

#### 9/4/2024

Freedom Forever LLC 43445 Buisiness Park Dr., Suite 110 Temecula, CA 92590

Job Number: 495612

Project Name: Kaleb Johnson

Project Address: 173 Hawksmoore Lane , Lillington, NC

**Design Criteria:** 

Applicable Code = ASCE 7-16

Design Wind Speed = 130 mph (3 Second Gust)

Exposure Category = B

Ground Snow Load = 15 psf 11.55 psf

Module Type = SILFAB SOLAR: SIL-430QD

Module Quantity = 16

To whom is may concern,

The above mentioned residential rooftop solar project has been designed to the specifications shown above. The team at Freedom Forever LLC has visited the site to observe the roof and its framing as well as gather other required information for the project. During this observation they did not see any signs of damage or distress to the roof structure which would preclude solar from being installed. Based on that review and the information provided, the calculations on the following pages were completed to determine the adequacy of the roof framing as well as the allowable attachment spacing for the PV panels. The calculations show that the roof can support the proposed PV system without structural modifications.

Mounting Plane	1	2	3	4	5	6	7	8	9	10
Roof Type	Comp Shingle									
Framing Type	Rafter									
Framing Size	2x6 @ 24									
Upgrade Size	NA									
A 1 <del>.</del>	Ecofasten									
Attachment Type	RockIt Smart Slide									
Lag Count	Silde 2									
Lag Count	2									
Embedment Depth	2									

Sincerely,

Taqi Khawaja, PE Freedom Forever LLC



## **Wind Calculations**

Pressures based on Section 29.4.4

$$p = q_h(GC_p)(\gamma_E)(\gamma_a)$$

$$q_h = .00256 * K_z * K_{zt} * K_d * V^2$$

 $K_z = 0.70$ 

K<sub>zt</sub> = 1.0

K<sub>d</sub> = 0.85 ASCE7 Table 26.6-1

 $q_z = 25.8 \text{ psf}$ 

Mounting Plan	0		1	2		3		4		5	
Woulding Plan	е	GC	Wind	GC	Wind	GC	Wind	GC	Wind	GC	Wind
	1	-1.49	-38.32								
	2e	-1.49	-38.32								
	2r	-2.14	-55.23								
Zone	2n	-2.14	-55.23								
	3r	-2.42	-62.30								
	3e	-2.14	-55.23								
	Down	0.46	11.94								

Mounting Plan	0		6		7		8		9	-	10
Mounting Plan	e	GC	Wind								
	1										
	2e										
	2r										
Zone	2n										
	3r										
	3e										
	Down										



## **Snow Load Calculations**

Flat Roof Snow Load based on Section 7.3

$$p_f = 0.7C_eC_tI_sp_g$$

p<sub>g</sub> = 15

 $p_f = 11.55$ 

C<sub>e</sub> = 1.00

C<sub>t</sub> = 1.10

I<sub>s</sub> = 1.0

Mounting Plane		1		2		3		4		5	
Poof Snow Load (nof)	C <sub>s</sub>	Snow	Cs	Snow	C <sub>s</sub>	Snow	C <sub>s</sub>	Snow	$C_s$	Snow	
Roof Snow Load (psf)	0.72	8.35									

Mounting Plane		6		7		8		9		10	
Roof Snow Load (psf)	C <sub>s</sub>	Snow	C <sub>s</sub>	Snow	$C_s$	Snow	C <sub>s</sub>	Snow	$C_s$	Snow	
Nooi Show Load (psi)											

#### **Load Combinations**

Dead Load =

3 psf

1.5

EM = Edge Module

IM = Interior Module

Uplift

 $\gamma_{\rm E}$ =

 $\gamma_a$ = 0.55 per Figure 29.4-8

Mounting Plan	ie		1		2		3		4		5
0.6D + 0.6W (psf)		EM	IM	EM	IM	EM	IM	EM	IM	EM	IM
	1	-17.21	-10.87								
	2e	-17.21	-10.87								
7000	2r	-25.59	-16.46								
Zone	2n	-25.59	-16.46								
	3r	-29.10	-18.80							·	
	3e	-25.59	-16.46								

Mounting Pla	ne		6		7		8		9	1	10
0.6D + 0.6W (psf)		EM	IM								
	1										
	2e										
7000	2r										
Zone	2n										
	3r										
	3e										



#### **Down Force**

Mounting Plane		1		2		3		4		5
Module Location	EM	IM	EM	IM	EM	IM	EM	IM	EM	IM
D+S (psf)	9.36	9.36								
D+06W (psf)	8.60	6.63								

Mounting Plane		6		7		8		9	1	10
Module Location	EM	IM								
D+S (psf)										
D+06W (psf)										

#### **Lateral Parallel to Roof**

Mounting Plane	1	2	3	4	5
D+S (psf)	4.69				

Mounting Plane	6	7	8	9	10
D+S (psf)					

## **Framing Check**

Lumber Species: DF

PV Load = 3 psf

Mounting Plane	1	2	3	4	5
Framing Type	Rafter				
Framing Size	2x6				
Framing Spacing (in)	24				
Span (ft)	4.7				
Moment (lb-ft)	90				
Shear (lbs)	77				
Upgrade Size	NA				

Mounting Plane	6	7	8	9	10
Framing Type					
Framing Size					
Framing Spacing (in)					
Span (ft)					
Moment (lb-ft)					
Shear (lbs)					
Upgrade Size					



# **Array Attachment Spacing**

Module = SILFAB SOLAR: SIL-430QD

Mounting Plane	1	2	3	4	5
Roofing Material	Comp Shingle				
Attachment Type	Ecofasten Rocklt Smart Slide				
Lag Count Per Attachment	2				
Min Lag Embedment (in)	2				
Landscape	72				
Portrait	48				

Mounting Plane	6	7	8	9	10
Roofing Material					
Attachment Type					
Lag Count Per Attachment					
Min Lag Embedment (in)					
Landscape					
Portrait					