RECOMMENDATION

Staff recommends the HPC approve the HAWP application.

PROPERTY DESCRIPTION

SIGNIFICANCE: Contributing Resource to the Takoma Park Historic District
STYLE: Craftsman
DATE: c.1915-1925

Figure 1: 7005 Westmoreland Ave. is to the south of the Takoma Park Urban Park.
PROPOSAL

The applicant proposes to install 20 (twenty) solar panels on the roof of the house.

APPLICABLE GUIDELINES

When reviewing alterations and new construction within the Takoma Park Historic District several documents are to be utilized as guidelines to assist the Commission in developing their decision. 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). The work proposed is additionally covered by the adopted policy on solar panels, 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.

Takoma Park Historic District Guidelines

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

The design review emphasis will be restricted to changes that are at 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 district.

Contributing Resources should receive a more lenient 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. As stated above, the design review emphasis will be restricted to changes that are at all visible from the public right-of-way, irrespective of landscaping or vegetation.

Some of the factors to be considered in reviewing HAWPs on Contributing Resources include:

- 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 stovetops, air conditioners, fences, skylights, etc. – should be allowed as a matter of course; alterations to areas that do not directly front on a public way-of-way which involve the replacement of or damaged to original ornamental or architectural features are discouraged, but may be considered and approved on a case-by-case basis

- Some non-original building materials may be acceptable on a case-by-case basis;
artificial siding on areas visible to the public right-of-way is discouraged where such materials would replace or damage original building materials that are in good condition.

- Alterations to features that are not visible 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.

**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.

9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work shall be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportions, and massing to protect the integrity of the property and its environment.

10. New additions and adjacent or related new construction will 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.

**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.

4. 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.)

**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).

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

STAFF DISCUSSION

The subject property is a one-story, front gable bungalow. The right roof slope faces south-southeast. There is a small, non-historic addition to the rear. The applicant proposes installing 20 (twenty) flush-mounted solar panels on the right roof slope.

Staff finds that the resource does not have the space to install a ground-mounted array and lacks an accessory structure to install the panels. In discussion with the solar company, the non-historic rear addition does not get adequate sun due to the large number of mature trees on the two properties to the south (see Fig. 2, below). The proposed solar panels will be installed almost to the front of the right (south-facing) roof slope.
Staff finds the roof of the subject property is not architecturally significant and the extant 3-tab shingle roof is not historically significant. Staff further finds that while it may be preferable to have the array set back from the front wall plane, the panels closest to the street are the ones with the most sun exposure and will generate the most electricity. Eliminating them would frustrate the purpose of installing the array.

Staff finds that the proposed solar array complies with the requirements of the HPC’s roof-mounted solar policy and it will not have a significant impact on the character of the house or surrounding district.

**STAFF RECOMMENDATIONS**

Staff recommends that the Commission approve the HAWP application under the Criteria for Issuance in Chapter 24A-8(b)(1), (6), and (d), having found that the proposal, is consistent with and compatible in character with the purposes of Chapter 24A; The Takoma Park Historic District Design Guidelines; the HPC Policy on Roof-Mounted Solar Panels;

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 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: LOIS WESSEL
Address: 7005 WESTMORELAND AVE
Daytime Phone: 301.213.6733

E-mail: _________________________________
City: ________________ Zip:____________
Tax Account No.: _________________________

AGENT/CONTACT (if applicable):

Name: Jessica Jones
Address: 812 OREGON AVE., STE J
Daytime Phone: 443.301.7228

E-mail: MDPERMITCOORDINATION@SUNRUN.COM
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:

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

☐ 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

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

SINGLE FAMILY HOME WITH DRIVEWAY.

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

20 FLUSH-MOUNTED SOLAR PANELS TO BE INSTALLED ON SOUTH FACING ROOF OF DWELLING. TOTAL SYSTEM SIZE OF 6.6KW
NO ADDITIONAL STRUCTURES TO BE BUILT OR ALTERED.
PLEASE SEE ATTACHED PLANS.
<table>
<thead>
<tr>
<th>Work Item 1: <strong>SOLAR PANELS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of Current Condition:</strong></td>
</tr>
<tr>
<td><strong>Proposed Work:</strong></td>
</tr>
<tr>
<td>SINGLE FAMILY HOME</td>
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<tr>
<td>SINGLE FAMILY HOME WITH ADDITION OF SOLAR PANELS ON ROOF.</td>
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<tr>
<th>Work Item 2: ___________________________</th>
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<td><strong>Description of Current Condition:</strong></td>
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<td><strong>Proposed Work:</strong></td>
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<th>Work Item 3: ___________________________</th>
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<td><strong>Description of Current Condition:</strong></td>
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<td><strong>Proposed Work:</strong></td>
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### HISTORIC AREA WORK PERMIT

