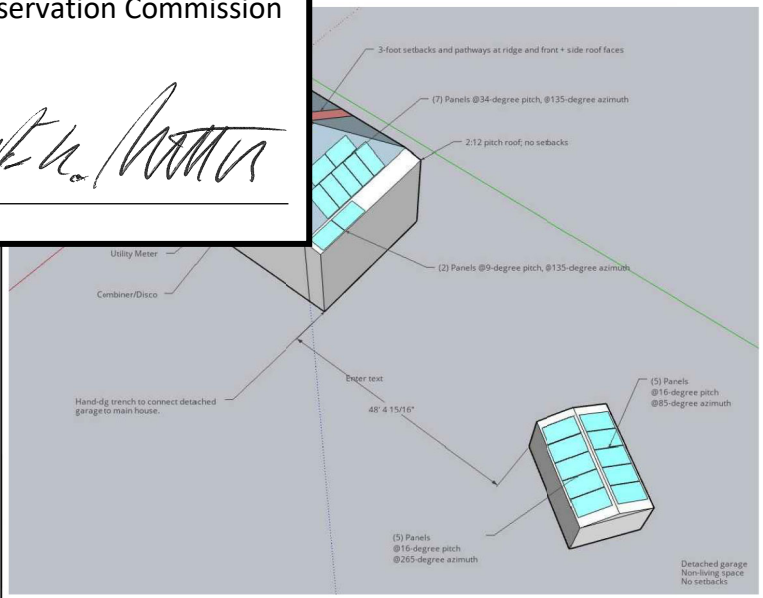
ERIC LINDBLOM
10.08 kW GRID-TIED PHOTOVOLTAIC SYSTEM
49 ELM AVENUE
TAKOMA PARK, MD 20912
SOLAR INDIVIDUAL PERMIT PACKAGE
COVER SHEET

REVISION LEVEL	DATE
REV-1	DATE

DRAWN BY: G. COBBS
INSTALLER:
PROJECT: 22192-01
DATE DRAWN: 05-31-2022
SCALE: 1/4" = 1'-0"

PVA-0





NOTE:
1. FIELD ADJUSTMENTS OF FEWER THAN 6" MAY BE ALLOWED BASED ON SITE CONDITIONS AND MEASUREMENTS.

TOTAL ROOF AREA: 948 SQ. FT.
TOTAL ARRAY AREA: 520 SQ. FT.
TOTAL PERCENTAGE OF ROOF COVERED BY SOLAR: 54.85%

ROOF	1	2	3	4	5	
MODULE QTY.	5	7	2	5	5	
AZIMUTH	225	135	135	85	265	
PITCH	8:12	8:12	2:12	3:12	3:12	

CONTRACT MODULE & QUANITY	24 SUNPOWER 420-WATT AC PANELS
MICROINVERTER TYPE & QUANITY	INTEGRATED WITH PANEL
ROOF TYPE	ASPHALT & TPO ROOF
ROOF ATTACHMENT QUANTITY	51
STORY HOME TYPE	2 - STORY
TOTAL ARRAY AREA	948 SQ. FT.

STATE OF MARYLAND
TIMOTHY E RUMFORD
No. 41066
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10.08 kW GRID-TIED PHOTOVOLTAIC SYSTEM
49 ELM AVENUE
TAKOMA PARK, MD 20912

SOLAR INDIVIDUAL PERMIT PACKAGE
ARRAY LAYOUT

REVISION LEVEL	DATE
REV-1	DATE

DRAWN BY: G. COBBS
INSTALLER:
PROJECT: 22192-01
DATE DRAWN: 05-31-2022
SCALE: 1/4" = 1'-0"

PVA-1

APPROVED
Montgomery County
Historic Preservation Commission

TABLE 1 - ARRA

	ROOF PITCH	ROOFING TYPE	ATTACHMENT TYPE	NO. OF STORIES				MAX. ATTACHMENT SPACING (in.)	MAX. RAIL OVERHANG (in.)
ROOF 1	34°	Asphalt Shingle	Pegasus L-foot	2				24"	8"
ROOF 2	34°	Asphalt Shingle	Pegasus L-foot	2				24"	8"
ROOF 3	9°	TPO	Pegasus L-foot	2				24"	8"
ROOF 4	16°	Asphalt Shingle	Pegasus L-foot	1				24"	8"
ROOF 5	16°	Asphalt Shingle	Pegasus L-foot	1	2x6 Truss @ 16" O.C.	7.75	Staggered	24"	8"
--	--	--	--	--	--	--	--	--	--
CHECK TABLE 2 FOR PENETRATION PATTERN GUIDE									

FIG 1: ROOF 1 STRUCTURAL FRAMING DETAIL

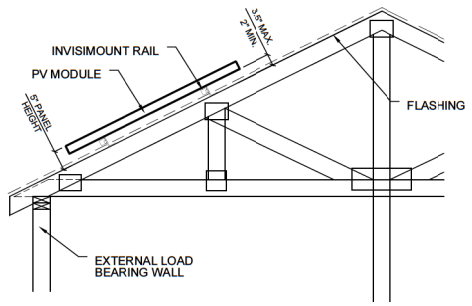
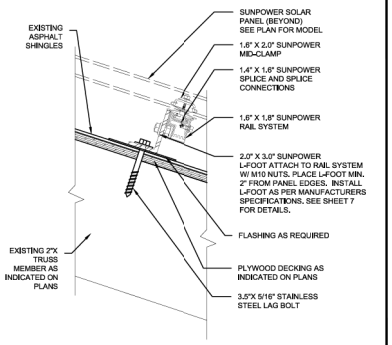
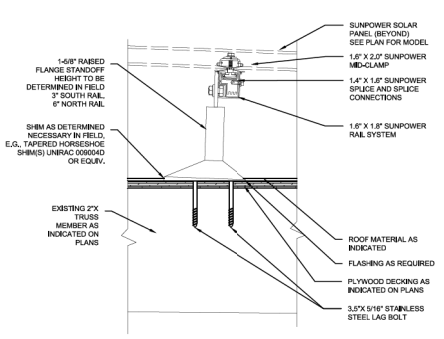


