

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



Benjamin Inman
6020 Winterpointe Ln.
Raleigh, NC 27606

Re: Structural Observation — 134 Pear Tree Lane, Fuquay-Varina, NC 27526

Mr. Inman,

At your request, on May 25, 2022 we performed a visual structural observation of deteriorated framing in the addition, sloping floors, and damaged beams at the Fuquay-Varina residence noted above. The structure is a double wide manufactured home over a pier/curtain wall with interior masonry piers. An addition has been constructed on the right side of the home that has raised 1st floor framing over a pier/curtain wall foundation system (*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.

DETERIORATED FRAMING

- Thorough probing of the 1st floor framing in the addition revealed that the following members were deteriorated beyond the salvageable limits (*see pictures 2-5 for examples*).
 - Both spans of the girder.
 - All floor joists in the front bay of the addition.
 - The 4th through 6th floor joists in the back joist bay from the left wall of the addition. Additionally, the floor sheathing above these joists.
 - The members were noted to have been haphazardly repaired (*see picture 6 for example*).

UNEVEN FLOORS

- Uneven floors and “soft” spots were noted at various locations throughout the manufactured home, especially along the marriage line.
 - Investigation of the crawlspace revealed that sections of sub-floor in the manufactured home had been haphazardly replaced (*see pictures 7-8 for examples*).
 - Crawlspace soils were noted to be damp, and the vapor barrier was in poor condition (*see picture 9 for example*).
- The middle and right portions of the manufactured home were not accessible due to low clearance and the presence of ductwork (*see picture 10 for example*).

ADDITIONAL OBSERVATION

- The left end of the girder in the addition was bearing on the non-structural curtain wall of the original manufactured home (*see picture 11*).

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

- The above-noted deteriorated floor framing has been the result of a combination of potential wood destroying insect (WDI) activity and rot due to prolonged exposure to moisture in the crawlspace.
- The above-noted uneven floors been the result of a combination of differential settlement of interior masonry piers due to inadequate management of moisture in the crawlspace and previous repairs made to the floor sheathing.
 - Soils in this area tend to expand when wetted and contract when dried. These minor cyclical movements can cause short term cosmetic damage and long term structural damage at areas around the structure with poor exterior drainage or wet or excessively dry interior crawlspace soils. Both cases can cause differential settlement to occur as parts of the structure settle at faster rates than at other locations.
 - Removal of ductwork and the underfloor insulation would be required to fully inspect the sub-floor of the manufactured portion of the home to diagnose the extent of the previous sub-floor repairs.

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

- Remove the above-noted significantly deteriorated portions of the girders and replace using full depth treated (3)2x8 #2 Southern Yellow Pine (SYP) material with continuous span between existing and proposed masonry girder support piers.
 - The girder should be supported with piers at the left end, and at mid span of both existing spans. The new piers should be constructed per the detail at the end of this report and should be centered over 24"x24"x10" thick poured concrete footings.
- Reinforce all joists in the addition with an additional ply of 2x10 #2 SYP, fastened to the side of the existing joists using (3)10d common nails at each end and at 12" on center staggered top and bottom along the lengths of the joists. Sistered material should span continuously between end supports.
 - New floor joists should be notched as necessary and fastened to the new girder and rim beam using Simpson double face hangars.
- Clean and reinforce the above-noted deteriorated and haphazardly repaired sheathing using tight fit ¾" plywood with edge support by 2x4s securely fastened to parallel joists (*see attached detail addendum*).
- The chassis should be jacked to the desired levels over settled masonry support piers and should be re-shimmed with full width treated material to the tops of piers.
- Improve vapor retarder coverage such that the entire crawlspace floor is covered and edges are sealed around the bases of masonry piers.
 - Vapor retarder improvements are recommended as an attempt to better manage moisture levels in crawlspace soils to help mitigate the effects of further settling of interior masonry piers. However, while this is typically the most cost effective solution for the given circumstances, this method is not always successful and interior pier(s) may continue to settle over time which could necessitate removal and replacement of affected piers with new piers installed over footings which extend down to firmer soils located deeper in the ground.

