HISTORIC PRESERVATION COMMISSION

Marc Elrich
County Executive

Robert Sutton
Chairman

Date: October 20, 2023

MEMORANDUM

TO: Rabbiah Sabbakhan
Department of Permitting Services
FROM: Michael Kyne
Historic Preservation Section
Maryland-National Capital Park & Planning Commission
SUBJECT: Historic Area Work Permit # 1043440: Solar panel 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 October 11, 2023 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: Sabrina Eaton (Fusion Solar Service, Agent)
Address: 7019 Eastern 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# 1043440
DATE ASSIGNED_____

APPLICATION FOR HISTORIC AREA WORK PERMIT

HISTORIC PRESERVATION COMMISSION
301.563.3400

APPLICANT:

Name: Fusion Solar Service E-mail: permits@fusionss.net

Address: 3600 Commerce Drive City: Baltimore Zip: 21227

Daytime Phone: 4434253023 Tax Account No.: 01071445

AGENT/CONTACT (if applicable):

Name: Ola Carew E-mail: permits@fusionss.net

Address: 3600 Commerce Drive City: Baltimore Zip: 21227

Daytime Phone: 4434253023 Contractor Registration No.: 30991

LOCATION OF BUILDING/PREMISE: MIHP # of Historic Property 7019 Eastern Ave Takoma Park

Is the Property Located within an Historic District? X Yes/Dis
__No/Indi

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Is there an Historic Preservation/Land Trust/Environmental Ea ude a map of the easement, and documentation from the Easement

REVIEWED
By Michael Kyne at 2:49 pm, Oct 20, 2023

Are other Planning and/or Hearing Examiner Approvals /Revie on? (Conditional Use, Variance, Record Plat, etc.?) If YES, include i supplemental information.

Building Number: 7019 Street: Eastern Ave

Town/City: Takoma Park Nearest Cross Street: _____

Lot: P1 Block: 7 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:

- ☐ 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.

_____ 9/14/2023

Signature of owner or authorized agent Date

HAWP APPLICATION: MAILING ADDRESSES FOR NOTIFING

[Owner, Owner's Agent, Adjacent and Confronting Property Owners]

Owner's mailing address	**Owner's Agent's** mailing address
7019 Eastern Ave	3600 Commerce Drive Ste 601 Baltimore Md 21227

Adjacent and confronting Property Owners mailing addresses

Ray Martone 7108 Cedar Ave Takoma Park	Peter Feiden 7025 Eastern Ave Takoma Park
7015 Eastern Ave., Takoma Park 20912	
7112 Cedar Avenue, Takoma Park 20912	

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

Home is in great shape.

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

Install 13 Roof Mounted Solar Panels. System Size 5.27kw

Panels installed on front face roof and rear facing roof.

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Work Item 1: _____

Description of Current Condition:	Proposed Work:

Work Item 2: _____

Description of Current Condition:	Proposed Work:

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Work Item 3: _____

Description of Current Condition:	Proposed Work:

HISTORIC AREA WORK PERMIT
CHECKLIST OF
APPLICATION REQUIREMENTS

	Required Attachments						
Proposed Work	1. 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	*	*	*	*	*		*

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Historic Preservation Commission

Gmail Olajumoke Carew <ocarew@luminasolar.com>

Fwd: 7019 Eastern Ave application for solar panel installation

1 message

Luisa Yared <lyared@luminasolar.com> Thu, Sep 14, 2023 at 3:03 PM
To: Olajumoke Carew <ocarew@luminasolar.com>

Hi Ola,

Here we have the second approval for Sabrina Eaton.

Best regards,

Luisa Yared
Project Support Coordinator
443.304.7282
443.562.5220
luminasolar.com
3600 Commerce Dr, Ste 601
Baltimore, MD 21227

Leave us a review!

---------- Forwarded message ---------
From: **PETER FEIDEN** <petefeiden@aol.com>
Date: Wed, Sep 13, 2023 at 7:34 PM
Subject: Re: 7019 Eastern Ave application for solar panel installation
To: Sabrina Eaton <sabrinaeaton@gmail.com>
Cc: Alex Ticu <alex@luminasolar.com>, Luisa Yared <lyared@luminasol

This

Sen from my iPhone

REVIEWED
By Michael Kyne at 2:49 pm, Oct 20, 2023

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On Sep 13, 2023, at 6:58 PM, Sabrina Eaton <sabrinaeaton@gm

To: Peter Feiden, 7025 Eastern Ave., Takoma Park, MD 20912

Hi Peter. I signed a contract to have Lumina Solar install solar panels on my southeast facing roofs. The work is supposed to happen in a few months. Before that work can occur, Lumina Solar needs to get a Historic Area Work Permit (HAWP) from Montgomery County. As part of that application, the solar company asked me to confirm that the solar panel installation is OK with neighbors. If this is OK with you, would it be possible for you to hit “reply all” on this email and say it is OK? It is CC:ed to the solar installation company people who are handling the job. They will send your approval email to the Historic Area Work Permit issuers with the application.

I appreciate your help with this. Let me know if you have any questions.

Thanks,

Sabrina Eaton, 7019 Eastern Ave., Takoma Park, MD 20912
Cell – 202-841-1891

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By Michael Kyne at 2:49 pm, Oct 20, 2023

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Montgomery County
Historic Preservation Commission

Gmail Olajumoke Carew <ocarew@luminasolar.com>

Fwd: Solar panel installation application for 7019 Eastern Ave

2 messages

Luisa Yared <lyared@luminasolar.com> Thu, Sep 14, 2023 at 3:03 PM
To: Olajumoke Carew <ocarew@luminasolar.com>

Hi Ola!

Here we have 1 approval for Sabrina Eaton.

Best regards,

Luisa Yared
Project Support Coordinator
443.304.7282
443.562.5220
luminasolar.com
2600 Commerce Dr, Ste 601
Baltimore, MD 21227

REVIEWED
By Michael Kyne at 2:49 pm, Oct 20, 2023

Leave us a review!

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Historic Preservation Commission

---------- Forwarded message ---------
From: **Ray Martone** <rmartone@gmail.com>
Date: Wed, Sep 13, 2023 at 7:11 PM
Subject: Re: Solar panel installation application for 7019 Eastern Ave
To: Sabrina Eaton <sabrinaeaton@gmail.com>
Cc: Alex Ticu <alex@luminasolar.com>, Luisa Yared <lyared@luminasolar.com>

OK

On Wed, Sep 13, 2023 at 7:08 PM Sabrina Eaton <sabrinaeaton@gmail.com> wrote:

> To: Ray Martone, 7108 Cedar Ave., Takoma Park, MD 20912
>
> Hi Ray. I signed a contract to have Lumina Solar install solar panels on my roof. The work is supposed to happen in a few months. Before that work can occur, Lumina Solar needs to get a Historic Area Work Permit (HAWP) from Montgomery County. As part of that application, the solar company asked me to confirm that the solar panel installation is OK with neighbors. If this is OK with you, would it be possible for you to hit “reply all” on this email and say it is OK? It is CC:ed to the solar installation company people who are handling the job. They will send your approval email to the Historic Area Work Permit issuers with the application.
>
> I appreciate your help with this. Let me know if you have any questions.
>
> Thanks,
>
> Sabrina Eaton, 7019 Eastern Ave., Takoma Park, MD 20912
> Cell – 202-841-1891

Olajumoke Carew <ocarew@luminasolar.com> Thu, Sep 14, 2023 at 3:33 PM
To: Luisa Yared <lyared@luminasolar.com>

Awesome, thank you so much!
[Quoted text hidden]

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By Michael Kyne at 2:49 pm, Oct 20, 2023

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Montgomery County
Historic Preservation Commission

AOstructures Inc.
PO Box 413
Carnelian Bay, CA 96140
916.541.8586
www.AOstructures.com

Project: Eaton Residence Property Owner Mr.s &/or Mrs. Eaton

Address: 7019 Eastern Ave. NW., Takoma Park, MD. 20912

[X] I reviewed the design of the photovoltaic (PV) system, as designed by the manufacturer, and the design criteria utilized for the mounting equipment and panel mounting assembly (rack system) for the installation of (13) panels supported by the rack system, as shown on the drawings prepared for the above referenced address. I certify that the configurations and design criteria meet the standards and requirements of the International Residential Code (IRC) and International Existing Building Code (IEBC) adopted by Montgomery County in COMCOR 08.00.02.

[X] The attachment of the rack system to the building at the above address, including the location, number, and type of attachment points; the number of fasteners per attachment point; and the specific type of fasteners (size, diameter, length, minimum embedment into structural framing, etc.) meets the standards and requirements of the IRC and IEBC adopted by Montgomery County in COMCOR 08.00.02.

[X] I evaluated the existing roof structure of the building at the above address and analyzed its capacity to support the additional loads imposed by the PV system. I certify that no structural modifications of the existing roof structure are required. The existing roof structure meets the standards and requirements of the IRC and IEBC, adopted by Montgomery County in COMCOR 08.00.02, necessary to support the PV system.

[ ] I evaluated the existing roof structure of the building at the above address and analyzed its capacity to support the additional loads imposed by the PV system. Structural modifications of the existing roof structure are required. I certify that the roof structure, as modified on the drawings for this project, will support the additional loads imposed by the PV system. I further certify that design of the modified roof structure meets the standards and requirements of the IRC and IEBC, adopted by Montgomery County in COMCOR 08.00.02.

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

49910
Maryland PE License Number

REVIEWED
By Michael Kyne at 2:49 pm, Oct 20, 2023

Date: 9/6/2023

Signature: DocuSigned by: Andrew Oesterreicher 4A8006A02EA947F...

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Seal

professional engineer under the laws of the State of Maryland.
License No. 49910 Expires: 9/15/24

SOLAR'S MOST TRUSTED

REC

inter solar award 2022 WINNER

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REC ALPHA® PURE SERIES

PRODUCT SPECIFICATIONS

COMPACT PANEL SIZE

410 WP
222 W/M²

PRODUCT REC 25 YEAR ProTrust WARRANTY PERFORMANCE LABOR
ELIGIBLE

LEAD-FREE
ROHS COMPLIANT

EXPERIENCE α PERFORMANCE

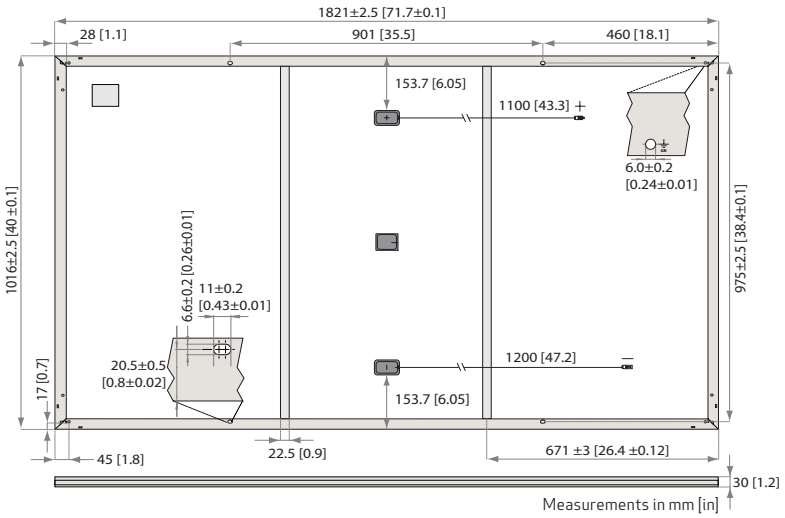
REC ALPHA PURE SERIES

PRODUCT SPECIFICATIONS

REC
SOLAR'S MOST TRUSTED

GENERAL DATA

Cell type:	132 half-cut REC heterojunction cells with lead-free, gapless technology, 6 strings of 22 cells in series
Glass:	3.2 mm solar glass with anti-reflective surface treatment in accordance with EN 12150
Backsheet:	Highly resistant polymer (black)
Frame:	Anodized aluminum (black)
Junction box:	3-part, 3 bypass diodes, lead-free IP68 rated, in accordance with IEC 62790
Connectors:	Stäubli MC4 PV-KBT4/KST4 (4 mm²) in accordance with IEC 62852, IP68 only when connected
Cable:	4 mm² solar cable, 1.1 m + 1.2 m in accordance with EN 50618
Dimensions:	1821 x 1016 x 30 mm (1.85 m²)
Weight:	20.5 kg
Origin:	Made in Singapore



