

February 18, 2021

Power Home Solar and Roofing 919 North Main Street Mooresville, NC 28115 **Design Criteria:**

Design Wind Speed (ASD)- 115 mph Ground Snow Load- 15 psf Risk Category- II Exposure category- C

RE: Structural Roof Evaluation for the Vuncannon Residence: 126 Tyler Dewar Lane, Fuquay Varina, North Carolina

As per your request, we have evaluated the roof structure under the proposed solar panel array. The information used to evaluate this structure was gathered during a field visit by Power Home Solar and Roofing on behalf of Right Angle Engineering. The roof structure consists of 2x8 rafters spaced at 16" on center. The roof material consists of asphalt shingles. The design criteria used to analyze this structure are listed above and included with this letter. The adopted building codes in this jurisdiction are: *the* 2018 North Carolina Building Code, the 2018 North Carolina Existing Building Code, and ASCE 7-16.

North Carolina Existing Building Code (NCEBC) 2018 section 807.4 indicates that alterations to an existing building that results in less than a 10% increase in the total stress may be performed without a structural evaluation of the existing building. As demonstrated in the attached calculations, the additional weight of the solar panels will be less than 10% increase in the gravity loading and the stress on the existing roof framing.

Based on our assessment we have determined that the existing roof framing will safely and adequately support the additional loads imposed by the solar panels without reinforcement. In order for the loads to be evenly distributed, the roof attachments should be staggered and spread evenly throughout the panel array. Attachment points should be spaced at a maximum of 48" on center. The racking system should be installed per the manufacture's specifications. There should be a minimum of 35 L-foot attachment points to the roof. Each attachment should have a 5/16" or 18/8 SS lag screw with 2.5" minimum penetration centered on each truss top chord. Waterproofing around the roof penetrations is the responsibility of others. Right Angle Engineering assumes no responsibility for improper installation of the solar panels.

Regards,

Robert D Smythe, P.E. Right Angle Engineering 2/18/21



Design Criteria:					
Design Wind Speed (3 second gust)	115	mph	•		
Exposure Category	С				
Risk Category	2				
Mean Roof Height	30	ft			
Roof Type	Gable Roof				
Building Type	enclosed				
Roof Dead Load- ASCE Table	C3-1				
Asphalt Shingles	2	psf	•		
5/8" Plywood Sheathing	2	psf			
Roof Framing	4	psf			
Insulation	0	psf			
Gypsum sheathing	0	psf			
Solar Panel Array	3	psf			
Dead Load Without Panels	8	psf			
Dead Load With Solar panels	11	psf			
Roof Live Load					
Existing Roof Live Load	20	psf	ASCE 7-16 Table 4.3-1		
Roof Live Load with Solar Panels	0	psf	2018 NCBC 1607.12.5		
Deef Consulted ACCE 7.16			I		
Roof Snow Load-ASCE 7-16	4-5	•			
Ground Snow Load (pg)	15	psf	Section 7.2		
Exposure Factor (Ce)	0.9		Table 7.3-1		
Thermal Factor (Ct)	1.1		Table 7.3-2		
Importance Factor (Is)	1		Table 1.5-2		
Flat Roof Snow Load (Pf)	10		Equation 7.3-1		
Slippery surface Slope Factor (Cs)	0.67		Figure 7-2		
Nonslippery Surface Slope Factor (Cs)	1		Figure 7-2		
(C3)	1		rigure 7-2		
Roof Snow Load	10	psf	Equation 7.4-1		
Reduced Roof Snow Load (Slippery		•	•		
Surface)	7	psf	Equation 7.4-1		
Load Combinations - ASCE 7-16 Section 2.4.1					
		With Solar			
	Without Solar Panels	panels			
D + Lr	28 psf	11 psf			

		With Solar
	Without Solar Panels	panels
D + Lr	28 psf	11 psf
D + S	18.4 psf	17.9 psf



Roof Slope 30 degrees Number of panels 22 Panel Area 385 ft^2	Solar Array 1-							
Panel Area 385 ft^2	Roof Slope	30	degrees					
Wind Calculations- ASCE 7-16 Figure 30.3-(2A-5B)	Number of panels	22						
Figure 30.3-(2A-5B)	Panel Area	385	ft^2					
Figure 30.3-(2A-5B)	Wind Calculations- ASCE 7-16							
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