6/3/2022

RE: Structural Certification for Installation of Residential Solar
THE ANTHONY CAMPBELL RESIDENCE:201 KUYPER DRIVE, UPPER NYACK, NY 10960

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 Asphalt Shingles roofing over roof plywood supported by 2X8 Rafters at 16 inches. The slope of the roof was approximated to be 19 degrees.

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.

Design Criteria

Code	2020 Building Code of NY (ASCE 7-16)				
Risk category		II	Wind Load	(component and Cladding)	
Roof Dead Load	Dr	10 psf		V	115 mph
PV Dead Load	DPV	3 psf		Exposure	C
Roof Live Load	Lr	20 psf			
Ground Snow	S	30 psf			

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

Sincerely,

Structural Letter for PV Installation

Date: 6/3/2022
Job Address: **201 KUYPER DRIVE**
UPPER NYACK, NY 10960
Job Name: **THE ANTHONY CAMPBELL RESIDENCE**
Job Number: **220603ACR**

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.

Table of Content

Engineering Calculations Summary

Code	2020 Building Code of NY (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	30	psf
Wind Load	(component and Cladding)		
	V	115	mph
	Exposure	C	

References

NDS for Wood Construction

Sincerely,

Wind Load Cont.

Risk Category =	II		
V=	**115**	**mph**	**ASCE 7-16 Figure 26.5-1B**
Exposure =	**C**		
K_{Zt} =	1.0		ASCE 7-16 Sec 26.8.2
K_Z =	0.85		ASCE 7-16 Table 26.10-1
K_d =	0.85		ASCE 7-16 Table 26.6-1
K_e =	0.99		ASCE 7-16 Table 26.9-1
$q_h= 0.00256K_zK_{zt}K_dK_eV^2$=	24.30	psf	
Pitch =	19.0	Degrees	
γ_E=	1.1		
γ_a=	0.8	(Wind Tunnel value)	

Uplift (W)		**Zone(1)**	**Zone(2r)**	**Zone(2e)**	**Zone(3)**
Fig. 30-3-2	GC_p=	-2.1	-2.6	-2.7	-2.7
Eq. 29.4-7	$P=q_h(GC_p)(\gamma_E)(\gamma_a)$=	-44.91	-55.60	-57.74	-57.74

GC_p=	0.3	Figure 30.3-2
$P=q_h(GC_p)(\gamma_E)(\gamma_a)$=	6.30	Equation 29.4-7

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

Connection Check

Attachement max. spacing=	4	ft	Staggered
RTMini-(2) SS304x60mm Withdrawal Value=	894	lbs	Manufacturer Test
Lag Screw Penetration (Minimum)	2	in	

Allowable Capacity= 447 lbs

Zone	**Trib Width**	**Area (ft)**	**Uplift (lbs)**	**Down (lbs)**
Zone(1)	4	11.0	310.7	102.4
Zone(2r)	4	11.0	380.1	102.4
Zone(2e)	4	11.0	394.0	102.4
Zone(3)	4	11.0	394.0	102.4

Conservative Max= 394.0 < 447

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 sheading or other material does not count.

Vertical Load Resisting System Design

Roof Framing **Rafters**

Snow Load Fully Exposed

	pg=	30	psf	C_t =	1.1					
	C_e =	0.9		I_s =	1.0		**p_s =**	**18**	psf	
	p_f =	21	psf	**$p_{fmin.}$ =**	**20.8**	psf		23.56	plf	
	Max Length, L =			**12**	ft					
	Tributary Width, W_T =			**16**	in					
	RLL =			**20**	psf	25.21	plf			
	Dr =			**10**	psf	13.33	plf			
	PvDL =			3	psf	4	plf			
Load Case: DL	w=			17	plf					
	M=			277	lb-ft					
	Mallowable = Sx x Fb'=			1224	lb-ft	>	277	lb-ft	**OK**	
Load Case: DL+RLL	DL+Lr=			39	plf					
	M_{down}=			617	lb-ft					
	Mallowable = Sx x Fb'=			1700	lb-ft	>	617	lb-ft	**OK**	
Load Case: DL+S	DL+S=			41	plf					
	M_{down}=			654	lb-ft					
	Mallowable = Sx x Fb'=			1564	lb-ft	>	654	lb-ft	**OK**	
Load Case: DL+0.6W	w=			22.4	plf					
	M_u=			358	lb-ft					
	Mallowable = Sx x Fb' (wind)=			2176	lb-ft	>	358	lb-ft	**OK**	
Load Case: 0.6DL+0.6W	w=			20.1	plf					
	M_u=			322	lb-ft					
	Mallowable = Sx x Fb' (wind)=			2176	lb-ft	>	322	lb-ft	**OK**	
DL+0.45W+0.75(RLL or S)				42	plf					
	M_{down}=			676	lb-ft					
	Mallowable = Sx x Fb'=			2176	lb-ft	>	676	lb-ft	**OK**	

Member Capacity

DF-L No.2

2X8	Design Value	C_L	C_F	C_i	C_r	K_F	ϕ	λ	Adjusted Value
F_b =	900 psi	1.0	1.2	1.0	1.15	2.54	0.85	0.8	1242 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	1600000 psi
E_{min} =	580000 psi	N/A	N/A	1.0	N/A	1.76	0.85	N/A	580000 psi

Depth, d =	7.25	in			
Width, b =	1.5	in			
Cross-Sectonal Area, A =	10.875	in^2			
Moment of Inertia, I_{xx} =	47.6348	in^4			
Section Modulus, S_{xx} =	13.1406	in^3			
Allowable Moment, $M_{all} = F_b'S_{xx}$ =	1360.1	lb-ft	DCR=M_u/M_{all} =	0.42 < 1	**Satisfactory**
Allowable Shear, $V_{all} = 2/3F_v'A$ =	1305.0	lb	DCR=V_u/V_{all} =	0.09 < 1	**Satisfactory**

Siesmic Loads Check

Roof Dead Load	10	psf
% or Roof with Pv	28.0%	
Dpv and Racking	3	psf
Average Total Dead Load	10.8	psf
Increase in Dead Load	3.8%	**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 - THE ANTHONY CAMPBELL RESIDENCE. The analysis was according to applicable building codes, professional engineering and design experience, opinions and judgments. The calculations produced for this structure'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.