ELECTRICAL DATA — Product Code*: RECxxxAA Pure

Power Output - P_{MAX} (Wp)	390	395	400	405	410
Watt Class Sorting - (W)	0/+5	0/+5	0/+5	0/+5	0/+5
Nominal Power Voltage - V_{MPP} (V)	40.6	41.0	41.4	41.8	42.2
Nominal Power Current - I_{MPP} (A)	9.61	9.64	9.67	9.69	9.72
Open Circuit Voltage - V_{OC} (V)	48.4	48.6	48.8	49.1	49.4
Short Circuit Current - I_{SC} (A)	10.38	10.39	10.40	10.41	10.42
Power Density (W/m²)	211	214	216	219	222
Panel Efficiency (%)	21.1	21.4	21.6	21.9	22.2

STC

Power Output - P_{MAX} (Wp)	297	301	305	308	3
Nominal Power Voltage - V_{MPP} (V)	38.3	38.6	39.0	39.4	3
Nominal Power Current - I_{MPP} (A)	7.77	7.79	7.82	7.83	7
Open Circuit Voltage - V_{OC} (V)	45.6	45.8	46.0	46.3	4
Short Circuit Current - I_{SC} (A)	8.38	8.39	8.40	8.41	8

NMOT

Values at standard test conditions (STC: air mass AM 1.5, irradiance 1000 W/m², temperature 25°C), based on a production spread with tolerance of ... AM 1.5, irradiance ... temperature ... wind speed 1 m/s). * where xxx indicates the nominal power class (P_{MPP}) at STC above.

CERTIFICATIONS

IEC 61215:2016, IEC 61730:2016, UL 61730	
IEC 62804	PID
IEC 61701	Salt Mist
IEC 62716	Ammonia Resistance
ISO 11925-2	Ignitability (Class E)
IEC 62782	Dynamic Mechanical Load
IEC 61215-2:2016	Hailstone (35mm)
IEC 62321	Lead-free acc. to RoHS EU 863/2015
ISO 14001, ISO 9001, IEC 45001, IEC 62941	

take-e-way
...WEEE-compliant ...eme

...°C (±2°C)
...24 %/°C
...24 %/°C
...04 %/°C
...near values

MAXIMUM RATINGS

Operational temperature:	-40 ... +85°C
Maximum system voltage:	1000 V
Maximum test load (front):	+7000 Pa (713 kg/m²)*
Maximum test load (rear):	-4000 Pa (407 kg/m²)*
Max series fuse rating:	25 A
Max reverse current:	25 A

* See installation manual for mounting instructions. Design load = Test load / 1.5 (safety factor)

WARRANTY

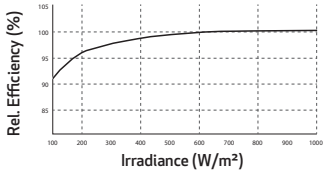
	Standard	REC Pr...	
Installed by an REC Certified Solar Professional	No	Yes	
System Size	All	≤25 kW	25-500 kW
Product Warranty (yrs)	20	25	25
Power Warranty (yrs)	25	25	25
Labor Warranty (yrs)	0	25	10
Power in Year 1	98%	98%	98%
Annual Degradation	0.25%	0.25%	0.25%
Power in Year 25	92%	92%	92%

The REC ProTrust Warranty is only available on panels purchased through an REC Certified Solar Professional installer. Warranty conditions apply. See www.recgroup.com for more details.

...	33
...	...4 pallets)
Panels per 13.6 m truck:	924 (28 pallets)
Panels per 53 ft truck:	891 (27 pallets)

LOW LIGHT BEHAVIOUR

Typical low irradiance performance of module at STC:



Specifications subject to change without notice.

Ref: PM-DS-12-06-Rev-9 02.23

Available from:

Declare.
Living Building Challenge Compliant

Founded in 1996, REC Group is an international pioneering solar energy company dedicated to empowering consumers with clean, affordable solar power. As Solar's Most Trusted, REC is committed to high quality, innovation, and a low carbon footprint in the solar materials and solar panels it manufactures. Headquartered in Norway with operational headquarters in Singapore, REC also has regional hubs in North America, Europe, and Asia-Pacific.

REC Solar PTE. LTD.
20 Tuas South Ave. 14
Singapore 637312
post@recgroup.com
www.recgroup.com

REC

ENPHASE

DATA SHEET

IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.

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By Michael Kyne at 2:49 pm, Oct 20, 2023

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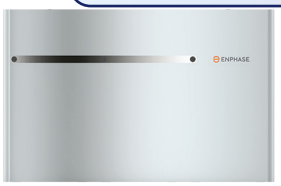
Montgomery County
Historic Preservation Commission



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.

Enphase 25 year limited warranty

IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.

Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.

UL CERTIFIED SAFETY

IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

- grid is down
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) requirements

IQ8SP-DS-0002-01-EN-US-2021-10-19

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings[1]	W	235 – 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 – 37	29 – 45
Operating range	V	25 – 48	25 – 58
Min/max start voltage	V	30 / 48	30 / 58
Max input DC voltage	V	50	60
Max DC current[2] [module Isc]	A	15	
Overvoltage class DC port		II	
DC port backfeed current	mA	0	
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	

OUTPUT DATA (AC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range[3]	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
Max units per 20 A (L-L) branch circuit[4]		16	13
Total harmonic distortion		<5%	
Overvoltage class AC port			
AC port backfeed current	mA		
Power factor setting			
Grid-tied power factor (adjustable)		0.85	
Peak e	%	97.5	
CEC w	%	97	
Night-	mW		

MECHANICAL DATA	
Ambient temperature range	-40°C t
Relative humidity range	4%
DC Connector type	MC4
Dimensions (HxWxD)	212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")
Weight	1.08 kg (2.38 lbs)
Cooling	Natural convection – no fans
Approved for wet locations	Yes
Acoustic noise at 1 m	<60 dBA
Pollution degree	PD3
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure
Environ. category / UV exposure rating	NEMA Type 6 / outdoor

COMPLIANCE	
Certifications	CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.

(1) No enforced DC/AC ratio. See the compatibility calculator at https://link.enphase.com/module-compatibility (2) Maximum continuous input DC current is 10.6A (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

SPEC SHEET

Part #	Box Quantity
17660	4″ QB2 (25)
17662	3″ Microflashing® (25); 4″ QB2 (25); L-Foot (25)

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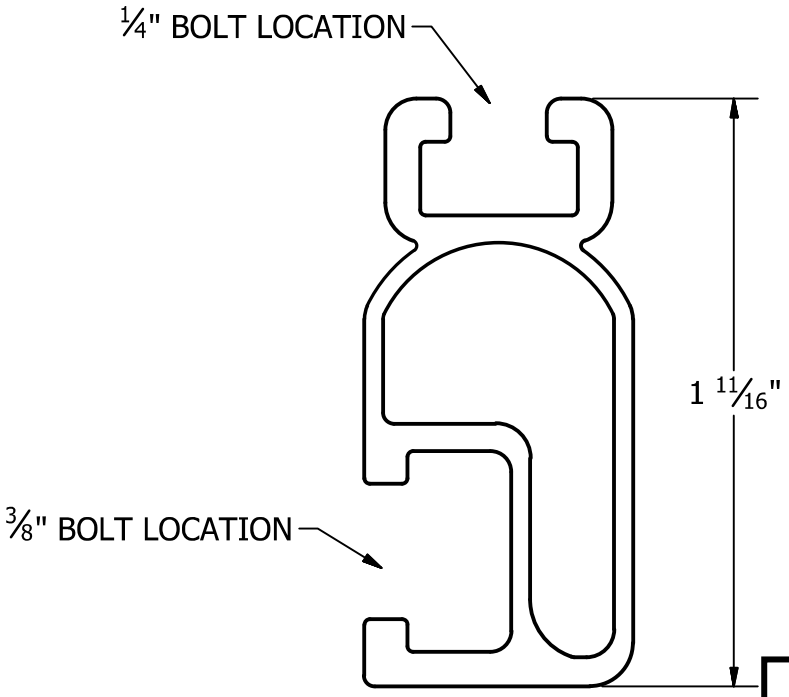

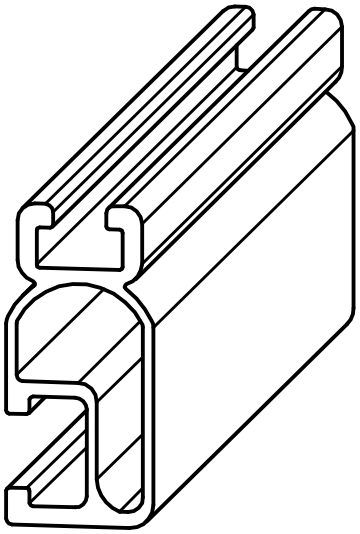

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PART # TABLE		
P/N	DESCRIPTION	LENGTH
315168M	SM LIGHT RAIL 168" MILL	168"
315168D	SM LIGHT RAIL 168" DRK	168"
315240M	SM LIGHT RAIL 240" MILL	240"
315240D	SM LIGHT RAIL 240" DRK	240"

UNIRAC
1411 BROADWAY BLVD. NE
ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DETAIL
DESCRIPTION:	LIGHT RAIL
REVISION DATE:	9/11/2017

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE NOMINAL

PRODUCT PROTECTED BY ONE OR MORE US PATENTS

LEGAL NOTICE

SM-P02

SHEET


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Historic Preservation Commission


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SOLAR PV SYSTEM: 5.265 kWp

EATON RESIDENCE

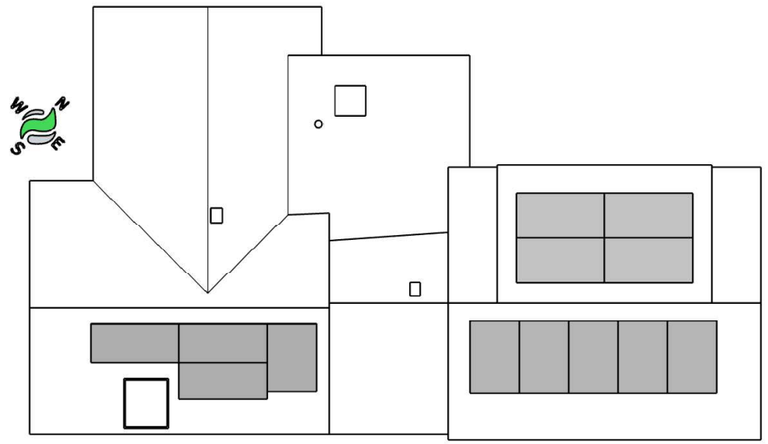
7019 EASTERN AVENUE NORTHWEST
TAKOMA PARK MD USA 20912