#### CHECKLIST OF APPLICATION REQUIREMENTS

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<td>Driveway/Parking Area</td>
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<td>Tree Removal</td>
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<td>Siding/Roof Changes</td>
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<td>Window/Door Changes</td>
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<td>Masonry Repair/Repoint</td>
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<td>Signs</td>
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</table>
• SYSTEM SIZE: 6600W DC, 4800W AC
• MODULES: (20) LG ELECTRONICS: LG330N1C-A5
• INVERTERS: (20) ENPHASE ENERGY: IQ7-60-2-US
• RACKING: SNAPNRACK RLU: RL UNIVERSAL, SPEEDTRACK, SEE DETAIL SNR-DC-00436

SCAPE OF WORK

• ALL WORK SHALL COMPLY WITH 2018 IRC/IBC/IEBC, MUNICIPAL CODE, AND ALL MANUFACTURERS’ LISTINGS AND INSTALLATION INSTRUCTIONS.
• PHOTOVOLTAIC SYSTEM WILL COMPLY WITH NEC 2017.
• ELECTRICAL SYSTEM GROUNDING WILL COMPLY WITH NEC 2017.
• PHOTOVOLTAIC SYSTEM IS UNGROUNDED. NO CONDUCTORS ARE SOLIDLY GROUNDED IN THE INVERTER. SYSTEM COMPLIES WITH 690.35.
• MODULES CONFORM TO AND ARE LISTED UNDER UL 1703.
• INVERTER CONFORMS TO AND IS LISTED UNDER UL 1741.
• RACKING CONFORMS TO AND IS LISTED UNDER UL 2703.
• SNAPNRACK RACKING SYSTEMS, IN COMBINATION WITH TYPE I, OR TYPE II MODULES, ARE CLASS A FIRE RATED.
• RAPID SHUTDOWN REQUIREMENTS MET WHEN INVERTERS AND ALL CONDUCTORS ARE WITHIN ARRAY BOUNDARIES PER NEC 690.12(1).
• CONSTRUCTION FOREMAN TO PLACE CONDUIT RUN PER 690.31(G).
• ARRAY DC CONDUCTORS ARE SIZED FOR DERATED CURRENT.
• 10.45 AMPs MODULE SHORT CIRCUIT CURRENT.
• 16.32 AMPs DERATED SHORT CIRCUIT CURRENT [690.9 (a) & 690.9 (b)].

VICINITY MAP

• SYSTEM SIZE: 6600W DC, 4800W AC
• MODULES: (20) LG ELECTRONICS: LG330N1C-A5
• INVERTERS: (20) ENPHASE ENERGY: IQ7-60-2-US
• RACKING: SNAPNRACK RLU: RL UNIVERSAL, SPEEDTRACK, SEE DETAIL SNR-DC-00436

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• 10.45 AMPs MODULE SHORT CIRCUIT CURRENT.
• 16.32 AMPs DERATED SHORT CIRCUIT CURRENT [690.9 (a) & 690.9 (b)].
SITE PLAN - SCALE = 1/16" = 1'-0"

ARRAY DETAILS:
- TOTAL ROOF SURFACE AREA: 2207 SQFT.
- TOTAL PV ARRAY AREA: 368.8 SQ FT.
- PERCENTAGE PV COVERAGE:
  \[(\text{TOTAL PV ARRAY AREA/\text{TOTAL ROOF SURFACE AREA}}) \times 100 = 16.7\%\]

NOTE: MICRO-INVERTERS INSTALLED UNDER EACH MODULE
**.projects**: 251R-005WESS

**Design Criteria**

**Max Distributed Load:** 3 PSF

**Snow Load:** 30 PSF

**Wind Speed:** 111 MPH 3-SEC GUST.

**Structural Notes:**
- Installers to verify rafter size, spacing and sloped spans, and notify E.O.R. of any discrepancies before proceeding.
- If array (excluding skirt) is within 12" boundary region of any roof plane edges (except valleys), then attachments need to be added and overhang reduced within the 12" boundary region as follows:
  - Allowable attachment spacing indicated on plans to be reduced by 50%
  - Allowable overhang indicated on plans to be 1/5th of allowable attachment spacing indicated on plans