FIGURE 2: INVISIMOUNT ROOF ATTACHMENT DETAILS @ TRUSS / RAFTERS



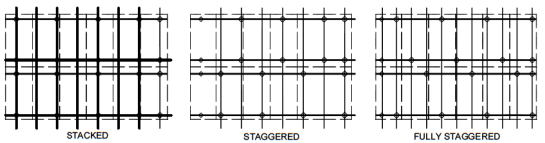
@ ASPHALT ROOF



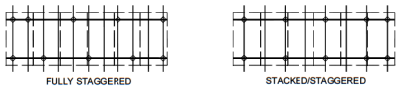
@ TPO ROOF

TABLE 2: PENETRATION GUIDE FOR INSTALL

TWO OR MORE ROWS OF MODULES

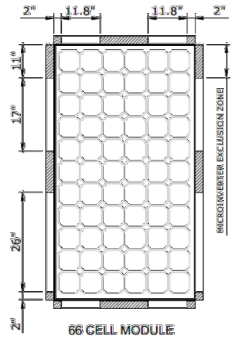


ONE ROW OF MODULES



* CHECK TABLE 1 FOR MAX.. PENETRATION SPACING AND PENETRATION PATTERN FOR EACH ARRAY.

FIGURE 3: MOUNTING CLAMP POSITIONING DETAILS



* RAILS SHALL BE POSITIONED IN THE NON-CROSS HATCHED REGIONS

DocuSigned by:
TIM RUMFORD
E70D81E087D845E...
6/11/2022

STATE OF MARYLAND
TIMOTHY E RUMFORD
No. 41066
PROFESSIONAL ENGINEER

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ERIC LINDBLOM
10.08 kW GRID-TIED PHOTOVOLTAIC SYSTEM
49 ELM AVENUE
TAKOMA PARK, MD 20912

SOLAR INDIVIDUAL PERMIT PACKAGE
STRUCTURAL INFORMATION AND MOUNTING DETAILS

REVISION LEVEL	DATE
REV-1	DATE

DRAWN BY:	G. COBBS
INSTALLER:	
PROJECT:	221912-01
DATE DRAWN:	05-31-2022
SCALE:	NTS

PVS-1

Project Name: Eric Lindblom - Montgomery County
49 Elm Avenue Takoma Park, MD 20912

Address:
Description: Pitched roof, 24 SunPower A-Series 420-watt Type-G AC panels. TWO STRUCTURES (1) and (2)

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

(1) GARAGE: 10 Panels @ Detached garage on InvisiMount racking with Pegasus Flashing. Detached garage is 2x6 16-OC truss framing with 5/8" deck and shingle roof.
(5) Panels @16-degree tilt, @85-degree azimuth
(5) Panels @16-degree tilt, @265-degree azimuth

LOW PITCH ANALYSIS - 16 DEG, 10 PANELS

Pnet = Net Design Wind Pressure (psf)
From ASCE 7-10, 100sf eff wind area, 7 to 27 deg, 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: 30
Array Number of Modules: 10
Number of fasteners per module: 3.0 AVE
Force per fastener: (lbs)

Down	Up
64.8	294.1

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	
10.5	2.3	x margin
OK	OK	>2

Uplift wind loads well below pull out force on fasterners. 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 or 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.

Present Conditions and Structure Info

(2) MAIN HOUSE: • (14) Panels @ Main house on InvisiMount racking with Standoffs and Pitch Pockets. Main house is 2x6 24-OC framing with 3/4" deck and shingle roof; torch down at the rear addition such that (2) panels will be on standoffs.
(7) Panels @34-degree tilt, @135-degree azimuth
(2) Panels @8-dergree tilt, @135-degree azimuth
(5) Panels @34-degree tilt, @225-degree azimuth

LOW PITCH ANALYSIS - 9 DEG, TWO PANELS

Pnet = Net Design Wind Pressure (psf)
From ASCE 7-10, 20sf eff wind area, 7 to 27 deg, zone 3

Down	Up		
12.5	52.4	115	mph

Module Areas (sf): 20.1
Wind Force (lbs), Per module: Pnet * Area=

Down	Up
250.7	1050.9

Array number of fasteners: 8
Array Number of Modules: 2
Number of fasteners per module: 4.0 AVE
Force per fastener: (lbs)

Down	Up
62.7	262.7

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	
10.9	2.6	x margin
OK	OK	>2

Uplift wind loads well below pull out force on fasterners. 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.

Present Conditions and Structure Info

(2) MAIN HOUSE: • (14) Panels @ Main house on InvisiMount racking with Standoffs and Pitch Pockets. Main house is 2x6 24-OC framing with 3/4" deck and shingle roof; torch down at the rear addition such that (2) panels will be on standoffs.
(7) Panels @34-degree tilt, @135-degree azimuth
(2) Panels @8-dergree tilt, @135-degree azimuth
(5) Panels @34-degree tilt, @225-degree azimuth

HIGH PITCH ANALYSIS - 34 DEG. 12 PANELS

Pnet = Net Design Wind Pressure (psf)
From ASCE 7-10, 100 sf eff wind area, 27 to 45 deg, zone 3

Down	Up		
19.8	23.8	115	mph

Module Areas (sf): 20.1
Wind Force (lbs), Per module: Pnet * Area=

Down	Up
397.1	477.3

Array number of fasteners: 31
Array Number of Modules: 12
Number of fasteners per module: 2.6 AVE
Force per fastener: (lbs)

Down	Up
153.7	184.8

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	
4.4	3.7	x margin
OK	OK	>2

Uplift wind loads well below pull out force on fasterners. 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.