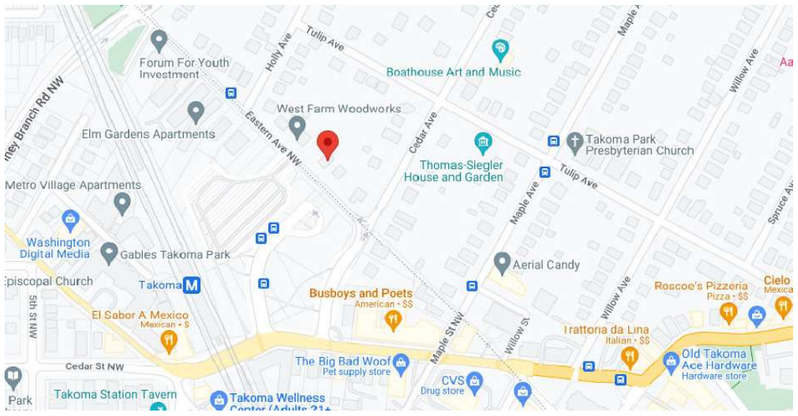
REVIEWED
By Michael Kyne at 2:49 pm, Oct 20, 2023

APPROVED
Montgomery County
Historic Preservation Commission

PROJECT INFORMATION

OWNER:	SABRINA EATON
ADDRESS:	7019 EASTERN AVENUE NORTHWEST TAKOMA PARK MD USA 20912
AHJ:	MONTGOMERY COUNTY (MD)
ADDRESS:	2425 REEDIE DRIVE WHEATON-GLENMONT, MARYLAND 20902
ZONING:	RESIDENTIAL
BUILDING CODE:	IBC 2018
ELECTRICAL CODE:	NEC 2017
ASCE VERSION:	ASCE 7-16
SNOW LOAD:	30 PSF
WIND SPEED:	115 MPH
WIND EXPOSURE:	B
DC RATING:	5.265 kW
AC RATING:	3.77 kW
RACKING:	UNIRAC SM LIGHT RAIL
MODULE:	(13) REC405AA
INVERTER:	(13) IQ8PLUS-72-2-US





PROJECT SCOPE

THIS PROJECT INVOLVES THE INSTALLATION OF (13) REC PURE 405W ALL BLACK SOLAR MODULES. THE SOLAR MODULES WILL BE RACKED USING A PRE-ENGINEERED RACKING SYSTEM. THE RACKED MODULES WILL BE ELECTRICALLY CONNECTED TO (13) ENPHASE DC TO AC POWER INVERTERS, AND INTERCONNECTED TO THE LOCAL UTILITY USING MEANS AND METHODS CONSISTENT WITH THE RULES ENFORCED BY THE LOCAL UTILITY AND PERMITTING JURISDICTION.

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Z001	COVER PAGE
A001	ATTACHMENT & SITE PLAN
S001	ASSEMBLY & LOAD CALCS
E001	ELECTRICAL - LINE DIAGRAM
E002	ELECTRICAL - WIRE CALCS
E003	STRING & CONDUIT LAYOUT
E004	EQUIP. RATINGS & SIGNAGE

FOR PERMITTING USE ONLY

PROJECT ADDRESS:

SABRINA EATON
7019 EASTERN AVENUE
NORTHWEST TAKOMA
PARK MD USA 20912

CONTRACTOR INFO:

FUSION SOLAR SERVICES

3600 COMMERCE DR
SUITE 601
BALTIMORE, MD 21227
(443) 955-0779

LICENSE NUMBER:

MHIC-30991

REV	DATE
IFC	8/18/2023

COVER

Z001

STATE OF MARYLAND
ANDREW OESTERREICHER
49910
PROFESSIONAL ENGINEER

Professional Certification: I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland. License No. 49910 Expires: 9/23/24

STAMPED AND SIGNED FOR STRUCTURAL ONLY

DocuSigned by:
Andrew Oesterreicher
4A8006A02EA947F...

FOR ENGINEERING USE ONLY

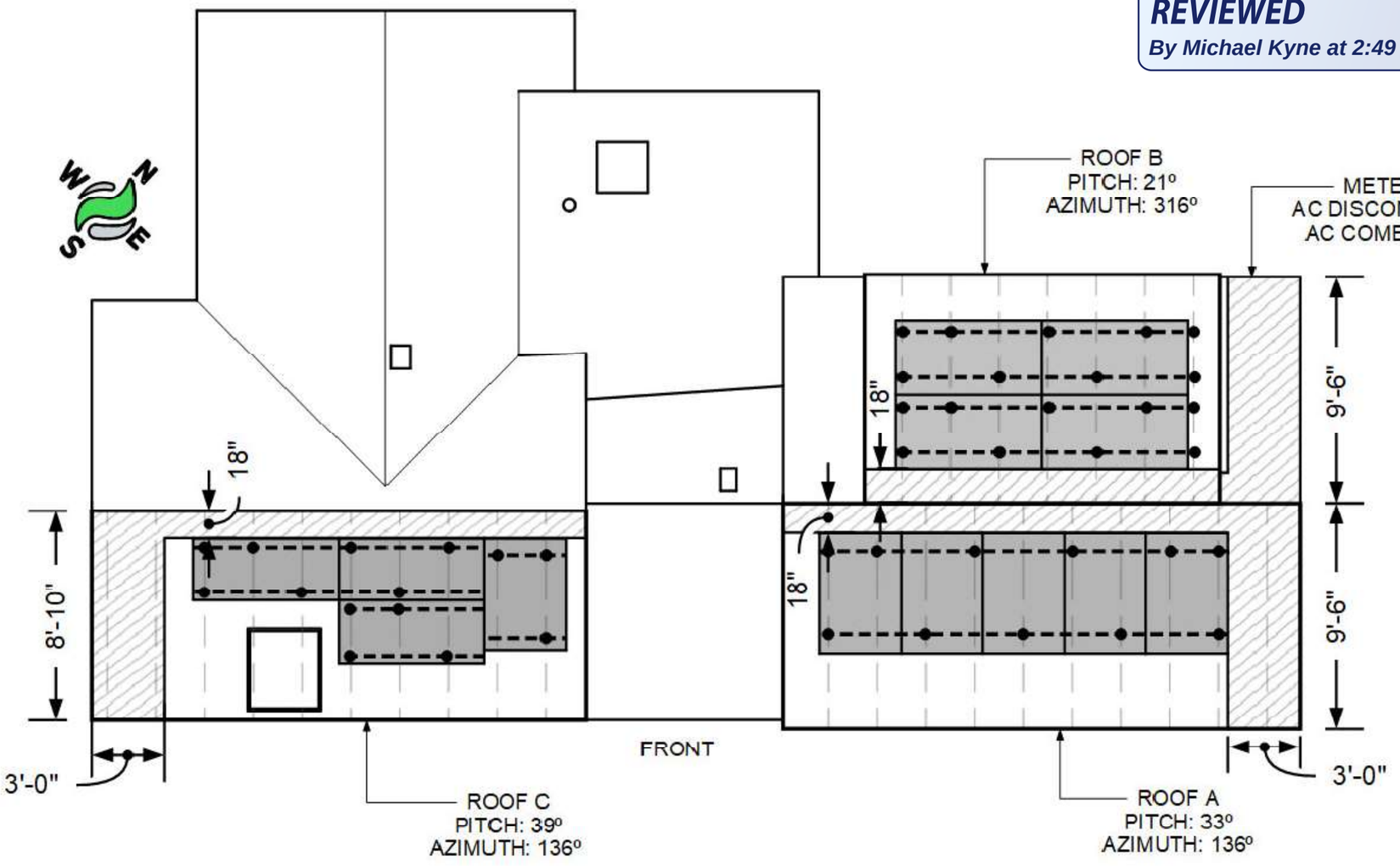
GENERAL NOTES

1) THIS PHOTOVOLTAIC (PV) SYSTEM SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE (NEC) ARTICLE 690, ALL MANUFACTURERS'S LISTING AND INSTALLATION INSTRUCTIONS, AND THE RELEVANT CODES AS SPECIFIED BY THE AUTHORITY HAVING JURISDICTION (AHJ).

2) ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE AND AS REQUIRED BY THE NEC AND AHJ.

3) PV SYSTEM CIRCUITS INSTALLED ON OR IN BUILDINGS SHALL INCLUDE A RAPID SHUTDOWN FUNCTION TO REDUCE SHOCK HAZARD FOR EMERGENCY RESPONDERS

4) THIS SYSTEM IS A UTILITY INTERACTIVE SYSTEM, AND THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE.



LEGEND

- ROOF SUPPORT
- MOUNTING RAIL
- ROOF ATTACHMENT
- PV ARRAY
- FIRECODE SETBACK

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ATTACHMENT PLAN

A001

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INSTALLATION NOTES

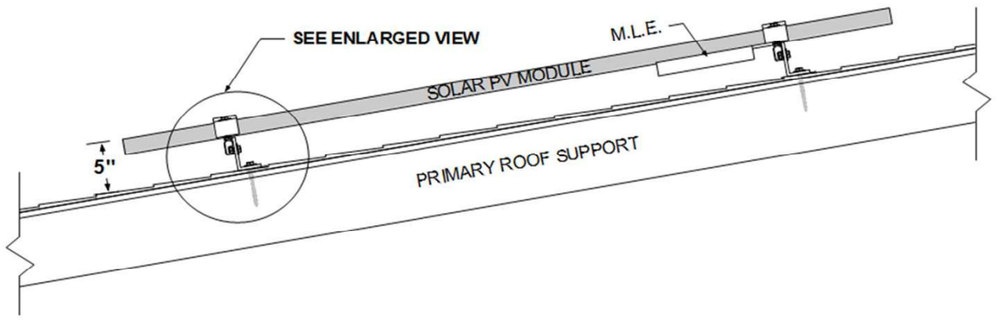
1) ALL SOLAR MODULES SUPPORTED BY ROOF ATTACHMENTS STAGGERED AT 48 IN O.C. (OR AS INDICATED)

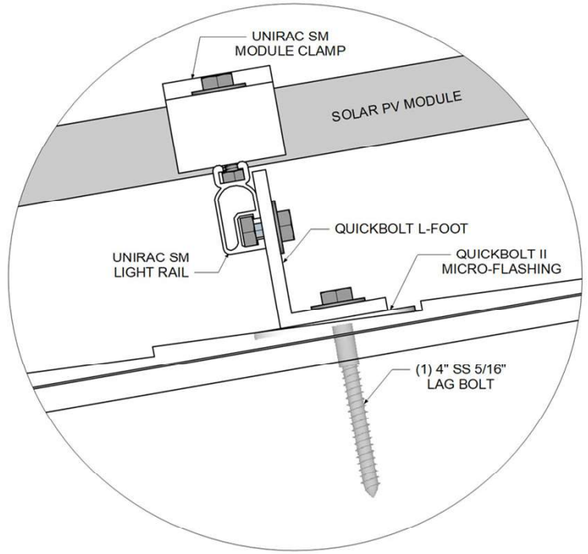
2) SOLAR PHOTOVOLTAIC SYSTEM INSTALLED PARALLEL TO ROOF SURFACE

3) SOLAR PHOTOVOLTAIC SYSTEM INSTALLED AT A MAXIMUM HEIGHT OF 6 IN ABOVE ROOF SURFACE (OR AS INDICATED)

