February 18, 2019 Project No. 19-1124

Matt Brueshaber, PE
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STONEWALL
STRUCTURAL ENGINEERING

Edward Nelson
PO Box 904
Lillington, NC 27546

Harnett

Re: Structural Observation — *2755 Brick Mill Road, Lillington, NC 27546*

Mr. Nelson,

At your request, on February 11th, 2019 we performed a visual structural observation of damaged floor framing, and signs of structural movement at the chimney at the Lillington 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.

DETERIORATED FLOOR-FRAMING

- Thorough probing revealed the following floor-framing members were deteriorated beyond salvageable limits *(see pictures 2-4 for examples)*:
  - A section of floor joists in the back joist bay, starting approximately 19'-10" from the right wall and extending to the right toward the girder with front-to-back orientation,
  - A section of floor joists in the 2nd joist bay from the back wall, starting approximately 25'-8" from the right wall and extending to the right toward the girder with front-to-back orientation,
  - The 5th through 9th joists from the right wall, in the 3rd joist bay from the back wall,
  - The floor joist ledger support strips along the girders located approximately 8' and 18' from the back wall
- Various girder spans were noted to be moderately deteriorated *(see pictures 5-6 for example)*.
- Areas of organic growth were noted on the floor framing throughout the central portion of the crawlspace. The worst of the organic growth was found between the HVAC ducts and the floor framing members *(see pictures 7-8 for examples)*.
  - Fiberglass insulation was noted to be stringing in the central portion of the crawlspace *(see picture 9 for example)*.

SIGNS OF MOVEMENT AT CHIMNEY

- A brick crack as wide as approximately 1/8" was noted along the back side of the chimney, where the chimney met the right wall of the home. A gap was also noted between the fly-rafter and the back face of the chimney where the chimney penetrated the roof line *(see pictures 10-11 for examples)*.

- Measurement by spirit plumb indicated the chimney was plumb in both orientations to within approximately 1/16" over 4'.
- Water staining was noted on the back face of the chimney.
- The bricks in the adjacent veneer of the wall did not appear to be laced with the chimney.
- No other brick cracks were noted where the front face of the chimney met the right wall of the home *(see picture 12 for example)*.

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.
  - Stringing fiberglass insulation and organic growth are further indications of excessive moisture levels and improper ventilation in the crawlspace.
- Our calculations show that the moderately deteriorated girder spans are currently able to still support structural loads.
  - Further deterioration of the girders may require removal and replacement of the affected girder spans.
- Due to the lack of excessive cracking around the chimney, its plumb state, and the above-noted signs of extended exposure to rainwater runoff from the edge of the roof, we believe the above-noted brick crack was due to long-term exposure to rainwater runoff and the un-laced construction of the veneer.

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

- Reinforce each of the deteriorated joists noted above with an additional full depth ply of 2x #2 Southern Yellow Pine (SYP), fastened to the side of the deteriorated 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.
  - If the deteriorated joist has less than 3" of non-deteriorated material remaining at the top of the joist, install tight-fit 2x blocking in the joist bays on both sides of the sistered members at 32" o.c. to prevent rotation of the members.
  - At the owner's discretion, any floor joists harboring organic growth may be removed and replaced with full depth 2x members. However, this would require access from within the finished living space in order to fasten the existing floor sheathing to the new members.
- Remove the above-noted deteriorated sections of the ledger strips and replace with Simpson face hangers to the end of each joist and fastened to the side of the existing girders.
- We recommend consulting with a qualified fungal remediation specialist to test and treat the above-noted organic growth as deemed necessary.
- We recommend consulting with a qualified WDI specialist to determine the level and distribution of possible WDI activity, especially in the back-middle portion of the floor framing system.
- Due to the infeasibility of achieving adequate cross-ventilation of the crawlspace, we recommend installation of a Code-approved closed crawlspace system with adequate

vapor barrier and mechanical drying measures to help avoid future occasions of advanced framing deterioration due to wood rot.

- Any cracks in the brick veneer near the chimney should be closed with a clear or color-matching sealant, and monitored for signs of further movement.
    - Additionally, we recommend the roof framing in the gable soffit along the back face of the chimney be observed to determine the cause of the apparently fallen fly-rafter, and possibly compromised waterproofing detail.
- 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.
    - Extend roof gutter downspouts and any HVAC condensation drains for discharge at least 5' from the perimeter of the structure onto soils adequately graded away from the home.

The above-listed recommendations are not intended to be implemented in lieu of a regular home maintenance schedule. Most serious and costly structural damage in this area occurs due to improperly maintained drainage. Roof gutter systems and any in-ground drains should always remain clear of debris and should be periodically checked to verify positive flow. This can be done by visual examination during or immediately following rainstorms. If standing water, backed-up drainage, or surface water which flows within 5' of the home's foundation is ever found, this should be addressed right away by consulting with a drainage specialist.

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.