STATE OF MARYLAND
TIMOTHY E RUMFORD
No. 41066
PROFESSIONAL ENGINEER

DocuSigned by:
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ERIC LINDBLOM
10.08 kW GRID-TIED PHOTOVOLTAIC SYSTEM
49 ELM AVENUE
TAKOMA PARK, MD 20912
SOLAR INDIVIDUAL PERMIT PACKAGE
STRUCTURAL CALCULATIONS, DETAILS

REVISION LEVEL	DATE
REV-1	DATE

DRAWN BY:	G. COBBS
INSTALLER:	
PROJECT:	221912-01
DATE DRAWN:	05-31-2022
SCALE:	NTS

PVS-2

REVIEWED

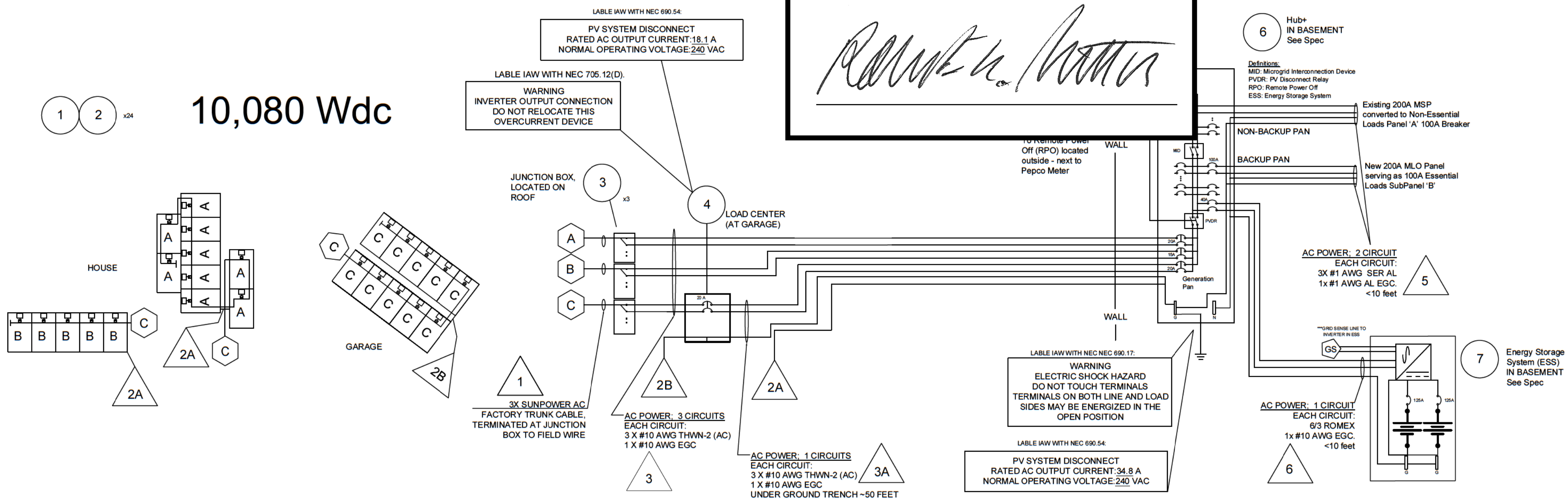
By Michael Kyne at 1:51 pm, Sep 23, 2022

DocuSign Envelope ID: 3F0B9E7E-F9EC-4ABD-A4A4-6969C416B44B

APPROVED

Montgomery County

Historic Preservation Commission


10,080 Wdc
1 2 x24
HOUSE
GARAGE
LABLE IAW WITH NEC 690.54:
PV SYSTEM DISCONNECT
RATED AC OUTPUT CURRENT: 18.1 A
NORMAL OPERATING VOLTAGE: 240 VAC
LABLE IAW WITH NEC 705.12(D).
WARNING
INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS
OVERCURRENT DEVICE
JUNCTION BOX, LOCATED ON ROOF
x3
LOAD CENTER (AT GARAGE)
3X SUNPOWER AC FACTORY TRUNK CABLE, TERMINATED AT JUNCTION BOX TO FIELD WIRE
AC POWER; 3 CIRCUITS
EACH CIRCUIT:
3 X #10 AWG THWN-2 (AC)
1 X #10 AWG EGC
AC POWER; 1 CIRCUITS
EACH CIRCUIT:
3 X #10 AWG THWN-2 (AC)
1 X #10 AWG EGC
UNDER GROUND TRENCH ~50 FEET
Hub+
IN BASEMENT
See Spec
Definitions:
MID: Microgrid Interconnection Device
PVDR: PV Disconnect Relay
RPO: Remote Power Off
ESS: Energy Storage System
Existing 200A MSP converted to Non-Essential Loads Panel 'A' 100A Breaker
NON-BACKUP PAN
BACKUP PAN
New 200A MLO Panel serving as 100A Essential Loads SubPanel 'B'
Off (RPO) located outside - next to Pepco Meter
WALL
Generation Pan
AC POWER; 2 CIRCUIT
EACH CIRCUIT:
3X #1 AWG SER AL
1x #1 AWG AL EGC.
<10 feet
LABLE 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
LABLE IAW WITH NEC 690.54:
PV SYSTEM DISCONNECT
RATED AC OUTPUT CURRENT: 34.8 A
NORMAL OPERATING VOLTAGE: 240 VAC
Energy Storage System (ESS) IN BASEMENT See Spec
AC POWER; 1 CIRCUIT
EACH CIRCUIT:
6/3 ROMEX
1x #10 AWG EGC.
<10 feet

