

MONTGOMERY COUNTY HISTORIC PRESERVATION COMMISSION
STAFF REPORT

| | | | |
|---------------------|---|-----------------------|---------------|
| Address: | 7211 Spruce Ave., Takoma Park | Meeting Date: | 6/26/2024 |
| Resource: | Contributing Resource Takoma Park Historic District | Report Date: | 6/18/2024 |
| Applicant: | Sue Wheaton Josh Bertaux, Agent | Public Notice: | 6/12/2024 |
| Review: | HAWP | Tax Credit: | no |
| Case Number: | 1069117 | Staff: | Dan Bruechert |
| Proposal: | Solar Panel Installation | | |

RECOMMENDATION

Staff recommends that the Historic Preservation Commission **approve with one condition** the HAWP application:

1. Approval of this HAWP does not extend to any of the panels proposed for the south (street-facing) side of the house denoted on Figure 3 of the staff report. Plans that reflect the approved panels must be submitted to Staff for review and approval prior to issuing the final approval documents.

PROPERTY DESCRIPTION

SIGNIFICANCE: Contributing Resource to the Takoma Park Historic District
STYLE: Craftsman
DATE: 1923



Figure 1: The subject property is located in the middle of the block.

PROPOSAL

The applicant proposes to install 27 (twenty-seven) roof-mounted solar panels.

APPLICABLE GUIDELINES

The Historic Preservation Office and Historic Preservation Commission (HPC) consult several documents when reviewing alterations and new construction within the Takoma Park Historic District. These documents include the historic preservation review guidelines in the approved and adopted amendment for the *Takoma Park Historic District (Guidelines)*, *Montgomery County Code Chapter 24A (Chapter 24A)*, and the *Secretary of the Interior's Standards for Rehabilitation (Standards)*, and the HPC's *Policy No. 20-01 ADDRESSING EMERGENCY CLIMATE MOBILIZATION THROUGH THE INSTALLATION OF ROOF-MOUNTED SOLAR PANELS*. The pertinent information in these four documents is outlined below.

Takoma Park Historic District Guidelines

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

- The design review emphasis will be restricted to changes that are all visible from the public right-of-way, irrespective of landscaping or vegetation (it is expected that the majority of new additions will be reviewed for their impact on the overall district), and
- The importance of assuring that additions and other changes to existing structures act to reinforce and continue existing streetscape, landscape, and building patterns rather than to impair the character of the historic district.

A majority of the buildings in the Takoma Park Historic District have been assessed as being "Contributing Resources." While these buildings may not have the same level of architectural or historical significance as Outstanding Resources or may have lost some degree of integrity, collectively, they are the basic building blocks of the Takoma Park district. They are important to the overall character of the district and the streetscape due to their size, scale, and architectural qualities, rather than for their particular architectural features.

Contributing Resources should receive a more lenient level of design review than those structures that have been classified as Outstanding. This design review should emphasize the importance of the resource to the overall streetscape and its compatibility with existing patterns rather than focusing on a close scrutiny of architectural detailing. In general, however, changes to Contributing Resources should respect the predominant architectural style of the resource.

The following guidance which pertains to this project are as follows:

- All exterior alterations, including those to architectural features and details, should be generally consistent with the predominant architectural style and period of the resource and should preserve the predominant architectural features of the resource; exact replication of existing details and features is, however, not required.
- Minor alterations to areas that do not directly front on a public right-of-way -such as vents, metal stovepipes, air conditioners, fences, skylights, etc. should be allowed as a matter of course; alterations to areas that do not directly front on a public right-of-way which involve the

replacement of or damage to original ornamental or architectural features are discouraged but may be considered and approved on a case-by-case basis.

- Alterations to features that are not visible at all from the public right-of-way should be allowed as a matter of course.
- All changes and additions should respect existing environmental settings, landscaping, and patterns of open space.

Montgomery County Code, Chapter 24A-8

The following guidance which pertains to this project are as follows:

- (b) The commission shall instruct the director to issue a permit, or issue a permit subject to such conditions as are found to be necessary to ensure conformity with the purposes and requirements of this chapter, if it finds that:
 - (1) The proposal will not substantially alter the exterior features of an historic site or historic resource within an historic district; or
 - (2) The proposal is compatible in character and nature with the historical, archeological, architectural or cultural features of the historic site or the historic district in which an historic resource is located and would not be detrimental thereto or to the achievement of the purposes of this chapter;
 - (6) In balancing the interests of the public in preserving the historic site or historic resource located within an historic district, with the interests of the public from the use and benefit of the alternative proposal, the general public welfare is better served by granting the permit.
- (d) In the case of an application for work on an historic resource located within an historic district, the commission shall be lenient in its judgment of plans for structures of little historical or design significance or for plans involving new construction, unless such plans would seriously impair the historic or architectural value of surrounding historic resources or would impair the character of the historic district. (Ord. No. 9-4, § 1; Ord. No. 11-59.)

Secretary of the Interior's Standards for Rehabilitation

The Secretary of the Interior defines rehabilitation as “the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features, which convey its historical, cultural, or architectural values.” The applicable *Standards* are as follows:

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

10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

Historic Preservation Commission Policy No. 20-01: Addressing Emergency Climate Mobilization Through the Installation of Roof-Mounted Solar Panels

Now, THEREFORE:

WHEREAS, Historic Area Work Permit decisions are guided by the criteria in Section 24A, The Secretary of the Interior’s Standards for Rehabilitation, and pertinent guidance from applicable master plan amendments and/or site or district-specific studies;

WHEREAS, The Secretary of the Interior’s Standards for Rehabilitation as interpreted by the National Park Service limit the placement of rooftop solar panels under Standards 2, 9, and 10 to less conspicuous locations;

WHEREAS, the County Council has established a Climate Emergency;

WHEREAS, the Historic Preservation is a body established by the County Executive and County Council;

WHEREAS, Section 24-8(b)(6) states, “In balancing the interest of the public in preserving the historic site or historic resource located within an historic district, with the interests of the public from the use and benefit of the alternative proposal, the general public welfare is better served by granting the permit;”

WHEREAS, the widespread use of solar panels, both for hot water and for electricity production, will reduce greenhouse gases in the county, in accordance with the aims of the Emergency Climate Mobilization resolution (Resolution No.: 18-974), it shall be the policy of the Historic Preservation Commission that:

1. The preferred locations for solar panel installation(s) on a designated historic site or an historic resource located within an historic district is a) on the rear of the property, b) on non-historic building additions, c) on accessory structures, or d) in ground-mounted arrays;
2. If it is not feasible to install solar panels in one of the identified preferred locations due to resource orientation or other site limitations; and,
3. The roof is determined to be neither architecturally significant, nor a character-defining feature of the resource, nor is it a slate or tile roof, that unless it can be demonstrated that the solar array will be installed without damaging the historic character of the resource or historic fabric; then
4. The public welfare is better served by approving a Historic Area Work Permit for solar panels on all visible side or front roof slopes under Section 24A-8(b)(6).

A Historic Area Work Permit (HAWP) is required for all work referenced in this policy.

STAFF DISCUSSION

The subject property is a one-and-a-half-story Craftsman Bungalow with a side gable asphalt shingle roof and large gable dormer on the front roof slope. A rear shed addition was constructed sometime after 1963, but before the historic district was established. The applicant proposes to install a total of 27

(twenty-seven) solar panels on the roof of the subject property. Panels will be mounted to the roof using a proprietary rail-less racking system that projects less than 2 ½" (two-and-a-half inches) above the roof surface. The panels are proposed for the non-historic rear addition, the rear roof slope, and on the front of the Contributing Resource.



Figure 2: The proposed solar panel arrangement. The front of the house is to the left.

Non-Historic Rear Addition

At the rear of the house there is a non-historic shed roof rear addition. The applicant proposes to install 7 (seven) solar panels on this roof surface, five are grouped to the north end of the addition and two grouped to the south (shown in blue in *Figure 2*, above). This roof surface is not at all visible from the public right-of-way and is identified as one of the preferred locations in the HPC's adopted solar panel policy.

Staff finds the proposed solar panels will not be visible from the right of way, will not impact historic fabric, and is a reversible treatment. Even though these panels are arranged in what Staff would call an organized configuration,¹ because they will not impact the visual characteristics of the house as viewed from the right-of-way, Staff recommends the HPC approve the solar panels on the rear non-historic addition as a matter of course, per the *Design Guidelines*; 24A-8(b)(2), (6), and (d); and Standards 2, 9, and 6.

Rear Roof Slope

On the rear of the house, there is a large rear-gable dormer. The applicant proposes installing 10 (ten)

¹ The Solar Panel Illustrated Guidelines are available here: <https://montgomeryplanning.org/wp-content/uploads/2021/12/Solar-Panel-Interactive.pdf>, and the recommendations for solar panel placement begins on page 8 of the document.

solar panels on the rear gable slope (shown in green in *Figure 2*, above). No solar panels are proposed on the dormer.

As with the rear addition, Staff finds the changes to the rear roof slope will not be at all visible from the public right-of-way. The five panels on the south side of the dormer are not arranged in a compact, organized configuration as recommended in the illustrated design guidelines (discussed above). Staff finds the proposed panels on the rear roof slope will detract from the historic character of the house, will not be visible from the public right-of-way, and can be reversed without damaging historic fabric and recommends the HPC approve the solar panels on the rear roofs slope per the *Design Guidelines*; 24A-8(b)(2), (6), and (d); and Standards 2, 9, and 6.

Front Roof Slope

On the front of the house, the applicant proposes to install 10 (ten solar panels). Four panels are proposed on each side of the front gable dormer, with one on each side of the dormer gable (shown in orange in *Figure 3*, below).



Figure 3: Detail of the propose solar panel arrangement on the street-facing roof side.

In developing the HPC's Solar Policy, the commissioners recognized that panels on the street-facing roof slopes would have a larger impact on the character of the resources and surrounding district than those in the rear. But the HPC did not want to eliminate panels on these roof slopes from consideration, only that

the applicant is required to satisfy a higher burden of persuasion. Typically applicants are required to provide additional details, such as a roof heat map, that show that the solar panels on the front of the house are necessary for the whole solar array to be financially viable or that the orientation of the resource requires panels be placed on the front, like in the case of south-facing resources.

In this instance, the applicant provided a roof heat map that shows the areas of the roof that are likely to generate the most electricity. The analysis continues to identify the percentage of solar access for each of the panel groupings based on topography and tree cover. The submitted documentation does not include an analysis of what percentage of the house's electricity needs the proposed solar panels will produce. Based on Staff's experience in reviewing these solar projects, 27 (twenty-seven) panels does not seem to be an unreasonable number.

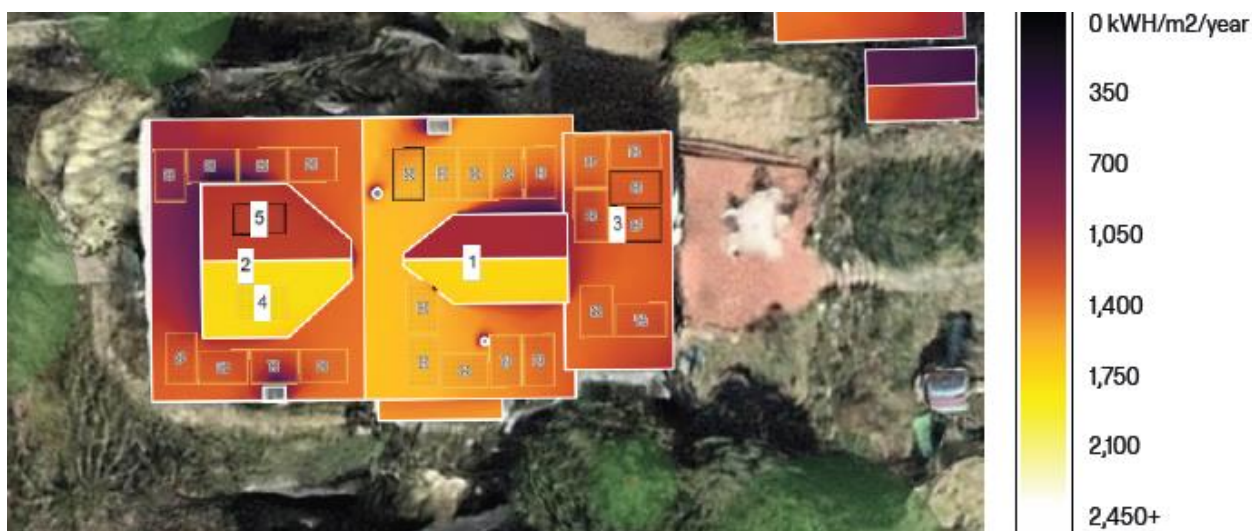


Figure 4: Roof heat map, showing the highest electricity generation is on the south-facing dormer roof slopes. This does not appear drawn to scale.

What the documentation fails to satisfy is the requirement that the solar project becomes infeasible without these panels (or some of these panels). While Staff recognizes this roof of the subject property is not architecturally or historically significant; and that the panels could be removed in the future without permanently damaging the fabric, Staff maintains that the disparate arrangement of the panels is incompatible with the adopted guidance and that, absent additional information, the panels on the street-facing roof slope should be eliminated from the proposal. Staff recommends the HPC add a condition to the approval of this HAWP that the approval does not extend to the street-facing roof slopes. Additional information could be provided as an amendment to the subject HAWP or could be presented at the HPC meeting to justify the inclusion of some (or all of) the panels on this roof slope.

Staff notes that additional panels on the rear-facing slopes could be approved at the Staff-level under the HPC's administrative regulations that delegate approval authority for certain classes of work to Staff.

STAFF RECOMMENDATION

Staff recommends that the Commission **approve with one (1) condition** the HAWP application;

1. Approval of this HAWP does not extend to any of the panels proposed for the south (street-facing) side of the house denoted on Figure 3 of the staff report. Plans that reflect the approved panels must be submitted to Staff for review and approval prior to issuing the final approval documents;

under the Criteria for Issuance in Chapter 24A-8(b)(2), (6), and (d), having found that the proposal will

not substantially alter the exterior features of the historic resource and is compatible in character with the district and the purposes of Chapter 24A;

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

and with the general condition that the applicant shall present an electronic set of drawings, if applicable, to Historic Preservation Commission (HPC) staff for review and stamping prior to submission for the Montgomery County Department of Permitting Services (DPS) building permits;

and with the general condition that final project design details, not specifically delineated by the Commission, shall be approved by HPC staff or brought back to the Commission as a revised HAWP application at staff's discretion;

and with the general condition that the applicant shall notify the Historic Preservation Staff if they propose to make **any alterations** to the approved plans. Once the work is completed the applicant will contact the staff person assigned to this application at 301-563-3400 or dan.bruechert@montgomeryplanning.org to schedule a follow-up site visit.



