MONTGOMERY COUNTY HISTORIC PRESERVATION COMMISSION

Address: 3915 Prospect Street, Kensington
Resource: Primary One (contributing) Resource
Kensington Historic District
Applicant: Eric ONeill
Review: HAWP
Case No.: 31/06-20H
Proposal: Solar Panel Installation

Meeting Date: 9/9/2020
Report Date: 9/2/2020
Public Notice: 8/26/2020
Tax Credit: n/a
Staff: Dan Bruechert

RECOMMENDATION

Staff recommends the HPC approve the HAWP application.

PROPERTY DESCRIPTION

SIGNIFICANCE: Primary One (contributing) Resource within the Kensington Historic District
STYLE: Colonial Revival
DATE: 1898

Figure 1: 3915 Prospect St. has non-historic garage and rear additions.
PROPOSAL

The applicant proposes to install 25 (twenty-five) solar panels on the rear addition and non-historic garage.

APPLICABLE GUIDELINES

When reviewing alterations and new construction within the Kensington Historic District several documents are to be utilized as guidelines to assist the Commission in developing their decision. These documents include the Approved & Adopted Amendment to the Master Plan for Historic Preservation: Kensington Historic District, Atlas #31/6 (Amendment), Vision of Kensington: A Long-Range Preservation Plan (Vision), Montgomery County Code Chapter 24A (Chapter 24A), and the Secretary of the Interior’s Standards for Rehabilitation (Standards), and the Historic Preservation Commission Policy No. 20-01: ADDRESSING EMERGENCY CLIMATE MOBILIZATION THROUGH THE INSTALLATION OF ROOF-MOUNTED SOLAR PANELS. The pertinent information in these documents is outlined below.

Montgomery County Code, Chapter 24A Historic Resources Preservation

(b) The commission shall instruct the director to issue a permit, or issue a permit subject to such conditions as are found to be necessary to insure conformity with the purposes and requirements of this chapter, if it finds that:

(1) The proposal will not substantially alter the exterior features of an historic site or historic resource within an historic district; or

(2) The proposal is compatible in character and nature with the historical, archeological, architectural or cultural features of the historic site or the historic district in which an historic resource is located and would not be detrimental thereto or to the achievement of the purposes of this chapter; or

Kensington Historic District Design Guidelines

The Vision was approved by the Montgomery County Council and was formally adopted by the Historic Preservation Commission. The goal of the Vision “was to establish a sound database of information from which to produce a document that would serve the HPC, M-NCPPC, their staff, and the community in wrestling with the protection of historic districts amidst the pressures of life in the 21st century.”

In addition, the Vision provides a specific physical description of the district as it was at the time of the study, an analysis of character-defining features of the district, a discussion of the challenges facing the district, and a discussion of proposed strategies for maintaining the character of the district, while allowing for appropriate growth and change.

The Vision identifies the following, as those features that help define the character of Kensington’s built environment:

- Building Setbacks: Residential and Commercial Patterns
- Rhythm of Spacing between Buildings
- Geographic and Landscape Features
- Scale and Building Height
- Directional Expression of Building
- Roof Forms and Material
- Porches
- Dominant Building Material
- Outbuildings
II.H

- Integrity of Form, Building Condition, and Threats
- Architectural Style

The Amendment notes that:
The district is architecturally significant as a collection of late 19th and early 20th century houses exhibit a variety of architectural styles popular during the Victorian period including Queen Anne, Shingle, Eastlake, and Colonial Revival. The houses share a uniformity of scale, setbacks, and construction materials that contribute to the cohesiveness of the district’s streetscapes. This uniformity, coupled with the dominant design inherent in Warner’s original plan of subdivision, conveys a strong sense of both time and place, that of a Victorian garden suburb.

Secretary of the Interior’s Standards for Rehabilitation:
2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.

Chapter 24A
(b) The commission shall instruct the director to issue a permit, or issue a permit subject to such conditions as are found to be necessary to insure conformity with the purposes and requirements of this chapter, if it finds that:
(1) The proposal will not substantially alter the exterior features of an historic site or historic resource within an historic district; or
(2) The proposal is compatible in character and nature with the historical, archeological, architectural or cultural features of the historic site or the historic district in which an historic resource is located and would not be detrimental thereto or to the achievement of the purposes of this chapter; or
(3) The proposal would enhance or aid in the protection, preservation and public or private utilization of the historic site or historic resource located within an historic district in a manner compatible with the historical, archeological, architectural or cultural value of the historic site or historic district in which an historic resource is located.
(d) In the case of an application for work on an historic resource located within an historic district, the commission shall be lenient in its judgment of plans for structures of little historical or design significance or for plans involving new construction, unless such plans would seriously impair the historic or architectural value of surrounding historic resources or would impair the character of the historic district. (Ord. No. 9-4, § 1; Ord. No. 11-59.)