4) ANY ROOFING PENETRATIONS SHALL HAVE PROPER FLASHING SEALANT USED TO PROVIDE WATERTIGHT ASSEMBLY

TOTAL ROOF PLAN AREA =	1415.32 SQ.FT.
TOTAL SOLAR ARRAY AREA =	258.917 SQ.FT.
ARRAY ROOF COVERAGE =	**19** %





	ROOF LABEL:	A	B	C
ROOF PROPERTIES	MATERIAL:	3-Tab Comp Shingle	3-Tab Comp Shingle	3-Tab Comp Shingle
	PITCH:	33º	21º	37º
	AZIMUTH:	136º	316º	136º
	PRIMARY SUPPORT:	2x10 RAFTERS	2x10 RAFTERS	2x4 TOP CHORD TRUSSES
	PRIMARY SUPPORT SPACING:	24"	24"	24"
	SPAN (EAVE TO RIDGE):	10'	10'	9'
	MEAN HEIGHT:	25'	25'	25'
	RACKING:	UNIRAC SM LIGHT RAIL	UNIRAC SM LIGHT RAIL	UNIRAC SM LIGHT RAIL
	STANDOFF:	QUICKBOLT	QUICKBOLT	QUICKBOLT
DEAD & POINT LOAD CALCULATIONS	NUMBER OF MODULES:	5	4	4
	MODULE WEIGHT (LBS):	225.00	180.00	180.00
	M.L.E. WEIGHT (LBS):	11.90	9.52	9.52
	RACKING WEIGHT (LBS):	48.40	38.72	38.72
	STANDOFF WEIGHT (LBS):	7.50	6.00	6.00
	ARRAY WEIGHT (LBS):	292.80	234.24	234.24
	ARRAY AREA (SQ.FT.):	99.58	79.67	79.67
	DISTRIBUTED LOAD (PSF):	**2.94**	**2.94**	**2.94**
	APPROX. NUMBER OF STANDOFFS:	13	10	10
	POINT LOAD (LBS/STANDOFF):	**22.52**	**23.42**	**23.42**

REVIEWED
By Michael Kyne at 2:49 pm, Oct 20, 2023

APPROVED

Montgomery County

Historic Preservation Commission

FOR PERMITTING USE ONLY

PROJECT ADDRESS:

SABRINA EATON
7019 EASTERN AVENUE
NORTHWEST TAKOMA
PARK MD USA 20912

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(443) 955-0779

LICENSE NUMBER:

MHIC-30991

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IFC	9/5/2023

ASSEMBLY & LOAD CALCS

S001

Professional Certification: I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland. License No. 49910 Expires: 9/15/24

STAMPED AND SIGNED FOR STRUCTURAL ONLY

DocuSigned by:
Andrew Oesterreicher
4A8006A02EA947F...

FOR ENGINEERING USE ONLY

INSTALLATION NOTES

1) ALL RACKING SHALL BE INSTALLED PER MANUFACTURER SPECIFICATIONS

2) M.L.E.'S = MODULE LEVEL ELECTRONICS (IE, POWER OPTIMIZERS, MICRO-INVERTERS, CABLES, ETC)

3) USE 5/16" X 4"HEX HEAD STAINLESS STEEL LAG SCREWS

MOUNTING SYSTEM PROPERTIES	
RACKING	UNIRAC SM LIGHT RAIL
STANDOFF	QUICKBOLT TO PRIMARY SUPPORT
MAX. RAIL SPAN (IN)	48
MIN. FASTENER DEPTH (IN)	2.5
MAX. RAIL CANTILEVER (IN)	16
MAX. ARRAY HEIGHT (IN)	5

CONDUCTOR AND CONDUIT SCHEDULE

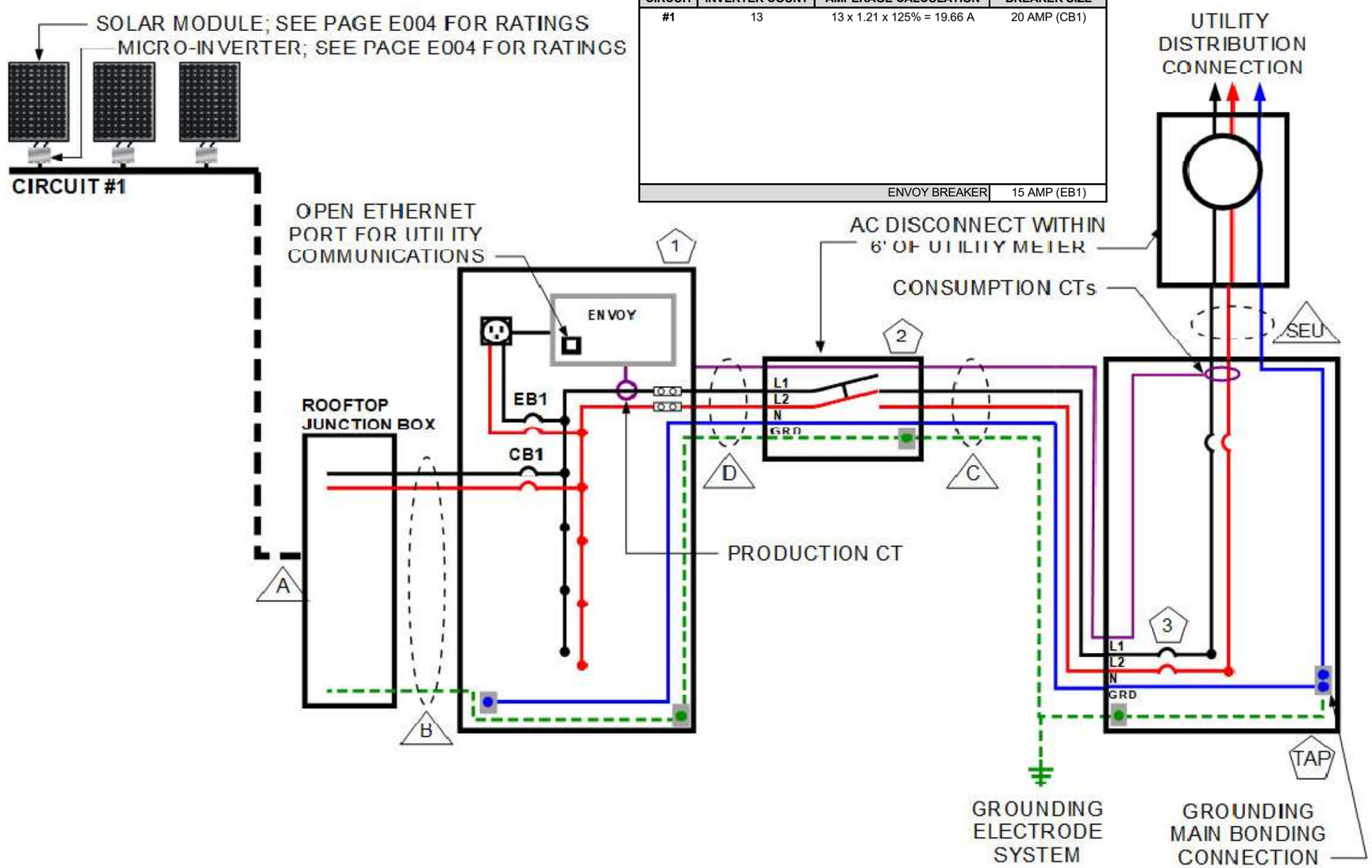
TAG	WIRE SIZE	GROUND SIZE	WIRE TYPE	DESCRIPTION	CONDUIT SIZE	CONDUIT TYPE	LENGTH
SEU	#4/0 AL	N/A	SEU	(2) PHASE CONDUCTORS & (1) NEUTAL	N/A	N/A	5'
A	#12 AWG	#6 AWG	Q-CABLE	(2) PHASE CONDUCTORS & (1) BARE COPPER IN FREE AIR	N/A	N/A	77' (MAX)
B	#10 AWG	#8 AWG	THWN-2	(2) PHASE CONDUCTORS & (1) GROUND	0.75"	EMT	37'
C	#10 AWG	#8 AWG	THWN-2	(2) PHASE CONDUCTORS & (1) NEUTRAL & (1) GROUND	0.75"	EMT	5'
D	#10 AWG	#8 AWG	THWN-2	(2) PHASE CONDUCTORS & (1) NEUTRAL & (1) GROUND	0.75"	EMT	5'

EQUIPMENT SCHEDULE

TAG	EQUIPMENT DETAILS	MOUNTING LOCATION
TAP	200 AMP EATON CH MAIN SERVICE PANEL WITH 200 AMP MAIN BREAKER (200 AMP SERVICE)	FLUSH-MOUNTED ON WALL OPPOSITE UTILITY METER
1	ENPHASE COMBINER (MODEL #X-IQ-AM1-240-4) WITH CIRCUITS AS LISTED IN TABLE	MOUNTED ADJACENT TO UTILITY METER
2	SERVICE RATED 30 AMP NEMA3R NON-FUSED DISCO (MODEL #DU221RB)	MOUNTED ADJACENT TO UTILITY METER
3	2 POLE, 20 AMP EATON CH MAIN SERVICE PANEL BREAKER	SOLAR PV BACKFED BREAKER IN MAIN SERVICE PANEL

CIRCUIT SCHEDULE

CIRCUIT	INVERTER COUNT	AMPERAGE CALCULATION	BREAKER SIZE
#1	13	13 x 1.21 x 125% = 19.66 A	20 AMP (CB1)
		ENVOY BREAKER	15 AMP (EB1)



ELECTRICAL NOTES

WHEN THE AC UTILITY SOURCE IS REMOVED FROM THE INVERTER OUTPUT CIRCUITS VIA ANY MEANS, SUCH AS AN AC BREAKER, AC DISCONNECT, OR REMOVAL OF THE SOLAR OR MAIN UTILITY SERVICE METER, THIS EQUIPMENT PERFORMS THE RAPID SHUTDOWN FUNCTION PER 690.12

ARRAY BONDED WITH #6 BARE Cu

TWO UNGROUNDED CONDUCTORS PER CIRCUIT OF INVERTERS (TYP)

ALL CONDUIT SIZING WILL BE IN ACCORDANCE TO THE NEC, CHAPTER 9

PVC OR LFMC MAY BE USED INSTEAD OF EMT CONDUIT

THE AC DISCONNECT IS LOCKABLE, TAGGABLE, 24/7 UTILITY ACCESSIBLE, LOAD BREAK CAPABLE, AND HAS VISIBLE BREAK.

