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April 23, 2024

Heather Johns

Re: Limited Structural Inspection
1188 Turner Road
Creedmoor, NC

Dear Ms. Johns,

At your request, a limited structural inspection of the above property was performed on April 19, 2024. The report that follows has been prepared based on that inspection. The inspection was performed by Evan Rimer, EI and Collin Vaughan, EI of Giles Flythe Engineers, Inc.

The scope of this project was limited to inspection and evaluation of cracks in the drywall finish materials, interior floor slope, cracks in the perimeter foundation walls, and structural concerns in the crawlspace. Additionally, a previous inspection by Criterium Giles Engineers with an associated report dated April 10, 2017 was review prior to our visit and referred to while onsite. The report is intended to cover only those premises that may be examined visually without excavation, removing surface materials, and disassembling components.

No tests, measurements, or calculations have been made except as described in this report. We have not investigated for toxic materials or wastes, or examined public records regarding this property. The scope of the inspection does not assure that the property conforms to any regulations, restrictions, or building codes that may be in effect at its location.

DESCRIPTION

The 3-story, wood-framed home (with a crawlspace) is constructed on concrete masonry unit (CMU) perimeter foundation walls with CMU block piers supporting the floor girders. The house was built in 1991 according to Granville County Real Estate Tax Records. For purposes of this report, all directions (left, right, rear, etc.) are taken from the viewpoint of an observer standing outside and facing the front door of the home.

Upon our arrival, access to the interior was provided by the homeowner. The items detailed above in the scope were subsequently inspected.

Note that the original builder was not interviewed and no plans for the construction of this home were provided. The information presented in this report is gathered from the conditions visible at the site, as they existed at the time of the inspection. A limited photo log is included with this report.

OBSERVATIONS

Interior:

1. Minor cracks (less than 1/16" wide) in the drywall finish materials were noted at the following locations:
 - a. On the second level, a crack below a window was noted in the front perimeter wall approximately 7'-4" from the right perimeter wall.
 - b. On the second level, a crack below a window was noted in the right perimeter wall approximately 10'-2" from the front perimeter wall.
 - c. On the second level, a crack above a door was noted approximately 13'-4" from the front perimeter wall and 9'-8" from the right perimeter wall.
 - d. On the second level, a crack above a door was noted approximately 12'-0" from the rear perimeter wall and 3'-0" from the right perimeter wall.
 - e. On the second level, a crack above a door was noted approximately 13'-4" from the front perimeter wall and 15'-9" from the left perimeter wall.
 - f. On the second level, a crack above a window was noted in the front perimeter wall approximately 6'-10" from the left perimeter wall.
 - g. On the second level, a crack above a door was noted approximately 12'-0" from the rear perimeter wall and 14'-10" from the left perimeter wall.
 - h. On the second level, a crack above a door was noted approximately 15'-0" from the rear perimeter wall and 12'-0" from the left perimeter wall.
 - i. On the second level, a crack at an interior corner was noted along the left perimeter wall approximately 15'-0" from the rear perimeter wall.
 - j. On the first level, a crack above a wall opening was noted approximately 1'-6" from the front perimeter wall and 13'-4" from the right perimeter wall.
 - k. On the first level, a crack above a wall opening was noted approximately 2'-6" from the front perimeter wall and 15'-4" from the left perimeter wall.
 - l. On the first level, a crack above a door was noted approximately 11'-0" from the rear perimeter wall and 8'-2" from the right perimeter wall. A corresponding crack on the opposite side of the wall was also noted at this location.
 - m. Additional minor cracks were noted throughout the interior of the home.
2. Tape delamination and nail pops in the drywall finish materials were noted at multiple locations throughout the interior of the home.
3. On the second level, separation (up to 1/8" wide) of the crown molding from the ceiling was noted approximately 9'-6" from the rear perimeter wall and 4'-0" from the right perimeter wall.
4. Floor slope was measured on the interior of the home at the following locations:
 - a. On the third level, floor slope (up to 1/2" vertical over 4'-0" horizontal) was measured sloping front to rear approximately 2'-0" from the rear knee wall of the attic and 16'-0" from the right perimeter wall.
 - b. On the second level, floor slope (up to 5/8" vertical over 4'-0" horizontal) was measured sloping front to rear approximately 21'-6" from the front perimeter wall and 12'-0" from the right perimeter wall.
 - c. On the second level, floor slope (up to 5/8" vertical over 4'-0" horizontal) was measured sloping left to right approximately 21'-6" from the front perimeter wall and 6'-0" from the right perimeter wall.
 - d. On the second level, floor slope (up to 1/2" vertical over 4'-0" horizontal) was measured sloping right to left approximately 5'-9" from the front perimeter wall and 9'-3" from the left perimeter wall.

