

11/12/2024

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

Job Number: 498387

Project Name: Shataca Hicks

Project Address: 237 Beacon Hill Road

City: Lillington

State: NC

Design Criteria:

Applicable Code = ASCE 7-16

Design Wind Speed = 130 mph (3 Second Gust)

Exposure Category = C
Ground Snow Load = 15 psf

Module Type = Trina: TSM-410NE09RC.05

Module Quantity = 17

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.

Sincerely,

Taqi Khawaja, PE Freedom Forever LLC



Wind Calculations

Pressures based on Section 29.4.4

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

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

 $K_z = 0.98$

K_{zt} = 1.0

K_d = 0.85 ASCE7 Table 26.6-1

 $q_z = 36.1 \text{ psf}$

Mounting Plan	^		1		2		3		4		5
Widulting Plan	E	GC	Wind	GC	Wind	GC	Wind	GC	Wind	GC	Wind
	1	-1.50	-54.18	-1.50	-54.18						
	2e	-1.50	-54.18	-1.50	-54.18						
	2r	-2.50	-90.30	-2.50	-90.30						
Zone	2n	-2.50	-90.30	-2.50	-90.30						
	3r	-3.60	-130.04	-3.60	-130.04						
	3e	-2.50	-90.30	-2.50	-90.30						
	Down	0.70	25.29	0.70	25.29						

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



Snow Load Calculations

Flat Roof Snow Load based on Section 7.3

$$p_f = 0.7C_eC_tI_sp_g$$

 $p_g = \qquad \quad 15 \qquad \qquad p_f = \quad 11.55$

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	C _s	Snow	C _s	Snow	C_s	Snow	C_s	Snow	
	0.78	9.05	0.78	9.05							

Mounting Plane		6		7		8		9		10	
Roof Snow Load (psf)	C _s	Snow	C _s	Snow	C _s	Snow	C_s	Snow	C_s	Snow	

Load Combinations

Dead Load = 3 psf EM = Edge Module IM = Interior Module

Uplift $\gamma_{\rm E}$ = 1.5 $\gamma_{\rm a}$ = 0.60 per Figure 29.4-8

Mounting Plan	e		1		2		3		4		5
0.6D + 0.6W (psf)		EM	IM	EM	IM	EM	IM	EM	IM	EM	IM
	1	-27.46	-17.71	-27.46	-17.71						
	2e	-27.46	-17.71	-27.46	-17.71						
Zone	2r	-46.96	-30.71	-46.96	-30.71						
Zone	2n	-46.96	-30.71	-46.96	-30.71						
	3r	-68.42	-45.01	-68.42	-45.01						
	3e	-46.96	-30.71	-46.96	-30.71						_

Mounting Plan	е		6		7		8		9	3	10
0.6D + 0.6W (psf)		EM	IM								
1 2e 2r	1										
	2e										
	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)	10.43	10.43	10.43	10.43						
D+06W (psf)	16.42	11.86	16.42	11.86						

Mounting Plane		6		7		8		9		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)	4.43	4.43			

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 Size	2x4	2x4			
Framing Spacing (in)	24	24			
Span (ft)	7	7			
Moment (lb-ft)	213	213			
Shear (lbs)	122	122			
% Stressed	47%	47%			
Upgrade Size	NA	NA			
New % Stressed	NA	NA			

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



Array Attachment Spacing

Module Model = Trina: TSM-410NE09RC.05

Module Quantity = 17

Landscape
Max Spacing (in)
Portrait
Max Spacing (in)

Mounting Plane	1	2	3	4	5
Attachment Type	Ecofasten Rocklt Smart Slide	Ecofasten Rocklt Smart Slide			
Lag Count Per Attachment	2	2			
Min Lag Embedment (in)	2	2			
Landscape Max Spacing (in)	#DIV/0!	#DIV/0!			
Portrait Max Spacing (in)	#DIV/0!	#DIV/0!			
Mounting Plane	6	7	8	9	10
Attachment Type					
Lag Count Per Attachment					
Min Lag Embedment (in)					