EQUIPMENT SCHEDULE

TAG	NAME	P/N	QTY	NOTES
1	SOLAR MODULES	SunPower A-Series 420-watt Type-G AC panels	24	3 CIRCUIT
2	Microinverters	SUNPOWER FACTORY ul	24	Mounted to modules at factory
3	JUNCTION BOX	Field determined	3	JUNCTION BOX, LOCATED ON ROOF
4	LOAD CENTER	70-AMP 2-SPACE 4 CIRCUIT MAIN LUG LOAD CENTER. OR EQUIV	1	SERVES AS AC DISCO AT GARAGE, WITH 20 A OCPD
5	RESERVED			
6	Hub+	See Spec Page	1	LOCATED IN BASEMENT
7	ESS	See Spec Page	1	LOCATED IN BASEMENT

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 COPPER RACKING SYSTEM TO EARTH GROUND -	#6	1	ROUTED WITH PV WIRE, THEN IN CONDUIT AFTER JUNCTION BOX
3	AC POWER FROM ROOF JBs TO AC LOAD CENTERS (LC) 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
3A	AC POWER FROM GARAGE LOAD CENTER (AC DISC) TO MAIN LOAD CENTER AT HOUSE THWN-2 (240 VAC) MAX DERATING CURRENT (SEE CALCS PAGE); MAX VOLTAGE (SEE CALCS PAGE)	#10 (L1, L2), #10 (EGC)	3	ROUTES UNDER GROUND ~50 FEET
4	RESERVED			
5	Hub+ to ESSENTIAL AND NON-ESSENTIAL LOADS PANELS THWN-2 (240 VAC) SER AL MAX DERATING CURRENT (SEE CALCS PAGE); MAX VOLTAGE (SEE CALCS PAGE)	#1 (L1, L2, N) AL, #3 AL (EGC)	4	IN BASEMENT <10 FEET
6	Hub+ to ESS 6/3 ROMEX	#6/3, #10 (EGC)	3	ROUTES IN BASEMENT, <10 FEET

DocuSigned by: Tim Rumford
E70D81E087D845E...

STATE OF MARYLAND TIMOTHY E RUMFORD No. 41066 PROFESSIONAL ENGINEER

7/13/2022

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: 2023-09-08

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ERIC LINDBLOM
10.08 kW GRID-TIED PHOTOVOLTAIC SYSTEM
49 ELM AVENUE
TAKOMA PARK, MD 20912
SOLAR INDIVIDUAL PERMIT PACKAGE
ELECTRICAL SINGLE-LINE DIAGRAM & SEPCIFICATIONS

REVISION LEVEL	DATE
REV-1	07-13-22

DRAWN BY:	G. COBBS
INSTALLER:	
PROJECT:	22192-01
DATE DRAWN:	05-31-2022
SCALE:	NTS

PVE-1

ELECTRICAL CALCULATIONS

Eric Lindblom - Montgomery County
49 Elm Avenue Takoma Park, MD 20912

1.	Conductor Sizing per Art. 690.8(B)(1)							
a.	Conductor must have 30 deg. C ampacity >= 125% of continuous current per Art 215.2(A)(1).	Module	24	SunPower A-Series 420-watt Type-G AC panels	420	10080	W ST	
		Inverter	24	SUNPOWER FACTORY ul		349	W m	
b.	Conductor must have (after corrections for conditions of use) >= continuous current per Table 310.16					8376		
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)=	420	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				
2.	OOP Sizing per Art. 690.8(B)(1)	Output Power Factor (min.)		1				
a.	Round up to next size per Art 240.4(B)	AC Max. Continuous Output Current @ 240 V		1.49 A				
		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:	C	10 ok <=11	and	A = 9, B=5		
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=	14.50	A	(1.45 A x number of inverters per ckt)			
		Icont*1.25=	18.13	A	OCP	20	A	20A FOR CIRC A, 15 A FOR CIRC B
		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 current per Art 215.2(A)(1).		derated:		23.2	A	OK>	18.13
7.	Conductor Sizing per Art. 690.8(B)(1)							
a.	Conductor must have 30 deg. C ampacity >= 125% of continuous current per Art 215.2(A)(1).							
b.	Conductor must have (after corrections for conditions of use) >= continuous current per Table 310.16							
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.							

Voltage Drop = (Amp*2*ft*ohm/ft)/V						
	Amp		ft	ohm/ft	V	Note
Inverter output=	14.50		100	0.00126	240	#10
Inverter output=	1.52%	ok		<3%	ok	
Load center output=	43.50		25.00	0.00050	240	#6
Load center output=	0.45%	ok		<3%	ok	
ESS output=	28.50		10.00	0.00050	240	#6
ESS output=	0.12%	ok		<3%	ok	

Energy Storage System (ESS): SunVault 13.						
Inverter: XW Pro 6848 NA, Battery: 2x SPWR-M001X						
DC Rated Rated Energy	13	KWh (128 Ah)				
Max Usable: DC Rated Rated Energy	12	KWh (118 Ah)				
Individual DC Breaker Rating	125	A				
Max. DC Continuous Output Current	96	A (at 51.2VDC)				
Max. AC Contiruous Backup Output Current	28.50	A (factory Prog.)				
AC Overcurrent Protection Device	40	A				
Max. AC Continuous Output Current (Grid tied)	27.0	A				
Max. DC Continuous Output Current	96	A				
Conductor sizing, Hub+ to ESS			1-way length (ft)		<10 feet	
Icont=	28.50	A	Battery Inverter Spec			
Icont*1.25+	35.63	A	OCP	40	A	
Wire	#6 AWG ROMEX		55	A	NEC TABLE 310.16	
	Temp derate factor		0.9	unitless	45	
	derated:		47.9	A	OK>	35.63
Conductor sizing, Hub+ to ESSENTIAL AND NON-ESSENTIAL LOADS PANELS						25.00
Icont=	28.50	A	Battery Inverter Spec			
Icont*1.25+	35.63	A				
Wire	#1 AWG THWN-2 AL		100	A	NEC TABLE 310.16	
	Temp derate factor		1	unitless	30	C
	Conduit Fill factor		1	unitless	Table 310.15(B)(20(a)	
	Derated		100	A	OK>	35.63
		use	OCP	100	A	

