MULHERN+KULP
RESIDENTIAL STRUCTURAL ENGINEERING

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ROOF TRUSS UPLIFT CONNECTIONS

120 MPH REGIONS IN NORTH CAROLINA

M+K Project #: 192-23000

Aaron,

Pursuant to your request, we have prepared this letter to address the roof truss uplift connections specified on structural plans provided by Mulhern & Kulp (M+K) for various models being built by Mungo Homes; specifically, in regions where the design wind speed is 120mph. It has come to our attention that, during the inspections process, roof truss manufacturer resultant uplift loads are being utilized to determine appropriate sizing of uplift connectors to the main wind force resisting system (the tops of walls) by some North Carolina Building Inspection Departments. These resultant truss uplift loads are often much higher than the published uplift capacities of the connectors as specified by M+K. This discrepancy has led inspectors to question whether the correct uplift connectors are being specified and installed, to meet the resultant uplift loads. Please see our response below.

Roof truss manufacturer resultant uplift loads are not to govern the design of the supporting members or uplift connections – that is the responsibility of the engineer of record per Section 2.3.2.4 of TPI 1-2014 "National Design Standard for Metal Plate Connected Wood Truss Construction". This is a Referenced Standard in the 2018 North Carolina State Building and Residential Codes.

Individual roof trusses are generally designed using 'components and cladding' (C&C) wind uplift values per ASCE7-10. This accounts for localized high- or low-pressure zones on an individual truss. However, under the direction of Section 1609 of the 2018 North Carolina State Building Code and ASCE 7-10, the connections of trusses to the tops of walls shall be designed utilizing Main Wind Force Resisting System (MWFRS) uplift loads. MWFRS uplift loads are lower than the C&C uplift loads as the structure is looked at using system effects to 'spread out' localized high- and low-pressure to a more uniform and average wind uplift value. Additionally, roof truss manufacturers may choose to be conservative in the design of their individual components and utilize higher loads than that specified by the code. Truss manufacturers are entitled to use whatever design loads that they wish to use in excess of the code minimums to design their building components. Last, resultant uplift loads published by the roof truss manufacturer may not include a reduction of 0.6 of the roof dead loads, as allowed per code.

For these reasons, uplift values on the roof truss shop drawings are usually much higher than the net uplift values calculated using the code specified design loads and analysis. Therefore, using the truss shop drawing reactions to design the uplift connections may yield significant and unnecessary over-design, both in the connectors use and the structural systems below.

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We have engineered the roof truss uplift connectors in accordance with the generally accepted engineering practices under the direction of Section 1609 of the 2018 North Carolina Building Code and ASCE 7-10. Where uplift connectors are specified on plan or in the structural notes, they should not be compared to the roof truss manufacturer resultant uplift loads. The inspection of the roof truss uplift connection should be limited to verification of correct connector (as specified on the plans and notes) and verification of correct installation (as specified by the connector manufacturer).

Please feel free to call if you have any questions.

Respectfully,

MULHERN & KULP STRUCTURAL ENGINEERING, INC.

Michael E. Mihal, *Project Engineer*

Shaun Kreidel, P.E. *Associate Owner & Atlanta Office Director*

Signature + Seal *04/12/2023*