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July 27, 2021

Ecovole  
2300 Main Street  
Kansas City, MO 64108

Re: Engineering Services  
Million Residence  
106 Northwest Grady Court, Lee's Summit MO  
7.040 kW System Size

To Whom It May Concern:

Pursuant to your request, we have reviewed the following information regarding solar panel installation on the roof of the above referenced home:

1. Site Visit/Verification Form prepared by an Ecovole Solar representative identifying specific site information including size and spacing of rafters for the existing roof structure.
2. Photographs of the interior and exterior of the roof system identifying existing structural members and their conditions.

Based on the above information we have evaluated the structural capacity of the existing roof system to support the additional loads imposed by the solar panels and have the following comments related to our review and evaluation:

***Description of Residence:***

The existing residence is typical wood framing construction with the roof system consisting of 2 x 6 dimensional lumber at 24" on center with a knee wall at midspan. The attic space is unfinished and photos indicate that there was free access to visually inspect the size and condition of the roof rafters. All wood material utilized for the roof system is assumed to be Doug-Fir #2 or better with standard construction components. The existing roofing material consists of composite asphalt shingles. Photos of the dwelling also indicate that there is a permanent foundation.

***A. Loading Criteria Used***

- 115 MPH wind loading based on ASCE 7-16 Exposure Category "B" at a slope of 20 degrees
- 7 PSF = Dead Load roofing/framing                      Live Load = 20 PSF                      Snow Load = 20 PSF
- 3 PSF = Dead Load solar panels/mounting hardware

*Total Dead Load = 10 PSF*

*The above values are within acceptable limits of recognized industry standards for similar structures in accordance with the (2018 IBC). Analysis performed of the existing roof structure utilizing the above loading criteria indicates that the existing rafters will support the additional panel loading without damage, if installed correctly.*

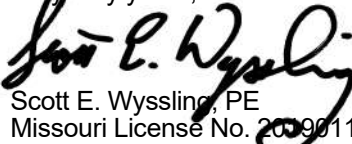
**B. Solar Panel Anchorage**

1. The solar panels shall be mounted in accordance with the most recent "*IronRidge Installation Manual*", which can be found on the IronRidge website (<http://Ironridge.com>). If during solar panel installation, the roof framing members appear unstable or deflect non-uniformly, our office should be notified before proceeding with the installation.
2. Maximum allowable pullout per lag screw is 235 lbs/inch of penetration as identified in the National Design Standards (NDS) of timber construction specifications for Doug-Fir (North Lumber) *assumed*. Based on our evaluation, the pullout value, utilizing a penetration depth of 3", is less than what is allowable per connection and therefore is adequate. Based on the variable factors for the existing roof framing and installation tolerances, using a thread depth of 3" with a minimum size of 5/16" lag screw per attachment point for panel anchor mounts should be adequate with a sufficient factor of safety.
3. Considering the roof slopes, the size, spacing, condition of roof, the panel supports shall be placed no greater than 72" o/c.
4. Panel supports connections shall be staggered to distribute load to adjacent trusses.

Based on the above evaluation, it is the opinion of this office that with appropriate panel anchors being utilized the roof system will adequately support the additional loading imposed by the solar panels. This evaluation is in conformance with the 2018 IBC, current industry and standards, and based on information supplied to us at the time of this report.

Should you have any questions regarding the above or if you require further information do not hesitate to contact me.

Very truly yours,

  
Scott E. Wyssling, PE  
Missouri License No. 2019011786

