



Structural Engineering & Inspections, LLC  
*Knowledge • Experience • Integrity*

P.O. Box 2485  
Brentwood, TN 37024  
Office: (615) 819-0029  
Fax: (615) 819-0297

---

September 20, 2017

Estate of Margaret Dodd  
302 Pennsylvania Avenue  
Lebanon, TN 37087

**SUBJECT: Real Estate Opinion Letter  
Foundation Wall and Brick Cracks  
302 Pennsylvania Ave, Lebanon, TN  
SE&I Project No: 17-1551**

At your request, Structural Engineering & Inspections, LLC (SE&I) visited the residential property, located at the address referenced above, on Friday, September 15, 2017. The purpose of our visit was to observe the basement foundation walls and to provide our professional opinions concerning their structural adequacy.

Our observations are limited to visible evidence in interior and/or exterior finishes and the exposed surfaces of the basement wall. For purposes of this report, all directions (left, right, front, back, etc.) are taken from the viewpoint of the observer standing in front of and facing the residence. Specific comments may refer to left-hand or right-hand and are taken as facing the object.

- The home appears to be a one story wood framed structure clad with a brick veneer constructed over a basement foundation system.
- There appear to be multiple cracks in the brick veneer. Most of the cracks are hairline in width or not much larger.
- The front wall of the foundation does not appear to be aligned between the upper concrete masonry unit (CMU) block wall and lower poured-in-place concrete wall. There did not appear to be any notable damage to make us believe these walls have moved separately from each other. The upper wall was likely built offset and square to allow for correct dimensions for framing above.
- There is evidence in the basement that a significant amount of moisture moves through the basement wall.
- The grade around the exterior of the home is relatively flat or in some cases possibly sloped towards the home.

## CONCLUSIONS

The information described above has been relied upon in forming our professional opinions concerning the condition of the home. The conclusions to follow are based on the prescriptive requirements of the local building code, standards of best practice for residential construction, on-site cursory assessment of the existing conditions, and/or analyses performed in accordance

with accepted engineering practice. Our findings are not intended to provide a warranty, guarantee or certification of future performance of the structure and/or its individual components.

## **Foundation and Bricks**

### **1. Discussion**

- a. The stair-stepping cracks observed along the brick walls appear to have developed as a result of minor movement of the basement walls. Some causes of movement of basement walls can be lateral pressure caused by the weight of soil adjacent to the wall or movement of the footings at the base of the wall due to migration of moisture in the soil. As a result of the minor movements of the basement walls, tensile stresses develop in the brick and mortar joints. Brick and mortar are brittle materials (not ductile) and have very little tensile strength to resist the developing stresses. As the tensile stresses increase a horizontal crack will typically develop near mid-height of the wall and stair-stepping cracks will often form near intersecting or perpendicular walls.
- b. Poorly graded yards can allow surface water and water discharging from downspouts to collect adjacent to the exterior wall of the house. Standing water will slowly seep into the ground and becomes trapped behind the wall. Not only does the water in the soil increase the lateral pressure on the wall, it can also migrate through the wall and into the basement area where it can lead to mildew and/or mold issues.

### **2. Conclusion**

- a. The excess water in the soil is most likely caused by the grade and backfill along the exterior of the wall. Hydrostatic pressure caused by moisture trapped in the soil can cause some minor movements.
- b. The excess pressure must be alleviated from the foundation wall, then the wall must be re-plumbed and reinforced to regain the structural integrity of the wall.

### **3. Recommendation**

- a. The soil along the exterior of the foundation wall must be excavated to the top of footing elevation in order to expose the foundation wall.
- b. The exterior surface of the foundation wall must be cleaned and a waterproofing system (not dampproofing) installed to prevent or minimize moisture passing through the foundation wall to the interior of the basement. The waterproofing must be protected by installing a styrofoam insulation board over the waterproofing.
- c. A foundation drain must be installed at the base of the foundation wall to alleviate hydrostatic pressure on the wall.
  - i. A high quality filter fabric liner (approximately 12' to 15' wide x continuous roll) must be placed in the bottom of the excavation and up the side of the excavation and foundation wall.
  - ii. A perforated drain pipe, covered with a filter fabric sock, must then be placed on top of the filter fabric along the top of the footing. The pipe must extend to the sump pump on the interior of the basement to be pumped out and away from the home to an appropriate drainage area.

- iii. The excavated area must then be backfilled with clean, washed 3/4" diameter stone. The stone must be placed over the drain pipe and inside the filter fabric material. The stone should be backfilled to approximately 18" to 24" below the finished grade elevation.
  - iv. The filter fabric must then be laid over the stone from each side of the excavation and lapped a minimum of 18" to 24" to completely encompass the clean washed stone.
  - v. The remainder of the excavated area must then be backfilled with soil to the finished grade elevation.
- d. The yard must be regraded as necessary to provide a positive slope away from the foundation of the house. The building code requires that the grade fall a minimum of 6" in the first 10' off the exterior wall of the house. Where opposing slopes meet, a drainage swale must be formed to allow water to flow around the house to an appropriate drainage area. The drainage swale must have a 2% slope, minimum.
  - e. Downspouts should be discharged into a buried PVC pipe system that transports the water through a sealed system to an appropriate drainage area. Clean-outs can be provided for periodic cleaning and maintenance. Alternatively, an above grade black corrugated pipe system can be used to extend the downspout discharge away from the foundation of the house.
  - f. After all other work has been completed, the mortar joints containing cracks should be tuck-pointed with new mortar. We recommend that the mortared joints be chiseled or ground out to leave only the CMU block. The surfaces should then be blown clean to remove any remaining dust and debris. New mortar should then be mixed and tucked into the cleaned joints. The mortar should fill the entire joint for the depth of the face shell of the block (approximately 1 to 1-1/2 inches). The joints should then be pointed to compress the mortar and provide a finished joint.
  - g. We do not recommend any lifting or piers be installed on this home at this time.

## **LIMITATIONS**

SE&I has performed a limited site survey of the existing conditions of the residence in an attempt to gather adequate information to form professional opinions concerning the issues described by our client.

SE&I has relied upon the information gathered during our review and survey of the residence to develop our findings, opinions, and recommendations. In existing construction, many of the structural components and systems are covered by interior and exterior finishes that prevent observation and assessment of their condition. We have not been authorized to perform any destructive (or nondestructive) evaluation or testing unless specifically noted above. A detailed evaluation and analysis of every structural member, even where visible, is beyond the scope of services for this report.

Although our report may be considered "final", additional information may become available from other sources for many reasons, including receipt of other's reports or additional investigative activities. Newly discovered evidence and information can affect the opinions stated within this report. Therefore, we reserve the right to amend the report to the extent dictated by the new information.

If I can be of any further assistance, please do not hesitate to call.

Respectfully submitted,

Structural Engineering & Inspections, LLC

Russell F. Tyree, PE  
Engineer

