

W. Harrison Welch, PE  
Stonewall Structural Engineering, PLLC  
4800 Falls of Neuse Rd. #120  
Raleigh, NC 27609  
(919)407-8663



Amy Drumm  
342 Lambert Ln.  
Fuquay-Varina, NC 27526

Re: Structural Observation — 342 Lambert Lane, Fuquay-Varina, NC 27526

Ms. Drumm,

At your request, on May 9, 2023 we performed a visual structural observation of uneven floors at the Fuquay-Varina residence noted above. The structure is a conventionally framed, detached, single family residence with raised first floor framing over a pier/girder foundation system with perimeter masonry foundation walls (*see picture 1*).

Our observations are listed below. Indicators such as “left,” “right,” “front,” and “back” are referenced as viewing the front of the home.

#### **UNEVEN FLOORS**

- Uneven floors were noted in the primary bedroom and bathroom on the left side of the home. Additionally, furniture in the primary bedroom was noted to be visibly leaning (*see picture 2 for example*).
  - Measurement by laser level indicated the girder beneath the left wall of the primary bedroom was down as much as approximately  $\frac{1}{4}$ " relative to the girder under the right wall of the bedroom.
  - Investigation from within the crawlspace revealed that the back end of the girders beneath the left and right walls of the primary bedroom were set low to the perimeter sill plate by as much as approximately  $\frac{1}{2}$ " and floor joists were out of contact over the girder (*see pictures 3-4 for examples*).
    - Per Section 2.2 of the structural warranty for the home (provided by the client), the builder of the home is responsible for correcting uneven floors which exceeded  $\frac{1}{4}$ " within a 32" increment.
- Uneven floors were noted in the laundry room.
  - Investigation from within the crawlspace revealed that the front end of the girder beneath the right wall of the laundry room was set low to the perimeter sill plate (*see picture 5*).

- A dip was noted in the floors at the back of the kitchen island (*see picture 6 for example*).
  - Investigation from within the crawlspace revealed that the back end of the 2<sup>nd</sup> girder from the right side of the home was low relative to the perimeter sill plate.
  - Investigation from within the crawlspace also revealed that the floor joists at the back of the kitchen island varied in depth. Measurement by laser level revealed that the bottoms of the joists were level to within  $\frac{1}{8}$ " between girders. Additional measurements by laser level indicated that the floor sheathing was out of level as much as approximately  $\frac{1}{4}$ " between joists (*see pictures 7-8 for examples*).
- Uneven floors were reported in the foyer and living room.
  - Investigation from within the crawlspace revealed that the floor joists changed length at the back of the foyer as the left girder of the joist bay stepped approximately 6' to the left.
  - Measurement by laser level indicated that the first interior masonry pier supporting the rightmost girder was down as much as approximately  $\frac{1}{4}$ " relative to the back foundation wall and the adjacent girder to the left.
- Uneven floors were noted along the left wall of the office (*see picture 9 for example*).
  - Measurement by laser level indicated that the foundation wall at the back of the garage was down as much as approximately  $\frac{1}{4}$ " relative to the front of the home.

Upon completion of our analysis, we have concluded the following:

- The above noted uneven floors have been the result of a combination of the interior framing and foundation elements being built low relative to the perimeter foundation, potentially inadequate handling of building materials during construction, and out of level construction of the perimeter foundation.
  - Lumber has the potential to swell when exposed to excess moisture and contract when dried. If inadequately acclimated wood is used during initial construction, it will contract as it dries which can create framing members of varying actual dimensions.
- We believe that the uneven floors noted at the back of the foyer/front of the living room have been the result of a change in the rigidity of the floor framing.
  - Due to the change in the length of the joists between end supports, the deflection of the joist changes rapidly upon entering the living room. This creates the feeling of uneven floors. Due to the lack of noted distress in the floor framing, we do not consider the floor system in this area of the home to be deficient.

We recommend the following work be performed by a qualified general contractor:

- To correct the low girders, raise the girders over masonry piers and shim using full width and full length treated shim material to the tops of piers. Girders should be raised at the ends such that the top of the girder is level to the top of the perimeter sill plate.
- In an attempt to stiffen the floors in the living room, a supplemental dropped girder may be installed. The new girder should be a built-up (3)2x8 #2 Southern Yellow Pine supplemental dropped girder installed within the middle third of the joist bay. The new girder should start at the back end of the girder beneath the left wall of the foyer and extend to the back of the home and should be supported by new CMU piers spaced approximately 6' on center over 20"x20"x10" thick poured concrete footings (*see detail addendum*). The girder ends may cantilever up to 2' over the end pier to avoid conflict with the existing perimeter wall footing.
  - Install tight fit, full depth 2x blocking or 1x cross-bridging between joists over the dropped girder to prevent rotation of joists over the new bearing line.
  - If needed, a W4x13 member may be used in place of the above-noted wood girder and may span up to 8' between supports.
  - Supplemental dropped girders may be set lower and have tight fit stub material installed between the top of girder and bottoms of joists to avoid conflict with utilities.
- To reduce the uneven floors at the back of the kitchen island, the shorter floor joists should be raised until the top of the floors are level and the ends of the joists should be shimmed into contact with their supporting members using tight-fit wood or steel shim material.