REVIEWED
By Michael Kyne at 2:49 pm, Oct 20, 2023

APPROVED
Montgomery County
Historic Preservation Commission

FOR PERMITTING USE ONLY

PROJECT ADDRESS:

SABRINA EATON
7019 EASTERN AVENUE
NORTHWEST TAKOMA
PARK MD USA 20912

CONTRACTOR INFO:

FUSION SOLAR SERVICES

3600 COMMERCE DR
SUITE 601
BALTIMORE, MD 21227
(443) 955-0779

LICENSE NUMBER:

MHIC-30991

REV	DATE
IFC	8/18/2023

ELECTRICAL - LINE DIAGRAM

E001

CALCULATION FOR PV BREAKER					
SYSTEM CURRENT	1.21	x	13	=	15.73 A
DESIGN AMPERAGE (FLA)	15.73	x	125%	=	19.6625 A
MAIN BUSS RATING	200	x	120%	=	240 A
EXISTING MAIN BREAKER					200 A
MAX SOLAR BREAKER	240	-	200	=	40 A

ARRAY TO COMBINER	
WIRE LENGTH	37 FT
WIRE SIZE	#10 AWG
SYSTEM PROPERTIES	
FULL LOAD AMPERAGE	15.73
SOURCE VOLTAGE	240
LENGTH OF RUN (FT)	37
LOAD DUTY	CONTINUOUS
CONDUCTOR TYPE	THWN-2
CONDUCTOR MATERIAL	COPPER
CONDUCTOR LOCATION	DRY OR WET
CONDUCTOR INSULATION TEMP	75ºC
DISTANCE ABOVE ROOF	ALL INTERIOR CONDUIT
AVERAGE OUTSIDE TEMP (ºF)	94
TEMP ADDER (ºF)	N/A
ADJUSTED AMBIENT TEMP (ºF)	94
TERMINAL TEMP RATING	75ºC
CIRCUIT TYPE	SINGLE PHASE 2-WIRE
QTY. OF CURRENT-CARRYING CONDUCTORS	2
ADDITIONAL CURRENT-CARRYING CONDUCTORS	
TOTAL # OF CURRENT-CARRYING CONDUCTORS	2
CONDUCTOR CONDITIONS OF USE	
LARGEST CIRCUIT FULL LOAD AMPS	15.73
LOAD DUTY MULTIPLIER	1.25
AMBIENT TEMP FACTOR	0.94
QTY. CONDUCTORS IN CONDUIT FACTOR	1.00
CONDUCTOR SELECTION	
MINIMUM REQUIRED CONDUCTOR AMPACITY	20.92
SELECTED CONDUCTOR AMPACITY	35.00
SELECTED CONDUCTOR SIZE (AWG)	10
TERMINAL REQUIREMENT	
LARGEST CIRCUIT FULL LOAD AMPS	15.73
LOAD DUTY MULTIPLIER	1.25
REQUIRED TERMINAL AMPACITY	19.66
VOLTAGE DROP	
OHMS/MILFT	1.240
LENGTH OF RUN (FT)	37
LOAD CURRENT	15.73
VOLTAGE DROP	1.44
VOLTS AT LOAD TERMINAL	238.56
PERCENT VOLTAGE DROP	0.61%

INTERCONNECTION	
METHOD	BREAKER TAP
WIRE SIZE	#10 AWG
SYSTEM PROPERTIES	
FULL LOAD AMPERAGE	15.73
SOURCE VOLTAGE	240
LENGTH OF RUN (FT)	15
LOAD DUTY	CONTINUOUS
CONDUCTOR TYPE	THWN-2
CONDUCTOR MATERIAL	COPPER
CONDUCTOR LOCATION	DRY OR WET
CONDUCTOR INSULATION TEMP	75ºC
AMBIENT TEMP	26-30ºC
TERMINAL TEMP RATING	75ºC
CIRCUIT TYPE	SINGLE PHASE 3-WIRE
QTY. OF CURRENT-CARRYING CONDUCTORS	2
CONDUCTOR CONDITIONS OF USE	
FULL LOAD AMPS	15.73
LOAD DUTY MULTIPLIER	1.25
AMBIENT TEMP FACTOR	1.00
QTY. CONDUCTORS IN CONDUIT FACTOR	1.00
CONDUCTOR SELECTION	
MINIMUM REQUIRED CONDUCTOR AMPACITY	19.66
SELECTED CONDUCTOR AMPACITY	35.00
SELECTED CONDUCTOR SIZE (AWG)	10
TERMINAL REQUIREMENT	
FULL LOAD AMPS	15.73
LOAD DUTY MULTIPLIER	1.25
REQUIRED TERMINAL AMPACITY	19.66
VOLTAGE DROP	
OHMS/MILFT	1.240
LENGTH OF RUN (FT)	15
LOAD CURRENT	15.73
VOLTAGE DROP	0.59
VOLTS AT LOAD TERMINAL	239.41
PERCENT VOLTAGE DROP	0.24%

PROJECT ADDRESS:

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ELECTRICAL - WIRE CALCS

E002

ELECTRICAL NOTES

1) ALL CONDUCTORS SHALL BE COPPER, RATED FOR 75ºC AND WET ENVIRONMENT, UNLESS OTHERWISE NOTED.

2) ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.

3) MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER MANUFACTURER'S INSTRUCTION.

LEGEND

- JUNCTION BOX
- SOLADECK
- END CAP
- EXTERIOR CONDUIT
- INTERIOR CONDUIT
- BASEMENT CONDUIT
- TRUNK CABLE

COLOR	CIRCUIT	MODULE COUNT
	#1	13

REVIEWED
By Michael Kyne at 2:49 pm, Oct 20, 2023

APPROVED
Montgomery County
Historic Preservation Commission

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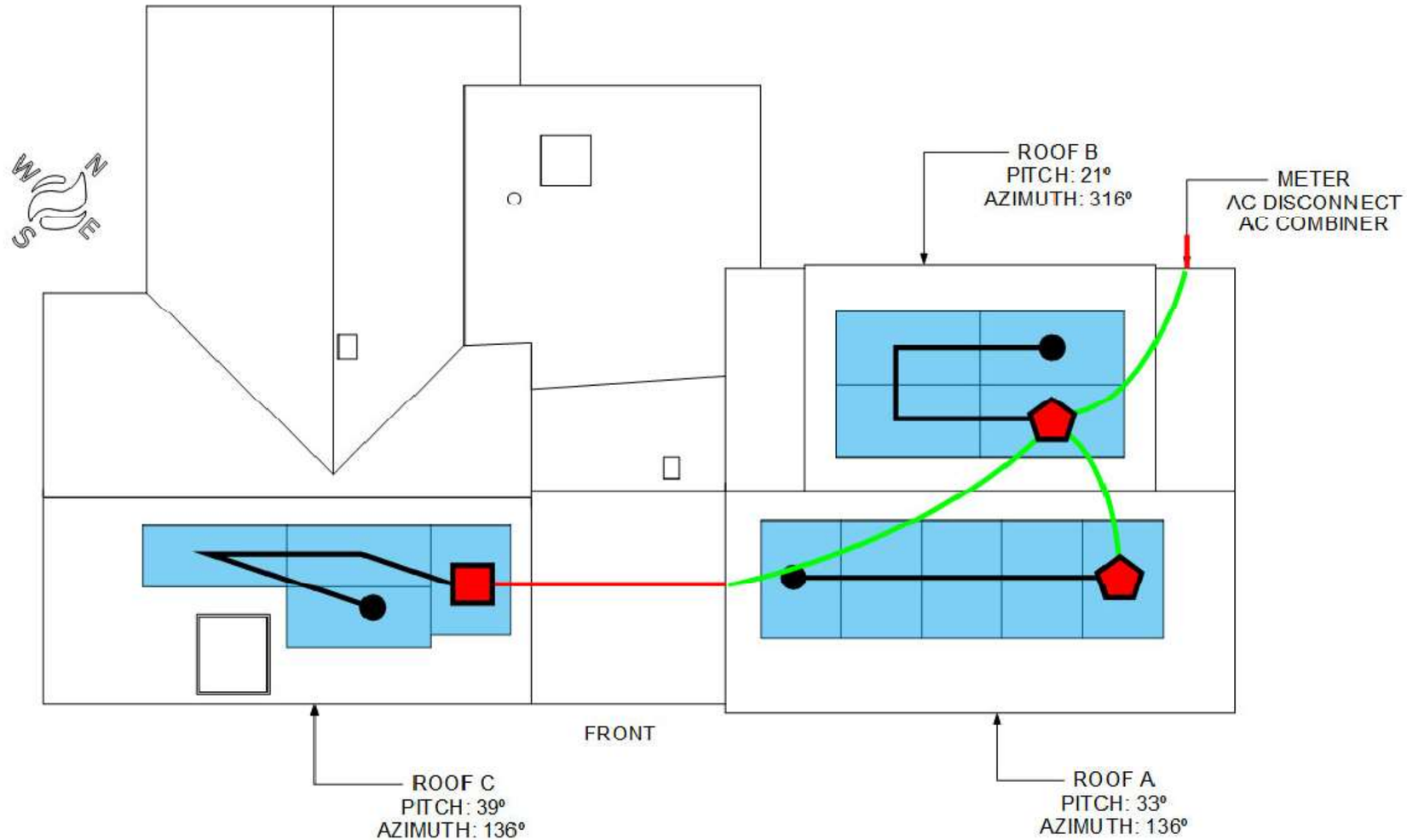

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CIRCUIT & CONDUIT LAYOUT

E003

SOLAR MODULE RATINGS		
REC Pure 405w All Black Specifications		
Length:	71.7	in
Width:	40	in
Thickness:	1.2	in
Weight:	45.00	lbs
Imp:	9.56	A
Vmp:	42.4	V
Voc:	48.9	V
Isc:	10.14	A
OCPD:	25	A
Pmax:	405	W
Vmax:	1000	V
Temp. Coefficient:	-0.24	%Voc/ºC

INVERTER 1 RATINGS		
Enphase IQ8+ Specifications		
Max # Per String:	13	
Imax (ac):	1.21	A
Vmax (dc):	60	V
Pmax:	290	W
Nom. AC Voltage:	240	V
OCPD:	20	A
Weight (Optimizer):	2.38	lbs
Imax (Input):	15	A
Pmax (dc) Input:	440	V

WARNING: PHOTOVOLTAIC POWER SOURCE

LABEL TO BE INSTALLED AT EXPOSED RACEWAYS, CABLE TRAYS, AND OTHER WIRING METHODS; SPACED AT MAXIMUM 10FT SECTION OR WHERE SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS.

LETTERS AT LEAST 3/8 INCH; WHITE ON RED BACKGROUND; REFLECTIVE

PHOTOVOLTAIC DC DISCONNECT

LABEL TO BE INSTALLED AT EACH DC DISCONNECTING MEANS

PHOTOVOLTAIC AC DISCONNECT

LABEL TO BE INSTALLED AT EACH AC DISCONNECTING MEANS

PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN

LABEL TO BE INSTALLED AT RAPID SHUTDOWN SWITCH

LETTERS AT LEAST 3/8 INCH; WHITE ON RED BACKGROUND; REFLECTIVE

WARNING

ELECTRICAL SHOCK HAZARD

DO NOT TOUCH TERMINALS! TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

LABEL TO BE INSTALLED AT EACH DISCONNECTING MEANS FOR PHOTOVOLTAIC EQUIPMENT

WARNING

ELECTRICAL SHOCK HAZARD

IF GROUND FAULT IS INDICATED NORMALLY GROUNDED CONDUCTORS MAY BE UNGROUNDED AND ENERGIZED

LABEL TO BE INSTALLED AT EACH DISCONNECTING MEANS FOR PHOTOVOLTAIC EQUIPMENT

WARNING

DUAL POWER SOURCE SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL TO BE INSTALLED ON EXTERIOR OF MAIN ELECTRICAL PANEL

WARNING

INVERTER OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL TO BE APPLIED TO THE DISTRIBUTION EQUIPMENT

INTERACTIVE PHOTOVOLTAIC SYSTEM CONNECTED

LABEL TO BE INSTALLED AT UTILITY METER

SOLAR PV LOADCENTER

5.265 kW DC SOLAR ARRAY

240 VOLT AC SYSTEM

INSTALLED COMPONENTS

(13) REC Pure 405w All BlackW Modules

(13) Enphase IQ8+

EMERGENCY CONTACT

LUMINA SOLAR: 800-971-6118

CIRCUIT CALCULATIONS

SYSTEM CURRENT:	1.21	x	13	=	15.73 A
DESIGN AMPERAGE:	15.73	x	125%	=	19.6625 A

CIRCUIT #1 =	13	15.73	19.66

SOLAR PV SYSTEM DISCONNECT

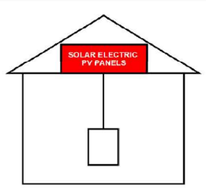
RATED AC OUTPUT CURRENT: **15.73 A**

NOMINAL OPERATING AC VOLTAGE: **240 V**

LABEL TO BE INSTALLED AT AN ACCESSIBLE LOCATION AT THE DISCONNECTING MEANS AS A POWER SOURCE

SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN ARRAY.