Historic Preservation Commission Policy No. 20-01: ADDRESSING EMERGENCY CLIMATE MOBILIZATION THROUGH THE INSTALLATION OF ROOF-MOUNTED SOLAR PANELS

Now, THEREFORE:

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

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

WHEREAS, the County Council has established a Climate Emergency;

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

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

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

1. The preferred locations for solar panel installation(s) on a designated historic site or an historic resource located within an historic district is a) on the rear of the property, b) on non-historic building additions, c) on accessory structures, or d) in ground-mounted arrays;

2. If it is not feasible to install solar panels in one of the identified preferred locations due to resource orientation or other site limitations; and,

3. The roof is determined to be neither architecturally significant, nor a character-defining feature of the resource, nor is it a slate or tile roof, that unless it can be demonstrated that the solar array will be installed without damaging the historic character of the resource or historic fabric; then

4. The public welfare is better served by approving a Historic Area Work Permit for solar panels on all visible side or front roof slopes under Section 24A-8(b)(6).

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

STAFF DISCUSSION

The applicant proposes to install 25 (twenty-five) roof-mounted solar panels in four arrays on the non-historic rear addition and the non-historic attached garage (both the rear addition and garage appear to have been reviewed and approved by the HPC in 1987).

Twenty-two of the proposed solar panels are on the rear slope of the garage or on the non-historic addition and will not be visible from the public right-of-way. Three solar panels are proposed for the front-facing slope of the attached garage. The solar panels that will not be visible from the public right-of-way should be approved under the Adopted Solar Policy and 24A-8(b)(1) and (d). Staff finds that the remaining three panels should be approved under the Solar Policy which identifies “non-historic building additions” as a preferred location for roof-mounted solar panels. Even though these panels will be visible from the right-of-way, Staff finds they will not detract from the historic character of the house and recommends approval.
Figure 2: Front elevation of 3915 Prospect St.

STAFF RECOMMENDATIONS

Staff recommends that the Commission approve the HAWP application under the Criteria for Issuance in Chapter 24A-8(b)(1) and (d), having found that the proposal is consistent with and compatible in character with the purposes of Chapter 24A; The Kensington Historic District Amendment and the Vision for Kensington; the HPC Policy on Roof-Mounted Solar Panels;

and with the Secretary of the Interior’s Standards for Rehabilitation #2;

and with the general condition that the applicant shall present the 3 permit sets of drawings, if applicable, to Historic Preservation Commission (HPC) staff for review and stamping prior to submission for the Montgomery County Department of Permitting Services (DPS) building permits;

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

and with the general condition that the applicant shall notify the Historic Preservation Staff if they propose to make any alterations to the approved plans. Once the work is completed the applicant will contact the staff person assigned to this application at 301-563-3400 or dan.bruechert@montgomeryplanning.org to schedule a follow-up site visit.
APPLICATION FOR
HISTORIC AREA WORK PERMIT
HISTORIC PRESERVATION COMMISSION
301.563.3400

APPLICANT:

Name:  ERIC ONEILL  E-mail:  WOLFSRUN@HOTMAIL.COM
Address:  3915 PROSPECT ST  City:  KENSINGTON  Zip: 20895
Daytime Phone:  202-203-8265  Tax Account No.:  01020743

AGENT/CONTACT (if applicable):

Name:  AARON WILLIAMS  E-mail:  AWILLIAMS@FUSIONSS.NET
Address:  3600 COMMERCE DR, #601  City:  BALTIMORE  Zip: 21227
Daytime Phone:  443-425-5988  Contractor Registration No.:  MHIC30991

LOCATION OF BUILDING/PREMISE: MIHP # of Historic Property________________________

Is the Property Located within an Historic District?  X_Yes/District Name  KENSINGTON-ARK
 _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:

☐ New Construction  ☐ Deck/Porch  ☐ Shed/Garage/Accessory Structure
☐ Addition  ☐ Fence  ☐ Solar
☐ Demolition  ☐ Hardscape/Landscape  ☐ Tree removal/planting
☐ Grading/Excavation  ☐ Roof  ☐ Window/Door
☐ Other:  SOLAR__________

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.

___________________________  8/11/2020
Signature of owner or authorized agent  Date

For Staff only:
HAWP#______________
Date assigned_______

District Name  KENSINGTON-ARK
Individual Site Name_________________

ERIC ONEILL
WOLFSRUN@HOTMAIL.COM
3915 PROSPECT ST
KENSINGTON
20895
202-203-8265
01020743
AARON WILLIAMS
AWILLIAMS@FUSIONSS.NET
3600 COMMERCE DR, #601
BALTIMORE
21227
443-425-5988
MHIC30991
X
KENSINGTON-ARK
X
SOLAR
8/11/2020
# HAWP APPLICATION: MAILING ADDRESSES FOR NOTIFING

