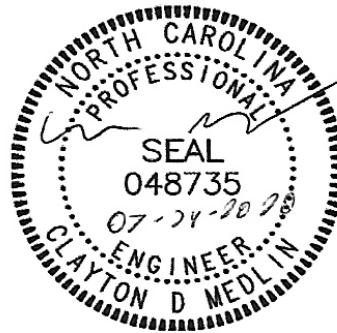


## Roof Assessment for Solar Panel Installation

**Date:** July 24, 2020  
**Prepared for:** Cashion & Sons Hensley 6pT  
**Project Number:** 200580  
**Assessment Date:** July 23, 2020  
**Site Address:** 18 Kimberly ct. Lillington NC 27546  
**Purpose:** Structural Roof Assessment for installation of 6 panel solar array.  
**Prepared by:** Landon Wilson & Clay Medlin, PE, NC #048735  
**NC COL:** C-3298, CDR & Assoc., Inc.



CDR & Assoc., Inc. thanks you for the opportunity to provide you with a letter for the inspection of the roof framing for the installation of solar panel system on the roof of the foresaid property hereafter referred to as "house". All references to directions or locations indicated in this report are by facing the front of the house.

### Observations and Analysis of Roof

- **Basis of Evaluation:** The engineering analysis is based on measurements and photographs taken onsite by CDR+A technician, Alex Nelson.
- **Roof Construction:** A layer of asphalt shingles over wood decking on 2x4 Roof Trusses spaced at 24" on center.
- **Roof Pitch:** 8/12
- **Solar Panel Array:** 6 panels.
- **Total Array Square Footage:** The panels are approximately 39.37" x 64.57" or 17.65 sf each, round up to 18 sf x 6 panels = total surface area of 109 sf.
- **Total weight of Array:** Panel weighs approximately 40 lbs. ea. X 6 = 240 lbs. for the Array.
- **Total Additional Weight on Roof:** 240 lbs / 109 sf = 2.22 psf add for rail mount system, assume 3 psf additional load on roof structure.
- **Rail Mount System:** The panels are mounted on aluminum rails at top and bottom of the panels for each row of panels.

- **Analysis of Roof Structure:**

- Additional dead load 15 psf (12 psf from roof + 3 psf for panels)
  - Roof Live Load - 20 psf. (Allowable Residential Code w/o reductions)
  - The 2x4 SYP Trusses spaced 24" apart were analyzed (worst case).
  - Roof Pitch 8/12.
  - The maximum unbraced span: 5' 6" measured horizontal.
  - Analysis with the additional roof load determined that the roof Trusses are 77% stressed. The Trusses are in compliance with the current Residential Building Code.
- 
- **Wind Speed:** Components and cladding 117 mph wind load uplift of -30 psf.
  - **Total Wind Load Uplift:** -30 psf x 109 sf = 3,270 lbs total uplift for solar array.
  - **Number of Attachment Anchors:** Use a minimum of two (2) bracket per panel (one top and bottom) = 12 total attachment brackets.
  - **Wind Load Uplift per Anchor:** 3,270 lbs total uplift / 12 = 273 lbs for solar array.
  - **Strength of Hold-down Anchors:** The Flashfoot attachment bracket are to be lagged directly into the top of the wood truss member with a 4" long (minimum) 5/16" wood screw per manufactures spec. The load testing results determined an average pullout failure load of 462 lbs per screw, exceeding the required 273 lbs per anchor. The loading proposed creates a safety factor of 1.70 or greater for the attachment.

## Conclusions & Recommendations

By analysis it was determined that the roof truss members were adequate for the addition load of the solar panel array.

The installation of the solar panel array using Flashfoot attachment bracket lagged directly into the top of the wood truss member is adequate for the loads imposed on them.

## Closure

We appreciate the opportunity to provide structural assessment services to you. Please contact us should you have any questions.

Sincerely,

CDR+A Structural Engineers