APPLICATION FOR HISTORIC AREA WORK PERMIT
HISTORIC PRESERVATION COMMISSION
301.563.3400

FOR STAFF ONLY:
HAWP#
DATE ASSIGNED

APPLICANT:

Name:
Address:
Daytime Phone:
E-mail:
City:
Zip:
Tax Account No.:

AGENT/CONTACT (if applicable):

Name:
Address:
Daytime Phone:
E-mail:
City:
Zip:
Contractor Registration No.:

LOCATION OF BUILDING/PREMISE: MIHP # of Historic Property

Is the Property Located within an Historic District? Yes/District Name
No/Individual Site Name

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

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

Building Number: Street:

Town/City: Nearest Cross Street:

Lot: Block: Subdivision: Parcel:

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

- Checklist of work types: 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: Joshua Bertaux
Date: 9

HAWP APPLICATION: MAILING ADDRESSES FOR NOTIFYING
 [Owner, Owner's Agent, Adjacent and Confronting Property Owners]

| | |
|--|--|
| Owner's mailing address | Owner's Agent's mailing address |
| Adjacent and confronting Property Owners mailing addresses | |
| 7214 Spruce Avenue, Takoma Park MD 20912 7212 Spruce Avenue, Takoma Park MD 20912 7210 Spruce Avenue, Takoma Park MD 20912 7213 Spruce Avenue, Takoma Park MD 20912 | |
| 7209 Spruce Avenue, Takoma Park MD 20912 114 Park Avenue, Takoma Park MD 20912 112 Park Avenue, Takoma Park MD 20912 106 Park Avenue, Takoma Park MD 20912 | |
| | |

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

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

| | |
|-----------------------------------|----------------|
| Work Item 1: _____ | |
| Description of Current Condition: | Proposed Work: |










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| Work Item 2: _____ | |
| Description of Current Condition: | Proposed Work: |

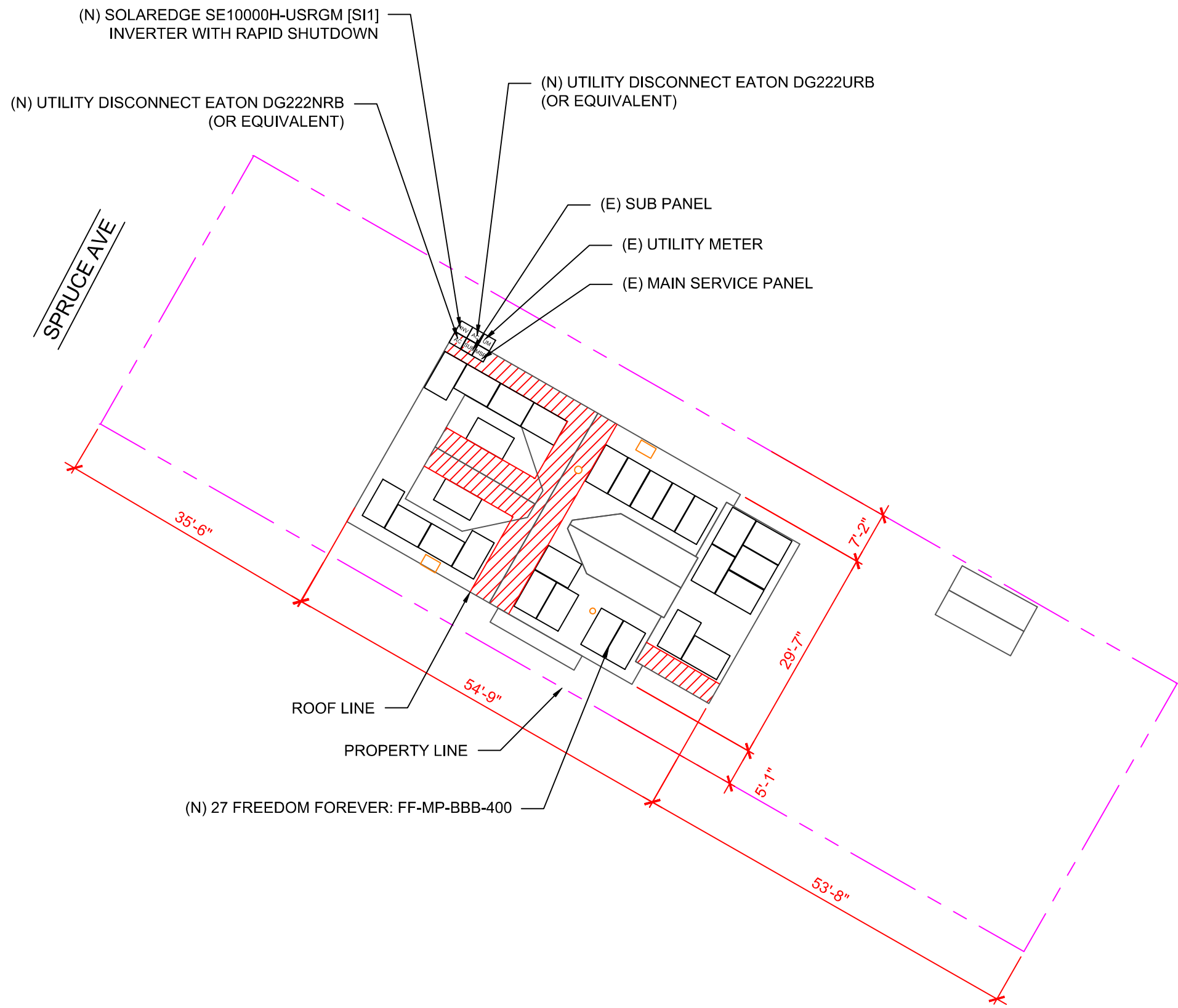
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| Work Item 3: _____ | |
| Description of Current Condition: | Proposed Work: |

**HISTORIC AREA WORK PERMIT
CHECKLIST OF
APPLICATION REQUIREMENTS**

| | Required Attachments | | | | | | |
|------------------------------------|------------------------|--------------|-------------------------|----------------------------|----------------|----------------|-----------------------------|
| Proposed Work | 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/ Landscaping | * | * | | * | * | * | * |
| Tree Removal | * | * | | * | * | * | * |
| Siding/ Roof Changes | * | * | * | * | * | | * |
| Window/ Door Changes | * | * | * | * | * | | * |
| Masonry Repair/ Repoint | * | * | * | * | * | | * |
| Signs | * | * | * | * | * | | * |

LEGEND:

-  CHIMNEY
-  PIPE VENT
-  MODULES
-  CONDUIT
-  SETBACK
-  AC DISCONNECT
-  JUNCTION BOX
-  INVERTER
-  MAIN SERVICE PANEL



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. 61131, Expiration Date: 05/21/2025

ROOF AREA: 2500 SQ FT

CLIENT:
 SUE WHEATON
 7211 SPRUCE AVE, TAKOMA PARK, MD 20912
 AHJ: COUNTY OF MONTGOMERY
 UTILITY: PEPCO
 METER: 1ND350446558
 APN: 13-01081455
 PHONE: (301) 270-9038
 EMAIL: SUEKWHEATON@GMAIL.COM

SYSTEM:
 SYSTEM SIZE (DC): 27 X 400 = 10,800 kW
 SYSTEM SIZE (AC): 10,000 kW @ 240V
 MODULES: 27 X FREEDOM FOREVER: FF-MP-BBB-400
 OPTIMIZERS: 27 X SOLAREEDGE S440
 INVERTER: SOLAREEDGE SE10000H-USRGM [S11]

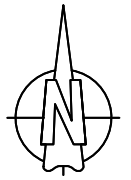
| REVISIONS | | |
|-----------|------------|-----------|
| NO. | REVISED BY | DATE |
| 1 | A.P. | 4/10/2024 |
| - | - | - |
| - | - | - |



FREEDOM FOREVER LLC
 5000 THAYER CENTER SUITE C, OAKLAND, MD 21550
 Tel: (800) 385-1075
 GREG ALBRIGHT

Greg Albright

CONTRACTOR LICENSE:
 HOME IMPROVEMENT CONTRACTOR 120928 /140496; MASTER ELECTRICIAN 14190












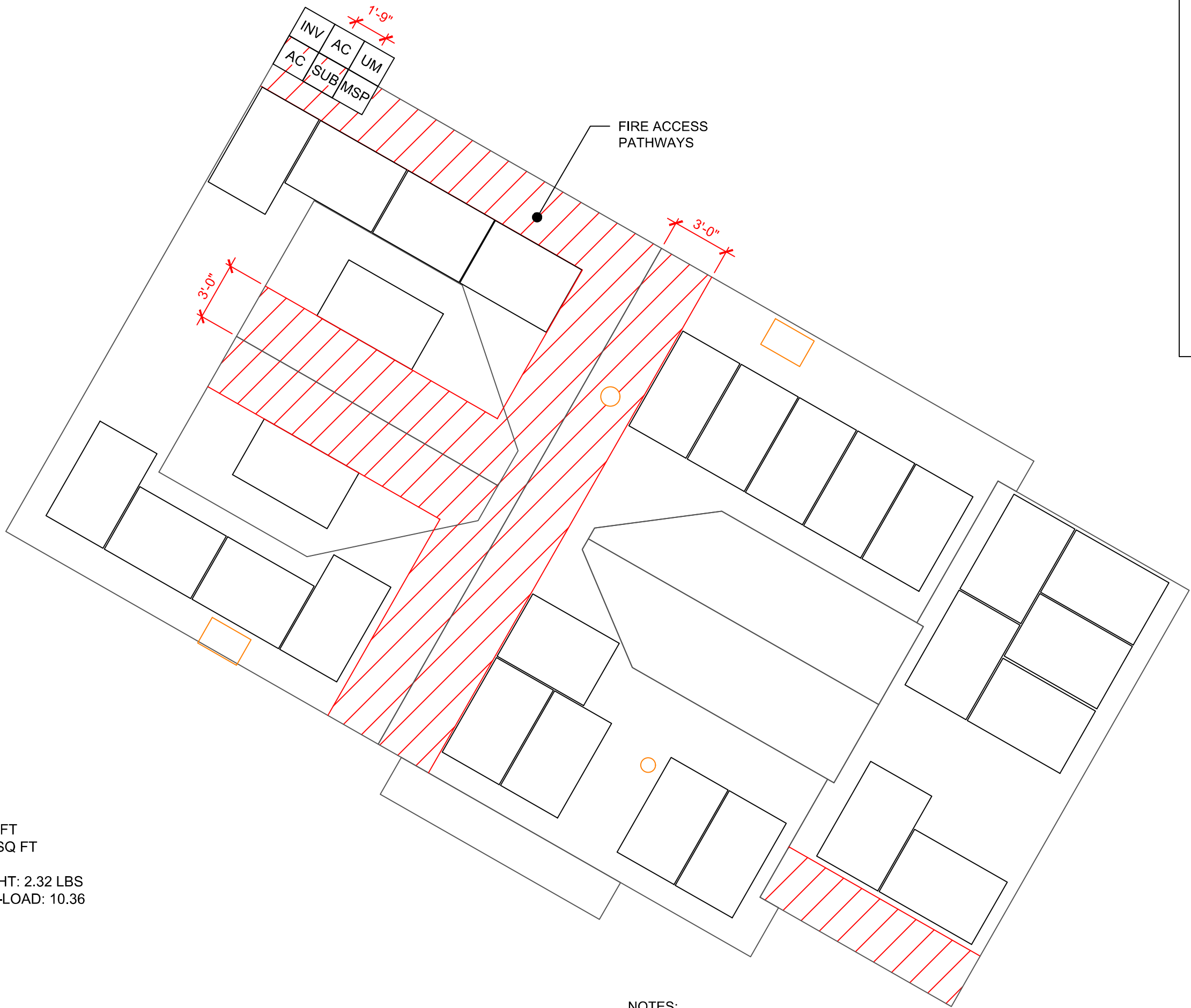
SITE PLAN
 SCALE: 1/16" = 1'-0"

1

| SITE PLAN | | | |
|-----------|-----------|--------------|--------|
| JOB NO: | DATE: | DESIGNED BY: | SHEET: |
| 417788 | 4/10/2024 | A.P. | PV-2 |

LEGEND:

-  CHIMNEY
-  PIPE VENT
-  MODULES
-  CONDUIT
-  SETBACK
-  AC DISCONNECT
-  JUNCTION BOX
-  INVERTER
-  MAIN SERVICE PANEL



TOTAL ROOF AREA: 2500 SQ FT
 TOTAL ARRAY AREA: 567.52 SQ FT
 ARRAY COVERAGE: 22.70%
 SYSTEM DISTRIBUTED WEIGHT: 2.32 LBS
 ROCKIT SMART SLIDE POINT-LOAD: 10.36 LBS



ROOF PLAN
 SCALE: 3/16" = 1'-0"

1

- NOTES:**
1. EMT CONDUIT ATTACHED TO THE ROOF USING CONDUIT MOUNTS
 2. ATTACHED CLAMPS AT 25% FROM THE EDGE AND 50% FROM THE CENTER OF THE MODULES
 3. JUNCTION BOX IS MOUNTED TO THE RAIL.



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. 61131, Expiration Date: 05/21/2025

ROOF AREA: 2500 SQ FT

CLIENT:
 SUE WHEATON
 7211 SPRUCE AVE, TAKOMA PARK, MD 20912
 AHJ: COUNTY OF MONTGOMERY
 UTILITY: PEPCO
 METER: 1ND350446558
 APN: 13-01081455
 PHONE: (301) 270-9038
 EMAIL: SUEKWHEATON@GMAIL.COM

SYSTEM:
 SYSTEM SIZE (DC): 27 X 400 = 10,800 kW
 SYSTEM SIZE (AC): 10,000 kW @ 240V
 MODULES: 27 X FREEDOM FOREVER: FF-MP-BBB-400
 OPTIMIZERS: 27 X SOLAREEDGE S440
 INVERTER: SOLAREEDGE SE10000H-USRGM [S11]

| REVISIONS | | |
|-----------|------------|-----------|
| NO. | REVISED BY | DATE |
| 1 | A.P. | 4/10/2024 |
| - | - | - |
| - | - | - |


 FREEDOM FOREVER LLC
 5000 THAYER CENTER SUITE C, OAKLAND, MD 21550
 Tel: (800) 385-1075
 GREG ALBRIGHT


 CONTRACTOR LICENSE:
 HOME IMPROVEMENT CONTRACTOR 120928 /140496; MASTER ELECTRICIAN 14190

ROOF PLAN WITH MODULES LAYOUT

| | | | |
|---------|-----------|--------------|--------|
| JOB NO: | DATE: | DESIGNED BY: | SHEET: |
| 417788 | 4/10/2024 | A.P. | PV-2A |



Freedom Forever
Planset Revision Letter

4/10/2024
REV #1

Attn. County of Montgomery (MD):

The changes outlined in Revision Details have been applied to the plans corresponding to the following customer:

SUE WHEATON
7211 SPRUCE AVE, TAKOMA PARK, MD 20912

Revision Details:

1. Sub Panel removed and 2 AC Disconnect added.

All corresponding changes are notated on the plans by revision clouds.

Thank you for your time in reviewing these plans. Please reach out if you have any additional questions or concerns.

Construction Engineering
Freedom Forever
engineering@freedomforever.com

ROOF MOUNT PHOTOVOLTAIC SYSTEM

CODES:

THIS PROJECT COMPLIES WITH THE FOLLOWING:
 2018 INTERNATIONAL ENERGY CONSERVATION CODE
 2018 INTENATIONAL RESIDENTIAL CODE
 2018 INTERNATIONAL FUEL AND GAS CODE
 2018 INTERNATIONAL MECHANICAL CODE
 2018 INTERNATIONAL SWIMMING POOL AND SPA CODE
 2018 INTERNATIONAL BUILDING CODE
 2017 NATIONAL ELECTRIC CODE
 AS ADOPTED BY COUNTY OF MONTGOMERY

CONSTRUCTION NOTES:

CONDUIT AND CONDUCTOR SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.

ALL SOLAR ENERGY SYSTEM EQUIPMENT SHALL BE SCREENED TO THE MAXIMUM EXTENT POSSIBLE AND SHALL BE PAINTED A COLOR SIMILAR TO THE SURFACE UPON WHICH THEY ARE MOUNTED.

MODULES SHALL BE TESTED , LISTED AND IDENTIFIED WITH FIRE CLASSIFICATION IN ACCORDANCE WITH UL 2703. SMOKE AND CARBON MONOXIDE ALARMS ARE REQUIRED PER SECTION R314 AND 315 TO BE VERIFIED AND INSPECTED BY INSPECTOR IN THE FIELD.

DIG ALERT (811) TO BE CONTACTED AND COMPLIANCE WITH EXCAVATION SAFETY PRIOR TO ANY EXCAVATION TAKING PLACE

PHOTOVOLTAIC SYSTEM GROUND WILL BE TIED INTO EXISTING GROUND AT MAIN SERVICE FROM DC DISCONNECT/INVERTER AS PER 2017 NEC SEC 250.166(A).

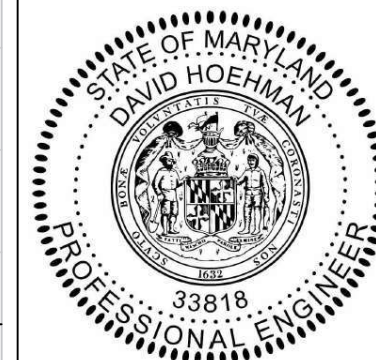
SOLAR PHOTOVOLTAIC SYSTEM EQUIPMENT WILL BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS OF ART. 690 OF THE 2017 NEC

THE MAIN SERVICE PANEL WILL BE EQUIPPED WITH A GROUND ROD OR UFER

UTILITY COMPANY WILL BE NOTIFIED PRIOR TO ACTIVATION OF THE SOLAR PV SYSTEM

SOLAREEDGE OPTIMIZERS ARE LISTED TO IEC 62109-1 (CLASS II SAFETY) AND UL 1741 STANDARDS

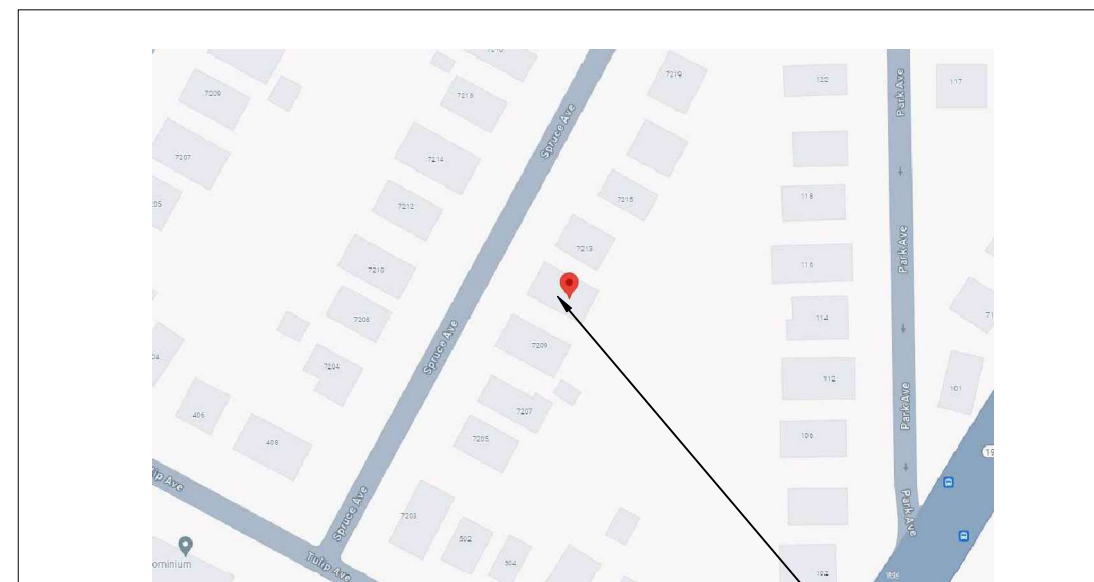
INSTALL CREW TO VERIFY ROOF STRUCTURE PRIOR TO COMMENCING WORK. EMT CONDUIT ATTACHED TO THE ROOF USING CONDUIT MOUNT.



