



November 3, 2017

Client  
Client Address

Subject: Structural Observation of 0000 Smith Rd, IL  
Job Number: 2017-33

Dear Mr. Smith,

On October 30th, 2017 at your request, KeliAnn Engineering visited and observed the single-family residence located at 0000 Smith Rd, IL. The purpose of the visit was to visually observe the structure of the house and to gather information related to the condition of the structure in order to form an opinion as to whether the structure of the house is in need of structural repair. Some of the comments are related to preventative maintenance and may not indicate a need for immediate repair.

The scope of this structural observation includes only portions of the house structure that are readily visible without moving or removing items causing visual obstruction. Observations were made at the exterior and interior of the structure. The items discussed in the report are not claimed to be all the problems or defects, but rather a representative list of items observed during the site visit. Unless otherwise stated, the roof is not included as part of this observation. Additionally, this report does not contain information or opinions related to hazardous gases or materials, plumbing, mechanical, or electrical systems, infestations of any kind, fireplace or insulation inspection.

The house is a wood framed structure built in the 1920's. There is a basement that is partially below grade and partially above grade. The original foundation walls are made of stone and concrete masonry units (cmu) with a mortar finish. The previous owners dug out the basement and underpinned the original foundation with a concrete foundation. There was also an addition done to the back of the house that has cmu foundation walls with wood floor framing.

**Level of the grade**

From the exterior of the property, the foundation walls cannot be seen in some locations and the grade/soil is against the brick façade. See photos 1, 2, and 3. The brick will deteriorate from constant contact with the ground. **The grade needs to be lowered so that the foundation is a minimum of 4" above grade/soil in all locations.**



Photo 1: High grade in the southeast corner of the house



Photo 2: High grade on the southwest side of the house



Photo 3: High grade on the northeast side of the house

### Steel Lintel maintenance

There are steel lintels supporting the exterior brick façade above the window and door openings in the brick façade. See photo 4 for a typical lintel. All the lintels were well maintained, however the lintels at the basement windows on the north side of the house and the window shown in photo 5 were showing initial signs of rusting. When water is allowed to come in contact with the steel lintel it causes the lintel to rust. When steel rusts, it expands to many times its initial size. Overtime this will cause the masonry above the window to be pushed out and eventually the lintel will deflect and fail.



Photo 4: Steel Lintel above rear window



Photo 5: Lintel on the north side of the house

**I recommend that these lintels and any others be maintained.** Paint needs to be applied to any exposed portions of the steel. Mortar needs to be applied in any decaying brick mortar joints where the lintel bears on the masonry. The horizontal joint between the masonry and steel above the window should not be caulked, but should have weep holes or a crack so that water is allowed to drain. Masonry is a porous material and naturally lets water behind it. The water drains down and without weep holes, ponds on the steel lintels. Weep holes allows water to drain out of the wall.

**Window Sill Repair**

Water is entering behind the masonry at the window sill shown in photo 6 and causing the cracks in the masonry below shown in photo 7. When water leaks behind the masonry it freezes, expands, and causes the masonry to crack and be pushed out. **I recommend that this window sill is sealed by a qualified contractor so that water is not allowed to penetrate the masonry wall and further damage the masonry.**



Photo 6: Crack in window sill on the south window on the east façade



Photo 7: Crack in masonry below cracked window sill

### Drainage

The structure of a house can be compromised by poor drainage. It is recommended that foundation walls be a minimum of 4 to 6 inches above the grade – level of the soil. It is also recommended that all soil and adjacent concrete slope away from the foundations of a house causing water to run away from the foundations. This keeps water from accumulating along the foundation/basement walls. If excess water accumulates at the foundation/basement wall it can cause damage to the wall itself and compromise the soil underneath the foundation. If this soil is compromised the wall can settle and cause sloped floors and cracking in the foundation and the structure above. There were several locations on the property where inadequate drainage was occurring;

1. The (3) downspouts located on the south side of the east façade (see photos 8, 9, and 10 and 11)
2. The downspout located on the south side of the house (see photo 12)