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

<table>
<thead>
<tr>
<th>Owner's mailing address</th>
<th>Owner’s Agent’s mailing address</th>
</tr>
</thead>
<tbody>
<tr>
<td>3915 PROSPECT ST</td>
<td>3600 COMMERCE DR, # 601, BALTIMORE, MD 21227</td>
</tr>
<tr>
<td>KENSINGTON, MD 20895</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adjacent and confronting Property Owners mailing addresses</th>
</tr>
</thead>
<tbody>
<tr>
<td>3911 Prospect St</td>
</tr>
<tr>
<td>Larry and Mary OTT</td>
</tr>
<tr>
<td><a href="mailto:ott.lawrence@gmail.com">ott.lawrence@gmail.com</a></td>
</tr>
<tr>
<td>3918 Prospect St</td>
</tr>
<tr>
<td>John and Christina Blazina</td>
</tr>
<tr>
<td><a href="mailto:vjblazina@gmail.com">vjblazina@gmail.com</a></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Description of Property: Please describe the building and surrounding environment. Include information on significant structures, landscape features, or other significant features of the property:

STANDARD 2 STORY SINGLE FAMILY HOME, CRAFTSMAN STYLE W/ FRONT AND BACK YARD

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

INSTALLING 25 ROOF MOUNTED SOLAR PANELS ON 3 ROOF SURFACES ON THE REAR OF THE HOME, AND 3 PANELS ON THE FRONT OF THE GARAGE, WHICH WILL BE OBSCURED BY TREES.
<table>
<thead>
<tr>
<th>Work Item 1: <strong>SOLAR</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of Current Condition: <strong>HOME IN EXCELLENT CONDITION</strong></td>
</tr>
<tr>
<td>Proposed Work: <strong>INSTALL 25 SOLAR PANELS ON 4 ROOF SURFACES</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work Item 2: ________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of Current Condition:</td>
</tr>
<tr>
<td>Proposed Work:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work Item 3: ________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of Current Condition:</td>
</tr>
<tr>
<td>Proposed Work:</td>
</tr>
</tbody>
</table>
3915 Prospect St
Kensington, MD 20895
Building
July 30, 2020

To: Lumina Solar  
3701 Commerce Drive, Suite 108  
Baltimore, MD 21227

Subject: Certification Letter  
Eric Oneill Residence  
3911 Prospect Street  
Kensington, MD 20895

To Whom It May Concern,

A team provided by Lumina Solar performed a jobsite observation of the existing framing and its condition at the above referenced address. The attached structural calculations are based upon this observation, and are only deemed valid if the information provided is true and accurate.

The purpose of this structural review is to determine the adequacy of the existing roof framing to support the additional loading due to the installation of the solar PV addition shown on the attached Lumina Solar drawings for the above referenced residence. This review applies to the section of roof that is directly supporting the solar PV system and its supporting elements.

The roof structure (Roof A, B, C & D) consists of asphalt shingles on plank decking on roofs A & B, and roof plywood on roofs C & D. The plank decking and plywood is supported by 2x10 rafters at 16" on center and pre-manufactured gable trusses that are spaced at 24" on center respectively. The rafters are sloped at approximately 31 degrees. The top chords of the trusses, which consist of 2x4 sections, are sloped at approximately 18 degrees. The bottom chord and web members also consist of 2x4 sections. The truss members are connected with steel gusset plates. The overall span of roof A & B, and B & C is approximately 23'-3" and 23'-2" respectively. The maximum unsupported projected horizontal top chord span on roof A & B, and B & C is approximately 13'-9" and 6'-3" respectively.

The existing roof structures (Roofs A, B, C & D) are judged to be adequate to resist the additional loading imposed by the installation of the solar panels. The spacing of the roof attachment points should be kept to a maximum of 48" on center with a staggered pattern to ensure proper distribution of loads.

**Design Criteria:**

- Applicable Codes = 2018 IBC/IRC, ASCE/SEI 7-16, NDS-18
- Roof Dead Load = 9.41 psf
- Roof Live Load = 30 psf
- Wind Speed = 115 mph, Exposure B, Risk Category II
- Ground Snow Load = 30 psf
- Roof Snow Load = 30 psf

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

Sincerely,

Scott A. Kirby, PE  
Structural Engineer

DocuSigned by:

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.: 41308  Expiration Date: 01-06-22

Eric Oneill Residence, Kensington, MD - 1
Gravity Loading

### Roof Snow Load Calculations

<table>
<thead>
<tr>
<th>Ground Snow Load, ( p_g ) = 30 psf</th>
<th>(Per Local Building Department)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat Roof Snow Load, ( p_f ) = 0.7C_eC_tI_sP_g</td>
<td>(ASCE 7, Eq. 7.3-1)</td>
</tr>
<tr>
<td>Exposure Factor, ( C_e ) = 1.0</td>
<td>(ASCE 7, Table 7-2)</td>
</tr>
<tr>
<td>Thermal Factor, ( C_t ) = 1.0</td>
<td>(ASCE 7, Table 7-3)</td>
</tr>
<tr>
<td>Importance Factor, ( I_s ) = 1.0</td>
<td>(ASCE 7, Table 1.5-2)</td>
</tr>
<tr>
<td>( p_f ) = 21 psf</td>
<td>(ASCE 7, Eq. 7.3-1)</td>
</tr>
<tr>
<td>Sloped Roof Snow Load, ( p_s ) = C_sP_f</td>
<td>(ASCE 7, Eq. 7.4-1)</td>
</tr>
<tr>
<td>Slope Factor, ( C_s ) = 1.0</td>
<td>(ASCE 7, Figure 7-2a)</td>
</tr>
<tr>
<td>( p_s ) = 21 psf</td>
<td>(ASCE 7, Eq. 7.4-1)</td>
</tr>
<tr>
<td>( p_{s, \text{min}} ) = 30.0 psf</td>
<td></td>
</tr>
</tbody>
</table>