Digitally signed
 by David
 Hoehman
 Date:
 2024.04.23
 20:10:30 -04'00'

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am duly licensed professional engineer under the laws of the State of Maryland.
 License No. 33818, Expiration Date: 07-04-2025

VICINITY MAP:



SITE LOCATION

CLIENT:
 SUE WHEATON
 7211 SPRUCE AVE, TAKOMA PARK, MD 20912
 AHJ: COUNTY OF MONTGOMERY
 UTILITY: PEPCO
 METER: 1ND350446558
 APN: 13-01081455
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| PV-10 | SAFETY PLAN |
| APPENDIX | MANUFACTURER SPECIFICATION SHEETS |










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| NO. | REVISED BY | DATE |
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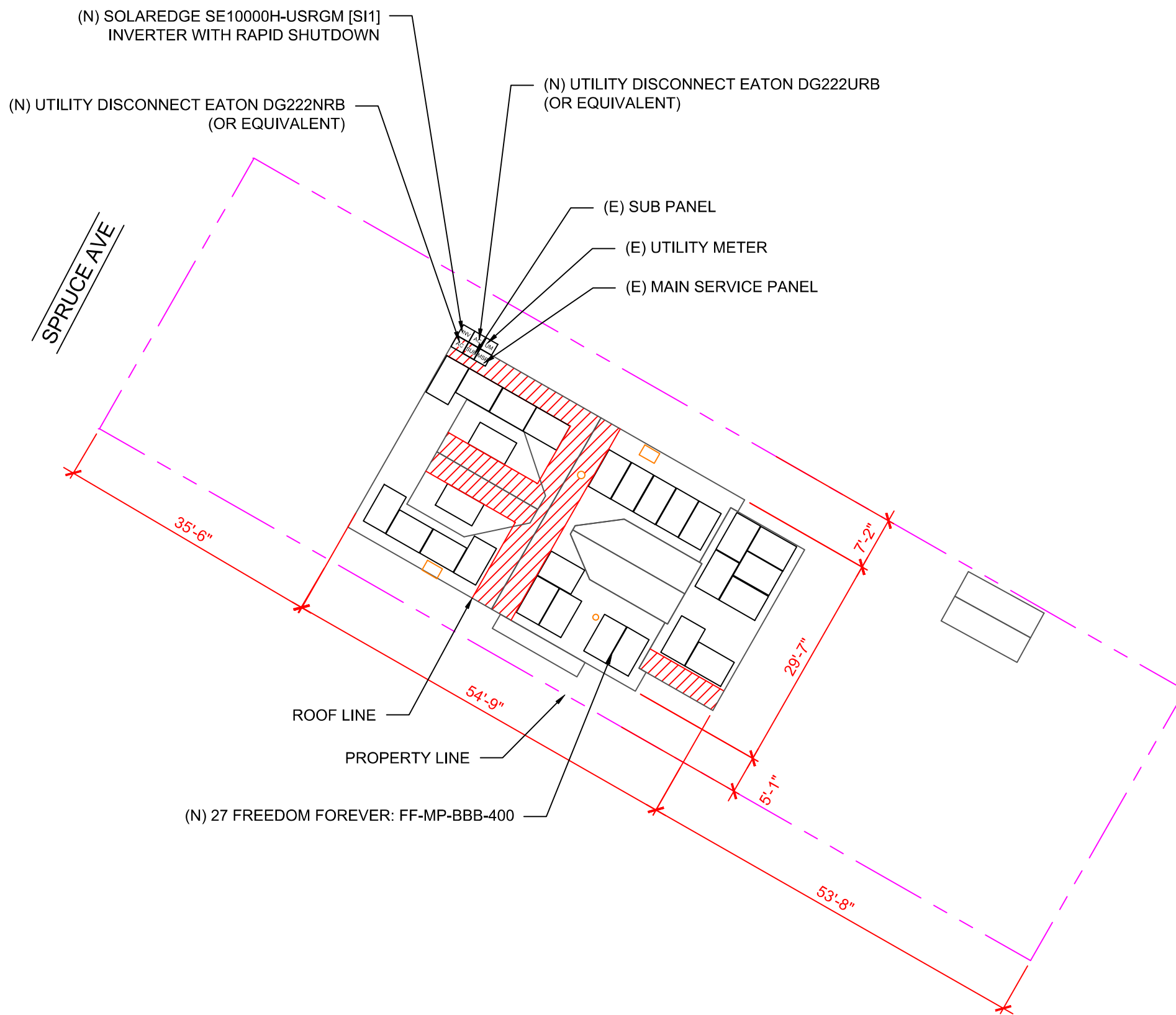

freedom
 FOREVER
 FREEDOM FOREVER LLC
 5000 THAYER CENTER SUITE C, OAKLAND, MD 21550
 Tel: (800) 385-1075
GREG ALBRIGHT

 CONTRACTOR LICENSE:
 HOME IMPROVEMENT CONTRACTOR 120928
 /140496; MASTER ELECTRICIAN 14190

| PROJECT DETAILS | | | |
|-----------------|-----------|--------------|--------|
| JOB NO: | DATE: | DESIGNED BY: | SHEET: |
| 417788 | 4/10/2024 | A.P. | PV-1 |

LEGEND:

-  CHIMNEY
-  PIPE VENT
-  MODULES
-  CONDUIT
-  SETBACK
-  AC DISCONNECT
-  JUNCTION BOX
-  INVERTER
-  MAIN SERVICE PANEL



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. 61131, Expiration Date: 05/21/2025

ROOF AREA: 2500 SQ FT

CLIENT:
 SUE WHEATON
 7211 SPRUCE AVE, TAKOMA PARK, MD 20912
 AHJ: COUNTY OF MONTGOMERY
 UTILITY: PEPCO
 METER: 1ND350446558
 APN: 13-01081455
 PHONE: (301) 270-9038
 EMAIL: SUEKWHEATON@GMAIL.COM

SYSTEM:
 SYSTEM SIZE (DC): 27 X 400 = 10,800 kW
 SYSTEM SIZE (AC): 10,000 kW @ 240V
 MODULES: 27 X FREEDOM FOREVER: FF-MP-BBB-400
 OPTIMIZERS: 27 X SOLAREEDGE S440
 INVERTER: SOLAREEDGE SE10000H-USRGM [S11]

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




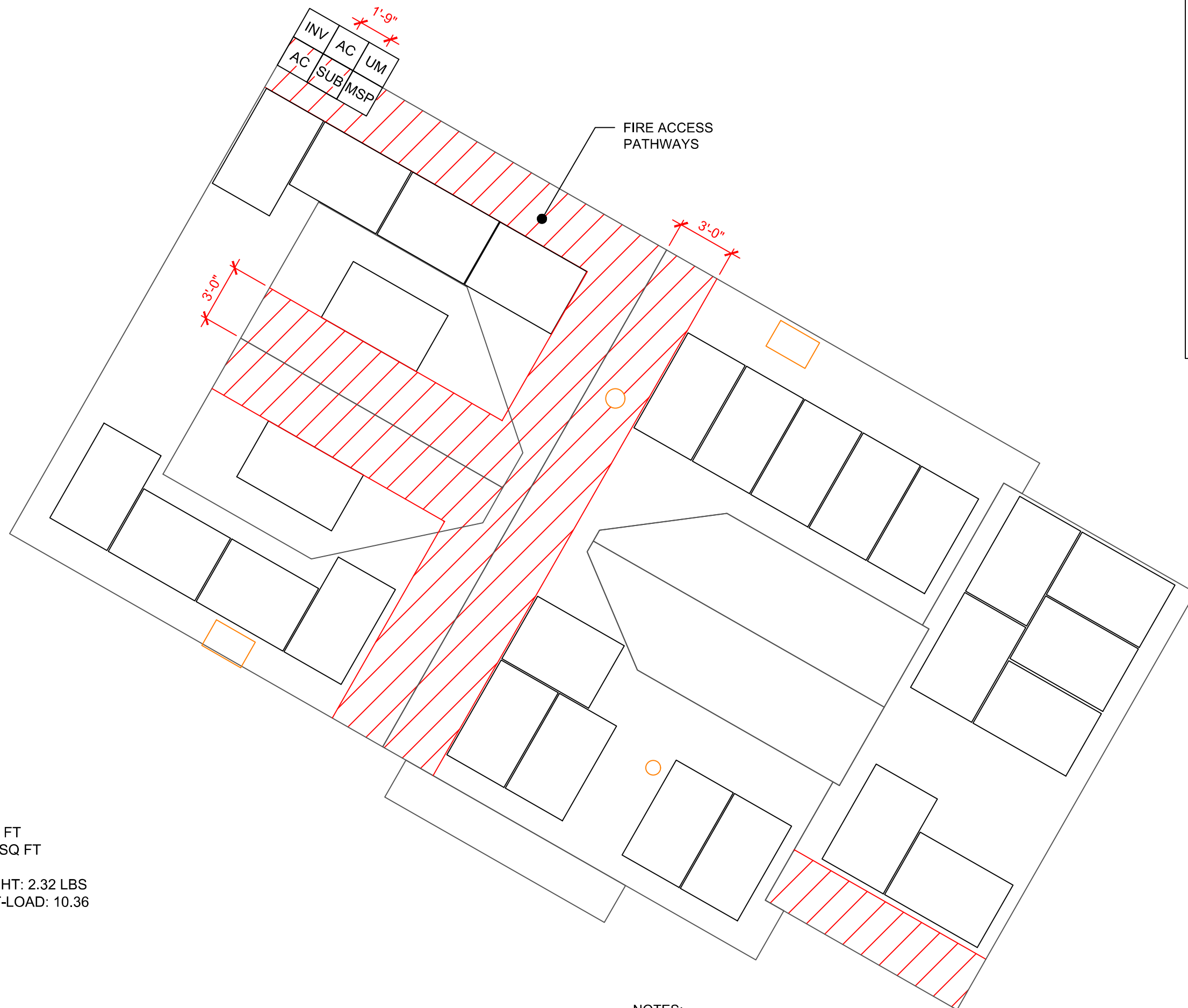
SITE PLAN
 SCALE: 1/16" = 1'-0"

1

| SITE PLAN | | | |
|-----------|-----------|--------------|--------|
| JOB NO: | DATE: | DESIGNED BY: | SHEET: |
| 417788 | 4/10/2024 | A.P. | PV-2 |

LEGEND:

-  CHIMNEY
-  PIPE VENT
-  MODULES
-  CONDUIT
-  SETBACK
-  AC DISCONNECT
-  JUNCTION BOX
-  INVERTER
-  MAIN SERVICE PANEL



TOTAL ROOF AREA: 2500 SQ FT
 TOTAL ARRAY AREA: 567.52 SQ FT
 ARRAY COVERAGE: 22.70%
 SYSTEM DISTRIBUTED WEIGHT: 2.32 LBS
 ROCKIT SMART SLIDE POINT-LOAD: 10.36 LBS



ROOF PLAN
 SCALE: 3/16" = 1'-0"

1

NOTES:

1. EMT CONDUIT ATTACHED TO THE ROOF USING CONDUIT MOUNTS
2. ATTACHED CLAMPS AT 25% FROM THE EDGE AND 50% FROM THE CENTER OF THE MODULES
3. JUNCTION BOX IS MOUNTED TO THE RAIL.



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ROOF AREA: 2500 SQ FT

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 INVERTER: SOLAREEDGE SE10000H-USRGM [S11]

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| | | | |
|-------------------------------|--------------------|----------------------|-----------------|
| ROOF PLAN WITH MODULES LAYOUT | | | |
| JOB NO: 417788 | DATE: 4/10/2024 | DESIGNED BY: A.P. | SHEET: PV-2A |

ROOF DETAILS:

TOTAL ROOF AREA: 2500 SQ FT
 TOTAL ARRAY AREA: 567.52 SQFT
 ARRAY COVERAGE: 22.70%
 SYSTEM DISTRIBUTED WEIGHT: 2.32 LBS
 ROCKIT SMART SLIDE POINT-LOAD: 10.36 LBS



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ROOF AREA STATEMENT

| ROOF | MODULE QUANTITY | ROOF PITCH | ARRAY PITCH | AZIMUTH | ROOF AREA | ARRAY AREA |
|--------|-----------------|------------|-------------|---------|-----------|--------------|
| ROOF 1 | 8 | 24 | 24 | 300 | 487 SQ FT | 168.16 SQ FT |
| ROOF 2 | 10 | 24 | 24 | 120 | 540 SQ FT | 210.19 SQ FT |
| ROOF 3 | 7 | 12 | 12 | 120 | 286 SQ FT | 147.14 SQ FT |
| ROOF 4 | 1 | 27 | 27 | 210 | 119 SQ FT | 21.02 SQ FT |
| ROOF 5 | 1 | 27 | 27 | 30 | 119 SQ FT | 21.02 SQ FT |
| ---- | ---- | ---- | ---- | ---- | SQ FT | SQ FT |
| ---- | ---- | ---- | ---- | ---- | SQ FT | SQ FT |
| ---- | ---- | ---- | ---- | ---- | SQ FT | SQ FT |
| ---- | ---- | ---- | ---- | ---- | SQ FT | SQ FT |
| ---- | ---- | ---- | ---- | ---- | SQ FT | SQ FT |

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Greg Albright

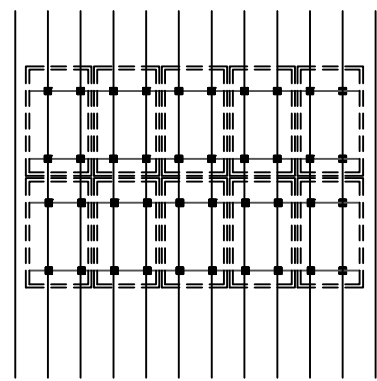
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| ARRAY DETAILS | | | |
|---------------|-----------|--------------|--------|
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| 417788 | 4/10/2024 | A.P. | PV-2B |

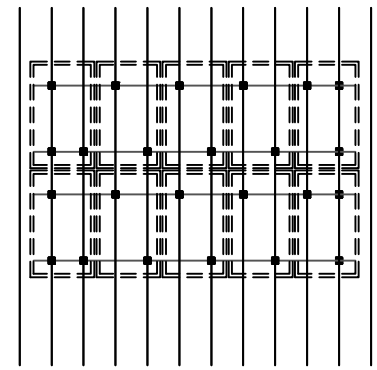
TABLE 1 - ARRAY INSTALLATION

| | ROOF PITCH | ROOFING TYPE | ATTACHMENT TYPE | FRAMING TYPE | MAX UNBRACED LENGTH(FT.) | STRUCTURAL ANALYSIS RESULT | PENETRATION PATTERN | MAX ATTACHMENT SPACING (IN.) | MAX RAIL OVERHANG(I N.) |
|--------|------------|--------------|------------------------------|----------------|--------------------------|----------------------------|---------------------|------------------------------|-------------------------|
| ROOF 1 | 24 | Comp Shingle | Ecofasten RockIt Smart Slide | 2x6 @ 24" O.C. | 7 | PASS | STAGGERED | 24 | 8 |
| ROOF 2 | 24 | Comp Shingle | Ecofasten RockIt Smart Slide | 2x6 @ 24" O.C. | 7 | PASS | STAGGERED | 24 | 8 |
| ROOF 3 | 12 | Comp Shingle | Ecofasten RockIt Smart Slide | 2x6 @ 24" O.C. | 7 | PASS | STAGGERED | 48 | 16 |
| ROOF 4 | 27 | Comp Shingle | Ecofasten RockIt Smart Slide | 2x6 @ 24" O.C. | 7 | PASS | STAGGERED | 48 | 16 |
| ROOF 5 | 27 | Comp Shingle | Ecofasten RockIt Smart Slide | 2x6 @ 24" O.C. | 7 | PASS | STAGGERED | 48 | 16 |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

1. CONTRACTOR TO VERIFY FRAMING TYPE AND MAX UNBRACED LENGTH PRIOR TO INSTALLATION. IF THE ABOVE INFORMATION DOES NOT MATCH FIELD CONDITIONS, NOTIFY ENGINEER OF RECORD IMMEDIATELY.
2. WHERE COLLAR TIES OR RAFTER SUPPORTS EXIST, CONTRACTOR SHALL USE RAFTERS WITH COLLAR TIES AS ATTACHMENT POINTS.
3. MAX RAIL OVERHANG APPLICABLE FOR RAILED ATTACHMENT INSTALLATIONS.