The above-listed determinations were made in accordance with common engineering principles and the intent of the 2018 edition of the *North Carolina Residential Building Code*. Sequencing, and means and methods of construction are considered to be beyond the scope of this report. Contractor is to provide adequate temporary shoring prior to cutting or removing any structural load-bearing elements. All work is to conform to applicable provisions of current building standards. Please feel free to contact us, should you have any questions or concerns regarding this matter.

Sincerely,  
W. Harrison Welch, PE  
*Stonewall Structural Engineering, PLLC*  
Lic. #P-0951



**PICTURE ADDENDUM**



*Picture 1 – 342 Lambert Lane  
Fuquay-Varina, NC 27526*



*Picture 2 – Example of leaning furniture*



*Picture 3 – Example of girder set low to the perimeter sill plate*



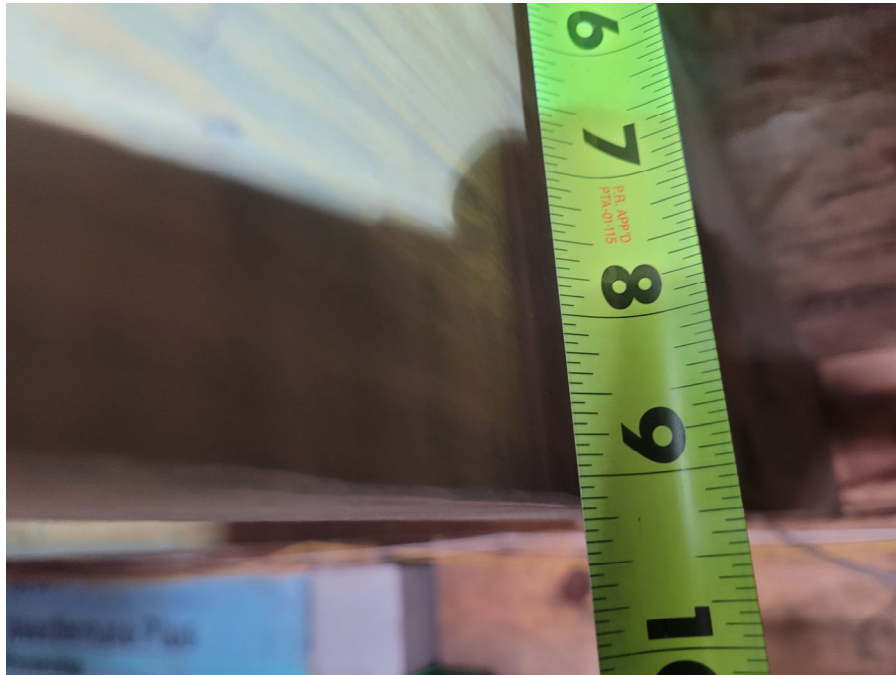
*Picture 4 – Example of joist out of contact with the girder below*



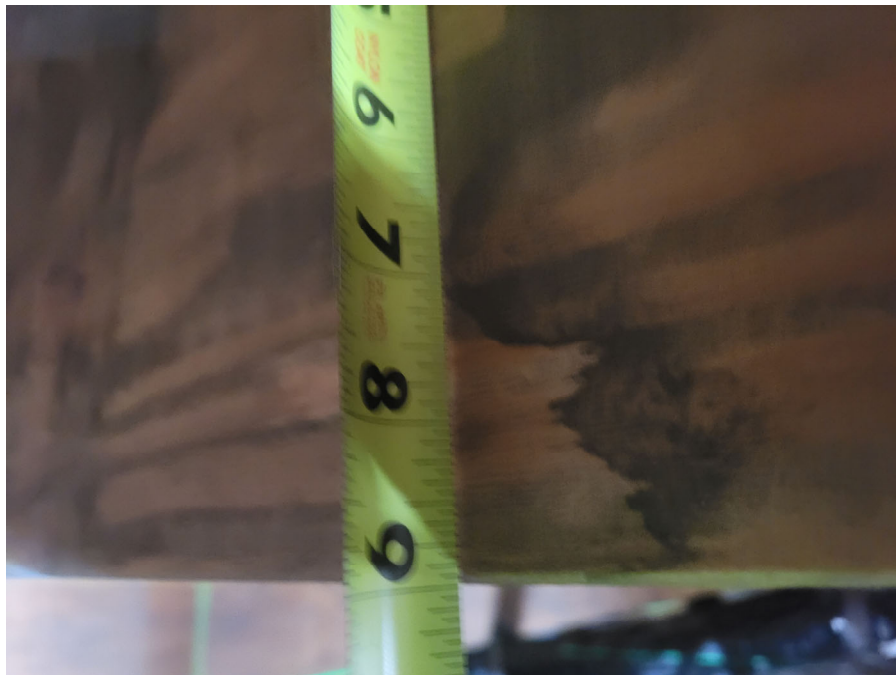
*Picture 5 – Example of girder set low to perimeter sill plate*



*Picture 6 – Example of dip in floors at kitchen island*



*Picture 7 – Example of floor joist beneath kitchen island*



*Picture 8 – Example of floor joist beneath kitchen island*



*Picture 9 – Example of uneven floors in the office*



DETAIL ADDENDUM