STATE OF MARYLAND
TIMOTHY E RUMFORD
No. 41066
PROFESSIONAL ENGINEER

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6/11/2022

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ERIC LINDBLOM
10.08 kW GRID-TIED PHOTOVOLTAIC SYSTEM
49 ELM AVENUE
TAKOMA PARK, MD 20912
SOLAR INDIVIDUAL PERMIT PACKAGE
ELECTRICAL CALCULATION

REVISION LEVEL	DATE
REV-1	DATE

DRAWN BY:	G. COBBS
INSTALLER:	
PROJECT:	22192-01
DATE DRAWN:	05-31-2022
SCALE:	NTS

PVE-2

SOLAR ELECTRIC SYSTEM DISCONNECT LOCATED IN MAIN SERVICE PANEL

LOCATION: USE ONLY WHEN THE MAIN SERVICE DISCONNECT IS ON THE METER (METER MAIN) LABEL ON THE OUTSIDE OF THE METER ENCLOSURE (WHEN THE METER ACTS AS THE RAPID SHUTDOWN): NEC 705.10 & 690.56(B)

PV SYSTEM POINT OF INTERCONNECTION

LOCATION: MAIN SERVICE PANEL

CAUTION SOLAR CIRCUIT

LABEL EVERY 10'

GENERAL NOTE:
ALL LABELS ARE TO MEET NEC 690 AND ANSI Z535.4 STANDARDS. SPECIFIC SYSTEMS REQUIREMENTS MAY VERY AS PER IFC 605.11.1 SIGNS SHALL BE REFLECTIVE & WEATHER RESISTANT WITH WHITE LETTERS ON AT LEAST 3/8" HIGH ON RED BACKGROUND

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LOCATION: PV SYSTEM DISCONNECT

WARNING - PHOTOVOLTAIC POWER SOURCE

IF APPLICABLE PER IFC 605.11.1.2

WARNING

DUAL POWER SUPPLY

SOURCES: UTILITY GRID AND SOLAR PHOTOVOLTAIC SYSTEM

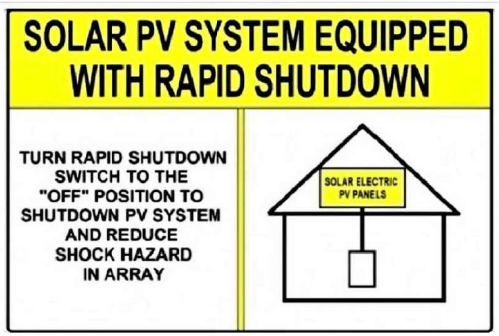
LOCATION: MAIN SERVICE PANEL

WARNING

ELECTRIC SHOCK HAZARD

DO NOT TOUCH TERMINALS TERMINALS ON BOTH LINES AND LOAD SIDE MAY BE ENERGIZED IN THE OPEN POSITION

LOCATION: PV SYSTEM DISCONNECT



REVIEWED
By Michael Kyne at 1:51 pm, Sep 23, 2022

APPROVED

Montgomery County

Historic Preservation Commission

STATE OF MARYLAND
TIMOTHY E RUMFORD
No. 41066
PROFESSIONAL ENGINEER

DocuSigned by:
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49 ELM AVENUE
TAKOMA PARK, MD 20912

SOLAR INDIVIDUAL PERMIT PACKAGE
ELECTRICAL DATA & SPECIFICATIONS

REVISION LEVEL	DATE
REV-1	DATE

DRAWN BY:	G. COBBS
INSTALLER:	
PROJECT:	22192-01
DATE DRAWN:	05-31-2022
SCALE:	NTS

PVE-3

REVIEWED
By Michael Kyne at 1:51 pm, Sep 23, 2022

APPROVED
Montgomery County
Historic Preservation Commission

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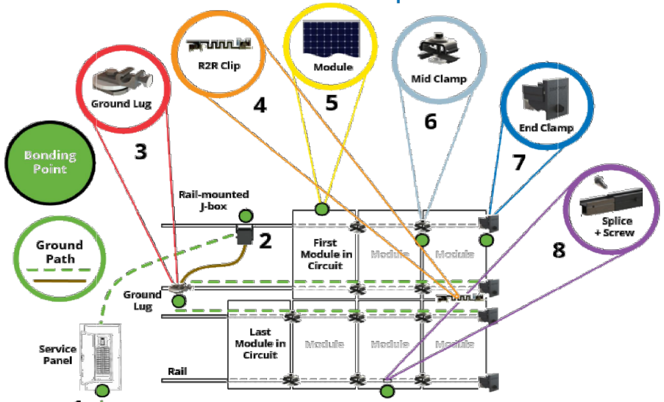
/2022