### PV System Weight

<table>
<thead>
<tr>
<th>Weight of PV System = 2.97 psf</th>
<th>(Per Lumina Solar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X Standoff Spacing = 4.00 ft</td>
<td>(Per Lumina Solar)</td>
</tr>
<tr>
<td>Y Standoff Spacing = 4.00 ft</td>
<td>(Per Lumina Solar)</td>
</tr>
<tr>
<td>Standoff Tributary Area = 16.0 ft</td>
<td>(Per Lumina Solar)</td>
</tr>
</tbody>
</table>

Point Load at Standoffs = 47.52 lb

Note: PV Standoffs are staggered to ensure proper distribution of loading.

### Roof Live Load (Roof A & B)

<table>
<thead>
<tr>
<th>Roof Live Load, ( RLL ) = 30 psf</th>
</tr>
</thead>
</table>

Note: Roof Live Load is removed in areas covered by the PV array.

### Roof Dead Load (Roof A & B)

<table>
<thead>
<tr>
<th>Asphalt Shingles = 2.70 psf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plank Decking = 2.50 psf</td>
</tr>
<tr>
<td>2x10 Rafters @ 16&quot; o/c = 3.21 psf</td>
</tr>
<tr>
<td>Vaulted Ceiling = 0.00 psf</td>
</tr>
<tr>
<td>Miscellaneous = 1.00 psf</td>
</tr>
</tbody>
</table>

Total Roof Dead Load = 9.41 psf

DL Adjusted to 31° Slope = 10.98 psf | (Worst Case)

### Roof Dead Load (Roof C & D)

<table>
<thead>
<tr>
<th>Asphalt Shingles = 2.70 psf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof Plywood = 1.77 psf</td>
</tr>
<tr>
<td>2x4 Top Chords @ 24&quot; o/c = 0.82 psf</td>
</tr>
<tr>
<td>Vaulted Ceiling = 0.00 psf</td>
</tr>
<tr>
<td>Miscellaneous = 1.00 psf</td>
</tr>
</tbody>
</table>

Total Roof Dead Load = 6.29 psf

DL Adjusted to 18° Slope = 6.61 psf | (Worst Case)
Wind Calculations

ASCE 7-16 - Components and Cladding

**Input Variables**

| Risk Category | IIA | (ASCE 7, Table 1.5-1) |
| Wind Speed, V | 115 mph | (ASCE 7, Figure 26.5-1A) |
| Exposure Category | B | (ASCE 7, Section 26.7) |
| Roof Shape | Gable |
| Roof Slope | 18 degrees | (Per Lumina Solar - MD) |
| Mean Roof Height | 20 ft | (Per Lumina Solar - MD) |
| Effective Wind Area | 50 ft² | (Per Lumina Solar - MD) |

**Design Wind Pressure Calculations**

Velocity Pressure, \( q_h \) = 0.00256*Kz*Kzt*Kd*Ke*V²  
(ASCE 7, Eq. 30.3-1)

Velocity Pressure Coefficient, \( K_z \) = 0.701  
(ASCE 7, Table 30.3-1)

Topographic Factor, \( K_zt \) = 1.0  
(ASCE 7, Figure 26.8-1)

Wind Directionality Factor, \( K_d \) = 1.0  
(ASCE 7, Figure 26.6-1)

Ground Elevation Factor, \( K_e \) = 1.0  
(ASCE 7, Figure 26.9-1)

\( q_h \) = 23.72 psf  
(ASCE 7, Eq. 30.3-1)

0.6*\( q_h \) = 14.23 psf  
(ASD Load Factor)

Wind Pressure, \( P = q_h * Gp \)  
(ASCE 7, Eq. 30.4-1)

**Roof Attachment Uplift Calculations**

<table>
<thead>
<tr>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCp =</td>
<td>-0.85</td>
<td>-1.35</td>
<td>-2.2</td>
</tr>
<tr>
<td>Uplift Pressure (psf) =</td>
<td>-12.10</td>
<td>-19.21</td>
<td>-31.31</td>
</tr>
<tr>
<td>X Standoff Spacing (ft) =</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Y Standoff Spacing (ft) =</td>
<td>4.00</td>
<td>4.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Tributary Area (ft²) =</td>
<td>16.00</td>
<td>16.00</td>
<td>8.00</td>
</tr>
<tr>
<td>Uplift Load (lbs) =</td>
<td>-193.55</td>
<td>-307.40</td>
<td>-250.47</td>
</tr>
</tbody>
</table>

**Roof Attachment Uplift Check**

Maximum Design Uplift = -308 lbs

Standoff Uplift Capacity = 400 lbs  
(Per Manufacturer)

308 lb demand < 400 lb capacity, Therefore, OK

**Fastener Capacity Check**

Fastener = 5/16" dia. Lag

Embedment Depth = 2.25 in  
(NDS Table 12.2A)

