

6/18/2025

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

Job Number: 559074

Project Name: Theresa Mcnulty

Project Address: 110 Denali Dr , Angier, NC

Design Criteria:

Applicable Code = ASCE 7-16

Design Wind Speed = 130 mph (3 Second Gust)

Exposure Category = B Seismic Design Cat= A
Ground Snow Load = 15 psf Roof Snow Load= 11.55 psf

Module Type = JA Solar: JAM54S31-405/MR

Module Quantity = 19

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	Comp Shingle								
Framing Type	Truss	Truss								
Framing Size	2x6 @ 24	2x6 @ 24								
Upgrade Size	NA	NA								
Attachment Type	SnapNRack RL Universal	SnapNRack RL Universal								
Lag Count	1	1								
Embedment Depth	2.5	2.5								

Sincerely,

Taqi Khawaja, PE Freedom Forever LLC

SEAL OS7554

SEAL OS7554

WGINEER JAMININ

Digitally Signed by: Taqi Khawaja, PE Digitally Signed on: 06/18/2025



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_{zt} = 1.0

K_d = 0.85 ASCE7 Table 26.6-1

 $q_z = 25.8 \text{ psf}$

Mounting Plan			1		2		3		4	5	
IVIOUITIIII PIAII	E	GC	Wind	GC	Wind	GC	Wind	GC	Wind	GC	Wind
	1	-1.49	-38.32	-1.49	-38.32						
	2e	-1.49	-38.32	-1.49	-38.32						
	2r	-2.14	-55.23	-2.14	-55.23						
Zone	2n	-2.14	-55.23	-2.14	-55.23						
	3r	-2.42	-62.30	-2.42	-62.30						
	3e	-2.14	-55.23	-2.14	-55.23						
	Down	0.46	11.94	0.46	11.94						

Mounting Plan	^		6		7		8		9		10
Woulding Plant	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_g = 15 $p_f = 11.55$

C_e = 1.00

C_t = 1.10

I_s = 1.0

Mounting Plane		1		2		3		4		5	
Roof Snow Load (psf)	C _s	Snow									
Noor Show Load (psi)	0.73	8.47	0.73	8.47							

Mounting Plane		6		7		8		9		10	
Roof Snow Load (psf)	C _s	Snow									
Noor Show Load (psi)							_		_	·	

Load Combinations

Dead Load = 3 psf

EM = Edge Module

IM = Interior Module

Uplift

 $\gamma_{\rm E}$ =

1.5 γ_a = 0.55 per Figure 29.4-8

- μ											
Mounting Plan	e		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	-17.21	-10.87						
	2e	-17.21	-10.87	-17.21	-10.87						
Zono	2r	-25.59	-16.46	-25.59	-16.46						
Zone	2n	-25.59	-16.46	-25.59	-16.46						
	3r	-29.10	-18.80	-29.10	-18.80						
	3e	-25.59	-16.46	-25.59	-16.46						

Mounting Plan	e		6		7		8		9		LO
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)	9.54	9.54	9.54	9.54						
D+06W (psf)	8.62	6.64	8.62	6.64						

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

Lateral Parallel to Roof

Mounting Plane	1	2	3	4	5
D+S (psf)	4.65	4.65			

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	Truss	Truss			
Framing Size	2x6	2x6			
Framing Spacing (in)	24	24			
Span (ft)	7	7			
Moment (lb-ft)	203	203			
Shear (lbs)	116	116			
% Stressed	21%	21%			
Upgrade Size	NA	NA			
New % Stressed	NA	NA			

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



Array Attachment Spacing

Module = JA Solar: JAM54S31-405/MR

Mounting Plane	1	2	3	4	5
Roofing Material	Comp Shingle	Comp Shingle			
Attachment Type	SnapNRack RL Universal	SnapNRack RL Universal			
Lag Count Per Attachment	1	1			
Min Lag Embedment (in)	2.5	2.5			
Landscape	72	72			
Portrait	72	72			

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