**Notes:**
- 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. 54593, Expiration Date: 06/25/2021

**Dimensions:**
- Scale: 1/4" = 1'-0"
SNAPRACK RL UNIVERSAL SPEEDTRACK COMPOSITION
ROOF MOUNTING

EMBED Ø 5/16" LAG SCREW 2-1/2" INTO THE ROOF STRUCTURAL MEMBER / RAFTER
FOR TORQUE SPECIFICATIONS SEE INSTALLATION MANUAL

Ø 5/16" S.S. LAG SCREW
2-1/2" MINIMUM EMBEDMENT

WASHER
FOAM GASKET

SPEEDTRACK
ROOFING MATERIAL

A

COMPLETED INSTALLATION
SECTION VIEW

ROOF DECKING
ROOFING MATERIAL

PILOT HOLE CENTER OF COURSE

ROOF Rafter (TYP.)
ROOF ATTACHMENTS SHALL BE EMBEDDED INTO ROOF RAIFFERS OR OTHER STRUCTURAL MEMBERS

ROOF SHEATHING, UNDERLAYMENT, AND ROOFING MATERIAL (TYP.)

2-1/2" MIN. EMBEDMENT INTO RAFTER ON STRUCTURAL MEMBER

SNAPRACK RL UNIVERSAL SPEEDTRACK COMPOSITION
ROOF MOUNTING

EMBED Ø 5/16" LAG SCREW 2-1/2" INTO THE ROOF STRUCTURAL MEMBER / RAFTER
FOR TORQUE SPECIFICATIONS SEE INSTALLATION MANUAL
120/240 VAC SINGLE PHASE SERVICE

UTILITY GRID

FACILITY LOADS

EXISTING 150A MAIN BREAKER

EXISTING 150A MAIN PANEL

\(\text{(N) 25A PV BREAKER AT OPPOSITE END OF BUSBAR}\)

\(\text{SQUARE D DU221RB 3R, 30A, 2P 120/240VAC}\)

\(\text{20A BREAKER [A]} \quad \text{20A BREAKER [B]}\)

\(\text{125A ENPHASE IQ AC COMBINER BOX WITH INTEGRATED 10A ENVOY BREAKER 3CX-IQ-AM1-240-3C}\)

\(\text{(20) LG ELECTRONICS: LG330N1C-A5 MODULES AND MICRO-INVERTER PAIRS}\)

\(\text{(20) ENPHASE ENERGY: IQ7-60-2-US}\)

\(\text{--} \quad \text{(1) BRANCH OF (10) MICRO-INVERTERS [A]} \quad \text{(1) BRANCH OF (10) MICRO-INVERTERS [B]}\)

\(\text{CONDUIT SCHEDULE}\)

<table>
<thead>
<tr>
<th>#</th>
<th>CONDUIT</th>
<th>CONDUCTOR</th>
<th>NEUTRAL</th>
<th>GROUND</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NONE</td>
<td>(2) 12 AWG PER ENPHASE Q CABLE BRANCH</td>
<td>NONE</td>
<td>(1) 10 AWG BARE COPPER</td>
</tr>
<tr>
<td>2</td>
<td>3/4&quot; EMT OR EQUIV.</td>
<td>(4) 10 AWG THHN/THWN-2</td>
<td>NONE</td>
<td>(1) 8 AWG THHN/THWN-2</td>
</tr>
<tr>
<td>3</td>
<td>3/4&quot; EMT OR EQUIV.</td>
<td>(2) 10 AWG THHN/THWN-2</td>
<td>(1) 10 AWG THHN/THWN-2</td>
<td>(1) 8 AWG THHN/THWN-2</td>
</tr>
</tbody>
</table>

\(\text{MODULE CHARACTERISTICS}\)

LG ELECTRONICS: LG330N1C-A5:

- OPEN CIRCUIT VOLTAGE: 40.9 V
- MAX POWER VOLTAGE: 33.7 V
- SHORT CIRCUIT CURRENT: 10.45 A
NOTES AND SPECIFICATIONS:

- SIGNS AND LABELS SHALL MEET THE REQUIREMENTS OF THE NEC 2017 ARTICLE 110.21(B), UNLESS SPECIFIC INSTRUCTIONS ARE REQUIRED BY SECTION 690, OR IF REQUESTED BY THE LOCAL AHJ.
- SIGNS AND LABELS SHALL ADEQUATELY WARN OF HAZARDS USING EFFECTIVE WORDS, COLORS AND SYMBOLS.
- LABELS SHALL BE PERMANENTLY AFFIXED TO THE EQUIPMENT OR WIRING METHOD AND SHALL NOT BE HAND WRITTEN.
- LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED.
- SIGNS AND LABELS SHALL COMPLY WITH ANSI Z535.4-2011, PRODUCT SAFETY SIGNS AND LABELS, UNLESS OTHERWISE SPECIFIED.
- DO NOT COVER EXISTING MANUFACTURER LABELS.