- Open all perimeter crawlspace vents for cross-flow of air beneath the home.
 - Alternatively, a Code-approved closed crawlspace system with adequate vapor barrier and mechanical drying measures may be installed.
- Modern building standards require at least 18" of clearance from top of crawlspace soils to the undersides of joists, and at least 12" of clearance from top of crawlspace soils to the undersides of girders. We recommend removal of soils from the crawlspace as is necessary to achieve minimum clearances to help prevent significant deterioration of wood framing members due to rot. Care should be taken not to undermine foundation elements by removal of soils from the crawlspace.
 - Once soils have been excavated, the floor system at the currently inaccessible portions of the crawlspace should be observed and analyzed.
 - If excavation is not to be performed, any new framing material should be treated #2 SYP in areas where minimum clearances are not met.
- Provide drainage improvements around the perimeter of the structure such that rainwater runoff is adequately diverted from the perimeter of the home. Drainage improvements are intended to help avoid the need for extensive foundation repair/stabilization work in the future.
 - Current building standards require 6" of fall within the first 10' from a structure or use of drains and swales. A system of exterior perimeter "French" drains and/or catch basins installed at low points in the grade may be necessary to achieve adequate drainage. Any low spots in the grade adjacent to the home should be filled for positive drainage away from the structure.
 - Install a system of roof gutters and downspouts around the low edges of the roof system on the perimeter of the structure. Extend gutter downspouts for discharge at least 5' away from the structure onto soils adequately sloped away from the home.

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,
Cody Johnston, PE
Stonewall Structural Engineering, PLLC
Lic. #P-0951