LABEL TO BE INSTALLED ON NO MORE THAN 3FT FROM THE SERVICE DISCONNECTING MEANS

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LABEL TO BE INSTALLED ON OR NO MORE THAN 3FT FROM THE RAPID SHUTDOWN SWITCH

SIGNAGE NOTES

1) ALL PLAQUES AND LABELS SHALL HAVE A RED BACKGROUND (OR AS SHOWN HERE)

2) ALL LETTERING SHALL BE WHITE AND HAVE A MINIMUM HEIGHT OF 3/8" (OR AS SHOWN HERE)

3) FONT SHALL BE ARIAL (OR SIMILAR) AND ALL LETTERING SHALL BE CAPITALIZED

4) ALL PLAQUES AND LABELS SHALL BE OF A MATERIAL SUITABLE FOR THE ENVIRONMENT INSTALLED

REVIEWED

By Michael Kyne at 2:49 pm, Oct 20, 2023

APPROVED

Montgomery County

Historic Preservation Commission

PROJECT ADDRESS:

SABRINA EATON
7019 EASTERN AVENUE
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EQUIP. RATINGS & SIGNAGE

E004

AOstructures Inc.
PO Box 413
Carnelian Bay, CA 96140
916-541-8586

APPROVED
Montgomery County
Historic Preservation Commission

September 8, 2023

TO: Lumina Solar

REVIEWED
By Michael Kyne at 2:49 pm, Oct 20, 2023

SUBJECT: Roof-top Solar PV Addition - Eaton Residence
7019 Eastern Ave. NW., Takoma Park, MD. 20912

SCOPE OF WORK:
AOstructures, Inc. was asked to provide a structural review for the project at the above subject [illegible] to the items listed below and based on the design criteria listed below. See additional limitations in Appendix B.

- Analyze the existing structure(s) to see if it is/they are suitable to support the additional weight of the proposed roof mounted solar PV system.
- Evaluate the connection capacity of the proposed racking system to the existing roof structure.

PROVIDED INFORMATION:
As-built plans were not provided for our review. The findings of this report are based upon a jobsite evaluation of the existing condition of the existing framing system collected by Lumina Solar as requested by AOstructures, Inc.. All attached structural calculations are based on the provided information and are only deemed valid if the provided information is true and accurate.

OBSERVED CONDITIONS:
The observed roof framing is described below. If field conditions differ, the contractor shall notify the engineer prior to starting construction.

The roof structure of (Roof's A & B) consists of composition shingle on roof plywood that is supported by 2x10 rafters @ 24"o.c.. The rafters support a vaulted ceiling and have a max projected horizontal span of 9'-0", with a slope of 37 degrees. The rafters are supported at the ridge by a ridge beam and at the eave by a load bearing wall.

The roof structure of (Roof C) consists of composition shingle on 1x decking that is supported by nominal 2"x4" rafters @ 24"o.c., paired with ceiling joists acting as rafter ties. The rafters are suported by veritcal struts which transfer gravity loads to the ceiling joists below. The rafters have a max projected horizontal span of 8'-0", with a slope of 21 degrees. The rafters are connected at the ridge to a ridge board and are supported at the eave by a load bearing wall.

CONCLUSIONS:
The existing roof framing members of (All Roof's) are judged to be adequate to withstand the loading imposed by the installation of the solar panels. No structural retrofits are required.

The spacing of the solar standoffs shall not exceed 48" o.c. and be staggered. All racking hardware shall be installed per manufacturer specifications and utilized within the manufacturers design limitations based on the design criteria of this report. AOstructures, Inc. assumes no responsibility for hardware installed outside the design & install specifications of the manfacturer. All waterproofing shall be provided by the contractor.

DESIGN CRITERIA:

- Applicable Codes = 2018 IBC/IRC, ASCE 7-16
- 72 cell solar PV modules w/ a flush mounted rail based racking system
- Roof Dead Load = 13 psf (Roof's A & B) -- 14 psf (Roof C)
- Roof Live Load = 20 psf
- Wind Speed = 115 mph, Exposure B, Risk Category II
- Ground Snow Load = 30 psf - Roof Snow Load = 21 psf
- Per IBC 1613.1; Seismic check is not required

Please contact me with any further questions or concerns regarding this project.

Sincerely,

Andrew Oesterreicher, P.E.
Project Engineer

DocuSigned by:
Andrew Oesterreicher
4A8006A02EA947F...

STATE OF MARYLAND
ANDREW OESTERREICHER
49910
PROFESSIONAL ENGINEER

Professional Certification: I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.
License No. 49910 *Expires:* 9/15/24

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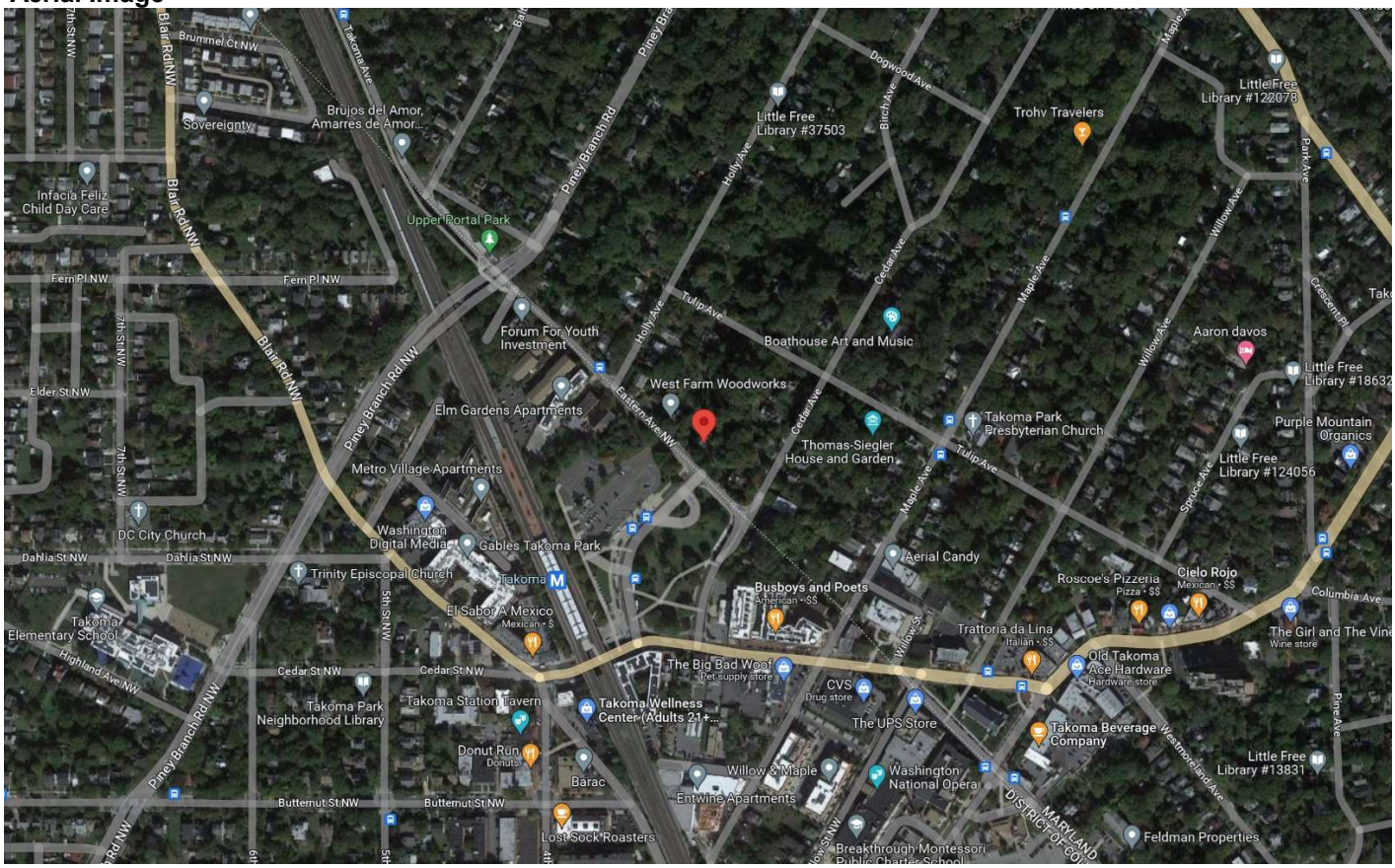
AOstructures Inc.
PO Box 413
Carnelian Bay, CA 96140
916.541.8586
www.AOstructures.com

Address: 7019 Eastern Ave. NW., Takoma Park, MD. 20912

Wind Design

Exposure: B
Wind Speed: 115 mph
Risk Category: II

Aerial Image



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Wind Calculations

Per ASCE 7-16 § 29.4.4 - Components and Cladding - Solar Specific

Input Variables				
Wind Speed	115 mph	Roof Slope	21 deg	
Exposure Category	B	Mean Roof Height	30 ft	
Roof Shape	Gable	Effective Wind Area	13.1 sft	(standoff area)

Design Wind Pressure Calculations		
Wind Pressure P = qh (GCp) (γe) (γa)		(Eq. 29.4-7)
qh = 0.00256 * Kz * Kzt * Kd * Ke * V^2		(Eq. 26.10-1)
Kz (Exposure Coefficient) =	0.7	(Table 26.10-1)
Kzt (topographic factor) =	1	(Fig. 26.8-1)
Kd (Wind Directionality Factor) =	0.85	(Table 26.6-1)
Ke (Ground Elevation Factor) =	1	(Table 26.9-1)
V (Design Wind Speed) =	115 mph	
Risk Category =	II	
(γe) Array Edge Factor =	1.00	
(γa) Solar Panel Pressure Equalization =	0.80	
qh (γe)	16.12	
0.6 * qh (γe) (γa) =	9.67	

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Standoff Uplift Calculations (ASD Level)				
Zone(s) =	3r	2n, 2r, 3e	1, 2e	
GCp =	-2.58	-2.38	-1.50	(Fig. 30.3-2C)
ASD Uplift Pressure (psf) =	-24.91	-22.98	-14.50	10.00
X Tributary Width (ft) =	2.67	4.00	4.00	
Y Tributary Width (ft) =	3.27	3.27	3.27	
Tributary Area (sf) =	8.72	13.08	13.08	
Footing Uplift (lb) =	**-217.4**	**-300.7**	**-189.8**	

Standoff Uplift Check	
Maximum Design Uplift =	-301 lb
Standoff Uplift Capacity =	400 lb
400 lb capacity > 301 lb demand	**Therefore, OK**

Fastener Uplift Capacity Check		
Fastener =	5/16"Ø Lag Screw	
Number of Fasteners =	1	
Embedment Depth =	2.0 in	
Pullout Capacity Per Inch =	205 lb	(per NDS)
Fastener Capacity =	410 lb	
w/ Cd of 1.6 =	656 lb	
656 lb capacity > 301 lb demand	**Therefore, OK**	

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GRAVITY LOADS

Roof Snow Load Calculations			
Unobstructed, Slippery Roof Surface?	no		
Roof Slope	21	degrees	
p_g = Ground Snow Load =	30.0	psf	
$p_f = 0.7\ C_e\ C_t\ I\ p_g$			(ASCE7 - Eq 7-1)
C_e = Exposure Factor =	1.0		(ASCE7 - Table 7-2)
C_t = Thermal Factor =	1.0		(ASCE7 - Table 7-3)
I = Importance Factor =	1.0		(ASCE7 - 7.3.3)
p_f = Flat Roof Snow Load =	21.0	psf	
$p_s = C_s p_f$			(ASCE7 - Eq 7-2)
Cs = Slope Factor =	1.00		(ASCE7 - Fig. 7-2)
p_s = Sloped Roof Snow Load =	**21.0**	**psf**	

PV Dead Load =	3 psf	(Per Lumi

Roof [illegible] (Roof's A & B)		
Comp[illegible]	[illegible]	psf
Roof Plywood	2.00	
2x10 Rafters @ 24"o.c.	1.93	
Vaulted Ceiling	4.00	
Miscellaneous	1.07	
Total Roof DL (Roof's A & B)	**13.0**	**psf**
DL Adjusted to 37 Degree Slope	16.3	psf

Roof Dead Load (Roof C)		
Composition Shingle	4.00	psf
1x Decking	3.00	
2"x4" Rafters @ 24"o.c.	1.12	
Vaulted Ceiling	4.00	(Enclosed Attic)
Miscellaneous	1.88	
Total Roof DL (Roof C)	**14.0**	**psf**
DL Adjusted to 21 Degree Slope	15.0	psf

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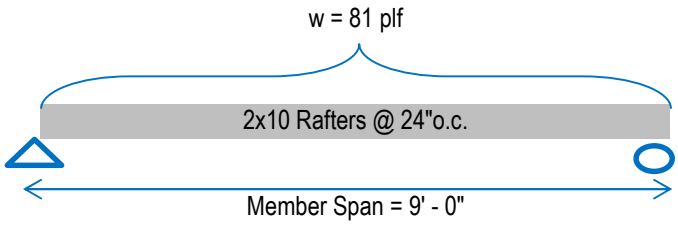
FRAMING CHECK

(Roof's A & B) **PASS**

Dead Load	16.3 psf
PV Load	3.0 psf
Snow Load	21.0 psf
Governing Load Combo = DL + SL	
Total Load	**40.3 psf**



Member Properties

Member Size	S (in^3)	I (in^4)	Lumber Sp/Gr	Member Spacing
2x10	21.39	98.93	SPF#2	@ 24"o.c.