STACKED DETAIL
For Illustration purposes only



STAGGERED DETAIL
For Illustration purposes only



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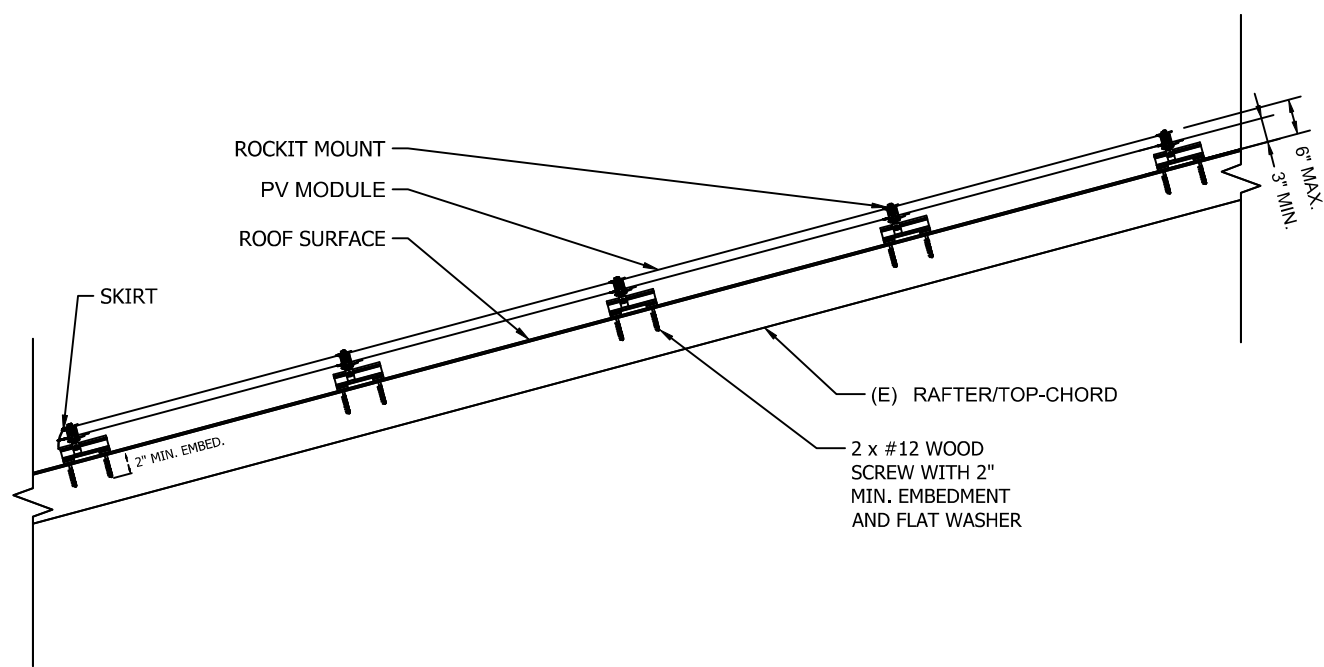
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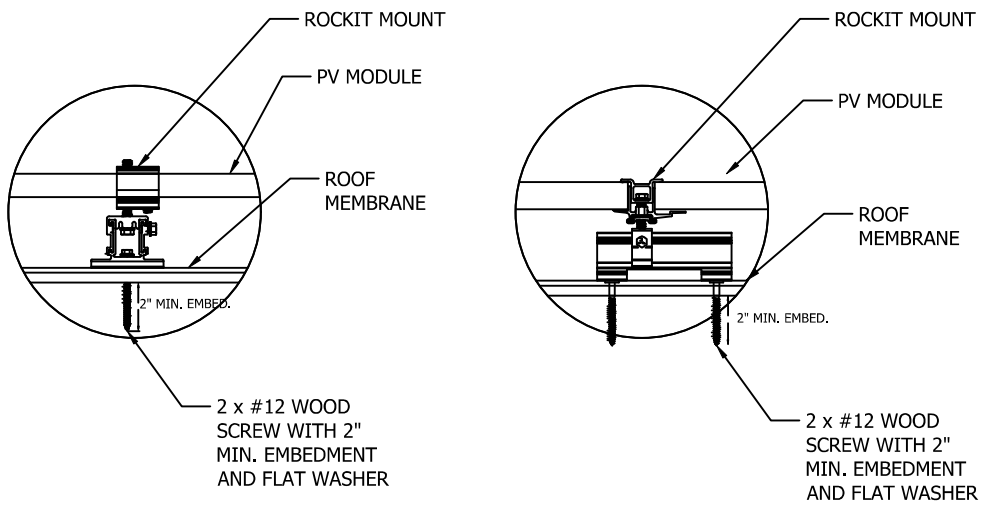
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| MOUNTING DETAILS | | | |
|------------------|-----------|--------------|--------|
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SOLAR PV ARRAY SECTION VIEW
Scale: NTS



ATTACHMENT DETAIL
Scale: NTS

| | | | | | |
|--------------------------------------|---|------|---|--------|----------------|
| BACKFEED FUSE SIZING | | | | | |
| MAX. CONTINUOUS OUTPUT 42.00A @ 240V | | | | | |
| 42.00 | X | 1.25 | = | 53AMPS | 60A FUSES - OK |

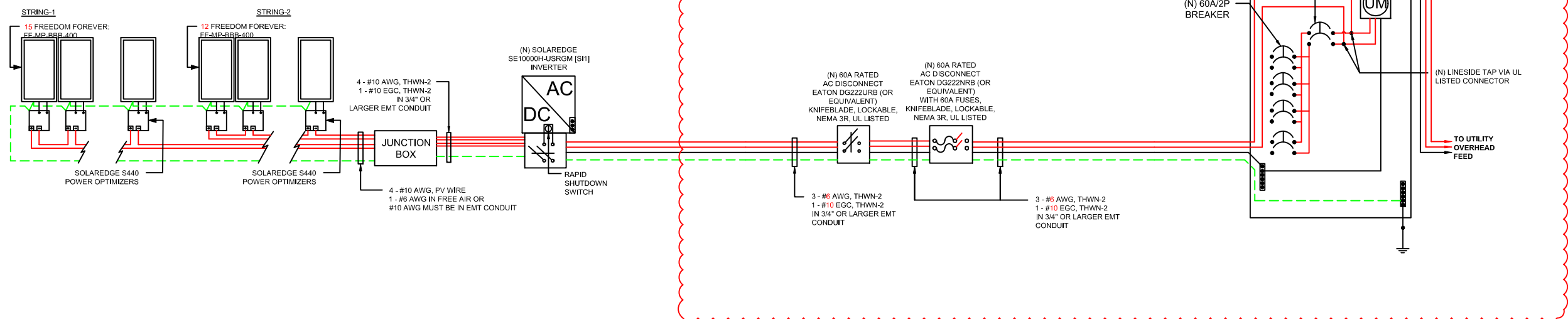
PV SYSTEM
10.800 kW-DC
 10.000 kW-AC

"AC DISCONNECT IS VISIBLE, TAGGABLE, AND 24/7 UTILITY ACCESSIBLE"



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NOTE:
 CONDUIT AND CONDUCTORS SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS

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 INVERTER: SOLAREEDGE SE10000H-USRGM [S11]

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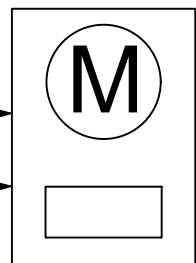
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| | | | |
|--------------------|--------------------|----------------------|----------------|
| THREE LINE DIAGRAM | | | |
| JOB NO: 417788 | DATE: 4/10/2024 | DESIGNED BY: A.P. | SHEET: PV-4 |

WARNING:
POWER SOURCE OUTPUT
CONNECTION
DO NOT RELOCATE THIS
OVERCURRENT DEVICE.

705.12(B)(2)(3)(b)



"WARNING"
DUAL POWER SOURCES
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM
RATED AC OUTPUT CURRENT - 42.00 AMPS
AC NORMAL OPERATING VOLTAGE - 240 VOLTS

690.54

NOTES:

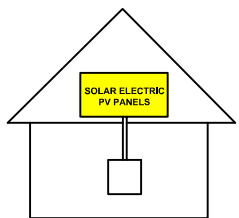
- NEC ARTICLES 690 AND 705 AND IRC SECTION R324 MARKINGS SHOWN HEREON.
- ALL MARKING SHALL CONSIST OF THE FOLLOWING:
 - UV RESISTANT SIGN MATERIAL WITH ENGRAVED OR MACHINE PRINTED LETTERS OR ELECTRO-PLATING.
 - RED BACKGROUND COLOR WHITE TEXT AND LINE WORK.
 - ARIAL FONT.
- ALL SIGNS SHALL BE SIZED APPROPRIATELY AND PLACED IN THE LOCATIONS SPECIFIED. SIGNAGE CANNOT BE HAND-WRITTEN.
- SIGNS SHALL BE ATTACHED TO THE SERVICE EQUIPMENT WITH POP-RIVETS OR SCREWS



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**SOLAR PV SYSTEM EQUIPPED
WITH RAPID SHUTDOWN**

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



690.56(C)(1)(A)

PV METER

PM

AC

PV SYSTEM AC DISCONNECT
RATED AC OUTPUT CURRENT - 42.00 AMPS
AC NORMAL OPERATING VOLTAGE - 240 VOLTS

690.15, 690.54

**RAPID SHUTDOWN SWITCH FOR
SOLAR PV SYSTEM**

690.56(C)(3)

INVERTER

MAXIMUM VOLTAGE V
MAXIMUM CIRCUIT CURRENT A
MAX DC-DC CONVERTER
OUTPUT CURRENT A

"WARNING"
ELECTRICAL SHOCK HAZARD.
TERMINALS ON BOTH LINE AND LOAD SIDES
MAY BE ENERGIZED IN THE OPEN POSITION.

690.13 (B)

PV SYSTEM DC DISCONNECT
MAXIMUM VOLTAGE: 480V
MAXIMUM CIRCUIT CURRENT: 27A
MAX RATED OUTPUT CURRENT OF
THE CONTROLLER OR DC-TO-DC
CONVERTER: 15A

690.53

ARRAY



NEC 690.31(G)(3) & (4)

"WARNING"
PHOTOVOLTAIC POWER SOURCE

EVERY 10' ON CONDUIT AND ENCLOSURES

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INVERTER: SOLAREEDGE SE10000H-USRGM [SH]

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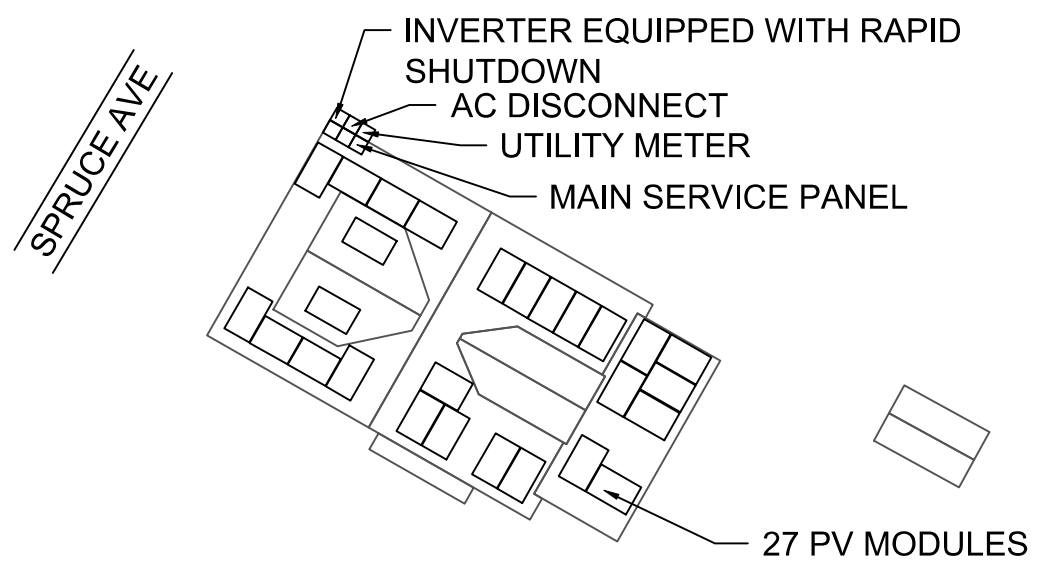
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/140496; MASTER ELECTRICIAN 14190

| LABELS | | | |
|---------|-----------|--------------|--------|
| JOB NO: | DATE: | DESIGNED BY: | SHEET: |
| 417788 | 4/10/2024 | A.P. | PV-7 |

CAUTION:

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM THE FOLLOWING SOURCES WITH DISCONNECTS AS SHOWN



WARNING

TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL



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| SITE PLACARD | | | |
|--------------|-----------|--------------|--------|
| JOB NO: | DATE: | DESIGNED BY: | SHEET: |
| 417788 | 4/10/2024 | A.P. | PV-7A |

NOTES:

1. NEC ARTICLES 690 AND 705 AND IRC SECTION R324 MARKINGS SHOWN HEREON.
2. ALL MARKING SHALL CONSIST OF THE FOLLOWING:
 - A. UV RESISTANT SIGN MATERIAL WITH ENGRAVED OR MACHINE PRINTED LETTERS OR ELECTRO-PLATING.
 - B. RED BACKGROUND COLOR WHITE TEXT AND LINE WORK.
 - C. AERIAL FONT.
3. ALL SIGNS SHALL BE SIZED APPROPRIATELY AND PLACED IN THE LOCATIONS SPECIFIED. SIGNAGE CANNOT BE HAND-WRITTEN.
4. SIGNS SHALL BE ATTACHED TO THE SERVICE EQUIPMENT WITH POP-RIVETS OR SCREWS.

1-10 11-20 21-30 31-40 41-50 51-60

SOLAREEDGE OPTIMIZER CHART

1

2

3

4

5

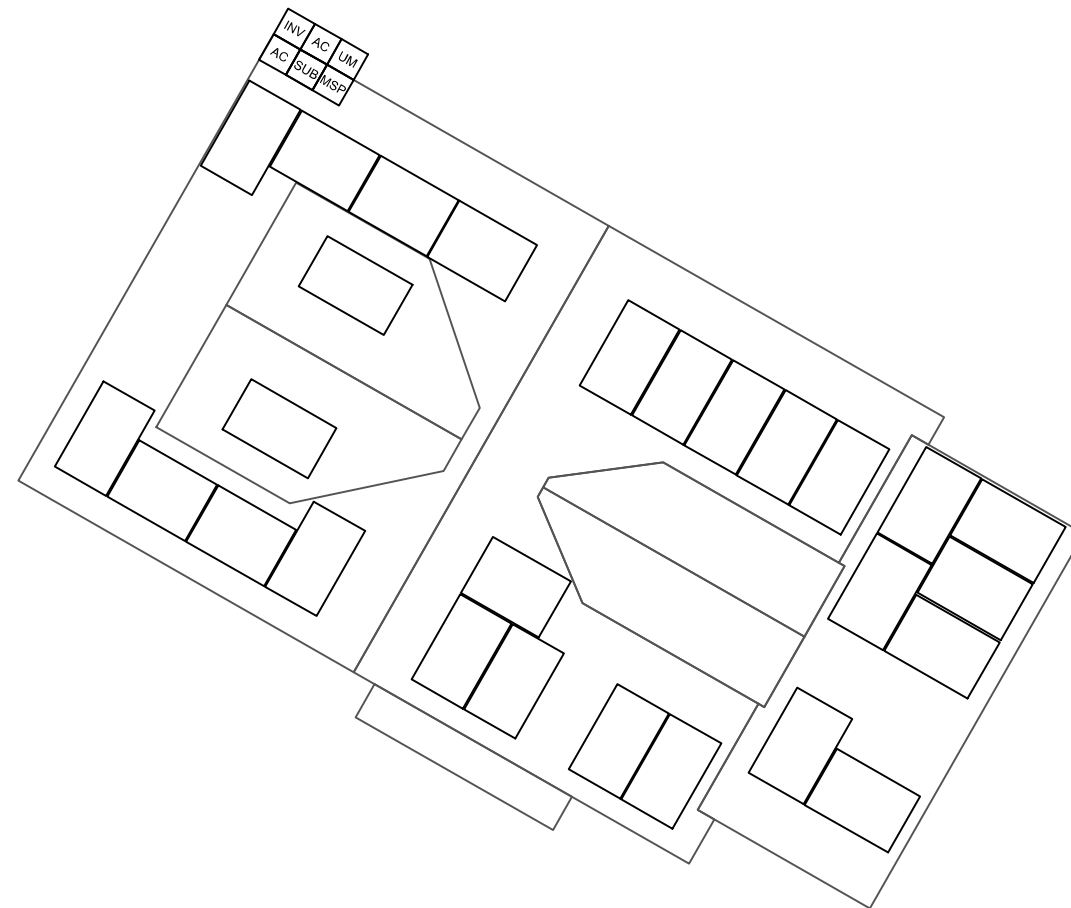
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7

8

9

10



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| OPTIMIZER CHART | | | |
|-----------------|-----------|--------------|--------|
| JOB NO: | DATE: | DESIGNED BY: | SHEET: |
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JOB HAZARD ANALYSIS

Crew leader to fill out all sections below, hold a pre-job safety meeting with all personnel, and upload this completed document and the Safety Plan to Site Capture

Ladder Access

- Ladders must be inspected before each use.
- Extension ladders must be set up on a firm and level surface at a 4-to-1 rise to run angle (or 75 degrees) and the top must be secured to the structure. Extension style ladders placed on uneven, loose or slippery surfaces must additionally have the base firmly anchored or lashed so the base will not slip out.
- Extension ladders must be used with walk-through devices or the ladder must extend 36" above the stepping off point.
- A-frame ladders must only be climbed with the ladder spreader bars locked in the open position; A-frame ladders shall not be climbed while in the closed position (ex, closed and used while leaned against a structure).

