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April 2021

Harnett County

Property Owner: Milton Brake

Property Address: 26 Strickland Lane, Lillington, NC 27546

Re: Photovoltaic System Roof Installation

Wind loads have been calculated for a speed of 118 MPH. The roof pitch and construction have been analyzed and the photovoltaic system structure is designed to resist resulting uplift and downward forces. Based on the deck material and the size and spacing of the rafters, we find the above referenced address is in sound condition and can withhold the additional weight (~ 3 PSF) of the solar panels. The attached drawings and diagrams reflect a design that safely transmits dead and live loads to the roof. To the best of my professional knowledge and belief, the subject construction and photovoltaic system installation will be in compliance with the 2018 NCRC (2015 IRC) and 2018 IFC/2018 NCBC (2015 IBC) and 2017 NEC codes at the time of our review.

System installation must be in accordance with manufacturer recommendations and specifications and should abide by any industry-specific methods and applicable safety regulations. The contractor is responsible for ensuring that the solar panels are installed according to the approved plans and must notify Principal Engineering, Inc. of any discrepancies that may prevent proper installation of the proposed system, or defects uncovered in the existing structure, so that the design may be adjusted. Principal Engineering, Inc. does not assume any responsibility for improper installation of the proposed photovoltaic system.



04/27/2021

North Carolina Firm No. C4113 Principal Engineering, Inc.

Uplift and Wind Downforce Calculation Summary (ASCE 7-10, 30.5 Part 2)

Mount, Rack, & Panel Proportioning

Property Owner:	Milton Brake	Max. Individual Panel Dimensions		
Project Address:	26 Strickland Lane	Length (in)	Width (in)	Area (sf)
City, State:	Lillington, NC 27546	77	39	20.85

Building Characteristics, Design Input, and Adjustment Factors				
3-Sec Gust Wind Speed: 118		From ASCE 7-10, Fig. 26.5-1A		
Exposure Category:	В	Para 26.7.3		
Risk Category:	II			
Effective Wind Area (sf):	10	(Area per individual fastener)		
Roof Dimensions: Length:	84			
Width:	72	Least Dimension: 72		
Roof Height (h):	15	Must be less than 60		
Pitch: 7 on 12 =	30.3	degrees; must be less than 45		
Ht. & Exposure Adjustment (λ) 1		Fig. 30.5-1		
Importance Factor (I) 1				
Topographic Adj. (K _{zt}) 1		Fig. 26.8-1		

Roof Zone Strip (a), in ft, Fig. 30.5-1, Note 5				
1 - Least Roof Horizontal Dimension (L or W) x 0.10	7.2			
2 - Roof Height x 0.4	6			
3 - Least Roof Horizontal Dimension (L or W) x 0.04	2.88			
4 - Least of (1) and (2)	6			
5 - Greater of (3) and (4)	6			
6 - Greater of (5) and 3 feet	6			

Net Design Pressures, Components & Cladding					
Allowable Stress Design, Use 0.6W (2.4.1)					
	Uplif	t (-psf) Down (psf)		n (psf)	
	P _{30net}	$\lambda K_{zt} P_{30net}$	P _{30net}	$\lambda K_{zt} P_{30net}$	
Zone 1	22.1	22.1	20.0	20.0	Interior Roof Area
Zone 2	25.7	25.7	20.0	20.0	Strip of (a) ft wide at roof edge
Zone 3	25.7	25.7	20.0	20.0	Corner intersection of strips

	Uplift (-psf)	Down (psf)	
	$W_{asd} = 0.6P_{30}$	$W_{asd} = 0.6P_{30}$	
Zone 1	13.3	12.0	Interior Roof Area
Zone 2	15.4		Strip of (a) ft wide at roof edge CA
Zone 3	15.4	12.0	Corner intersection of strips
			55.0

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UNIRAC & Rail Selection (FS=3.0) (SolarMount)				
Manufacturer: UNIRAC		Perpendicular Panel Orientation		
Model:	SolarMount	Allowable Scheme by Uplift Pressure		
Ultimate Uplift (lb):	1913	< 60 psf 2 rails, 4'-0" OC mounts		
<u>Parallel</u> : Mounts per Individual Panel		60-90 psf 2 rails, 2'-0" OC mounts		
# Mounts/ Panel for FS=3.0		90-150 psf 3 rails, 2'-0" OC mounts		
Zone 1	0.7	150-170 psf 4 rails, 2'-0" OC mounts		
Zone 2	0.8	170 psf +, panel clip capacity exceeded		
Zone 3	0.8			
(From rail analysis, allowable spacing/rails controlled by individual mount pullout before rail bending)				



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