Pullout Capacity per Inch = 296 lb

Fastener Capacity = 666 lb

w/ F.S. of 1.5 = 444 lb

308 lb demand < 444 lb capacity, Therefore, OK
Framing Check (Roof A & B)

Loading

Dead Load = 10.98 psf
PV Load = 2.97 psf
Live Load = 30 psf  (Removed at PV Array)
Snow Load = 30.0 psf
Wind Load = 5.69 psf

Governing Load Combination = DL + SL  (ASCE 7, Eq. 2.4.1-3)
Total Load = 43.9 psf

Member Properties

<table>
<thead>
<tr>
<th>Member Size</th>
<th>S (in$^3$)</th>
<th>I (in$^4$)</th>
<th>Lumber Sp</th>
<th>Span (ft)</th>
<th>Member Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x10</td>
<td>21.39</td>
<td>98.93</td>
<td>DF#2</td>
<td>13.75</td>
<td>16 &quot;o/c</td>
</tr>
</tbody>
</table>

Top Chord Bending Stress

\[
F_b (\text{psi}) = f'b \times C_d \times C_f \times C_r
\]

\[
F_b (\text{psi}) = 900 \times 1.15 \times 1.1 \times 1.15
\]

Allowable Bending Stress, \( F_b \) (psi) = 1309 psi

Distributed Load, \( w = 58.6 \) plf
Maximum Moment, \( M_{1,2} = \frac{wL^2}{8}, 9\frac{wl^2}{128} \)

\[
M_1 = 1385 \text{ ft-lbs} = 16618 \text{ in-lbs}
\]

\[
M_2 = 779 \text{ ft-lbs} = 9348 \text{ in-lbs}
\]

Actual Bending Stress = \( M_1/S \)  \( M_2/S \)

Actual Bending Stress = 776.9 psi  436.99 psi  Ratio = 0.59

Allowable Bending Stress > Actual Bending Stress --59.34% Stressed -- Therefore, OK

Check Deflection

Allowable Deflection, \( \Delta_{all} = L/120 \)  (Total Load)  \( E = 1,600,000 \) psi (Per NDS)

\[
\Delta_{all} = 1.375 \text{ in}
\]

Actual Deflection, \( \Delta_{actual} = \frac{5w*L^4}{(384*E*I)} \)  (Single Span)

\[
\Delta_{actual} = 0.298 \text{ in} \quad \text{L/554 Therefore, OK}
\]

Check Shear

Allowable Shear, \( F_v = 180 \) psi  (NDS Table 4A)

Max Shear, \( V_{\text{max}} = \frac{5w*L}{8} \)

\[
V_{\text{max}} = 447.6 \text{ lbs}
\]

Allowed Shear = \( F_v*A = 2498 \) lbs

Allowable Shear > Actual Shear -- 17.92% Stressed -- Therefore, OK
Framing Check (Roof C & D)

### Loading

<table>
<thead>
<tr>
<th>Load Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dead Load</td>
<td>6.61 psf</td>
</tr>
<tr>
<td>PV Load</td>
<td>2.97 psf</td>
</tr>
<tr>
<td>Live Load</td>
<td>30 psf</td>
</tr>
<tr>
<td>Snow Load</td>
<td>30 psf</td>
</tr>
<tr>
<td>Wind Load</td>
<td>5.69 psf</td>
</tr>
</tbody>
</table>

(Governing Load Combination = DL + SL) (ASCE 7, Eq. 2.4.1-3)

Total Load = 39.6 psf

### Member Properties

<table>
<thead>
<tr>
<th>Member Size</th>
<th>S (in^3)</th>
<th>I (in^4)</th>
<th>Lumber Sp</th>
<th>Span (ft)</th>
<th>Member Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x4</td>
<td>3.06</td>
<td>5.36</td>
<td>DF#2</td>
<td>6.25</td>
<td>24 &quot;o/c</td>
</tr>
</tbody>
</table>

### Top Chord Bending Stress

F\text{b} (psi) = f'\text{b} \times C_d \times C_i \times C_r

F\text{b} (psi) = 900 \times 1.15 \times 1.5 \times 1.15

Allowable Bending Stress, F\text{b} (psi) = 1785 psi

Distributed Load, w = 79.17 plf

Maximum Moment, M_{1,2} = wL^2/8, 9wl^2/128

M_1 = 386.6 ft-lbs = 4639 in-lbs
M_2 = 217.4 ft-lbs = 2609 in-lbs

Actual Bending Stress = M_1/S  \quad M_2/S

Actual Bending Stress = 1515 psi  \quad 852.01 psi  \quad Ratio = 0.85

Allowable Bending Stress > Actual Bending Stress --84.84% Stressed -- Therefore, OK

### Check Deflection

Allowable Deflection, \Delta_{all} = L/120  \quad (Total Load)  \quad E = 1,600,000 psi (Per NDS)

\Delta_{all} = 0.625 in

Actual Deflection, \Delta_{actual} = (5w*L^4)/(384*E*I)  \quad (Single Span)