Additional notes:

Mobile Equipment

- Only Qualified operators will operate equipment; operators must maintain a certification on their person for the equipment being operated.
- Type(s) of mobile equipment (Type/Make/Model):
- Qualified operator(s):

Material Handling and Storage

- Materials will be staged/stored in a way that does not present a hazard to client, personnel or public. Materials stored on the roof will be physically protect from failing or sliding off.

Fall Protection

- A site-specific plan for fall prevention and protection is required prior to starting work and must remain onsite at all times until work is complete; a fall rescue plan must be outlined and discussed among the crew prior to work start.
- First-person-Up (FPU) must install their anchor and connect before any other task, including installing other anchors. The Last-Person-Down (LPD) must be the only person on a roof uninstalling fall protection.

FPCP (name and title):

FPU and LPD (name and title):

Electrical Safety

- The Electrical Qualified Person (EQP) is required onsite to perform electrical work.
- All electrical work will be performed with equipment in an electrically safe condition (de-energized) unless approval has been granted prior to work.
- Service drops and overhead electrical hazards will be identified and protected from contact, as necessary.

EQP (name and tile):

Public Protection

- The safety of the Client and Public must be maintained at all times.
- The Client and the Public shall be prevented from entering the work zone through the use of barriers and/or signage, as required.
- Company, Client and Public property shall be protected from falling objects.
- Pets (including dogs) shall be secured by their owners prior to work start.
- The Client should not leave pets, family members, or others in charge or care of Employees, Contractors, or Temporary Workers.

Crew leader responsible for communication with the client:

Client and public is excluded from work area by barricades (N/A, Yes, No):

Training and Pre-Job Safety Briefing

- All employees onsite shall be made aware of the specific hazards of this project and review this HJA during a pre-job briefing, and their signature indicates awareness of site conditions and the plan to eliminate any hazards identified prior to and during the project.

Crew leader (name/title):

Crew member (name/title):

Crew member (name/title):

Crew member (name/title):

Crew member (name/title):

Crew member (name/title):

Airborne Contaminants:

- Asbestos-containing (Transite) piping (ACP) - Do not disturb (move, drill, cut fracture, etc.)
- Asbestos-containing thermal insulation (ACI) and Asbestos-containing duct wrapping (ACW) - do not disturb, no attic or crawlspace access is allowed if work to be performed could cause exposure to personnel, client or public.

If yes, list specific tasks and protection in place:

Weather and Environment

- The site supervisor shall forecast the weather conditions at the job site, prior to crew arrival, in order to mitigate any hazards associated with inclement weather (heat, cold, wind, rain, etc.)
- The site supervisor will utilized a portable wind meter (anemometer) to verify actual onsite wind conditions, by checking at the ground and on any elevated work surface (ex, rooftop) prior to work start, at midday and prior to solar panel staging on a roof.
- Elevated work involving the moving or maneuvering of solar panels shall cease at 25mph (sustained wind) until wind subsides.

Forecasted weather maximum temp (degrees f):

Heat Related Illness Prevention

- Employees shall have access to potable drinking water that is fresh, pure, and suitably cool. The water shall be located as close as practicable to the areas where employees are working. Water shall be supplied in sufficient quantity at the beginning of the work shift to provide at least one quart per employee per hour for drinking for the entire shift. Employees may begin the shift with smaller quantities of water if they identify the location and have effective means for replenishment during the shift to allow employees to drink on quart or more per hour. The frequent drinking of water shall be encouraged.
- Shade shall be present when temperature exceeds 80 degrees Fahrenheit. When the outdoor temperature in the work exceeds 80 degrees Fahrenheit, employees shall have and maintain one or more areas with shade at all times.
- New employees must be acclimatized. New employees will be monitored by their Crew Leader (site supervisor) for the first two (2) weeks of employment or longer when necessary.
- Employees will be allowed and encouraged to implement scheduled breaks during each shift. Employees must take cool-down breaks in the shade any time they feel the need to do so to protect them from overheating. Supervisors are REQUIRED to allow employees any break period they need during high heat conditions.
- Cool Vests are encouraged for all employees at all times during periods of high heat.
- Identify the location of the closet Occupational/Industrial Clinic or Hospital in case a crew member becomes ill.

What is the specific plan to provide and replenish sufficient water for all employees on site?

If offsite replenish is necessary, where will you go to replenish water (location/address):

Who will replenish the drinking water (name):

Restroom facilities

- Employees shall have access to restroom facilities with hand-washing stations. Use of onsite restroom is at the client's discretion (location is annotated below). If client does not give permission, location of suitable restroom facilities with hand-washing stations offsite will be provided. The onsite supervisor will identify location and make arrangements to ensure all employees have access at any point.

Restroom facilities will be (circle one): Onsite - Offsite

If Offsite, add location name and address:

Incident Reporting Procedure

- Contact your Site Supervisor

Name:

Phone:

- Contact your Manager

Name:

Phone:

- Contact your Site Supervisor

Name:

Phone:

With: Your full name, phone number, office location, brief description of what happen and when.

NOTE ADDITIONAL HAZARDS NOT ADDRESSED ABOVE

(add as many as necessary by using additional sheets)

| | |
|--------------------|-----------------------------------|
| Define the Hazard: | Method/steps to prevent incident: |
| | |
| Define the Hazard: | Method/steps to prevent incident: |
| | |
| Define the Hazard: | Method/steps to prevent incident: |
| | |
| Define the Hazard: | Method/steps to prevent incident: |
| | |

CLIENT:
SUE WHEATON
7211 SPRUCE AVE, TAKOMA PARK, MD 20912
AHJ: COUNTY OF MONTGOMERY
UTILITY: PEPCO
METER: 1ND350446558
APN: 13-01081455
PHONE: (301) 270-9038
EMAIL: SUEKWHEATON@GMAIL.COM

SYSTEM:
SYSTEM SIZE (DC): 27 X 400 = 10,800 kW
SYSTEM SIZE (AC): 10,000 kW @ 240V
MODULES: 27 X FREEDOM FOREVER:
FF-MP-BBB-400
OPTIMIZERS: 27 X SOLAREEDGE S440
INVERTER: SOLAREEDGE SE10000H-USRGM [S11]

| REVISIONS | | |
|-----------|------------|-----------|
| NO. | REVISED BY | DATE |
| 1 | A.P. | 4/10/2024 |
| - | - | - |
| - | - | - |



FREEDOM FOREVER LLC
5000 THAYER CENTER SUITE C, OAKLAND, MD 21550
Tel: (800) 385-1075
GREG ALBRIGHT

Greg Albright

CONTRACTOR LICENSE:
HOME IMPROVEMENT CONTRACTOR 120928
/140496; MASTER ELECTRICIAN 14190

SAFETY PLAN

| | | | |
|---------|-----------|--------------|--------|
| JOB NO: | DATE: | DESIGNED BY: | SHEET: |
| 417788 | 4/10/2024 | A.P. | PV-10 |

FOR INSTALLATION REFERENCE ONLY

SCAN QR CODE TO ACCESS REFERENCE LINK

FREEDOM REFERENCES



INSTALL HOTLINE

PV INSTALLATION REFERENCES



ENPHASE



SOLAREEDGE



TESLA

BATTERY INSTALLATION REFERENCES



Enphase Storage Systems



SOLAREEDGE Storage Systems



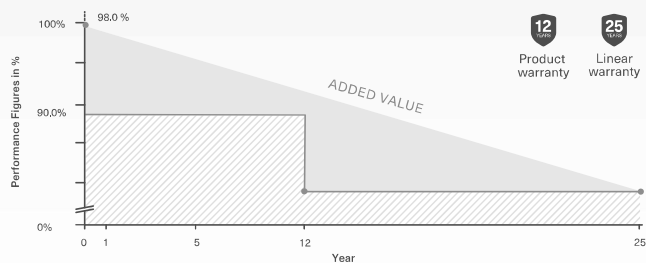
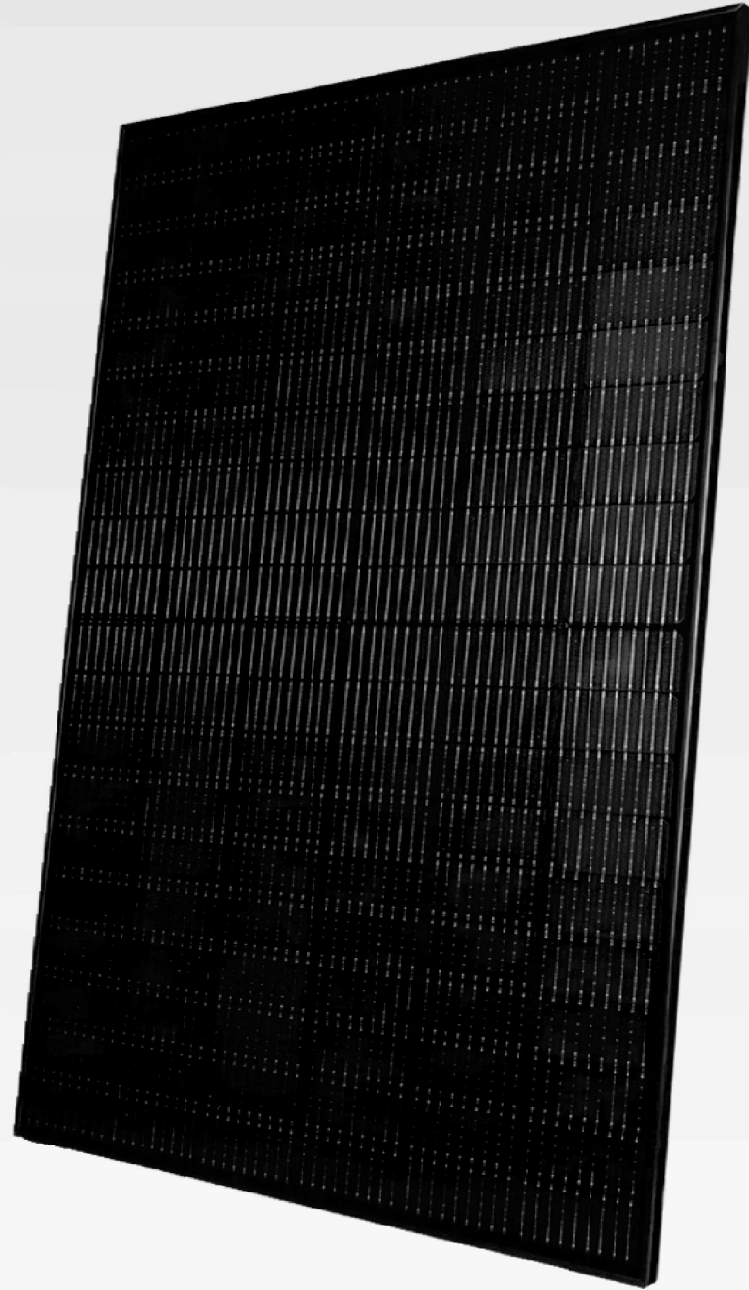
TESLA Storage Systems



NON-BACKUP Battery Systems



Misc. Quick Guide



MODULE SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

| Characteristics | FF-MP-BBB-400 |
|--------------------------------|---|
| Maximum Power (Pmax) | 400W |
| Maximum Power Voltage (Vmp) | 31.01V |
| Maximum Power Current (Imp)[A] | 12.90A |
| Open Circuit Voltage (Voc)[V] | 37.04V |
| Short Circuit Current (Isc)[A] | 13.79A |
| Module Efficiency | 20.48% |
| Power Tolerance | 0/+5W |
| STC | Irradiance of 1000W/m ² , AM1.5, Cell Temperature 25°C |

MECHANICAL CHARACTERISTICS

| | |
|----------------------|---|
| Cell Type | Mono perc, 182 mm-half cells, 108 (6x9+6x9) |
| Weight | 22.1 kgs (48.7 lbs) |
| Dimension | 1722 x 1134 x 35 mm (67.80 x 44.65 x 1.38 in) |
| Front Glass | 3.2 mm (.13 in) |
| Junction Box | IP68 (3 Bypass Diodes) |
| Output Cables | 1200 mm (47.24 in) |
| Connector | Staubli MC4 |
| Frame & Installation | Anodized aluminum profile |

OPERATIONS CHARACTERISTICS

| | |
|-------------------------|------------|
| Operational Temperature | -40°C~+85° |
| Max System Voltage | 1500V |
| Max Series Fuse Rating | 25A |
| Safety Class | Class II |
| Fire Rating | Type 1 |

MECHANICAL LOADING

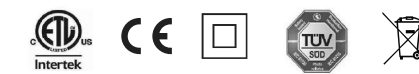
| | |
|-----------------------|----------------------------------|
| Snow Load | 5,400Pa (113lb/ft ²) |
| Rear Side Design Load | 2,400Pa (50lb/ft ²) |

PACKAGING INFORMATION

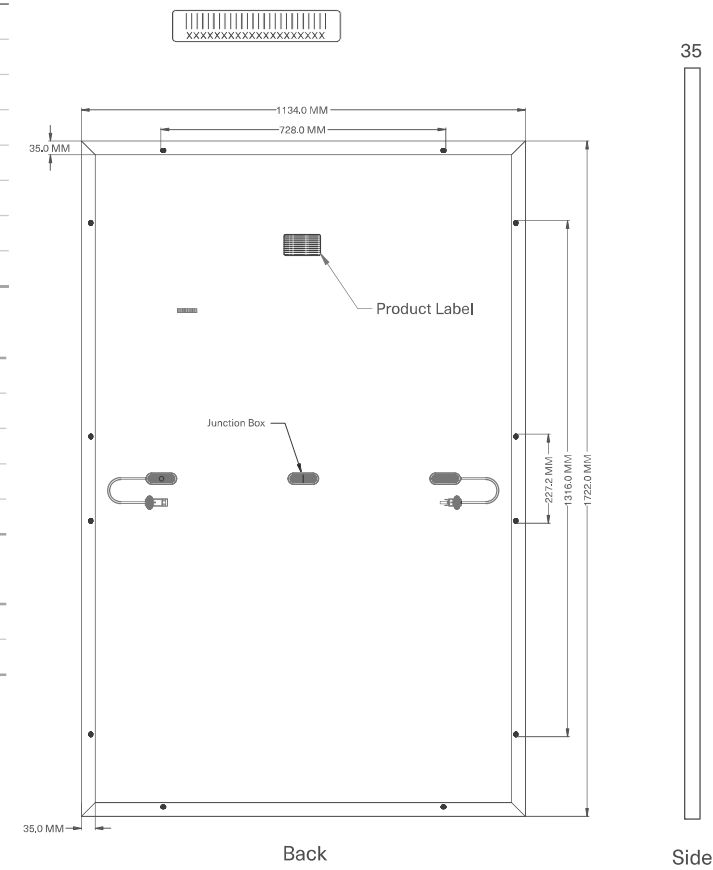
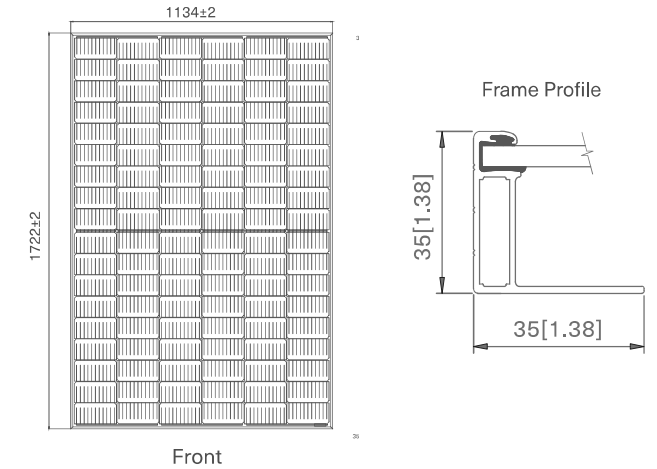
| | 20' GP | 40' HC |
|-----------------------|--|--------|
| Pallets per Container | 6 | 26 |
| Panels per Container | 186 | 806 |
| Panels per Pallet | 31 | 31 |
| Packaging Bon Weight | 679 kg (1497 lbs) | |
| Panels per Pallet | 1785 x 1130 x 1180 mm (70.28 x 44.49 x 46.46 in) | |

TEMPERATURE RATINGS

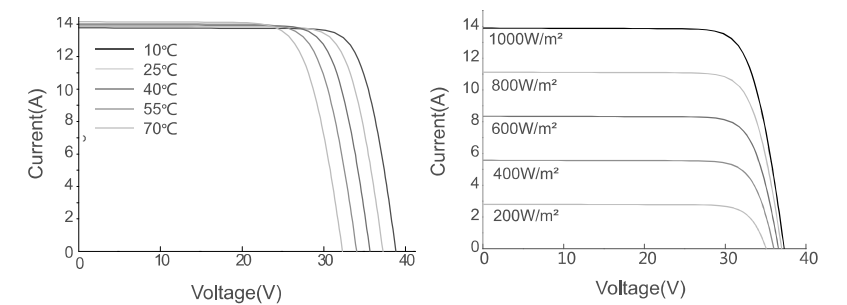
| | |
|---|------------|
| Temperature Coefficient of P _{max} | -0.350%/°C |
| Temperature Coefficient of V _{oc} | -0.275%/°C |
| Temperature Coefficient of I _{sc} | +0.045%/°C |
| Nominal Operating cell Temperature (NOCT) | 42°C±2°C |



UL 61730 | UL 61215 | ISO 9001 | ISO 14001



CURRENT-VOLTAGE CURVE



CERTIFICATE OF COMPLIANCE



This certificate confirms the model(s) for the product listed are in compliance and authorized to bear the Certification Mark(s) shown below when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This document is for use with the Design Light Consortium or California Energy Commission application only.