Photo 8: East façade with poorly draining downspouts



Photo 9: Downspout empties behind porch wall on east Façade



Photo 10: Downspout empties too close to the existing foundation



Photo 11: Downspout empties too close to the existing foundation

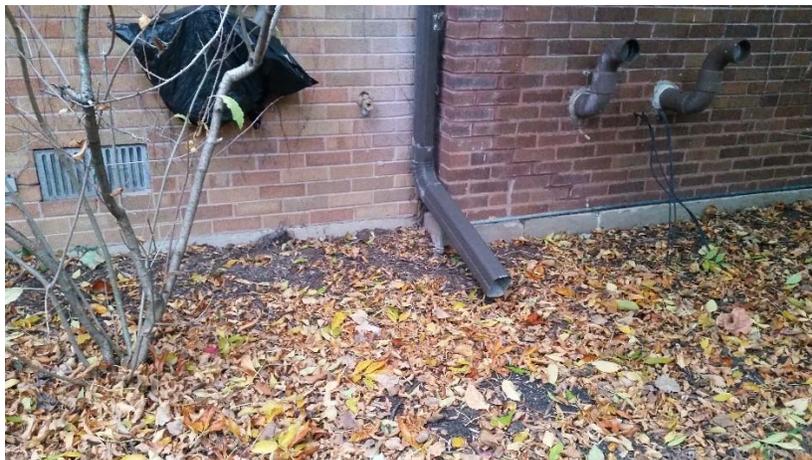


Photo 12: Downspout empties too close to the existing foundation

### Cracks in the Front Stoop

There are cracks in the front stoop between the concrete stairs and the masonry walls. This is caused by the settlement of the stoop due to the poor drainage in the area. **I recommend that the drainage is fixed to stop the movement of the stoop and that the cracks are sealed with a caulk to keep water from getting in the cracks.** If water is allowed to enter the cracks, it will freeze in the winter, expand, and cause more cracking.

### Settlement of the Southwest corner of the house

The southwest corner of the house has settled. Evidence of such settlement is the slope of the first-floor family room and the second-floor bedroom toward the southwest corner of the house. Additional evidence is the stair step crack shown in photo 13.

Typical settlement is caused by the weight of the structure compacting the soil underneath the structure. It is typical that some of the soil underneath a home is not well compacted at the time of construction and the weight of the structure compacts the soil and causes typical settlement. Settlement caused by compaction of the soil occurs within the first few years after the structure is built and once the soil is compacted it is stable and the house does not settle anymore. Settlement itself does not mean that the structure is structurally unsound. If the structure settles without rotation (the walls remain vertical), the soil is compacted to a stable state, and the amount of settlement is not severe, than settlement does not compromise the structural integrity of the structure.

I do not believe that this settlement is typical settlement. The crack shown in photo 13 has a narrow mortar joint at the bottom and the mortar joints widen further up the wall. Additionally, there also looks like there have been multiple repairs in this area.

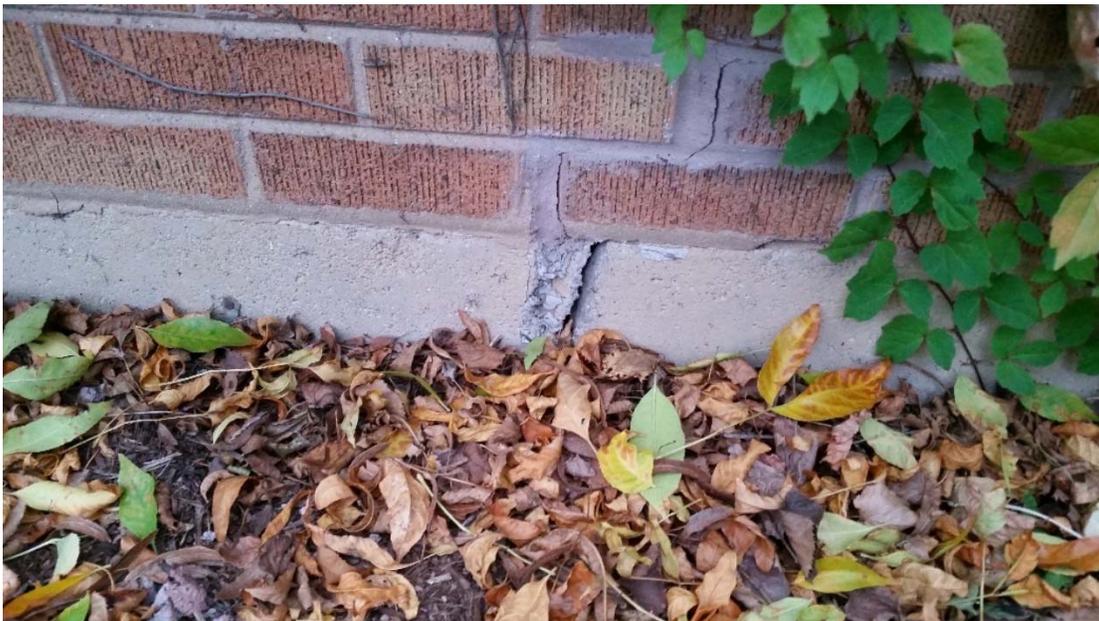


Photo 13: Crack in southwest corner of the house on the west façade

Because this settlement is very localized I believe it is caused by a weakening of the soil caused by poor drainage and worsened by the weight of the chimney. **I recommend that the downspout at this corner is checked for proper drainage and cracked pipes below the grade then any area of ponding or broken pipe is repaired.** I believe that proper drainage in this area will stop the continued settlement. If the drainage is not fixed I believe that the settlement will continue. **If the settlement does not stop with proper drainage, piers should be installed.**

Settlement can be aggravated by circumstances such as drought conditions, changes in ground water table, or poor drainage and therefore it is impossible to guarantee that any residence or structure will not have future settlement, however slight. In rare cases the soil shrinks and swells with the water content and/or is too weak to support the house. If the interested party would like to further explore the possibility of future settlement, a soils test can be completed by a soils engineering company to determine the composition of soil and the bearing capacity of the soil. However, I do not feel it is required in this case.

