PV LETTERS

Contractor Address: Top Tier Solar Solutions
1530 Center Park Dr #2911,
Charlotte, NC 28217

October 29, 2025

Subject: Proposed Solar Panel Installation
Jeffrey Banks Residence, 775 Maple Rd, Angier, NC
DC System Size: 7.935 kW
PV Letters Job #004-27272

To Whom it May Concern,

We have reviewed information, provided by our client, related to the proposed solar panel installation at the above-referenced address. The purpose of the review was to determine if the existing roof is structurally adequate for the proposed installation. Based on our review and analysis of the given information, and in accordance with governing building codes, I certify that the capacity of the structural roof framing that directly supports the additional gravity loading due to the solar panel supports and modules had been reviewed and determined to meet or exceed the requirements in accordance with the Design Criteria.

Design Parameter Summary

Governing Building Code: 2018 North Carolina Residential Code
Risk Category: II
Wind Exposure: C
Design Wind Speed: 120 mph
Ground Snow Load: 15 psf

Roof Information

Roof Structure: 2x4 Rafters @ 24" O.C.
Roofing Material: Asphalt Shingles
Roof Slope: 34 degrees

Roof Connection Details

Framing Mount Wood Screws: (2) #14 Self-Drilling Screw with a minimum penetration depth of 1.75" into rafter only, at 72" O.C. max
Decking Mount Wood Screws: (6) #14 Self-Drilling Screw with a minimum penetration depth of 0.25", at 57" O.C. max
Note: Required installation of 75% / 25% between Framing and Decking Mounts.

Engineering Analysis

The proposed installation - including weight of panels, racking, mounts, and inverters where applicable - will be approximately 3 psf. In the areas where panels are installed, roof live loads will not be present. The reduction of roof live load is adequate to fully or partially compensate for the addition of the panel installation. Because the member forces in the area of the solar panels are not increased by more than 5%, and so per provisions in the adopted building codes, the structure need not be altered for gravity loading.

The proposed installation will be 6" max. above the roof surface (flush mounted) and parallel to the roof surface. Therefore, any increase in wind loading on the building structure from the solar panel installation is expected to be negligible. Wind is the governing lateral load case. Because the increase in lateral loading is not increased by more than 10%, per provisions in the adopted building codes, the structure need not be altered for lateral loading.

Wind uplift on the panels has been calculated in accordance with the relevant provisions of ASCE 7-10. This loading has been used to verify the adequacy of the connection specified above. Connection locations should be in accordance with design drawings.

IronRidge XR10 rails will support the modules and will fasten to the roof structure with IronRidge QuickMount Halo Ultragrip along the rail.

Conclusion

The roof structure need not be altered for either gravity loading (including snow) or lateral loading (including wind). Therefore, the existing structure is permitted to remain unaltered. Connections to the roof must be made per the "Roof Connection Details" section above. Copies of all relevant calculations are enclosed.

Limitations and Disclaimers

Electrical design is excluded from this analysis. Waterproofing is the sole responsibility of the installer and is also excluded from this analysis. Solar panels must be installed per manufacturer specifications. Structural design and analysis of the adequacy of solar panels, racks, mounts, and other components is performed by each component's respective manufacturer; the undersigned makes no statement of opinion regarding such components.

If you have any questions or concerns, please contact us at (208)-994-1680, or by email at Projects@pvletters.com.

Sincerely,

Trevor A. Jones, P.E.
10/29/2025

NORTH CAROLINA PROFESSIONAL SEAL 056324 ENGINEER TREVOR JONES

Trevor Jones

Digitally signed by Trevor Jones
DN: E=trevor@pvletters.com, CN=Trevor Jones, O="PV Letters, LLC", L=Burley, S=Idaho, C=US
Date: 2025.10.29 12:08:12-06'00'

518 Lake Cleveland St.
Burley, ID 83313
Firm #: P-2910
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Standard Loading Comparison

This calculation justifies the additional solar load by comparing existing to proposed gravity loads in the location of the solar panels.

	Without Solar	With Solar	
Dead Load			
Asphalt Shingles	5	5	psf
1/4" Plywood	1	1	psf
Framing	2	2	psf
Insulation	--	--	psf
1/2" Gypsum Ceiling	--	--	psf
M,E, & Misc	--	--	psf
Solar Panel	0	3	psf
Total Dead Load	8	11	psf
Snow Load			
Ground Snow Load, P_g	15		psf
Exposure Factor, C_e	1.00		
Thermal Factor, C_t	1.1		
Importance Factor, I_s	1		
Flat Roof Snow Load	12		ASCE 7 Eqn. 7.3-1 or jurisdiction min.
Slope	34		degrees
Unobstructed Slippery Surface?	No	No	
Slope Factor, C_s	1.00	1.00	
Sloped Roof Snow Load	11.6	11.6	psf
Live Load			
Roof Live Load	20	0	psf
Load Combination			
1.4 D	11.2	15.4	psf
1.2 D +1.6 Lr	41.6	13.2	
1.2 D + 1.6 S	28.1	31.7	psf
Max. Load	41.6	31.7	psf
% of original		**76.15%**	

Result: **Because the total forces are decreased, per the relevant code provisions stated in the body of the letter, the existing roof structure is permitted to remain unaltered.**

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Wood Screw Calculation (per ASCE 7-10)

This calculation justifies the connection of the solar panels to existing roof members, by showing the connection capacity is equal to or greater than the uplift force demands.

Connection Demand

Spacing perpendicular to rail, in	34	
Roof Angle, degrees	34	
Roof Layout	Gable	
Wind Speed, mph	120	
Exposure Coefficient, K_z	0.85	(Table 26.10-1)
Topographic Factor, K_{zt}	1.00	(Table 26.8.1)
Directionality Factor, K_d	0.85	(Table 26.6-1)
Elevation Factor, K_e	0.99	(Table 26.9-1)
Velocity Pressure q_z, psf	26.3	(Table26.10-1)

Zones:	1	2	3
Spacing parallel to rail, in	72	72	72
GC_p (max)(Figure 29.4-7)	1.00	2.00	2.00
Exposed Panels? (γ_E = 1.5) (Fig. 29.4-7)	No	No	No
Effective Wind Area on each con., ft^2	17.2	17.2	17.2
Pressure Equalization Factor, γ_a (Figure 29.4-8)	0.71	0.71	0.71
Uplift Force, psf (Equation 29.4-7)	18.6	37.2	37.2
Max. Uplift Force / Connection (0.6 WL), lbs	191.9	383.9	383.9
Solar Dead Load (0.6 DL). Lbs	31.0	31.0	31.0
Max. Uplift Force (0.6 WL - 0.6 DL), lbs	**161.0**	**352.9**	**352.9**

Connection Capacity

Attachment FTG	IronRidge QuickMount Halo Ultragrip	
Attachment location	Framing	Decking
Fastener Type	Wood Screw	Wood Screw
Fastener Diameter, in	0.242	0.242
Embedment Length, in	1.75	0.25
Lumber Species & Grade	SPF #2 (Assumed)	
Nominal Withdrawal Capacity W, lbs	213	30.4
# of Screws	2	6
Load Duration Factor C_d	1.6	1.6
Screw Adj. Withdrawal Cap. W', lbs	**681**	**292**
Attachment FTG Strength with Cd, lbs	**1606**	**374**
Assumed attachment distribution	75%	25%
Max applied load, lbs	353	
Max allowable load, lbs	584	

Compare Adjusted Withdrawal Capacity to ASD Factored Demand

Zones:	1	2	3
	O.K.	O.K.	O.K.