PRINCIPAL Engineering, Inc.

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April 2021

Harnett County

Property Owner: Theselonia Mclean

Property Address: 284 Sandclay Drive, Spring Lake, NC 28390

Re: Photovoltaic System Roof Installation

Wind loads have been calculated for a speed of 119 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.

4/22/2021

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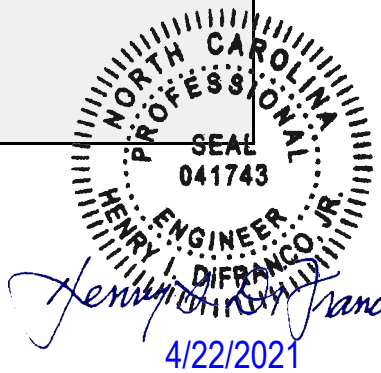
Uplift and Wind Downforce Calculation Summary (ASCE 7-10, 30.5 Part 2)

Mount, Rack, & Panel Proportioning

Property Owner:	Theselonia Mclean	Max. Individual Panel Dimensions		
Project Address:	284 Sandclay Drive	Length (in)	Width (in)	Area (sf)
City, State:	Spring Lake, NC 28390	77	39	20.85

Building Characteristics, Design Input, and Adjustment Factors			
3-Sec Gust Wind Speed:	119	From ASCE 7-10, Fig. 26.5-1A	
Exposure Category:	C	Para 26.7.3	
Risk Category:	II		
Effective Wind Area (sf):	10	(Area per individual fastener)	
Roof Dimensions: Length:	67		
Width:	40	Least Dimension:	40
Roof Height (h):	15	Must be less than 60	
Pitch: 4 on 12 =	18.4	degrees; must be less than 45	
Ht. & Exposure Adjustment (λ)	1.21	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	4
2 - Roof Height x 0.4	6
3 - Least Roof Horizontal Dimension (L or W) x 0.04	1.6
4 - Least of (1) and (2)	4
5 - Greater of (3) and (4)	4
6 - Greater of (5) and 3 feet **a=**	**4**



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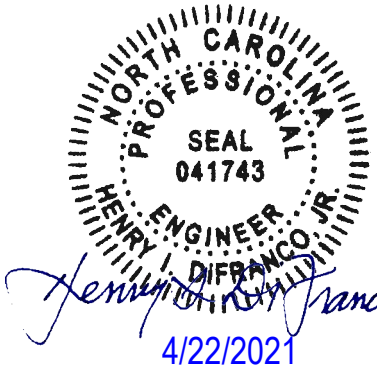
Net Design Pressures, Components & Cladding					
Allowable Stress Design, Use 0.6W (2.4.1)					
	Uplift (-psf)		Down (psf)		
	P_{30net}	$lK_{zt}P_{30net}$	P_{30net}	$lK_{zt}P_{30net}$	
Zone 1	20.6	24.9	12.9	15.6	Interior Roof Area
Zone 2	36.1	43.7	12.9	15.6	Strip of **(a)** ft wide at roof edge
Zone 3	53.4	64.6	12.9	15.6	Corner intersection of strips

	Uplift (-psf)	Down (psf)	
	$W_{asd} = 0.6P_{30}$	$W_{asd} = 0.6P_{30}$	
Zone 1	**14.9**	**9.4**	Interior Roof Area
Zone 2	**26.2**	**9.4**	Strip of **(a)** ft wide at roof edge
Zone 3	**38.8**	**9.4**	Corner intersection of strips

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
Parallel *: 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	0.8	150-170 psf 4 rails, 2'-0" OC mounts
Zone 2	1.4	170 psf +, panel clip capacity exceeded
Zone 3	2.1	
(From rail analysis, allowable spacing/rails controlled by individual mount pullout before rail bending)		



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