SunPower InvisiMount™ with R2R Grounding Clip Ground Path and Compliance



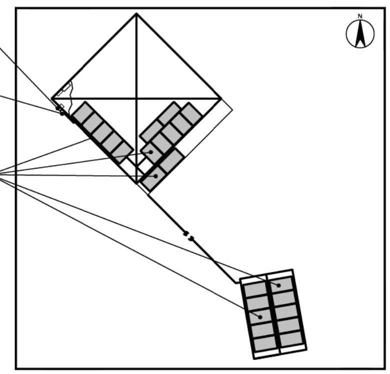
	Bonding Components	Compliance NEC	Compliance UL
1	Grounding Electrode to Service Panel	690.47(A) 690.47(D)	n/a
2	Service Panel to Ground Wire	690.43(C)	1741
3	Ground Wire to Ground Lug to Rail	690.43(C)	2703
4	Module Frame to Module Frame	690.43(C)	2703
5	Module Frame	n/a	1703
6	Rail to Mid Clamp to Module Frame	690.43(A) 690.43(C) 690.43(D)	2703
7	Module Frame to End Clamp to Rail	690.43(A) 690.43(C) 690.43(D)	2703
8	Rail to Splice	690.43(A) 690.43(C) 690.43(D)	2703

#508988 RevM 15 SunPower Proprietary

FIGURE 1: SUNPOWER EQUINOX GROUNDING DETAILS

CAUTION:

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM THE FOLLOWING SOURCES WITH DISCONNECT(S) LOCATED AS SHOWN:



49 ELM MD

FIGURE 2: PLACARD IDENTIFYING LOCATION OF DISCONNECTS AND POWER SOURCES

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TAKOMA PARK, MD 20912
SOLAR INDIVIDUAL PERMIT PACKAGE
EQUINOX GROUNDING DETAILS

REVISION LEVEL DATE
REV-1 DATE
DRAWN BY: G. COBBS
INSTALLER:
PROJECT: 22192-01
DATE DRAWN: 05-31-2022
SCALE: NTS

PVE-4

A SERIES

SUNPOWER®

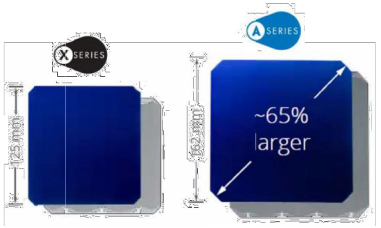
420–390 W Residential AC Module

SunPower® Maxeon® Technology

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

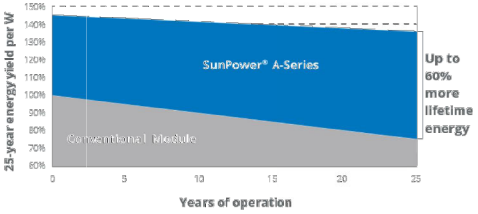
Highest Power Density Available.

SunPower's new Maxeon® Gen 5 cell is 55% larger than prior generations, delivering the most powerful cell and highest efficiency module 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.

25-yr SunPower Complete Confidence

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
- Engineered and calibrated by SunPower for SunPower AC mod

STATE OF MARYLAND
TIMOTHY E RUMFORD
No. 41065
PROFESSIONAL ENGINEER

DocuSigned by:
TIM RUMFORD
E7DD01E087D64SE...

6/11/2022

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esidential AC Module

rical Data	
	@240 VAC
	366 VA
	349 VA
	240 / 211–264
	1.45
	11
	97.0%
	60 Hz
	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	A420-G-AC	A415-G-AC	A410-G-AC	A400-G-AC	A390-G-AC
Nom. Power [5] (Pnom) W	420	415	410	400	390
Power Tol.	+5/–0%				
Module Efficiency	22.5	22.3	22.0	21.5	20.9
Temp. Coef. (Power)	–0.29%/°C				
Shade Tol.	Integrated module-level max. power point tracking				

Tested Operating Conditions	
Operating Temp.	–40°F to +185°F (–40°C to +85°C)
Max. Ambient Temp.	122°F (50°C)
Max. Load	Wind: 62 psf, 3000 Pa, 305 kg/m² front & back Snow: 125 psf, 6000 Pa, 611 kg/m² 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)

Warranties, Certifications, and Compliance	
Warranties	• 25 year limited power warranty • 25-year limited product warranty
Certifications and Compliance	• 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 Equipment[6] Enables installation in accordance with: • 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) When used with InvisiMount racking and InvisiMount accessories (UL 2703): • Module grounding and bonding through InvisiMount • Class A fire rated When used with AC module Q Cables and accessories (UL 6703 and UL 2238)[6]: • Rated for load break disconnect
PID Test	Potential-induced degradation free

1 SunPower 415 W, 22.3% efficient, compared to a Conventional Panel on same-sized arrays (260 W, 16% efficient, approx. 1.6 m²), 7.3% 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.
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 PVRSE 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.s.npower.com/datasheets Specifications included in this datasheet are subject to change without notice.
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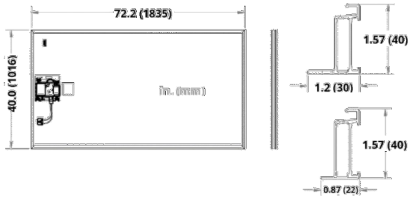

UL LISTED 8478330
Module Fire Performance: Type 2

SUNPOWER®

Please read the Safety and Installation Instructions 532628 for additional details.