WARNING:

- DO NOT RELOCATE THIS OVERCURRENT DEVICE
- DO NOT ADD LOADS

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

Solar PV System Equipped with Rapid Shutdown

Solar Panels and Microinverters on Roof

Main Panel and PV Breaker Disconnect (INT) AC Disconnect PV Load Center

Service Entrance

7005 Westmoreland Ave, Takoma Park, MD, 20912
**Structural Calculations for the Lois Wessel Residence PV Installation**

**Date:** 8/3/2020  
**Job Address:** 7005 Westmoreland Ave  
Takoma Park, MD, 20912  
**Job Number:** 251R-005WESS

**Scope of Work**

These calculations are for the existing roof framing which supports the new PV modules as well as the attachment of the PV system to existing roof framing. All PV mounting equipment shall be designed and installed per manufacturer's approved installation specifications.

**Calculation Index**

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>Structural Geometry, Live Load, Snow Load, Wind Load, &amp; Dead Load</td>
</tr>
<tr>
<td>3</td>
<td>Roof (1) Framing Check</td>
</tr>
<tr>
<td>4</td>
<td>Roof Attachment Check, Seismic Check, &amp; Scope of Work</td>
</tr>
</tbody>
</table>

**Engineering Calculations Summary**

**Code:** 2018 IBC/IEBC/IRC w/ DHCD Modificaitons, ASCE 7-16, 2018 NDS

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>Snow Load:</td>
<td>S = 30 psf</td>
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<tr>
<td>Live Load:</td>
<td>LL = 20 psf</td>
</tr>
<tr>
<td>Wind:</td>
<td>Wind Speed Ult. (V) = 111 mph Exp. = B</td>
</tr>
<tr>
<td>PV Dead Load:</td>
<td>DPV = 3.0 psf</td>
</tr>
</tbody>
</table>

---

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. 54593, Expiration Date: 06 25 2021

133 Technology Dr., Suite 100, Irvine, CA 92618     I     P   949.383.0993
Structural Geometry:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Roof Height, $h_n$</td>
<td>13 ft</td>
<td></td>
</tr>
<tr>
<td>Eave Height, $h_e$</td>
<td>8 ft</td>
<td></td>
</tr>
<tr>
<td>Building Length, $L$</td>
<td>80 ft</td>
<td></td>
</tr>
<tr>
<td>Building Width, $B$</td>
<td>30 ft</td>
<td></td>
</tr>
<tr>
<td>Module Area</td>
<td>20 ft²</td>
<td></td>
</tr>
<tr>
<td>Roof Pitch, $\theta$</td>
<td>25 degrees</td>
<td></td>
</tr>
</tbody>
</table>

Live Load:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof Live Load, $L_r$</td>
<td>20.00 psf</td>
<td>Equation 4.8-1</td>
</tr>
</tbody>
</table>

Snow Load:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Snow Load, $p_g$</td>
<td>30 psf</td>
<td>Fig. 7-1</td>
</tr>
<tr>
<td>Snow Importance Factor, $I_s$</td>
<td>1</td>
<td>Table 1.5-1</td>
</tr>
<tr>
<td>Thermal Factor, $C_t$</td>
<td>1.1</td>
<td>Table 7-3</td>
</tr>
<tr>
<td>Exposure Factor, $C_e$</td>
<td>0.9</td>
<td>Table 7-2</td>
</tr>
<tr>
<td>Roof Slope Factor, $C_s$</td>
<td>0.75</td>
<td>Figure 7-2c</td>
</tr>
<tr>
<td>Flat Snow Load, $P_f$</td>
<td>20.8 psf</td>
<td>Equation 7.3-1</td>
</tr>
</tbody>
</table>