Basic Listee: PT IDN SOLAR TECH
Address: KOMPLEK KABIL INDONUSA ESTATE, BLOK A NOMOR 19B, BATU BESAR, Batam
Country: Indonesia

Multiple Listee: Freedom Forever Procurement LLC
Address: 43445 Business Park Drive, Suite 110, Temecula, CA 92590
Country: USA

Party Authorized to Apply Label: PT IDN SOLAR TECH
Report Issuing Office: Intertek Testing Services Shanghai Limited

Control Number: 5019087 **Authorized by:** *Jordan Hobbert*
 for L. Matthew Snyder, Certification Manager

VALID LISTING MARKS



This Certificate of Compliance is for the exclusive use of Intertek's Client and is provided pursuant to the Certification Agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the Agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the Agreement, for any loss, expense or damage occasioned by the use of this Certificate. Only the Client is authorized to permit copying or distribution of this Certificate and then only in its entirety. Use of Intertek's Certification mark is restricted to the conditions laid out in the Agreement and in this Certificate. Any further use of the Intertek name for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. Initial Factory Assessments and Follow up Services are for the purpose of assuring appropriate usage of the Certification mark in accordance with the Agreement, they are not for the purposes of production quality control and do not relieve the Client of their obligations in this respect.

Intertek Testing Services NA Inc.
 545 East Algonquin Road, Arlington Heights, IL 60005
 Telephone 800-345-3851 or 847-439-5667

| | |
|---------------------|--|
| Standard(s): | Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction [UL 61730-1:2017 Ed.1+R:30Apr2020] |
| | Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction [CSA C22.2#61730-1:2019 Ed.2] |
| | Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing [UL 61730-2:2017 Ed.1+R:30Apr2020] |

CERTIFICATE OF COMPLIANCE



| | | |
|--------------------|---|--|
| | Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing [CSA C22.2#61730-2:2019 Ed.2] | |
| | Terrestrial Photovoltaic (Pv) Modules - Design Qualification And Type Approval - Part 1: Test Requirements [UL 61215-1:2017 Ed.1] | |
| | Terrestrial Photovoltaic (PV) Modules - Design Qualification And Type Approval - Part 1-1: Special Requirements For Testing of Crystalline Silicon Photovoltaic (PV) Modules [UL 61215-1-1:2017 Ed.1] | |
| | Terrestrial Photovoltaic (Pv) Modules - Design Qualification And Type Approval - Part 2: Test Procedures[UL 61215-2:2017 Ed.1] | |
| Product: | Crystalline Silicon Photovoltaic (PV) Modules | |
| Brand Name: | Freedom Forever | |
| Models: | MULTIPLE LISTEE 12 MODELS | BASIC LISTEE MODELS |
| | FF-MP-BBB- followed by 365, 370, 375 or 380. FF-MP-BBB- followed by 395, 400, 405 or 410. | NUSA120H- followed by 365, 370, 375 or 380; followed by MB. NUSA108H- followed by 395, 400, 405 or 410; followed by MB. |

SolarEdge Home Wave Inverter For North America

SE3800H-US / SE5000H-US / SE6000H-US /
SE7600H-US / SE10000H-US / SE11400H-US



INVERTERS

Optimized installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking 99% weighted efficiency
- Quick and easy inverter commissioning directly from a smartphone using SolarEdge SetApp
- Fixed voltage inverter for longer strings
- Integrated arc fault protection and rapid shutdown for NEC 2014-2023 per articles 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Small, lightweight, and easy to install both outdoors or indoors
- Built-in module-level monitoring
- Optional: Faster installations with built-in consumption metering (1% accuracy) and production revenue grade metering (0.5% accuracy, ANSI C12.20)

/ SolarEdge Home Wave Inverter For North America

SE3800H-US / SE5000H-US / SE6000H-US /
SE7600H-US / SE10000H-US / SE11400H-US

| Applicable to inverters with part number | SEXXXXH-XXXXBXX4 | | | | | SE11400H-XXXXBXX5 | Units |
|---|---------------------------------|------------|----------------------------|------------|-------------|------------------------------|-------|
| | SE3800H-US | SE5000H-US | SE6000H-US | SE7600H-US | SE10000H-US | SE11400H-US | |
| OUTPUT | | | | | | | |
| Rated AC Power Output | 3800 @ 240V 3300 @ 208V | 5000 | 6000 @ 240V 5000 @ 208V | 7600 | 10000 | 11400 @ 240V 10000 @ 208V | VA |
| Maximum AC Power Output | 3800 @ 240V 3300 @ 208V | 5000 | 6000 @ 240V 5000 @ 208V | 7600 | 10000 | 11400 @ 240V 10000 @ 208V | VA |
| AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Vac |
| AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229) | ✓ | - | ✓ | - | - | ✓ | Vac |
| AC Frequency (Nominal) | 59.3 - 60 - 60.5 ⁽¹⁾ | | | | | | Hz |
| Maximum Continuous Output Current @240V | 16 | 21 | 25 | 32 | 42 | 47.5 | A |
| Maximum Continuous Output Current @208V | 16 | - | 24 | - | - | 48.5 | A |
| Power Factor | 1, Adjustable - 0.85 to 0.85 | | | | | | |
| GFDI Threshold | 1 | | | | | | A |
| Utility Monitoring, Islanding Protection, Country Configurable Thresholds | Yes | | | | | | |
| INPUT | | | | | | | |
| Maximum DC Power @240V | 5900 | 7750 | 9300 | 11800 | 15500 | 17650 | W |
| Maximum DC Power @208V | 5100 | - | 7750 | - | - | 15500 | W |
| Transformer-less, Ungrounded | Yes | | | | | | |
| Maximum Input Voltage | 480 | | | | | | Vdc |
| Nominal DC Input Voltage | 380 | | | | | | Vdc |
| Maximum Input Current @240V ⁽²⁾ | 10.5 | 13.5 | 16.5 | 20 | 27 | 30.5 | Adc |
| Maximum Input Current @208V ⁽²⁾ | 9 | - | 13.5 | - | - | 27 | Adc |
| Max. Input Short Circuit Current | 45 | | | | | | Adc |
| Reverse-Polarity Protection | Yes | | | | | | |
| Ground-Fault Isolation Detection | 600k Sensitivity | | | | | | |
| Maximum Inverter Efficiency | 99.2 | | | | | | % |
| CEC Weighted Efficiency | 99 | | | | | 99 @ 240V 98.5 @ 208V | % |
| Nighttime Power Consumption | < 2.5 | | | | | | W |

(1) For other regional settings please contact SolarEdge support.

(2) A higher current source may be used; the inverter will limit its input current to the values stated.

/ SolarEdge Home Wave Inverter

For North America

SE3800H-US / SE5000H-US / SE6000H-US/

SE7600H-US / SE10000H-US / SE11400H-US

| Applicable to inverters with part number | SEXXXXH-XXXXXXBXX4 | | | | | SE11400H-XXXXXXBXX5 | | |
|---|---|-------------|-------------|---|---|---------------------|-----|---------|
| | SE3800H-US | SE5000H-US | SE6000H-US | SE7600H-US | SE10000H-US | SE11400H-US | | |
| ADDITIONAL FEATURES | | | | | | | | |
| Supported Communication Interfaces | RS485, Ethernet, ZigBee (optional), wireless SolarEdge Home Network (optional) ⁽³⁾ , Wi-Fi (optional), Cellular (optional) | | | | | | | |
| Revenue Grade Metering, ANSI C12.20 | Optional ⁽⁴⁾ | | | | | | | |
| Consumption Metering | | | | | | | | |
| Inverter Commissioning | With the SetApp mobile application using Built-in Wi-Fi Access Point for Local Connection | | | | | | | |
| Rapid Shutdown - NEC 2014-2023 per articles 690.11 and 690.12 | Automatic Rapid Shutdown upon AC Grid Disconnect | | | | | | | |
| STANDARD COMPLIANCE | | | | | | | | |
| Safety | UL1741, UL1741 SA, UL1741 SB, UL1699B, CSA C22.2, Canadian AFCI according to T.I.L. M-07 | | | | | | | |
| Grid Connection Standards | IEEE1547-2018, Rule 21, Rule 14 (H), CSA C22.3 No. 9 | | | | | | | |
| Emissions | FCC Part 15 Class B | | | | | | | |
| INSTALLATION SPECIFICATIONS | | | | | | | | |
| AC Output Conduit Size / AWG Range | 1" Maximum / 14 – 6 AWG | | | 1" Maximum / 14 – 4 AWG | | | | |
| DC Input Conduit Size / # of Strings / AWG Range | 1" Maximum / 1 – 2 strings / 14 – 6 AWG | | | 1" Maximum / 1 – 3 strings / 14 – 6 AWG | | | | |
| Dimensions with Safety Switch (H x W x D) | 17.7 x 14.6 x 6.8 / 450 x 370 x 174 | | | 21.06 x 14.6 x 7.3 / 535 x 370 x 185 | 21.06 x 14.6 x 8.2 / 535 x 370 x 208 ⁽⁵⁾ | in / mm | | |
| Weight with Safety Switch | 22 / 10 | 25.1 / 11.4 | 26.2 / 11.9 | 38.8 / 17.6 | 44.9 / 20.4 ⁽⁵⁾ | lb / kg | | |
| Noise | < 25 | | | < 50 | | | dBA | |
| Cooling | Natural Convection | | | | | | | |
| Operating Temperature Range | -40 to +140 / -40 to +60 ⁽⁶⁾ | | | | | | | °F / °C |
| Protection Rating | NEMA 4X (Inverter with Safety Switch) | | | | | | | |

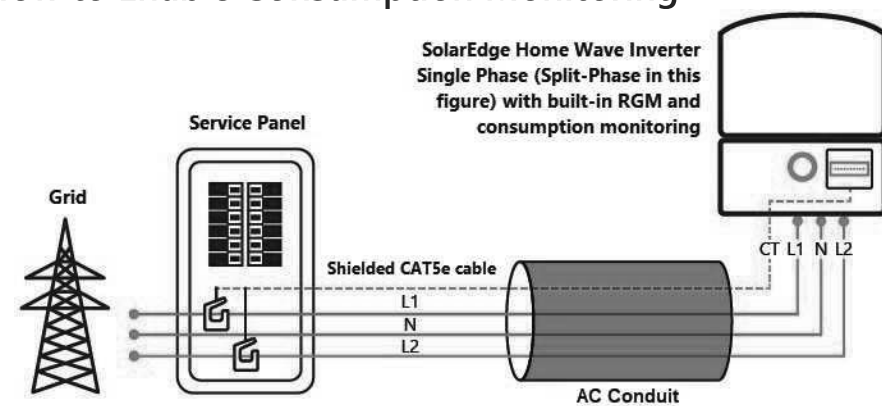
(3) For more information, refer to the [SolarEdge Home Network](#) datasheet

(4) Inverter with Revenue Grade Production and Consumption Meter P/N: SExxxxH-US000BE4. For consumption metering, current transformers should be ordered separately: SEACT0750-400NA-20 or SEACT0750-400NA-20, 20 units per box.

(5) SE11400H-USxxxBxx5 is the updated PN, though SE11400H-USxxxBxx4 will still be available. All specifications are similar for both models. **EXCLUDING** the weight and dimensions [HxWxD]; The weight and dimensions of SE11400H-USxxxBxx4 are 17.6 [kg] and 21.06-14.6-7.3 / 535-370-185 [in/mm], accordingly.

(6) Full power up to at least 50°C / 122°F; for power de-rating information refer to the [Temperature De-rating Technical Note for North America](#).

How to Enable Consumption Monitoring



By simply wiring current transformers through the inverter's existing AC conduits and connecting them to the service panel, homeowners will gain full insight into their household energy usage helping them to avoid high electricity bills.

Power Optimizer

For North America

S440, S500



POWER OPTIMIZER

PV power optimization at the module level

- Specifically designed to work with SolarEdge residential inverters
- Faster installations with simplified cable management and easy assembly using a single bolt
- Detects abnormal PV connector behavior, preventing potential safety issues*
- Flexible system design for maximum space utilization
- Module-level voltage shutdown for installer and firefighter safety
- Compatible with bifacial PV modules
- Superior efficiency (99.5%)
- Meets NEC requirements for arc fault protection (AFCI) and Photovoltaic Rapid Shutdown System (PVRSS)
- Mitigates all types of module mismatch loss, from manufacturing tolerance to partial shading

* Expected availability in 2022

solaredge.com



/ Power Optimizer

For North America

S440, S500

| | S440 | S500 | Unit |
|---|---|------|---------|
| INPUT | | | |
| Rated Input DC Power ⁽¹⁾ | 440 | 500 | W |
| Absolute Maximum Input Voltage (Voc) | 60 | | Vdc |
| MPPT Operating Range | 8 - 60 | | Vdc |
| Maximum Short Circuit Current (Isc) of Connected PV Module | 14.5 | 15 | Adc |
| Maximum Efficiency | 99.5 | | % |
| Weighted Efficiency | 98.6 | | % |
| Ovenvoltage Category | II | | |
| OUTPUT DURING OPERATION | | | |
| Maximum Output Current | 15 | | Adc |
| Maximum Output Voltage | 60 | | Vdc |
| OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM INVERTER OR INVERTER OFF) | | | |
| Safety Output Voltage per Power Optimizer | 1+/-0.1 | | Vdc |
| STANDARD COMPLIANCE | | | |
| Photovoltaic Rapid Shutdown System | NEC 2014, 2017 & 2020 | | |
| EMC | FCC Part 15 Class B, IEC61000-6-2, IEC61000-6-3 | | |
| Safety | IEC62109-1 (class II safety), UL1741 | | |
| Material | UL94 V-0, UV Resistant | | |
| RoHS | Yes | | |
| Fire Safety | VDE-AR-E 2100-712:2013-05 | | |
| INSTALLATION SPECIFICATIONS | | | |
| Maximum Allowed System Voltage | 1000 | | Vdc |
| Dimensions (W x L x H) | 129 x 153 x 30 / 5.07 x 6.02 x 1.18 | | mm / in |
| Weight (including cables) | 655 / 1.5 | | gr / lb |
| Input Connector | MC4 ⁽²⁾ | | |
| Input Wire Length | 0.1 / 0.32 | | m / ft |
| Output Connector | MC4 | | |
| Output Wire Length | (+) 2.3, (-) 0.10 / (+) 7.54, (-) 0.32 | | m / ft |
| Operating Temperature Range ⁽³⁾ | -40 to +85 | | °C |
| Protection Rating | IP68 / Type6B | | |
| Relative Humidity | 0 - 100 | | % |

(1) Rated power of the module at STC will not exceed the power optimizer Rated Input DC Power. Modules with up to +5% power tolerance are allowed

(2) For other connector types please contact SolarEdge

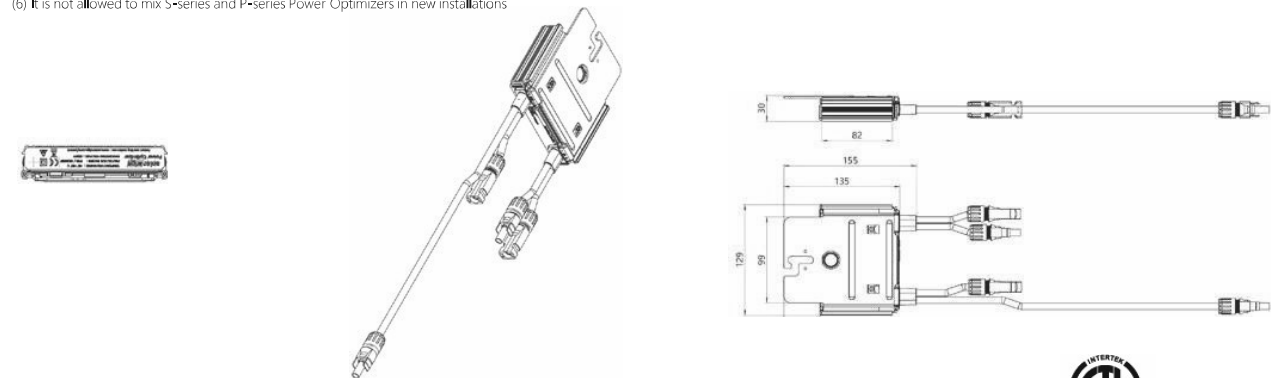
(3) For ambient temperature above +70°C / +158°F power de-rating is applied. Refer to Power Optimizers Temperature De-Rating Technical Note for more details

| PV System Design Using a SolarEdge Inverter | Single Phase HD-Wave | Three Phase for 208V grid | Three Phase for 277/480V grid | |
|---|--------------------------------------|---|-------------------------------|----|
| Minimum String Length (Power Optimizers) | S440, S500 | 8 | 14 | 18 |
| Maximum String Length (Power Optimizers) | 25 | | 50 ⁽⁴⁾ | |
| Maximum Nominal Power per String | 5700 (6000 with SE7600-US-SE11400-U) | 6000 | 12750 | W |
| Maximum Allowed Connected Power per String ⁽⁵⁾ (Permitted only when the difference in connected power between strings is 1,000W or less) | Refer to Footnote 5 | One String 7200W Two strings or more 7800W | 15,000W | |
| Parallel Strings of Different Lengths or Orientations | Y | | | |