534092 RevA

Datasheet

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ERIC LINDBLOM
10.08 kW GRID-TIED PHOTOVOLTAIC SYSTEM
49 ELM AVENUE
TAKOMA PARK, MD 20912

SOLAR INDIVIDUAL PERMIT PACKAGE
ELECTRICAL MODULE SPECS

REVISION LEVEL	DATE
REV-1	DATE

DRAWN BY: G. COBBS
INSTALLER:
PROJECT: 22192-01
DATE DRAWN: 05-31-2022
SCALE: NTS

PVE-5

Datasheet

SUNPOWER®

SunPower® SunVault™ Hub+™

Electrical	
Model Numbers	SV-HUB-01-A, SV-HUB-01-B
Applications	Self-supply, backup, and cost savings
Special Features	12 V jumpstart: YES / Generator control: YES / Rapid Power Off: YES
Supported Backup Configurations	• Whole home (up to 200 A service) • Partial home (up to 400 A service)
Max. Allowed Service / Disconnect Rating	200 A
Nom. Allowed Service Voltage	120 / 240 V 60 Hz, split phase
Short Circuit Rating[1]	10 kA / 22 kA[2]
Overcurrent Protection Device Allowed[3]	100–200 A / service entrance rated
AC Metering	Solar meter: ANSI C12.20, < 0.5% RGM | Site meter: < 2%
Connectivity	Ethernet, WiFi, and cellular
Backup Transition	Seamless
Load / Generation Breakers[4]	Refer to installation guide for available spaces
Overvoltage Category	OV IV
Pollution Degree	III
Protection Class	I
Scalability[5]	Supports multiple storage and PV array systems in parallel

Mechanical	
Dimensions	17 w × 46 h × 6 in. d (43 × 117 × 15 cm)
Weight	80 lb (36 kg)
Mounting Options	Indoor / Outdoor
Conduit Entry	Multiple; up to 3 in.

Warranties, Certifications, and Compliance	
Warranty	10 years
Certifications and Compliance	• ANSI C12.20 (Class 0.5) • CSA C22.2 No. 107.1 • FCC Part 15 Subclass B • UL 67 • UL 869A • UL 1741

Environmental	
Ambient Operating Temp.	–4°F to 122°F (–20°C to 50°C)
Shelf Ambient Temp.	–22°F to 140°F (–30°C to 60°C)
Humidity	0–95%, condensing
Enclosure Type / Ingress Rating	NEMA Type 3R / IP54
Max. Elevation	6560 ft (2000 m)
Environment	Indoor / Outdoor

1 Higher short circuit rating is compatible with external suitable rated equipment.
2 With external J-Class fuse or CSR breaker. See the *SunVault Installation Guide* for guidelines.
3 Recommended service-rated circuit breaker type must be installed.
4 See the *SunVault Installation Guide* for guidelines.
5 See the *SunVault Installation Guide* for guidelines.
Refer to www.sunpower.com/facts for additional reference information.
For more details, see extended datasheet www.sunpower.com/datasheets. Specifications included in this datasheet are subject to change without notice.

DocuSigned by:
TIM RUMFORD
E70D81E087D845E...
6/11/2022

SUNPOWER®
536813 RevB

sunpower.com

SUNPOWER®

ult 13 and SunVault 26

ice		
	SunVault 13	SunVault 26
	SV-BASE13-12-0 or SV-BASE13-12-A	SV-BASE13-12-A and SV-ENERGY13-12-A
	13 kWh (128 Ah)	26 kWh (256 Ah)
	12 kWh (118 Ah)	24 kWh (236 Ah)
	125 A / two pole	
	51.2 V	
Nom. AC Voltage (L–N–L)	120 / 240 VAC 60 Hz, split phase	
CEC Weighted RTE Efficiency[2]	> 86%	
Max. Backup Discharge Power (cont./5 min./10 sec.)	6.8 kW / 7.5 kW / 8.5 kW	
Max. AC Continuous Backup Output Current	28.5 A	
Max. AC Output Fault Current	35 A	
Max. Short Circuit Rating	10 kA	
AC Overcurrent Protection Device	40 A / two pole	
Max. Split-Phase Imbalance L-N	4800 W	
Power Factor (full-rated power)	± 0.85	
Battery Cell Chemistry	Lithium iron phosphate ($LiFePO_4$)	
Overvoltage Category	II	
Pollution Degree	III	
Protection Class	I	
Max. Continuous Charge Power (Grid tied / Backup)	6.4 kW	
Max. Continuous Discharge Power (Grid tied)	6.0 kW	
Max. AC Continuous Output Current (Grid tied)	27 A	

Environmental	
Seismic Rating	IEEE 693-2005, AC-156
Environmental Rating	Indoor and outdoor rated
Acoustic Noise Level	< 50 dBA @ 1 m distance, 86°F (30°C)
Recommended Operating Temp.	32°F to 86°F (0°C to 30°C)
Ambient Operating Temp.	14°F to 113°F (–10°C to 45°C)
Shelf Ambient Temp.[3]	–4°F to 113°F (–20°C to 45°C)
Initial Energy Reserve	30%
Humidity	0–95% condensing
Enclosure Type / Ingress Rating	NEMA Type 3R / IP54
Max. Elevation	6560 ft (2000 m)

Warranties, Certifications, and Compliance	
Warranty	10 years
Certifications and Compliance	• FCC Part 15 Subclass B • IEEE 1547 • UL 1642 • UL 1973 • UL 1741 • UL 1741 SA (CA Rule 21) • UL 9540 • UN 38.3

Mechanical	
User Interface	Mobile App, LED Panel
Dimensions	64.5 h × 26 w × 14.8 in. d (164 × 66 × 38 cm)[4]
Weight	• SV-BASE13: 270 lb (122.5 kg) w/inverter; 528 lb (239.5 kg) fully assembled • SV-ENERGY13: 400 lb (181.4 kg) fully assembled
Mounting Options	Wall or floor[5]

1 Some energy reserved for internal consumption.
2 Tested at 6 kW, 25°C conditions.
3 Extended exposure reduces battery performance.
4 Two enclosures for 26 kWh.
5 Additional hardware details in installation guide.
Some parameters can vary depending on site-specific conditions.

See the *SunVault Storage Installation Guide* for guidelines. See www.sunpower.com/facts for additional reference information. Specifications included in this datasheet are subject to change without notice.