Check Bending Stress

Fb (psi) =	f'b	x	Cd	x	Cf	x	Cr
	875	x	1.15	x	1.1	x	1.15

Allowed Bending Stress = 1272.9 psi

Maxi = (wL^2) / 8
= 815.6247 ft#

Actual Bending Stress = (Maximum Moment) / S
= 457.6 psi

Allowed > Actual -- 36% Stressed -- Theref

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Check Deflection

Allowed Deflection (Total Load) = L/180 (E = 1400000 psi Per NDS)
= 0.6 in

Deflection Criteria Based on = Simple Span

Actual Deflection (Total Load) = (5*w*L^4) / (384*E*I)
= 0.086 in
= L/1256 > L/180 **Therefore OK**

Allowed Deflection (Live Load) = L/180
0.6 in

Actual Deflection (Live Load) = (5*w*L^4) / (384*E*I)
0.045 in
L/2400 > L/180 **Therefore OK**

Check Shear

Member Area = 13.9 in^2 Fv (psi) = 135 psi (NDS Table 4A)

Allowed Shear = Fv * A = 1873 lb Max Shear (V) = w * L / 2 = 362 lb

Allowed > Actual -- 19.4% Stressed -- Therefore, OK

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Framing Check

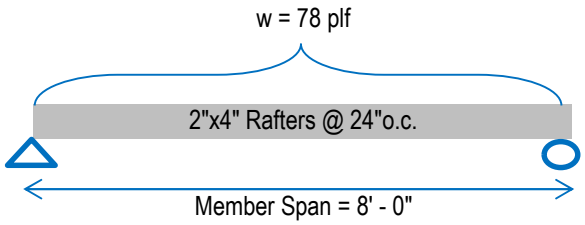
(Roof C)

PASS

Dead Load	15.0	psf
PV Load	3.0	psf
Snow Load	21.0	psf

Governing Load Combo = DL + SL

Total Load **39.0 psf**



Member Properties

Member Size	S (in^3)	I (in^4)	Lumber Sp/Gr	Member Spacing
2"x4"	5.33	10.67	SPF#2	@ 24"o.c.

Check Bending Stress

Fb (psi) =	f'b	x	Cd	x	Cf	x	Cr
	875	x	1.15	x	1.5	x	1.15

Allowed Bending Stress = 1735.7 psi

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= (wL^2) / 8
= 623.9365 ft#

Actual Bending Stress = (Maximum Moment) / S
= 1403.9 psi

Allowed > Actual - 80.9% Stressed -- There

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Check Deflection

Allowed Deflection (Total Load) = L/180 (E = 1400000 psi Per NDS)
= 0.533 in

Deflection Criteria Based on = Simple Span

Actual Deflection (Total Load) = (5*w*L^4) / (384*E*I)
= 0.482 in
= L/200 > L/180 **Therefore OK**

Allowed Deflection (Live Load) = L/240
0.4 in

Actual Deflection (Live Load) = (5*w*L^4) / (384*E*I)
0.260 in
L/370 > L/240 **Therefore OK**

Check Shear

Member Area = 8.0 in^2 Fv (psi) = 135 psi (NDS Table 4A)

Allowed Shear = Fv * A = 1080 lb Max Shear (V) = w * L / 2 = 312 lb

Allowed > Actual -- 28.9% Stressed -- Therefore, OK

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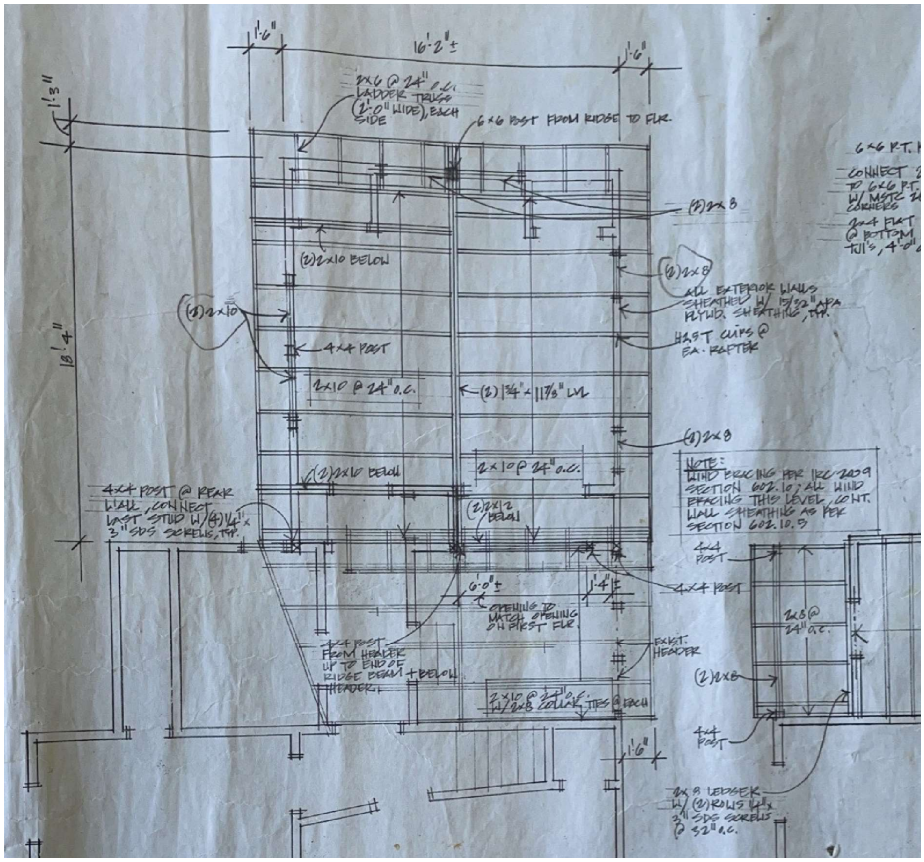
Appendix A: Framing Information & Site Specific Pictures



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Appendix B: General Notes

GENERAL

- The contractor shall verify all dimensions, property setbacks, AHJ/HOA CC&R's, elevations and site conditions before starting work and shall notify AOstructure, Inc, (AOstructures) of any discrepancies.
- All report conclusions represent AOstructures, Inc.'s best professional judgment based upon industry standards.
- Resolve any conflicts on the drawings with AOstructures, Inc before proceeding with construction.
- The design criteria used for this project & listed on the first page of the report is based on the engineers best judgement and/or provided by the ATC council. AHJ specific requests may differ. Please contact our team if the design criteria needs to be modified.
- A site visit was not physically conducted by AOstructures. The accompanying calculations and certification are provided with the understanding that the site building and construction standards meet an acceptable level of industry standards. It shall be the contractors responsibility to identify any irregularities such as inconsistent framing conditions, water damage, fire damage, cracked, split or noticeably deflecting framing members.
- AOstructures is not responsible for enforcing safety measures or regulations. The contractor shall design, construct, and maintain all safety devices including shoring and bracing, and shall be solely responsible for conforming to all local, state and federal safety and health standards, laws and regulations. The contractor shall take necessary precautions to maintain and insure the integrity of the structure during construction. If a lawsuit is filed by one of the contractor's or subcontractor's employees, or any one else, the contractor will indemnify, defend and hold the owner and aostructures, inc harmless of any and all such claims.
- Any and all waterproofing shall be provided by the contractor. AOstrctures is not responsible for waterproofing.
- All hardware shall be installed per manufacturer specifications and within specified design limitations. AOstructures is not responsible for improperly installed hardware or hardware installed outside of the manfacturer specifications.

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USER RELIANCE

- AOstructures has been retained by Sunnova Solar (Client) to perform this assessment. This report and the information contained herein is for the sole use of the Client. This report has no other purpose and shall not be relied upon, or used, by any other person or entity for any purpose without the express written consent of AOstructures. Any party that chooses to rely on this report shall indemnify and hold AOstructures harmless from any claim or recovery against AOstructures.

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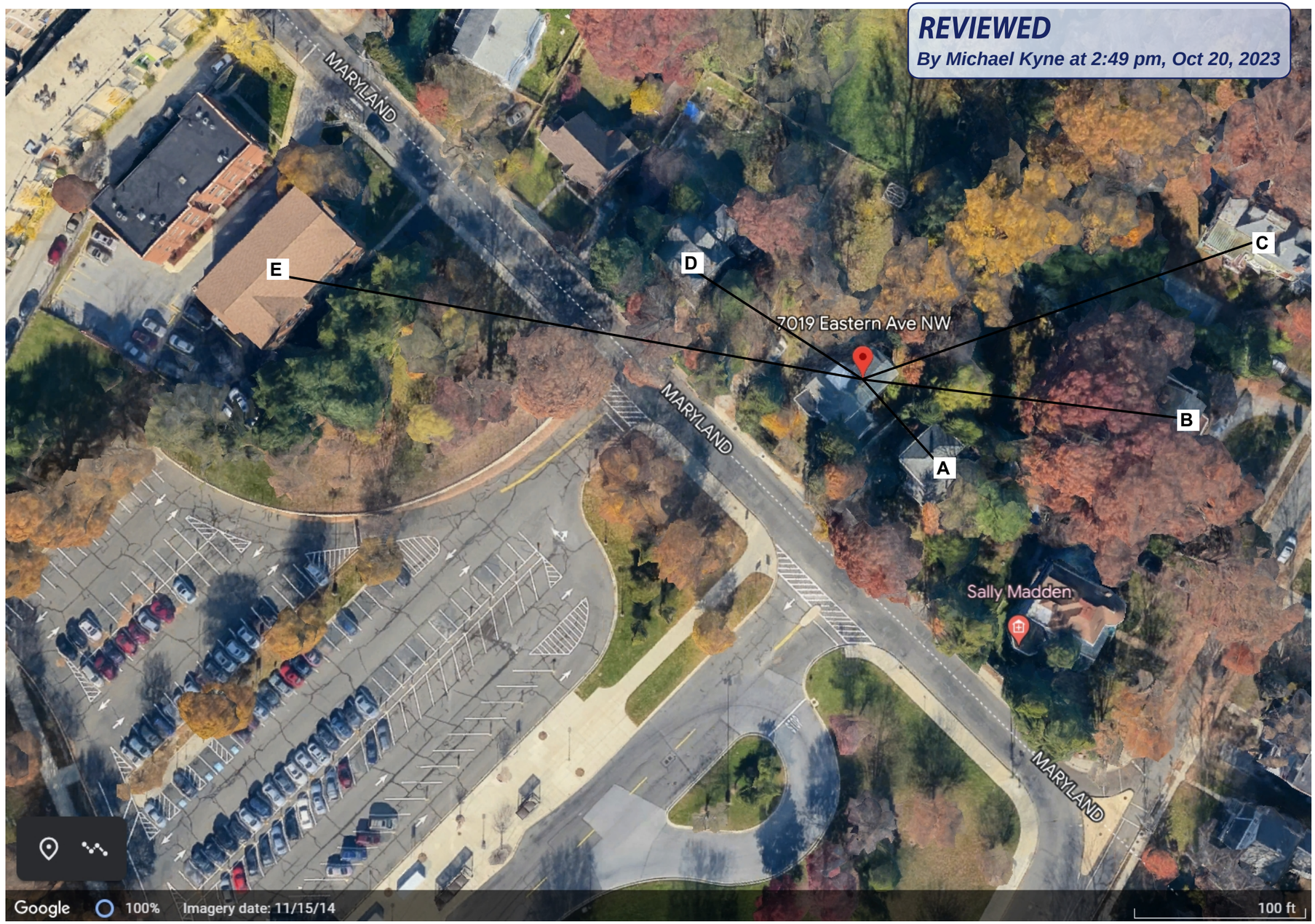
ROOF MOUNTED ARRAY'S

