

5/23/2022

RE: Structural Certification for Installation of Residential Solar
ERNEST PASQUOT:18011 US-441, LAKE CITY, FL 32024

Attn: To Whom It May Concern

This Letter is for the existing roof framing which supports the new PV modules as well as the attachment of the PV system to existing roof framing. From the field observation report, the roof is made of Metal roofing over 1/2 inch plywood supported by 2X4 Trusses at 24 inches. The slope of the roof was approximated to be 7,18,23 and 43 degrees and having an allowable maximum chord span of 6 feet between supports.

After review of the field observation data and based on our structural capacity calculation, **the existing roof framing has been determined to be adequate to support the imposed loads without structural upgrades.** Contractor shall verify that existing framing is consistent with the described above before install. Should they find any discrepancies, a written approval from SEOR is mandatory before proceeding with install. Capacity calculations were done in accordance with applicable building codes.

<u>Code</u>	2020 Florida Building Code (ASCE 7-16)		
<u>Risk category</u>	II	<u>Wind Load</u>	(component and Cladding)
<u>Roof Dead Load</u>	Dr	10 psf	V 140 mph
<u>PV Dead Load</u>	DPV	3 psf	Exposure B
<u>Roof Live Load</u>	Lr	20 psf	
<u>Ground Snow</u>	S	0 psf	

If you have any questions on the above, please do not hesitate to call.

Sincerely,

Vincent Mwumvaneza, P.E
EV Engineering LLC
[276-220-0064/951-355-3348](tel:276-220-0064)



This item has been electronically signed and sealed by Vincent Mwumvaneza using a Digital Signature and Date. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Digitally signed by Vincent Mwumvaneza
Date: 2022.05.23 19:20:23 -04'00'



Structural Letter for PV Installation

Date: 5/23/2022
Job Address: 18011 US-441
LAKE CITY, FL 32024
Job Name: ERNEST PASQUOT
Job Number: 220523EP

Scope of Work

This Letter is 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.

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Engineering Calculations Summary

Code	2020 Florida Building Code (ASCE 7-16)	
Risk category	II	
Roof Dead Load	Dr	10 psf
PV Dead Load	DPV	3 psf
Roof Live Load	Lr	20 psf
Ground Snow	S	0 psf
Wind Load	(component and Cladding)	
	V	140 mph
	Exposure	B

References

NDS for Wood Construction

Sincerely,

Vincent Mwumvaneza, P.E
EV Engineering LLC
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Wind Load Cont.

Risk Category =	II	
V =	140 mph	ASCE 7-16 Figure 26.5-1B
Exposure =	B	
K_{zt} =	1.0	ASCE 7-16 Sec 26.8.2
K_z =	0.57	ASCE 7-16 Table 26.10-1
K_d =	0.85	ASCE 7-16 Table 26.6-1
K_e =	1.00	ASCE 7-16 Table 26.9-1
$q_h = 0.00256 K_z K_{zt} K_d K_e V^2$ =	24.21 psf	
Pitch =	7.0 Degrees	
γ_E =	1.5	Conservatively assuming all exposed
γ_a =	0.8	conservatively assuming 10 ft ² effective area

<u>Uplift (W)</u>		Zone(1')	Zone(1)	Zone(2)	Zone(3)
Fig. 30.3-2	GC_p =	-0.9	-1.4	-1.9	-2.4
Eq. 29.4-7	$P = q_h(GC_p)(\gamma_E)(\gamma_a)$ =	-26.15	-40.67	-55.20	-69.73
	GC_p =	0.3			
	$P = q_h(GC_p)(\gamma_E)(\gamma_a)$ =	8.72			

Figure 30.3-2

Equation 29.4-7

Rafter Attachments: 0.6D+0.6W (CD=1.6)

Connection Check

Attachment max. spacing = 4 ft

S-5 Ultimate Withdrawal Value = 900 lbs Manufacturer Test

Safety Factor = 3

Allowable Capacity = 300 lbs

Zone	Average Trib Width	Area (ft)	Uplift (lbs)	Down (lbs)
Zone(1')	4	11.0	106.0	71.0
Zone(1)	4	11.0	158.8	71.0
Zone(2)	4	11.0	211.7	71.0
Zone(3)	4	11.0	264.5	71.0
Conservative Max =			264.5	< 300

CONNECTION IS OK

1. Pv seismic dead weight is negligible to result in significant seismic uplift, therefore the wind uplift governs
2. Embedment is measured from the top of the framing member to the tapered tip of a lag screw. Embedment in sheathing or other material does not count.

Vertical Load Resisting System Design

Trusses

Max Length, L =	6.0 ft	(Beam maximum Allowable Horizontal Span)
Tributary Width, W_T =	24 in	
Dr =	10 psf	20 plf
L_r =	20 psf	
W_{down} =	8.72 psf	17.4 plf
Pv =	3 psf	6 plf

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

Pv max Shear =	71.0 lbs	
Max Moment, M_u =	109 lb-ft	Conservative
Max Shear, $V_u = wL/2 + P_v$ Point Load =	149 lb	

Note: Proposed loading will add less than 5% of the existing loads.

Member Capacity

DF-L No.2

2X4	Design Value	C_L	C_F	C_i	C_r	K_F	ϕ	λ	Adjusted Value
F_b =	900 psi	1.0	1.5	1.0	1.15	2.54	0.85	0.8	1553 psi
F_v =	180 psi	N/A	N/A	1.0	N/A	2.88	0.75	0.8	180 psi
E =	1600000 psi	N/A	N/A	1.0	N/A	N/A	N/A	N/A	psi
E_{min} =	580000 psi	N/A	N/A	1.0	N/A	1.76	0.85	N/A	580000 psi

Depth, d = 3.5 in

Width, b = 1.5 in

Cross-Sectional Area, A = 5.25 in²

Moment of Inertia, I_{xx} = 5.35938 in⁴

Section Modulus, S_{xx} = 3.0625 in³

Allowable Moment, $M_{all} = F_b' S_{xx}$ = 396.2 lb-ft

Allowable Shear, $V_{all} = 2/3 F_v' A$ = 630.0 lb

DCR = M_u / M_{all} = 0.17 < 1

DCR = V_u / V_{all} = 0.24 < 1

Satisfactory

Satisfactory

Siesmic Loads Check

Roof Dead Load	10 psf
% or Roof with Pv	52.8%
Dpv and Racking	3 psf
Average Total Dead Load	11.6 psf
Increase in Dead Load	7.9% OK

The increase in seismic Dead 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 information in pictures and a drawing set titled PV plans - ERNEST PASQUOT. The analysis was according to applicable building codes, professional engineering 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.