\Delta_{actual} = 0.317 in  \quad L/237  \quad Therefore, OK

### Check Shear

Allowable Shear, F_y = 180 psi  \quad (NDS Table 4A)

Max Shear, V_{max} = 5w*L/8

V_{max} = 274.9 lbs

Member Area = 5.25 in^2

Allowed Shear = F_y*A = 945 lbs

Allowable Shear > Actual Shear -- 29.09% Stressed -- Therefore, OK
SOLAR PV SYSTEM: 8.125 kWp

ONEILL RESIDENCE
3911 PROSPECT STREET KENSINGTON, MD USA 20895

PROJECT INFORMATION
OWNER: ERIC ONEILL
ADDRESS: 3911 PROSPECT STREET KENSINGTON, MD USA 20895

AHJ: MONTGOMERY
ADDRESS: 255 ROCKVILLE PIKE, 2ND FLOOR ROCKVILLE, MD 20850

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: 8.125 kW
AC RATING: 6 kW
RACKING: UNIRAC SM LIGHT RAIL
MODULE: (25) CS1H-325MS
INVERTER: (25) IQ7-60-2-US

BATTERY: (1) POWERWALL 2

PROJECT SCOPE
THIS PROJECT INVOLVES THE INSTALLATION OF (25) CANADIAN SOLAR 325W SOLAR MODULES. THE SOLAR MODULES WILL BE RACKED USING A PRE-ENGINEERED RACKING SYSTEM. THE RACKED MODULES WILL BE ELECTRICALLY CONNECTED TO (25) ENPHASE DC TO AC POWER INVERTERS, AND (1) TESLA POWERWALLS, AND INTERCONNECTED TO THE LOCAL UTILITY USING MEANS AND METHODS CONSISTENT WITH THE RULES ENFORCED BY THE LOCAL UTILITY AND PERMITTING JURISDICTION.

INDEX OF PAGES
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

APPENDIX
MODULE DATASHEET
INVERTER DATASHEET
RACKING DATASHEET
ANCHOR DATASHEET

GENERAL NOTES
1) THIS PHOTOVOLTAIC (PV) SYSTEM SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE (NEC) ARTICLE 690, ALL MANUFACTURER’S LISTING AND INSTALLATION INSTRUCTIONS, AND THE RELEVANT CODES AS SPECIFIED BY THE AUTHORITY HAVING JURISDICTION (AHJ).
2) PV SYSTEM CIRCUITS INSTALLED ON OR IN BUILDINGS SHALL INCLUDE A RAPID SHUTDOWN FUNCTION TO REDUCE SHOCK HAZARD FOR EMERGENCY RESPONDERS IN ACCORDANCE WITH 690.12(A) THROUGH (D).
3) THIS SYSTEM IS A UTILITY INTERACTIVE SYSTEM, AND THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE.
4) ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE AND AS REQUIRED BY THE NEC AND AHJ.
5) PV EQUIPMENT SHALL BE GROUNDED ACCORDING TO NEC 690.43 AND MINIMUM NEC TABLE 250.122.
1) ALL RACKING SHALL BE INSTALLED PER MANUFACTURER SPECIFICATIONS.

2) ALL ROOFING PENETRATIONS SHALL EMBED IN STRUCTURAL MEMBERS AND PROPER FLASHING SEALANT SHALL BE USED TO PROVIDE WATERTIGHT ASSEMBLY.

3) WHEN POSSIBLE, ALL RACKING STANDOFFS WILL BE STAGGERED AMONGST THE ROOF SUPPORT MEMBERS.

4) REFER TO PAGE S001 FOR MAXIMUM ALLOWABLE RAIL SPAN AND MODULE OVERHANG, AND ATTACHMENT DETAILS.

5) ALL RACKING AND STRUCTURAL WORK FOR THIS PROJECT SHALL COMPLY WITH BUILDING CODE, IBC 2018 AND ASCE 7-16.

- ALL SOLAR MODULES SUPPORTED BY ROOF ATTACHMENTS 48" O.C.

- SOLAR PHOTOVOLTAIC SYSTEM INSTALLED PARALLEL TO ROOF SURFACE

- SOLAR PHOTOVOLTAIC SYSTEM INSTALLED AT A MAXIMUM HEIGHT OF 6" ABOVE ROOF SURFACE
RACKING AND STRUCTURAL NOTES

1) ALL RACKING SHALL BE INSTALLED PER MANUFACTURER SPECIFICATIONS

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

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

4) ALL RACKING AND STRUCTURAL WORK FOR THIS PROJECT SHALL COMPLY WITH BUILDING CODE, IBC 2018 AND ASCE 7-16

SITE CONDITIONS

| WIND SPEED | 115 MPH |
| SNOW LOAD | 30 PSF |
| ROOF ZONE (TYP.) | 3 |
| BUILDING CODE | IBC 2018 |
| ELECTRICAL CODE | NEC 2017 |
| ASCE VERSION | ASCE 7-16 |