(4) A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement

(5) If the inverters rated AC power < maximum nominal power per string, then the maximum power per string will be able to reach up to the inverters maximum input DC power. Refer to: <https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf>

(6) It is not allowed to mix S-series and P-series Power Optimizers in new installations



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RoHS

35

Product specifications

Eaton DG222URB

Catalog Number: DG222URB

Eaton General duty non-fusible safety switch, single-throw, 60 A, NEMA 3R, Rainproof, Painted galvanized steel, Two-pole, Two-wire, 240 V

General specifications

| | |
|--|---|
| Product Name | Catalog Number |
| Eaton general duty non-fusible safety switch | DG222URB |
| | UPC |
| | 782113144238 |
| Product Length/Depth | Product Height |
| 7.38 in | 14.38 in |
| Product Width | Product Weight |
| 8.69 in | 9 lb |
| Warranty | Certifications |
| Eaton Selling Policy 25-000, one (1) year from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first. | UL Listed |
| | Catalog Notes |
| | WARNING! Switch is not approved for service entrance unless a neutral kit is installed. |



Product specifications

| |
|----------------------------|
| Product Category |
| General duty safety switch |
| Enclosure material |
| Painted galvanized steel |
| Type |
| Non-fusible, single-throw |
| Fuse configuration |
| Non-fusible |
| Number of wires |
| 2 |
| Enclosure |
| NEMA 3R |
| Voltage rating |
| 240V |
| Amperage Rating |
| 60A |
| Number Of Poles |
| Two-pole |

Resources

| |
|--|
| Catalogs |
| Eaton's Volume 2—Commercial Distribution |
| Multimedia |
| Double Up on Safety |
| Switching Devices Flex Center |
| Specifications and datasheets |
| Eaton Specification Sheet - DG222URB |
| Warranty guides |
| Selling Policy 25-000 - Distribution and Control Products and Services |



Eaton Corporation plc
Eaton House
30 Pembroke Road
Dublin 4, Ireland
Eaton.com
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Eaton.com/socialmedia

Product specifications

Eaton DG222NRB

Catalog Number: DG222NRB

Eaton General duty cartridge fuse safety switch, 60 A, NEMA 3R, Painted galvanized steel, Class H fuses, Fusible with neutral, Two-pole, Three-wire, Category: general duty safety switch, 240 V

General specifications

| | |
|--|--|
| Product Name | Catalog Number |
| Eaton general duty cartridge fuse safety switch | DG222NRB |
| | UPC |
| | 782113144221 |
| Product Length/Depth | Product Height |
| 7.35 in | 14.37 in |
| Product Width | Product Weight |
| 8.4 in | 10 lb |
| Warranty | Certifications |
| Eaton Selling Policy 25-000, one (1) year from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first. | UL Listed |
| | Catalog Notes |
| | Maximum hp ratings apply only when dual element fuses are used. 3-Phase hp rating shown is a grounded B phase rating, UL listed. |



Physical Attributes

Enclosure
NEMA 3R

Enclosure material
Painted galvanized steel

Fuse configuration
Fusible with neutral

Number Of Poles
Two-pole

Number of wires
3

Type
General duty, cartridge fused

Performance Ratings

Amperage Rating
60A

Fuse class provision
Class H fuses

Voltage rating
240V

Miscellaneous

Product Category
General duty safety switch

Resources

Catalogs
Eaton's Volume 2—Commercial Distribution

Multimedia
Double Up on Safety
Switching Devices Flex Center

Specifications and datasheets
Eaton Specification Sheet - DG222NRB

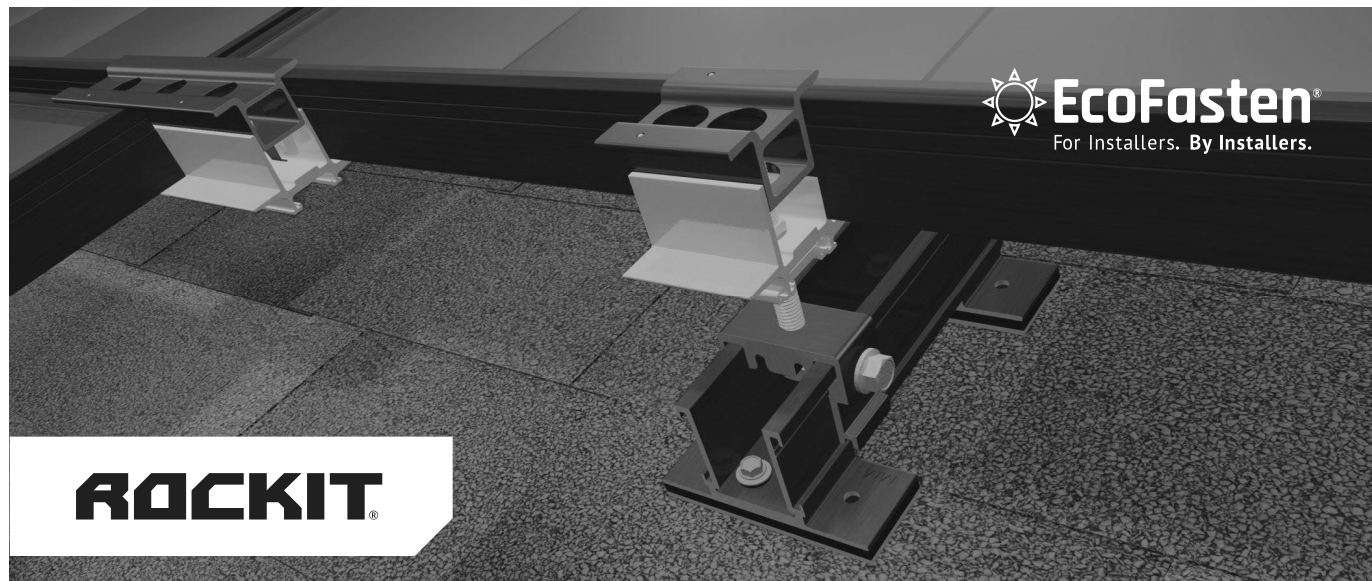


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ROCKIT SMART SLIDE

Integrated UltraGrip Technology™

Pre-installed sealing pads are compatible with all composition shingle roofs. The compression achieved when fastened to the roof creates a super strong watertight seal. In most cases, the slide can be mounted to the deck without the need for sealant. A layer of flexible foam provides cushioning, which allows the waterproofing sealant to embed deep into the granules of the shingle as well as to flexibly conform over the steps found on architectural-style shingles.



ROCKIT

INTRODUCING ROCKIT SMART SLIDE!

Introducing EcoFasten's patent pending RockIt Smart Slide, our simple solution for quickly installing the popular RockIt rail-less racking system to composition shingle roofs.

Features & Benefits

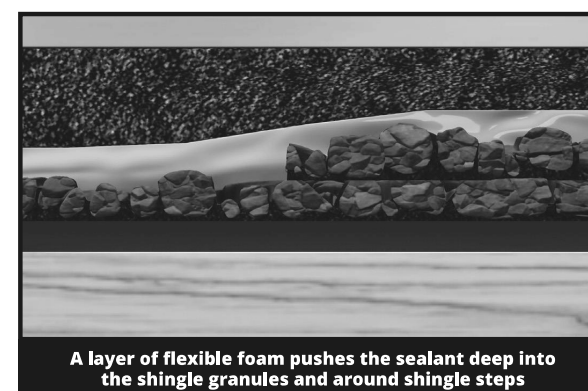
- Eliminates the need to pry up shingle courses and install a metal flashing
- Multiple opportunities to find the rafter
- No need for additional material when architectural shingles are not level
- Longer 6.75" slide avoids overlaps in shingle courses
- Integrated flashing utilizes UltraGrip Technology™ to create a watertight seal



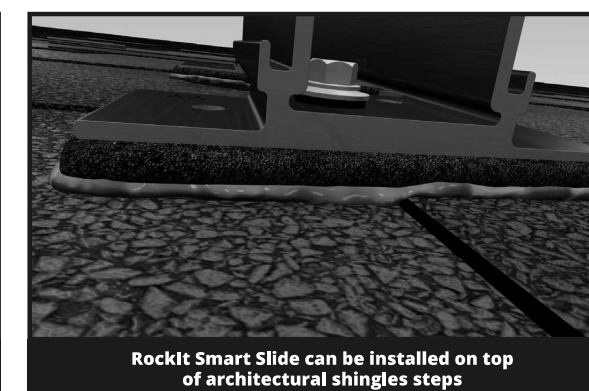
ROCKIT SMART SLIDE

Required Components:

| Part Number: | Description: |
|--------------|---------------------------|
| 2011024 | RI SMART SLIDE BLK 6.75" |
| 2011025 | RI SMART SCRW #12X3" W/BW |



A layer of flexible foam pushes the sealant deep into the shingle granules and around shingle steps



RockIt Smart Slide can be installed on top of architectural shingles steps

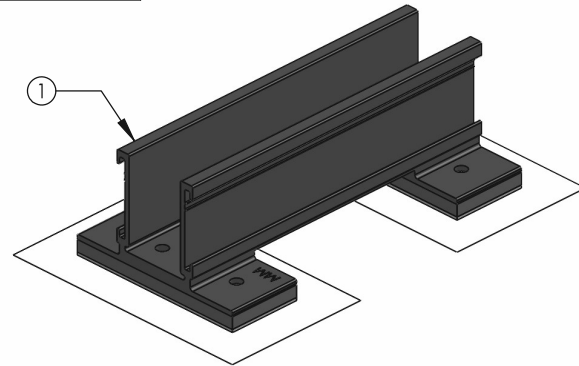
Testing & Documentation

- [UL441 Rain Report](#)
- [TAS 100 \(A\)-95 Wind and Wind Driven Rain Resistance](#)
- [Mechanical Load Test/Structural Capacity Certification](#)
- [Florida Product Approval](#)
- [RockIt Installation Manual](#)
- [RockIt CutSheets](#)



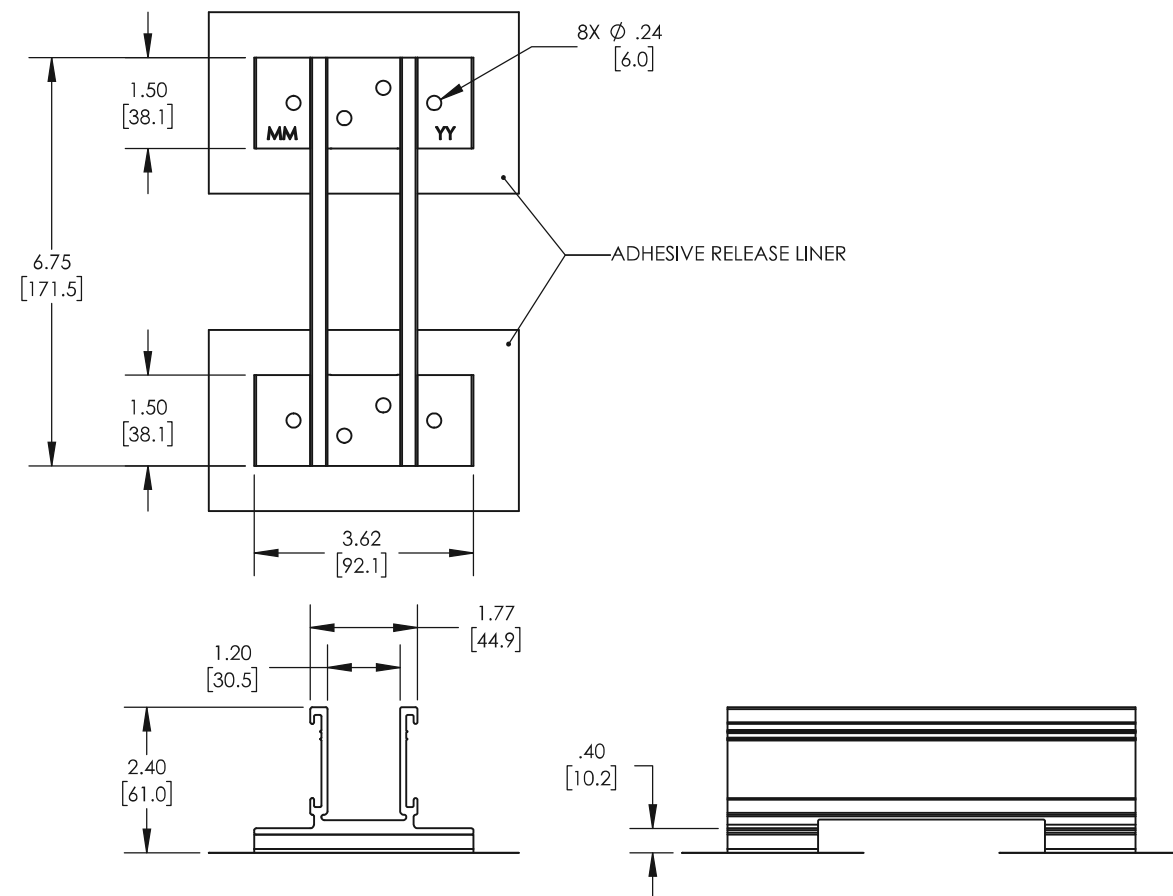
RI SMART SLIDE BLK 6.75"

| PART NUMBER | DESCRIPTION |
|-------------|--------------------------|
| 2011024 | RI SMART SLIDE BLK 6.75" |



| ITEM NO. | DESCRIPTION |
|----------|-----------------------------|
| 1 | ROCKIT SMART SLIDE ASSEMBLY |

1) ROCKIT FLASHLESS SLIDE ASSEMBLY

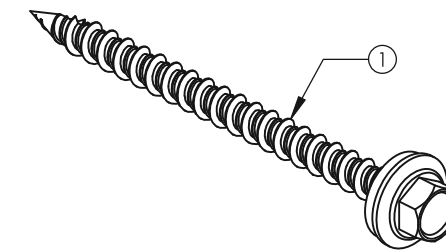


| | |
|----------|---|
| MATERIAL | ALUMINUM, EPDM, ADHESIVE, TREATED PAPER |
| FINISH | BLACK |

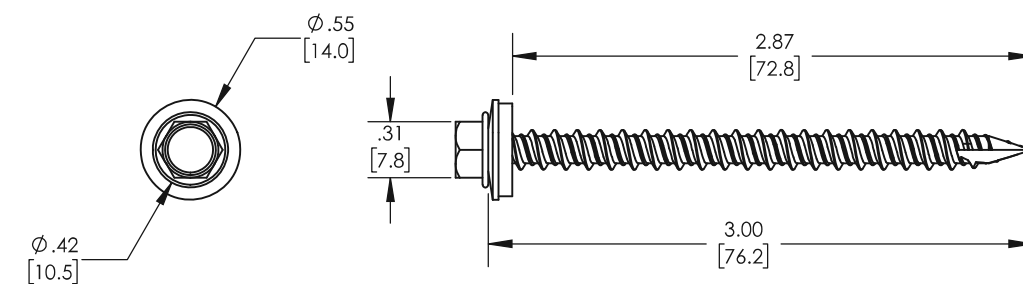
Rev: CS-3

RI SMART SCREW #12X3" W/BW

| PART NUMBER | DESCRIPTION |
|-------------|----------------------------|
| 2011025 | RI SMART SCREW #12X3" W/BW |



| ITEM NO. | DESCRIPTION |
|----------|---|
| 1 | SELF TAPPING SCREW #12 WITH SEALING WASHER ASSEMBLY |



| | |
|----------|------------------------------|
| MATERIAL | STAINLESS STEEL, EPDM RUBBER |
| FINISH | MILL, BLACK |

Rev: CS-2

August 2, 2023

EcoFasten
4141 West Van Buren St.
Phoenix, AZ 85009

Attn.: EcoFasten Solar Engineering Department

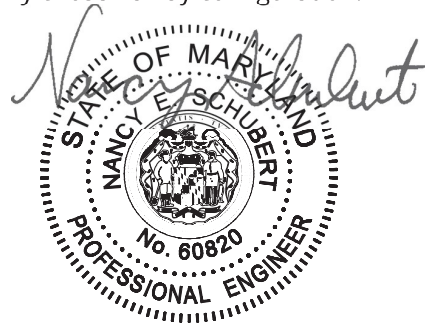
Re: EcoFasten *RockIt System, with Comp Slide or Smart Slide*, Engineering Certification for Gable and Hip roofs.