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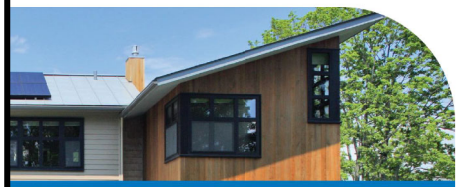
ERIC LINDBLOM
10.08 kW GRID-TIED PHOTOVOLTAIC SYSTEM
49 ELM AVENUE
TAKOMA PARK, MD 20912

SOLAR INDIVIDUAL PERMIT PACKAGE
SUNVAULT SPECS.

REVISION LEVEL	DATE
REV-1	DATE

DRAWN BY: G. COBBS
INSTALLER:
PROJECT: 22192-01
DATE DRAWN: 05-31-2022
SCALE: NTS

PVE-6



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

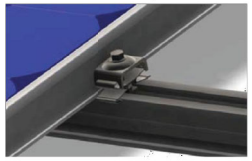
- Built for use with SunPower DC and AC modules
- Best-in-class system reliability and aesthetics
- Combine with SunPower modules and monitoring app

Elegant Simplicity

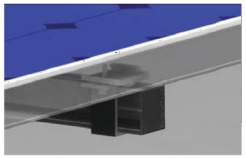
SunPower® InvisiMount™ is a SunPower-designed rail-based mounting system. The InvisiMount system addresses residential sloped roofs and combines faster installation time, design flexibility, and superior aesthetics. The InvisiMount product was specifically envisioned and engineered to pair with SunPower 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

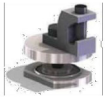


Mid Clamp

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	• 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.

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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: 2023-09-08

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SOLAR INDIVIDUAL PERMIT PACKAGE
HARDWARE MOUNTING DETAILS, SPEC.

REVISION LEVEL	DATE
REV-1	DATE

DRAWN BY:	G. COBBS
INSTALLER:	
PROJECT:	22192-01
DATE DRAWN:	05-31-2022
SCALE:	NTS

PVM-1

Standoffs & Flashings Installation Manual 907.2

[1] Installer responsibility

The installer is solely responsible for:

- Complying with all applicable local or national building codes, including any that may supercede this manual;
- Ensuring that Unirac and other products are appropriate for the particular installation and the installation environment;
- Ensuring that the roof, its rafters, connections, and other structural support members can support the array under building live load conditions;
- Using only Unirac parts and installer-supplied parts as specified by Unirac (substitution of parts may void the warranty);
- Maintaining the waterproof integrity of the roof; and
- Ensuring safe installation of all electrical aspects of the PV array.

UNIRAC®

*See **www.unirac.com/distributors** for your nearest Unirac distributor.*

Unirac welcomes input concerning the accuracy and user-friendliness of this publication. Please write to publications@unirac.com.

Unirac Installation Manual

Pub 090615-6ii
June 2009

			Components
		t standard or HD rails. g screws at opposite ge parallel to the rails.	• Welded standoff • 2 lags, $^{5}/_{16}$″ x $3^{1}/_{2}$″* (zinc)
Flat top 1-piece zinc-plated steel	$1^{5}/_{8}$″	Use with SunFrame, SolarMount standard, or SolarMount HD rails. Secure to rafter with 2 lag screws at opposite corners. Secure L-foot or installer-supplied strut directly to standoff with standoff hardware.	• Welded standoff • Bolt, $^{3}/_{8}$″ x $1^{1}/_{4}$″ • Lock washer, $^{3}/_{8}$″ • 2 lags, $^{5}/_{16}$″ x $3^{1}/_{2}$″*
Flat top 2-piece aluminum	$1^{5}/_{8}$″	Use with SunFrame, SolarMount standard, or SolarMount HD rails. Secure to rafter with 2 lag screws. Secure L-foot or installer-supplied strut directly to standoff with standoff hardware. ***Especially convenient when installing over a tile roof because flashing can be precisely fitted over secured base prior to installation of shaft.***	• Shaft • Base assembly • Bolt, $^{3}/_{8}$″ x $1^{1}/_{4}$″ Flange Head • Lock washer, $^{3}/_{8}$″ • 2 lags, $^{5}/_{16}$″ x $3^{1}/_{2}$″* (zinc) • EPDM Washer

* *A lag-bolt removal credit is available wherever an installer prefers to substitute a different lag bolt. The installer is solely responsible for determining whether lags are adequate to handle live and dead loads under wind conditions at the installation site. Wind loads and lag pullout capacities are addressed in Code-Compliant installation manual for SolarMount (Installation Manual 227) and SunFrame (Installation Manual 809).*

Flashings for all current standoffs ($1^{5}/_{8}$″ O.D. shaft)
(see illustrations, p. 3)

	Part no.*	Dimensions
Collared, galvanized	990101	8.75″ x 12.5″
Collared, aluminum	990102	8.75″ x 12.5″
Collared, soft aluminum	990103	18″ x 18″

**Packs of 12 flashings.*

Flashings for other uses ($1^{1}/_{2}$″ - $1^{1}/_{8}$″ O.D. shaft)

	Part no.	Dimensions
Collared, galvanized	990109	8.75″ x 12.5″

Flashing refers to thin, continuous pieces of sheet metal or other impervious material installed to prevent the passage of water into a structure from an angle or joint.

Flashing generally operates on the principal that, for water to penetrate a joint, it must work itself upward against the force of gravity or in the case of wind-driven rain, it would have to follow a tortuous path during which the driving force will be dissipated.

Unirac offers flashings to be used specifically with Unirac standoffs. These flashings are collared, thereby eliminating the need for the use of sealant between standoff and flashing. The flashing slides over the standoff, under the shingle above, and over the shingle below.

The following installation instruction provides an explanation of planning and installation of three different applications.

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HARDWARE MOUNTING DETAILS, SPEC.

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