Sloped Roof Snow Loads, $P_s$ = 15.6 psf | Equation 7.4-1 |

Is the width of the roof > 20ft? Yes

Drift Height, $h_d$ = 1.44 ft | Figure 7-9 |

Roof slope for a rise of one, $S$ = 2.14

Unbalanced Width = 5.61 ft | Fig 7-5 |

Unbalanced Snow Load = 33.14 psf | Fig 7-5 |

Wind Load:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Wind Speed (3s-gust), $V$</td>
<td>111.0 mph</td>
<td>Figure 26.5-1A</td>
</tr>
<tr>
<td>VASD</td>
<td>86 mph</td>
<td></td>
</tr>
<tr>
<td>Building Occupancy Category</td>
<td>2</td>
<td>Table 1.5-1</td>
</tr>
<tr>
<td>Exposure Category</td>
<td>B</td>
<td>Sec 26.7.3</td>
</tr>
<tr>
<td>Topographic Factor, $K_Z$</td>
<td>1.00</td>
<td>Equation 26.8-1</td>
</tr>
<tr>
<td>Adjustment Factor, $\lambda$</td>
<td>1.00</td>
<td>Figure 30.5-1</td>
</tr>
<tr>
<td>Edge Zone, $a$</td>
<td>3.00 ft</td>
<td>Figure 30.5-1</td>
</tr>
</tbody>
</table>

Uplift (0.6W)

<table>
<thead>
<tr>
<th>Zone 1 (psf)</th>
<th>Zone 2 (psf)</th>
<th>Zone 3 (psf)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GC$p$ = -1.22</td>
<td>-1.77</td>
<td>-1.77</td>
<td>Table C30.3-8</td>
</tr>
<tr>
<td>$P_{716} = .6 \times qh \times GCP_{zone} \times Y_e \times Y_a$</td>
<td>= -9.60</td>
<td>= -13.44</td>
<td>= -13.44</td>
</tr>
</tbody>
</table>

Downward (0.6W)

<table>
<thead>
<tr>
<th>Zone 1 (psf)</th>
<th>Zone 2 (psf)</th>
<th>Zone 3 (psf)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GC$p$ = 0.58</td>
<td>0.58</td>
<td>0.58</td>
<td>Table C30.3-8</td>
</tr>
<tr>
<td>$P_{716} = .6 \times qh \times GCP_{zone} \times Y_e \times Y_a$</td>
<td>= 9.60</td>
<td>= 9.60</td>
<td>= 9.60</td>
</tr>
</tbody>
</table>

Dead Load:

<table>
<thead>
<tr>
<th>Component</th>
<th>Roof</th>
<th>Walls - Exterior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composition Shingle</td>
<td>3.0 psf</td>
<td>Wood 5.0 psf</td>
</tr>
<tr>
<td>5/8 OSB Sheathing</td>
<td>2.0</td>
<td>2x4 Studs @ 16&quot; 2.0</td>
</tr>
<tr>
<td>2x6 Rafter @ 24&quot; OC</td>
<td>1.0</td>
<td>Gypsum 3.0</td>
</tr>
<tr>
<td>Misc. (Ceiling, Insulation, etc.)</td>
<td>1.0</td>
<td>Misc. (Insulation, etc.) 2.0</td>
</tr>
<tr>
<td>PV System, Ppv</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>Total Roof DL = 10.0 psf</td>
<td></td>
<td>Total Wall DL = 12.0 psf</td>
</tr>
</tbody>
</table>
Roof Framing Check:

- **Roof Framing**: 2x6 Rafter @ 24° OC
- **Timber Species**: Southern Pine #2
- **Max Beam Span**: 12.67 ft
- **b**: 1.5 in
- **d**: 5.50 in
- **Moment of Inertia, Ix**: 20.80 in⁴
- **Section Modulus, Sx**: 7.56 in³
- **Bending Stress, Fb**: 750 psi
- **Elastic Modulus, Emin**: 580000 psi

<table>
<thead>
<tr>
<th>C0 (Wind)</th>
<th>C0 (Snow)</th>
<th>CL</th>
<th>CM</th>
<th>C1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.60</td>
<td>1.15</td>
<td>1.16</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

**Wood Adjustment Factors:**

- **PV Tributary Width, Wpv**: 3.30 ft
- **PV Tributary Length, Lpv**: 6.0 ft
- **PV Tributary Area, At**: 19.8 ft²
- **PV Dead Point Load, Pd = Ppv x At**: 54 lb
- **Roof Distributed Load, wDL**: 13 plf

**Load Case: 0.6DL + 0.6W (CD = 1.6)**

- **Roof Zone**: 1
- **Pup = Pnet x At + 0.6 x Pd x cos(θ)**: 158 lb
- **Mb(wind_up)**: 167 lb-ft
- **Fb' (wind) = Fb x CD x CL x CM x Cx x Cx x Cu x x Cr**: 2081 psi
- **Mallowable = Sx x Fb' (wind)**: 1311 lb-ft > 167 lb-ft