This letter addresses the structural performance and code compliance of EcoFasten's RockIt Flush Mount System. The contents of the letter shall be reviewed in its entirety before application to any project design. The RockIt System is a proprietary rooftop mounting system used to support photovoltaic (PV) modules installed in portrait or landscape orientation and set parallel to the underlying roof surface. PV modules are supported by extruded aluminum RockIt Mount assemblies which are connected to a RockIt roof attachment, either the RockIt Comp Slide or RockIt Smart Slide, which is attached directly to the roof structure. Assembly details of a typical RockIt system and its core components are shown in Exhibit ECO 1.0. The RockIt Comp Slide assembly is shown in drawing EX-1 and the RockIt Smart Slide assembly is shown in drawing 850076. The EcoFasten RockIt System is designed and certified to the structural requirements of the reference standards listed below, for the load conditions and configurations tabulated in the attached span tables.

- Minimum Design Loads for Buildings and Other Structures, ASCE/SEI 7-16
- 2021 International Building Code, by the International Code Council, Inc.
- 2021 International Residential Code, by the International Code Council, Inc.
- Maryland Building Performance Standards (COMAR 09.12.51)
- SEAOC (Structural Engineer Association of California) report PV2-2017 Wind Design for Solar Arrays
- Aluminum Design Manual 2015, by The Aluminum Association, Inc.
- NDS-2018, National Design Specification for Wood Construction, by the American Wood Council

The span tables provided in this letter are certified based on the structural performance of EcoFasten RockIt System in conjunction with RockIt Comp Slide or Smart Slide only, with no consideration of the structural adequacy of the PV modules, or the underlying roof supporting members. The certified capacities in these tables shall be used when all EcoFasten provided components are installed with no generic replacement parts. These tables are intended to be used under the responsible charge of a registered design professional where required by the authority having jurisdiction. It is the responsibility of the installer or system designer to verify the structural capacity and adequacy of the system components regarding the applied or resultant loads of any chosen array configuration.

Sincerely,



Nancy Elaine Schubert, PE

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. 60820, License Expiration Date: 3/27/2025.

Shade Report - Sue Wheaton

Customer
Sue Wheaton

Designer
Katherine Garcia

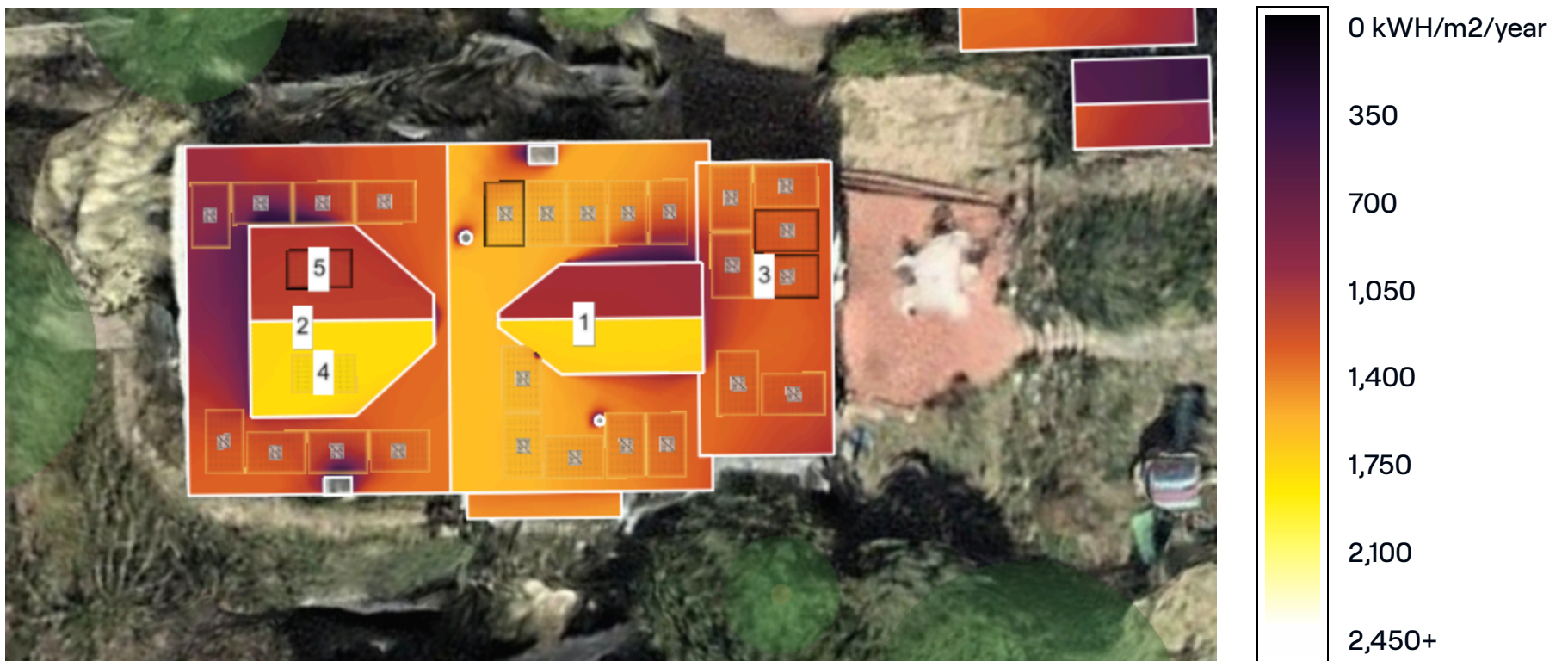
Organization
Freedom Forever

Address
7211 Spruce Ave, Takoma Park, MD
20912, USA, Takoma Park, MD 20912

Coordinates
38.9764229, -77.0102275

Date
5/8/2024

Annual irradiance



Summary

| Array ID | Panel count | Azimuth | Pitch | Annual TOF | Annual solar access | Annual TSPF |
|----------------------------------|-------------|---------|-------|------------|---------------------|-------------|
| 1 | 10 | 120° | 24° | 91% | 84% | 76% |
| 2 | 8 | 300° | 24° | 73% | 79% | 58% |
| 3 | 7 | 120° | 12° | 89% | 75% | 67% |
| 4 | 1 | 210° | 27° | 96% | 97% | 93% |
| 5 | 1 | 30° | 27° | 64% | 93% | 60% |
| Weighted average by panel count: | | | | | 81% | 68.4% |

Monthly solar access % across arrays

| Array ID | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 70 | 78 | 78 | 87 | 91 | 92 | 92 | 88 | 83 | 79 | 70 | 67 |
| 2 | 72 | 73 | 77 | 81 | 82 | 83 | 83 | 82 | 79 | 74 | 72 | 71 |

Shade Report - Sue Wheaton

Customer
Sue Wheaton

Designer
Katherine Garcia

Organization
Freedom Forever

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Coordinates
38.9764229, -77.0102275

Date
5/8/2024

| Array ID | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 3 | 56 | 71 | 71 | 78 | 81 | 83 | 84 | 80 | 73 | 72 | 60 | 47 |
| 4 | 97 | 96 | 97 | 98 | 97 | 96 | 97 | 98 | 98 | 97 | 98 | 96 |
| 5 | 89 | 87 | 88 | 94 | 95 | 95 | 95 | 96 | 89 | 90 | 91 | 91 |

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Sue Wheaton

Designer
Katherine Garcia

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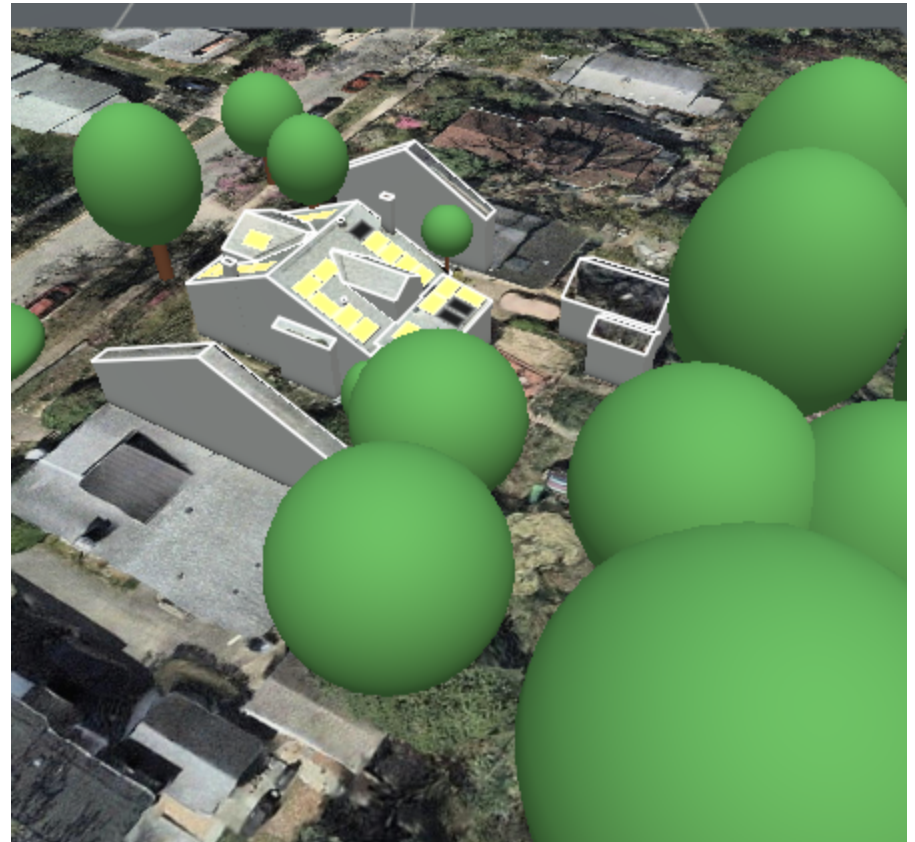
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Date
5/8/2024

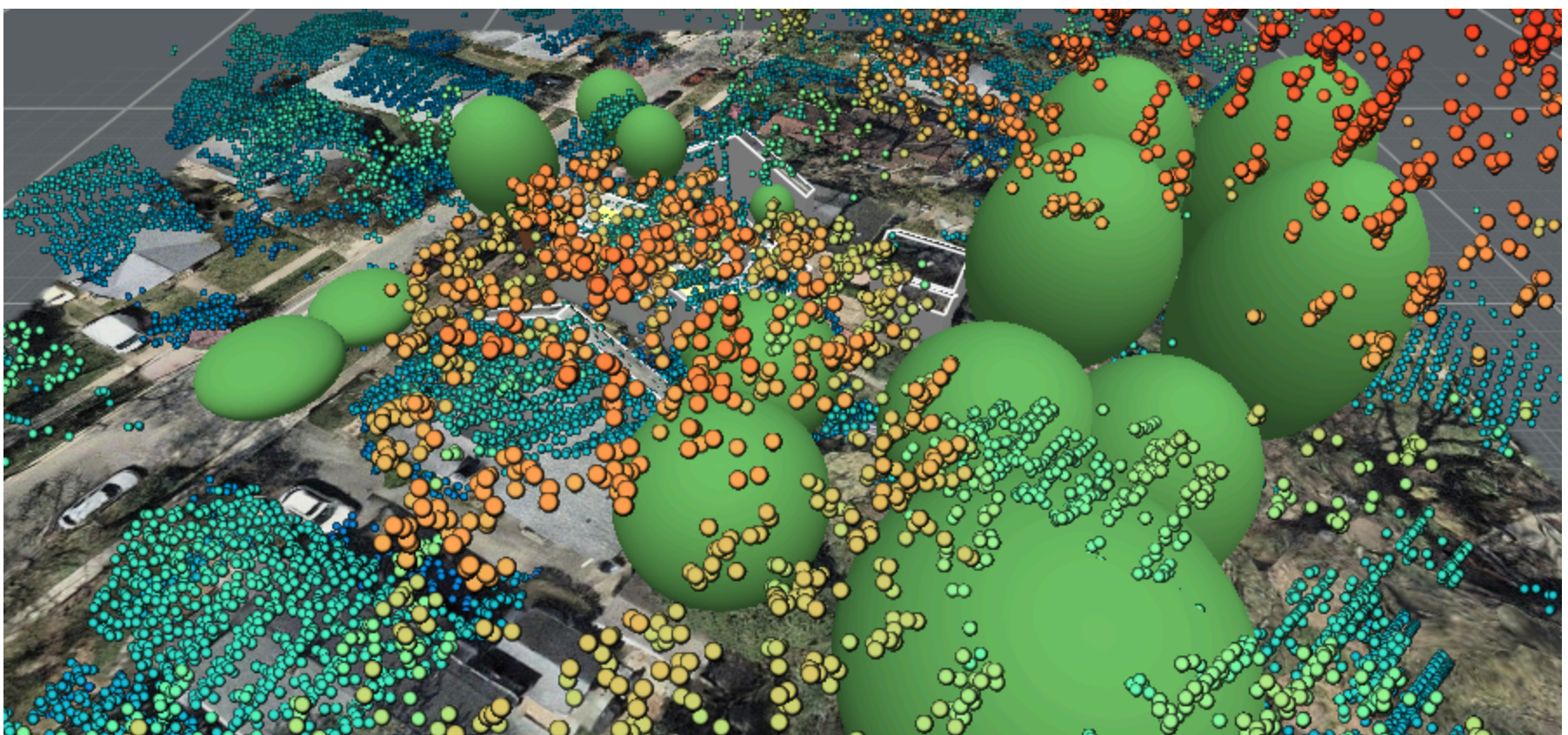
Zoomed out satellite view



3D model



3D model with LIDAR overlay



Shade Report - Sue Wheaton

Customer
Sue Wheaton

Designer
Katherine Garcia

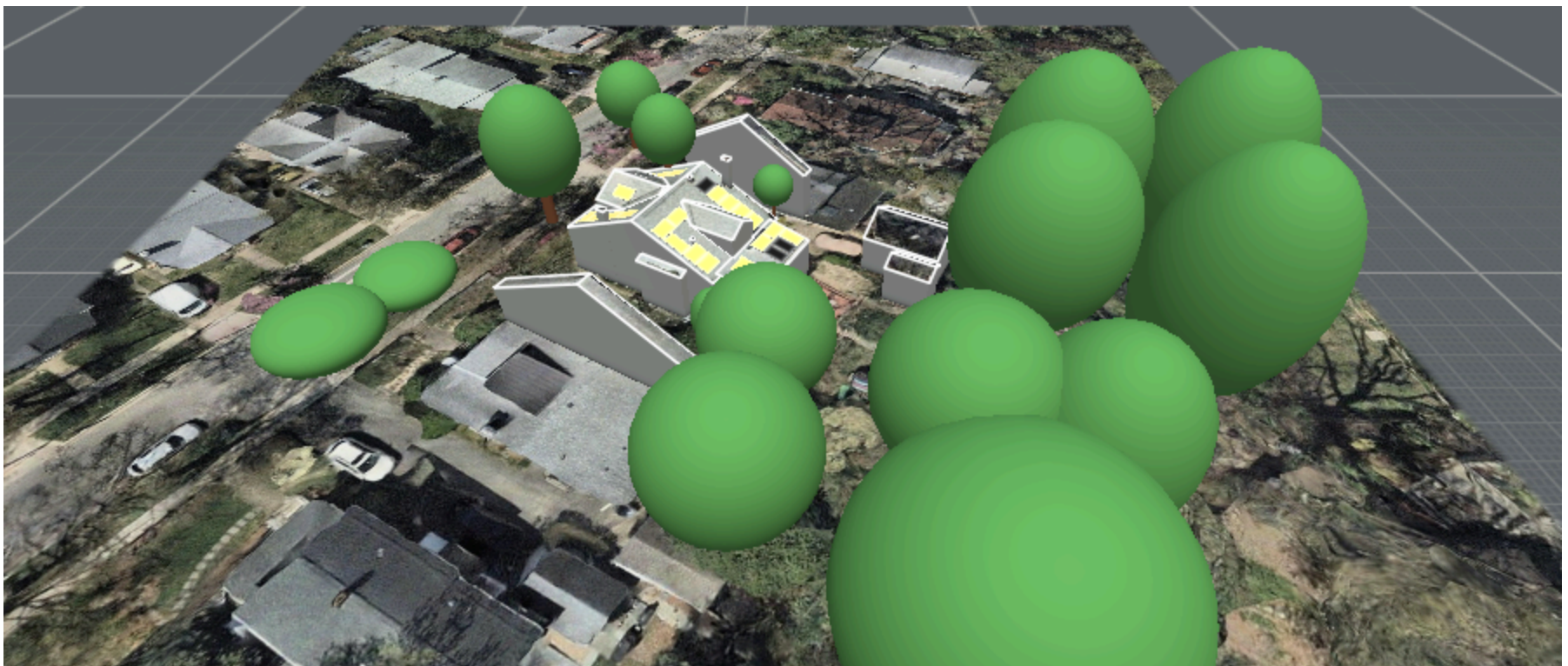
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Date
5/8/2024

Street view with corresponding 3D model



I, **Katherine Garcia**, certify that I have generated this shading report to the best of my abilities, and I believe its contents to be accurate.