PICTURE ADDENDUM



*Picture 1 – 134 Pear Tree Lane
Fuquay-Varina, NC 27526*



Picture 2 – Example of deteriorated girder



Picture 3 – Example of deteriorated sheathing



Picture 4 – Example of deteriorated floor joist



Picture 5 – Example of deteriorated floor joist



Picture 6 – Example of haphazardly reinforced floor joist



Picture 7 – Example of haphazardly replaced sheathing



Picture 8 – Example of haphazardly replaced floor sheathing



Picture 9 – Example of damp soils with poor vapor barrier coverage

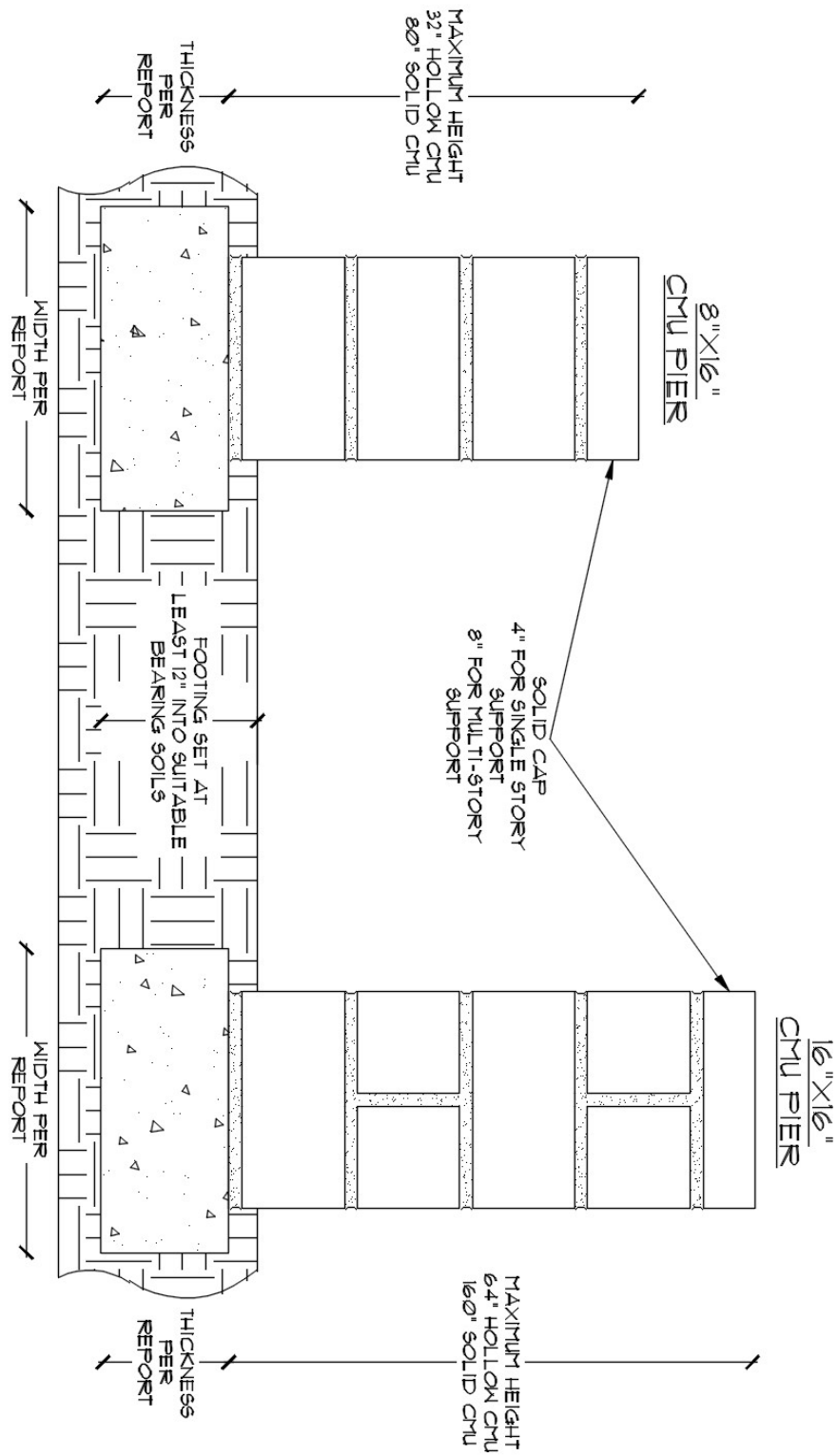


Picture 10 – Example of limited access due to clearance and ductwork

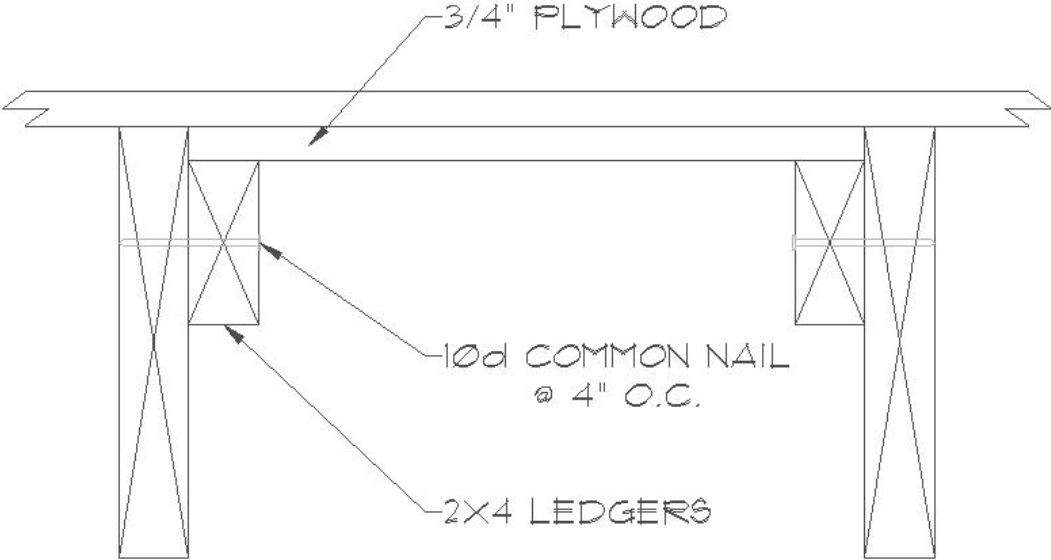


Picture 11– Example of girder end bearing on the curtain wall

DETAIL ADDENDUM



Interior Masonry Pier



Floor Sheathing Reinforcement