- If an analysis of a supporting stucture is included in our scope of work, the structural assessment only includes the members directly supporting the proposed solar PV system.
- No structural members can be cut for conduit, etc., unless specifically shown. Obtain prior written approval for installation of any additional conduit, etc.
- It is assumed that a standard quality of construction care was used to construct the original building. It shall be the contractors responsibility to field verify any and all framing member supporting the proposed PV array are in adequate condition. The contractor shall field inspect for sub-standard construction means, signs of dryrot, mold, fire damage, etc. and notify engineer if any compromised material is found on site prior to starting construction.
- It is assumed that there have been no additional loads (HVAC or MEP equipment, additional layers of roofing, etc) added to the building over the course of the structures histroy. The contractor and/or client shall verify this with the property owner and notify AOstructures, Inc. if additional load has been added to the structure already.
- Flexible utility connections must be used at any building seismic joint.
- Care should be taken to ensure that PV arrays do not preclude drainage of rain water.
- Unless otherwise noted, construction material shall be evenly distributed if placed on framed floors or roofs. Loads shall not exceed the allowable loading for the supporting members and their connections.
- All lags or wood screws at the roof shall be stainless steel and installed withing the middle 1/3 of the dimensional width of the framing members.
- All fasteners shall be a minimum of 6" away from any truss panel or hinge joints, truss plates and/or member ends. Field verify location of fasteners prior to starting construction. All fasteners shall be pre-drilled to avoid splitting existing lumber.
- Unless otherwise noted, all lags installed in underlying roof framing members shall be embedded (threaded embed) a minimum of 2.5" into the underlying framing.
- AOstructures is not responsible for downslope effects of snow shedding or sliding off of the PV array nor any damage to downslope decks, roofs, walkways, landscaping, automobiles, pets, people, etc.. If snow guards are requested by the customer, notify AOstructures.



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PROJECT ADDRESS:

SABRINA EATON
7019 EASTERN AVENUE
NORTHWEST TAKOMA PARK,
MD 20912

CONTRACTOR INFO:

FUSION SOLAR SERVICES

3600 COMMERCE DR
SUITE 601
BALTIMORE, MD
21227
(443) 955-0779

LICENSE NUMBER:

MHIC-30991

REV	DATE
IFC	09/27/2023

GLARE STUDY - MAP

G001

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SOUTH-FACING ARRAY ANALYSIS

INSTALLATION AZIMUTH: 136 DEG.

INSTALLATION SLOPE: 33 DEG.
INSTALLATION HEIGHT: 25 FEET ABOVE GRADE
GRADE ELEVATION: 276 FEET

LOCATION	AZIMUTH (DEG)	(1) SUN AZIMUTH REQ'D FOR REFLECTION	DISTANCE AWAY (FT)	ELEVATION (FT)	(2) ELEVATION ANGLE (DEG)	(3) SUN ANGLE ABOVE HORIZ. REQ'D FOR REFLECTION
INSTALLATION	136	----	----	301	----	----
BUILDING A	137	225	57	274	25.35	139.35
BUILDING B	97	185	176	351	15.86	129.86
BUILDING C	71	159	245	308	1.64	115.64
BUILDING D	308	36	124	287	6.44	120.44
BUILDING E	282	10	340	300	0.17	114.17

NOTE: Elevations & distances taken from Google Earth

(1) = INSTALLATION AZIMUTH + (INSTALLATION AZIMUTH - BUILDING OF CONCERN AZIMUTH)

(2) = VERTICAL ANGLE BETWEEN INSTALLATION AND BUILDING OF CONCERN DUE TO ELEVATION DIFFERENCE

(3) = (90 - INSTALLATION SLOPE)x2 + ELEVATION ANGLE

LOCATION	SUN AZIMUTH (DEG)	MIN. SUN ELEVATION (DEG)	MAX. SUN ELEVATION (DEG)	SUN ANGLE REQ'D FOR REFLECTION	REFLECTION?
BUILDING A	225	12	68	139.35	NO
BUILDING B	185	27	73	129.86	NO
BUILDING C	159	23	72	115.64	NO
BUILDING D	36	N/A	N/A	120.44	NO
BUILDING E	10	N/A	N/A	114.17	NO

NORTH-FACING ARRAY ANALYSIS

INSTALLATION AZIMUTH: 316 DEG.

INSTALLATION SLOPE: 21 DEG.
INSTALLATION HEIGHT: 25 FEET ABOVE GRADE
GRADE ELEVATION: 276 FEET

LOCATION	AZIMUTH (DEG)	(1) SUN AZIMUTH REQ'D FOR REFLECTION	DISTANCE AWAY (FT)	ELEVATION (FT)	(2) ELEVATION ANGLE (DEG)	(3) SUN ANGLE ABOVE HORIZ. REQ'D FOR REFLECTION
INSTALLATION	316	----	----	301	----	----
BUILDING A	137	135	57	274	25.35	163.35
BUILDING B	97	175	176	351	15.86	153.86
BUILDING C	71	201	245	308	1.64	139.64
BUILDING D	308	324	124	287	6.44	144.44
BUILDING E	282	10	340	300	0.17	138.17

NOTE: Elevations & distances taken from Google Earth

(1) = INSTALLATION AZIMUTH + (INSTALLATION AZIMUTH - BUILDING OF CONCERN AZIMUTH)

(2) = VERTICAL ANGLE BETWEEN INSTALLATION AND BUILDING OF CONCERN DUE TO ELEVATION DIFFERENCE

(3) = (90 - INSTALLATION SLOPE)x2 + ELEVATION ANGLE

LOCATION	SUN AZIMUTH (DEG)	MIN. SUN ELEVATION (DEG)	MAX. SUN ELEVATION (DEG)	SUN ANGLE REQ'D FOR REFLECTION	REFLECTION?
BUILDING A	135	12	68	163.35	NO
BUILDING B	175	26	72	153.86	NO
BUILDING C	201	23	72	139.64	NO
BUILDING D	324	N/A	N/A	144.44	NO
BUILDING E	10	N/A	N/A	138.17	NO

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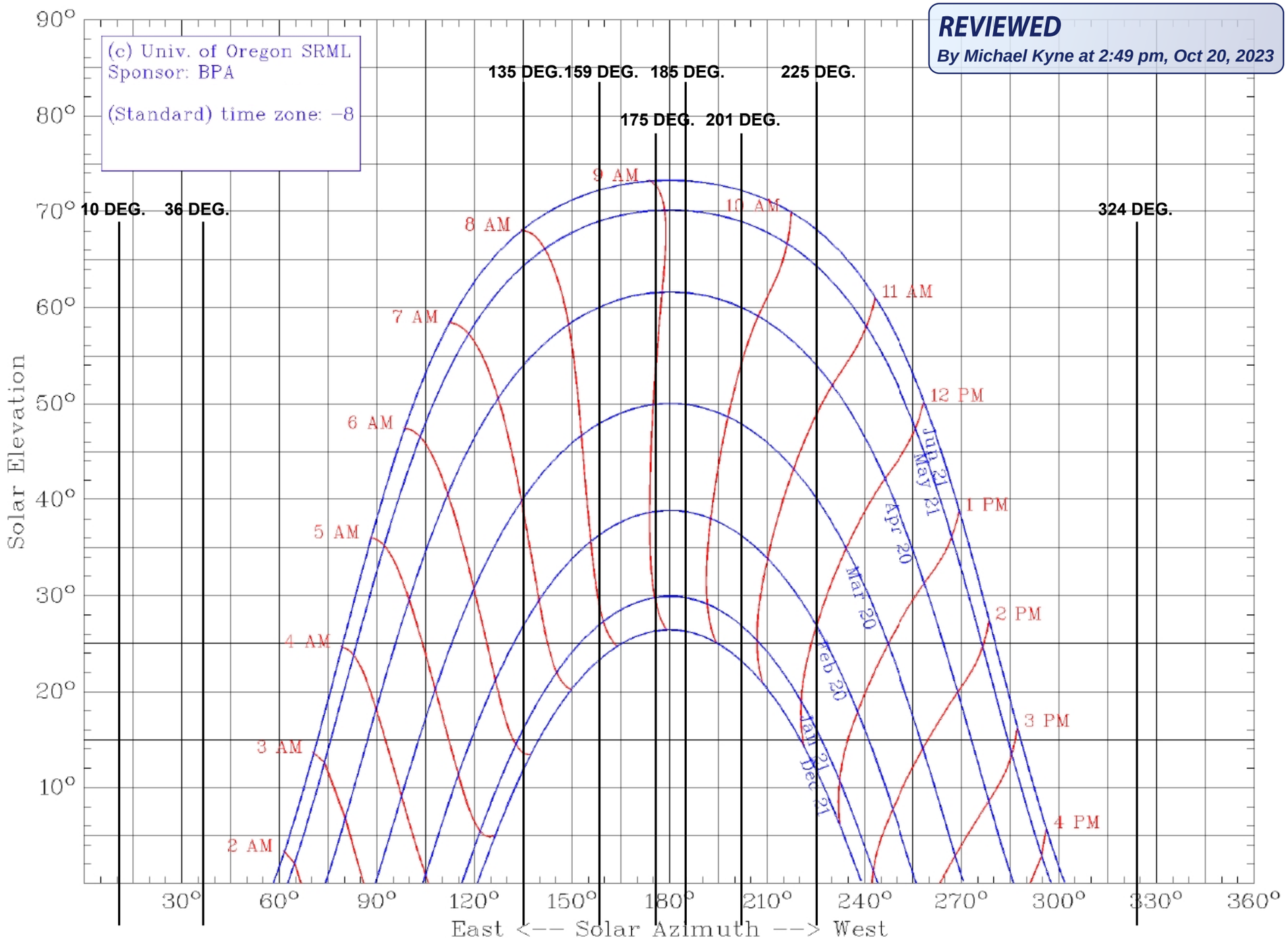
GLARE STUDY - RESULTS

G002



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GLARE STUDY - SUN CHART

G003