DEAD LOAD CALCULATION

<table>
<thead>
<tr>
<th>LOAD</th>
<th>QTY. OR LIN. FT.</th>
<th>WEIGHT PER (LB)</th>
<th>TOTAL LBS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODULES</td>
<td>25</td>
<td>42.3</td>
<td>1057.50</td>
</tr>
<tr>
<td>M.L.E.'S</td>
<td>25</td>
<td>2.38</td>
<td>59.50</td>
</tr>
<tr>
<td>RACKING</td>
<td>226.4</td>
<td>0.81</td>
<td>183.40</td>
</tr>
<tr>
<td>STANDOFF</td>
<td>99</td>
<td>0.5</td>
<td>49.50</td>
</tr>
</tbody>
</table>

TOTAL ARRAY WEIGHT (LBS) 1349.9
TOTAL ARRAY AREA (SQ.FT.) 454.1
DISTRIBUTED LOAD (PSF) 2.97

POINT LOAD CALCULATION

| TOTAL ARRAY WEIGHT (LBS) | 1349.90 |
| POINT LOAD (LBS/STANDOFF) | 13.64 |

| TOTAL NUMBER OF STANDOFFS (TYP.) | 99 |

Eric O'Neill
3911 Prospect Street
Kensington, MD USA 20895
(443) 955-0779

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.: 41308 Exp. Date: 01-06-2022

Meric-30991

For Permitting Use Only

Contractor Info:
3701 Commerce Dr
Suite 101
Baltimore, MD 21227
(443) 955-0779

License Number:
MHIC-30991

Rev.
Date
I.F.C 8/4/2020

Assembly & Load Calcs
S001

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S001

For Engineering Use Only
1) ALL EQUIPMENT TO BE LISTED AND LABELED FOR ITS APPLICATION

2) WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC110.26

3) IF USED, PV POWER SOURCE BREAKER TO BE LOCATED AT BOTTOM OF BUS PER NEC690.64(b)(7)

4) LISTING AGENCY NAME AND NUMBER TO BE INDICATED ON INVERTERS AND MODULES PER NEC110.3(b)

5) PV POWER SOURCE TO BE SUITABLE FOR BACKFEED PER NEC690.64(b)(5)

5) AC COMBINER PANELS SHALL BE LABELED AS "INVERTER AC COMBINER PANEL"

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.

Eric O'Neill
3915 Prospect Street
Kensington, MD USA 20895

Ac Disconnect within 6' of the Utility Meter:

Will be a 2 pole 60 Amp breaker in the "Non-backed up" side of the Gateway.

240 Volt, 3 Phase
Non-Fused Disconnect Switch
mounted adjacent to the
utility meter

40 Amp

Array bonded with 4/0 S.wg Cu

Solar Module Total
25

Modules and Inverters
DC wiring from the solar module (top)

Array

10 Panels / Inverters
12.50
15 Amp
Circuit Breaker

This Array
10 x 1.125% =

This Array
15 Panels / Inverters
18.75
20 Amp
Circuit Breaker

Two Ungrounded conductors per circuit of inverters (typ)

Installation of the conduct (G) will have

two circuits, will consist of:

(4) 4/0 THHN-CU Copper Ground

Enphase AC Combiner

with circuit breakers listed below:

(1) 20 Amp, 2 pole circuit breaker as shown
(1) 20 Amp, 2 pole circuit breaker as shown
(1) 10 Amp, 3 pole circuit breaker for Envoy

Tesla Powerwall

240V Remote Disable Switch for Powerwall shutdown

Re-Feed with 369-A0-4/0-A0/4-2/0AA

200 Amp Eaton CH Sub-Pannel

(3) #8 - THHN-THWN-2 Copper
(1) #4 - THHN-THWN-2 Copper Ground

E001
1) ALL CONDUCTORS SHALL BE COPPER, RATED FOR 90°C 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.

4) MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER GEC VIA WEEB LUG PER NEC690.4(c)

