9/24/2024

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

Job Number:	495493
Project Name:	Raymond Patterson
Project Address:	118 Oleander Lane , Sanford, 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 =	18	

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	2x4 @ 24	2x4 @ 24								
Upgrade Size	NA	NA								
Attachment Type	Ecofasten RockIt Smart Slide	Ecofasten RockIt Smart Slide								
Lag Count	2	2								
Embedment Depth	2	2								

Sincerely,

Taqi Khawaja, PE
Freedom Forever LLC

NORTH CAROLINA PROFESSIONAL SEAL 057554 ENGINEER TAQI KHAWAJA

Signed by: Taqi Khawaja, PE
Signed on: 09/24/2024

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 psf

Mounting Plane		1		2		3		4		5	
		GC	Wind	GC	Wind	GC	Wind	GC	Wind	GC	Wind
Zone	1	-1.48	-38.07	-1.48	-38.07						
	2e	-1.48	-38.07	-1.48	-38.07						
	2r	-1.75	-45.15	-1.75	-45.15						
	2n	-1.75	-45.15	-1.75	-45.15						
	3r	-2.17	-55.84	-2.17	-55.84						
	3e	-2.17	-55.84	-2.17	-55.84						
	Down	0.77	19.84	0.77	19.84						

Mounting Plane		6		7		8		9		10	
		GC	Wind	GC	Wind	GC	Wind	GC	Wind	GC	Wind
Zone	1										
	2e										
	2r										
	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	C_s	Snow	C_s	Snow	C_s	Snow	C_s	Snow
	0.67	7.70	0.67	7.70						

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 γ_E= 1.5 γ_a= 0.55 per Figure 29.4-8

Mounting Plane		1		2		3		4		5	
0.6D + 0.6W (psf)		EM	IM	EM	IM	EM	IM	EM	IM	EM	IM
Zone	1	-17.08	-10.79	-17.08	-10.79						
	2e	-17.08	-10.79	-17.08	-10.79						
	2r	-20.59	-13.13	-20.59	-13.13						
	2n	-20.59	-13.13	-20.59	-13.13						
	3r	-25.90	-16.67	-25.90	-16.67						
	3e	-25.90	-16.67	-25.90	-16.67						

Mounting Plane		6		7		8		9		10	
0.6D + 0.6W (psf)		EM	IM	EM	IM	EM	IM	EM	IM	EM	IM
Zone	1										
	2e										
	2r										
	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)	8.37	8.37	8.37	8.37						
D+06W (psf)	12.44	9.16	12.44	9.16						

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

Lateral Parallel to Roof

Mounting Plane	1	2	3	4	5
D+S (psf)	4.83	4.83			

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	2x4	2x4			
Framing Spacing (in)	24	24			
Span (ft)	8	8			
Moment (lb-ft)	246	246			
Shear (lbs)	123	123			
Upgrade Size	NA	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	Comp Shingle			
Attachment Type	Ecofasten RockIt Smart Slide	Ecofasten RockIt Smart Slide			
Lag Count Per Attachment	2	2			
Min Lag Embedment (in)	2	2			
Landscape	72	72			
Portrait	48	48			

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