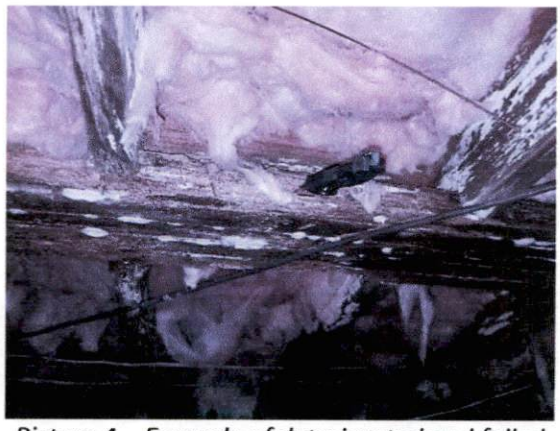
Sincerely,
Matt Brueshaber, PE
Stonewall Structural Engineering, PLLC
Lic. #P–0951

PICTURE ADDENDUM

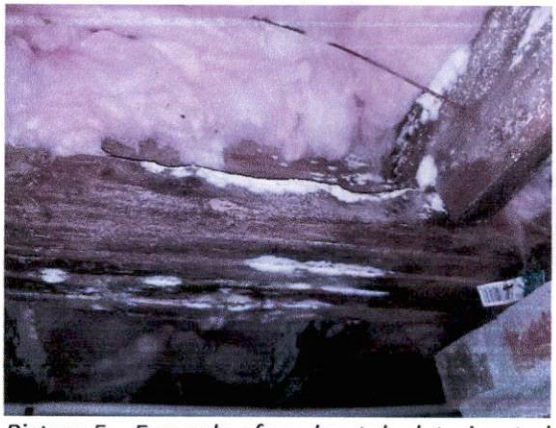
Picture 1 – 2755 Brick Mill Road, Lillington, NC

Picture 2 – Example of deteriorated and broken floor joist

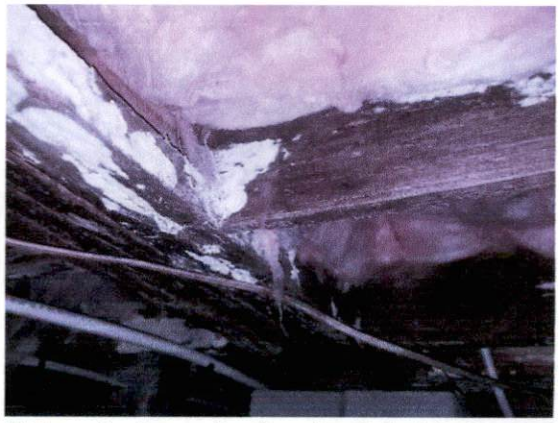
Picture 3 – Example of deteriorated and broken floor joist



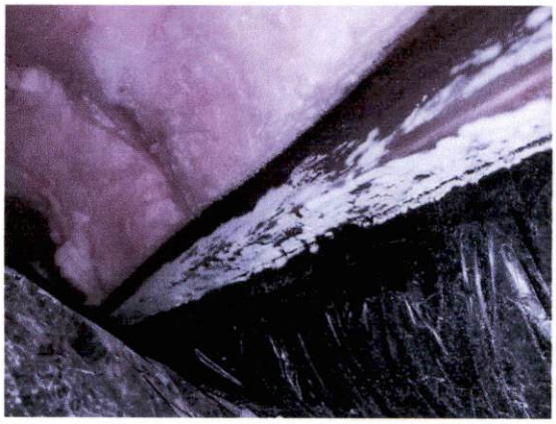
Picture 4 – Example of deteriorated and failed ledger strip



Picture 5 – Example of moderately deteriorated girder span



Picture 6 – Example of moderately deteriorated girder span



Picture 7 – Example of area of organic growth

Picture 8 – Example of area of organic growth

Picture 9 – Example of stringing fiberglass insulation

Picture 10 – Example of brick crack along back face of chimney at right wall of home, and water staining on brick frace

Picture 11 – Example of gap between chimney and end of fly rafter, and brick veneer crack

Picture 12 – Example of front face of chimney and right wall of home with no cracks

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Estimate

ADDRESS
Edward Nelson
PO Box 904
Lillington, NC 27546

SHIP TO
Edward Nelson
2755 Brick Mill Rd
Lillington, NC 27546

ESTIMATE #
2686

DATE
02/23/2019

DATE	ACTIVITY	QTY	RATE	AMOUNT
02/23/2019	**Floor Frame** Floor Framing - Reinforce each of the deteriorated joists noted with an additional full depth ply of 2x #2 Southern Yellow Pine (SYP), fastened to the side of the deteriorated 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. o If the deteriorated joist has less than 3" of non-deteriorated material remaining at the top of the joist, install tight-fit 2x blocking in the joist bays on both sides of the sistered members at 32" o.c. to prevent rotation of the members. o At the owner's discretion, any floor joists harboring organic growth may be removed and replaced with full depth 2x members. However, this would require access from within the finished living space in order to fasten the existing floor sheathing to the new members. Approximately twenty six joists.	26	150.00	3,900.00
02/23/2019	**Floor Frame** Floor Framing - Remove the above-noted deteriorated sections of the ledger strips and replace with Simpson face hangers to the end of each joist and fastened to the side of the existing girders. Aproximately 51 joists	51	25.00	1,275.00
02/23/2019	**Floor Frame** Floor Framing - Various girder spans were noted to be moderately deteriorated. There are four sections of girder that are possibly in need of replacement. After the mold remediation has been done we will determine if they need to be replaced.	4	1,000.00	4,000.00
02/23/2019	**Site Work** Site Work - Any cracks in the brick veneer near the chimney should be closed with a clear or colormatching sealant, and monitored for signs of further movement.	1	250.00	250.00
02/23/2019	**Plans and Permits:01.2 Building Permits** Building Permits - Apply for and pick up permits required.	1	375.00	375.00

Please note: Payment is due upon completion of the job.

TOTAL **$9,800.00**

ESN

If you have any questions feel free to contact any of us at the following:

Drew Vallery at: Drewv@advancedsr.com
Carlos Barahona at: Carlosb@advancedsr.com
Irma Barahona at: Irmab@advancedsr.com

Accepted By Edith S. Nelson

Accepted Date 08 March 2019

If you have any questions feel free to contact any of us at the following:

Drew Vallery at: Drewv@advancedsr.com
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Irma Barahona at: Irmab@advancedsr.com