#### **Cracks in the Front Masonry Wall**

There were several large cracks in the east basement wall (see photos 14 thru 16) but the large concrete footing under the wall that was installed when the basement was dug out is not cracked. Therefore, I do not believe that the cracks are due to settlement. I believe that the cracks are from an increased load behind the basement wall because of the poor drainage on the east façade. Water behind the wall significantly increases the load on the foundation wall and caused it to crack.



Photo 14: Crack in the north side of the east foundation wall



Photo 15: Cracks in the south side of the east foundation wall

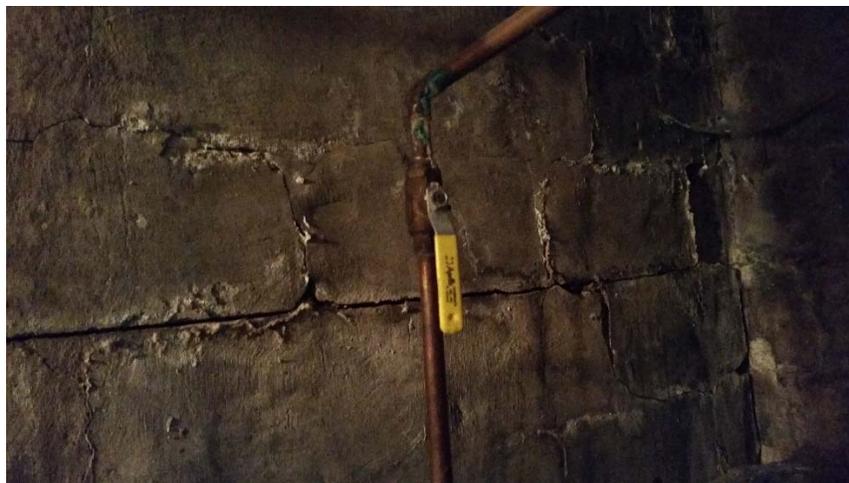


Photo 16: Cracks in the south side of the east foundation wall

**I recommend that the masonry walls are repaired. A qualified mason should inspect these walls and scrape away all deteriorating mortar then prepare the crack as required, including cleaning all loose debris from the crack. Finally, the mason should fill the entire depth of the crack with mortar. If this is not done water can penetrate the foundation, freeze, and crack the foundation even further.**

**I recommend that any limestone foundation walls repaired with the following repair procedure;**

1. Remove all loose mortar without compromising the structural integrity of the house. A qualified mason should inspect the walls and scrape away all deteriorating mortar.
2. Replace mortar with PHL mortar. This mortar is specifically made to be used with limestone walls. This mortar can be purchased from Henry Frerk Sons Materials.
3. Verify that all drainage issues are fixed and all limestone walls are allowed to dry. Drying is facilitated by making sure that there is no ponding around the house.

### Efflorescence

Efflorescence was observed on some of the masonry (see photo 16). The efflorescence itself does not compromise the structural integrity of the brick and can be cleaned off with soap and water. However, it is a salt and mineral white powdery deposit that is formed when water is allowed to seep through the brick. The water seepage is a problem and will cause the masonry to deteriorate. **I recommend that any places where efflorescence is seen is watched for a potential water issue/leak and the point of water infiltration is repaired.**

### Basement walls

The majority of the foundation walls were covered with drywall and could not be viewed by KeliAnn Engineering. If moisture is ever seen to be seeping from behind the drywall, the drywall should be removed and the crack should be repaired in a manner similar to what was specified above.

### Brick Façade Maintenance

Any cracks in the brick should be repaired with mortar to keep water from penetrating the brick wall. Additionally, all brick expansion joints should be maintained with a flexible joint sealer to keep water out but allow the brick to move with thermal expansion.

### Cut Glulam Beam

There is a glulam beam in the crawlspace under the addition to the back of the house. This glulam beam was cut to allow mechanical vents through. When the beam was cut, and adequate foundation was not installed (see photo 17). **I recommend that the wood posts and wood footing is replaced with a steel column and a concrete footing.**



Photo 17: Wood post under addition floor

There is a separate garage located behind the house. The garage was not viewed by KeliAnn Engineering LLC and is not included in this report.

The opinions and recommendations given in this letter are based on visible conditions that are in plain sight at the time of the site visit. No digging, demolition, or testing was completed. Opinions related to compliance with specifications, legal, and/or code requirements are specifically excluded as being a part of our agreement. Additionally, no guarantee or warranty as to the future life, performance, and/or need for repair of this structure or any item is stated nor implied.

This report is provided for the use of the person to whom this report is addressed and is in no way intended to be used by a third party.

Sincerely,  
KeliAnn Engineering, LLC by Keli Dudek, S.E.