**Load Case: DL + 0.6W (CD = 1.6)**

- **Pdown = Pnet x At + Pd x cos(θ)**: 244 lb
- **Mb(wind_down)**: 749 lb-ft
- **Fb' (wind) = Fb x CD x CL x CM x Cx x Cx x Cu x x Cr**: 2081 psi
- **Mallowable = Sx x Fb' (wind)**: 1311 lb-ft > 749 lb-ft

**Load Case: DL + 0.75(0.6W) + 0.75S (CD = 1.6)**

- **Roof Snow Distributed Load, wSL**: 42 plf
- **Psnow = P x At**: 280 lb
- **Mb(wind_snow)**: 1078 lb-ft
- **Fb' (wind) = Fb x CD x CL x CM x Cx x Cx x Cx x Cu x x Cr**: 2081 psi
- **Mallowable = Sx x Fb' (snow)**: 1311 lb-ft > 1078 lb-ft

**Load Case: DL + S (CD = 1.15)**

- **Roof Snow Distributed Load, wSL**: 42 plf
- **Psnow = P x At**: 280 lb
- **Mb(snow)**: 931 lb-ft
- **Fb' (snow) = Fb x CD x CL x CM x Cx x Cx x Cx x Cu x x Cr**: 1496 psi
- **Mallowable = Sx x Fb' (snow)**: 943 lb-ft > 931 lb-ft
Rafter Attachments: 0.6D+0.6W (Zone 2)

\[ P_{\text{uplift}} = Ax \times P_{\text{net}} = 234 \text{ lb} \]

Connecter Uplift Capacity per SnapNRack Test Results = 604 lb > 234 OK

5/16" Lag Screws Withdrawal Value = 307 lb/in

Lag Screw Penetration = 2.5 in

Allowable Capacity with CD = 1228 lb > 234 OK

Seismic Check:

<table>
<thead>
<tr>
<th>Existing Dead Load:</th>
<th>Solar Dead Load:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A existing</td>
<td>W panel</td>
</tr>
<tr>
<td>Roof existing</td>
<td>2400 ft²</td>
</tr>
<tr>
<td>W roof existing</td>
<td>16800 lb</td>
</tr>
<tr>
<td>A wall existing</td>
<td>1760 ft²</td>
</tr>
<tr>
<td>W wall existing</td>
<td>21120 lb</td>
</tr>
<tr>
<td>W total</td>
<td>37920 lb</td>
</tr>
<tr>
<td>W total</td>
<td>37920 lb</td>
</tr>
</tbody>
</table>

\[ \% \text{increase} = \left( \frac{W_{\text{total}} + W_{\text{array}}}{W_{\text{total}}} \right) = \frac{38956}{37920} \times 100\% - 100\% = 2.73\% \]

**The increase in weight as a result of the solar system is less than 10% of the existing structure and therefore no further seismic analysis is required.**

**Limits of Scope of Work and Liability**

We have based our structural capacity determination on applicable building codes, professional engineering inspection and design experience, opinions and judgments. The calculations produced for this dwelling’s assessment are only for the proposed solar panel installation referenced in the stamped plan set and were made according to generally recognized structural analysis standards and procedures.
August 3, 2020

Subject: Structural Certification for Proposed Residential Solar Installation.
Job Number: 251R-005WESS;Rev A, Dated 7/29/2020
Client: Lois Wessel
Address: 7005 Westmoreland Ave, Takoma Park, MD, 20912

Attn: To Whom It May Concern

A field observation was performed by a Sunrun qualified technician to document the existing conditions of the above mentioned address. Structural evaluation of loading was based on review of site observations and the design criteria listed below.

Design Criteria:

- 2018 IBC/IEBC/IRC w/ DHCD Modifications, ASCE 7-16, 2018 NDS
- Basic Wind Speed Vult = 111 mph (Vasd = 86 mph), Exposure B
- Ground Snow Load = 30 psf

Based on this evaluation, I certify that the alteration to the existing structure by the installation of the PV system meets the requirements of the applicable existing building and/or new building code provisions adopted/referenced above.

Additionally, the PV module assembly and hardware supporting it have been reviewed to be in accordance with manufacturer’s specifications and verified to meet the minimum loading requirements referenced above.

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. 54593, Expiration Date: 06 25 2021

Jason Brown
Professional Engineer