CALCULATION FOR MAIN PV BREAKER & CIRCUITS

SYSTEM CURRENT: 1 x 25 = 25 A

MAX SOLAR BREAKER: 21 x 125% = 26.25 A

CIRCUIT #1 =
10 x 1 x 125% = 12.5 A

CIRCUIT #2 =
15 x 1 x 125% = 18.75 A
WARNING: PHOTOVOLTAIC POWER SOURCE
LABEL TO BE INSTALLED AT EACH DC DISCONNECTING MEANS [NEC 690.13(B)]
LETTERS OF AT LEAST 3/8 INCH; WHITE ON RED BACKGROUND; REFLECTIVE [IFC 605.11.1.1]
WARNING ELECTRICAL SHOCK HAZARD
DO NOT TOUCH TERMINALS! TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION
WARNING ELECTRICAL SHOCK HAZARD
IF GROUND FAULT IS INDICATED NORMALLY GROUNDED CONDUCTORS MAY BE UNGROUNDED AND ENERGIZED
WARNING DUAL POWER SOURCE SECOND SOURCE IS PHOTOVOLTAIC SYSTEM
LABEL TO BE APPLIED TO THE DISTRIBUTION EQUIPMENT [NEC 690.64(B)(7)]
SOLAR PV SYSTEM DISCONNECT
RATED AC OUTPUT CURRENT: 25 A
NOMINAL OPERATING AC VOLTAGE: 240 V
LABEL TO BE INSTALLED AT AN ACCESSIBLE LOCATION AT THE DISCONNECTING MEANS AS A POWER SOURCE [NEC 690.54]
SOLAR PV SYSTEM DISCONNECT
RATED AC OUTPUT CURRENT: 25 A
NOMINAL OPERATING AC VOLTAGE: 240 V
LABEL TO BE INSTALLED AT AN ACCESSIBLE LOCATION AT THE DISCONNECTING MEANS AS A POWER SOURCE [NEC 690.54]
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
PHOTOVOLTAIC DC DISCONNECT
LABEL TO BE INSTALLED AT EACH DC DISCONNECTING MEANS [NEC 690.13(B)]
LETTERS OF AT LEAST 3/8 INCH; WHITE ON RED BACKGROUND; REFLECTIVE [IFC 605.11.1.1]
PHOTOVOLTAIC AC DISCONNECT
LABEL TO BE INSTALLED AT EACH AC DISCONNECTING MEANS [NEC 690.13(B)]
LETTERS OF AT LEAST 3/8 INCH; WHITE ON RED BACKGROUND; REFLECTIVE [IFC 605.11.1.1]
PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN
LABEL TO BE INSTALLED AT RAPID SHUTDOWN SWITCH [NEC 690.54(C)]
LETTERS OF AT LEAST 3/8 INCH; WHITE ON RED BACKGROUND; REFLECTIVE [IFC 605.11.1.1]
SOLAR PV SYSTEM DISCONNECT
RATED AC OUTPUT CURRENT: 25 A
NOMINAL OPERATING AC VOLTAGE: 240 V
LABEL TO BE INSTALLED AT AN ACCESSIBLE LOCATION AT THE DISCONNECTING MEANS AS A POWER SOURCE [NEC 690.54]
SOLAR PV SYSTEM DISCONNECT
RATED AC OUTPUT CURRENT: 25 A
NOMINAL OPERATING AC VOLTAGE: 240 V
LABEL TO BE INSTALLED AT AN ACCESSIBLE LOCATION AT THE DISCONNECTING MEANS AS A POWER SOURCE [NEC 690.54]
Real Property Data Search

Search Result for MONTGOMERY COUNTY

View Map  View GroundRent Redemption  View GroundRent Registration

Special Tax Recapture: None

Account Identifier: District - 13 Account Number - 01020743

Owner Information

Owner Name: ONEILL ERIC MICHAEL
ONEILL JULIANA SCHWITZKE
Principal Residence: YES
Use: RESIDENTIAL
Deed Reference: /48806/ 00209

Mailing Address: 3915 PROSPECT ST
KENSINGTON MD 20895-

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ONEILL JULIANA SCHWITZKE
Principal Residence: YES
Use: RESIDENTIAL
Deed Reference: /48806/ 00209

Mailing Address: 3915 PROSPECT ST
KENSINGTON MD 20895-

Location & Structure Information

Premises Address: 3915 PROSPECT ST
KENSINGTON 20895-0000

Legal Description: PT LT 9 KENSINGTON PARK

Map: HP43  Grid: 0000  Parcel: 0000
Neighborhood: 13070015.16  Subdivision: 0015
Section: 11  Block: 8  Lot: 2019
Assessment Year: 07/01/2019

Plat Ref: /4

Town: KENSINGTON

Primary Structure Built Above Grade Living Area 4,014 SF
Finished Basement Area 460 SF
Property Land Area 15,525 SF

Stories: 2 1/2  Basement: YES  Type: STANDARD UNIT
Exterior Quality: FRAME/ 7

Full/Half Bath: 3 full/ 1 half  Garage: 1 Attached

Last Notice of Major Improvements

Value Information

<table>
<thead>
<tr>
<th></th>
<th>Base Value</th>
<th>Value</th>
<th>Phase-in Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land:</td>
<td>515,800</td>
<td>515,800</td>
<td></td>
</tr>
<tr>
<td>Improvements:</td>
<td>666,600</td>
<td>646,000</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>1,182,400</td>
<td>1,161,800</td>
<td>1,161,800</td>
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<tr>
<td>Preferential Land:</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Transfer Information

Seller: ONEILL ERIC MICHAEL  Date: 06/23/2014  Price: $0
Type: NON-ARMS LENGTH OTHER  Deed1: /48806/ 00209  Deed2:

Seller: O'NEILL JOHN H JR IRRV TRUST  Date: 12/03/2013  Price: $400,000
Type: ARMS LENGTH IMPROVED  Deed1: /48022/ 00018  Deed2:

Seller: O'NEILL JOHN H JR  Date: 01/10/2013  Price: $0
Type: NON-ARMS LENGTH OTHER  Deed1: /45765/ 00215  Deed2:

Exemption Information

Partial Exempt Assessments: 07/01/2020  07/01/2021
County: 000 0.00
State: 000 0.00
Municipal: 000 0.00|0.00 0.00|0.00|0.00

Special Tax Recapture: None