- e. On the first level a crown in the floor was noted spanning front to rear approximately 11'-4" from the right perimeter wall. Floor slope (up to 1-1/4" vertical over 4'-0" horizontal) was measured sloping at the right of the crown approximately 12'-0" from the rear perimeter wall.

Exterior:

- 5. Cracks in the parge coating were noted along the perimeter walls at the following locations:
 - a. A vertical/stairstep crack (up to 1/4" wide) was noted in the right perimeter wall of the rear porch approximately 2'-0" from the rear perimeter wall.
 - b. A vertical/stairstep crack (up to 3/16" wide) was noted in the right perimeter wall at the rear-right corner of the home.
 - c. A previously sealed vertical crack was observed with minor additional propagation (less than 1/16" wide) in the right perimeter wall approximately 7'-6" from the rear perimeter wall. Additionally, out of plane displacement (up to 3/16") was noted at this location.
 - d. A vertical/stairstep crack (up to 3/16" wide) was noted in the left perimeter wall approximately 18'-8" from the front perimeter wall.
 - e. Multiple additional cracks (up to 1/8" wide or less) were noted throughout the perimeter walls.
- 6. Separation (up to 7/16" wide) was noted at the rear-right re-entrant corner of the rear porch to main home transition.
- 7. The chimney along the left perimeter of the home was noted to be leaning out of plumb (up to 15/16" horizontal over 4'-0" vertical). Additionally, excessive separation of the chimney from the home was noted at the top. Per conversations with the homeowner, (2) push piers were installed beneath the chimney foundation.
- 8. Gutters and downspouts were noted to not be installed on the home. Grade was noted with relatively neutral slope along the perimeter walls of the home.

Crawlspace:

- 9. The floor framing in the crawlspace generally consisted of true 2x8 floor joists spanning left to right and typically spaced at 16" O.C. The floor joists were supported by the perimeter foundation walls and floor girders.
- 10. Cracks in the foundation walls were noted in the crawlspace at the following locations:
 - a. A minor vertical crack (up to 1/16" wide) was noted in the rear foundation wall of the rear porch approximately 12'-6" from the right foundation wall.
 - b. A minor vertical/stairstep crack (up to 3/16" wide) was noted in the right foundation wall of the rear porch at the rear-right corner.
 - c. A minor vertical crack (up to 1/16" wide) was noted in the rear foundation wall at the rear-left corner of the crawlspace.
 - d. A minor vertical/stairstep crack (up to 1/8" wide) was noted in the left foundation wall approximately 5'-0" from the rear foundation wall.
 - e. A minor vertical/stairstep crack (up to 1/8" wide) was noted in the left foundation wall approximately 5'-7" from the front foundation wall.
 - f. A vertical crack (up to 1/4" wide) was noted in the rear foundation wall approximately 4'-6" from the left foundation wall.
 - g. A vertical/stairstep crack (up to 5/16" wide) was noted in the left foundation wall approximately 16'-9" from the front foundation wall.
 - h. A vertical/stairstep crack (up to 7/16" wide) was noted in the front foundation wall approximately 4'-0" from the left foundation wall.



- i. A vertical crack (up to 1/4" wide) was noted in the front foundation wall approximately 4'-0" from the right foundation wall.
 - j. A vertical/stairstep crack (up to 1/4" wide) was noted in the right foundation wall at the rear-right corner of the home.
11. A separation (up to 1/4" wide) of the right foundation wall from the front foundation wall was noted at the front-right corner of the home.
 12. A cracked/crumbling CMU pier was noted along the front foundation wall approximately 11'-3" from the left foundation wall.
 13. A cracked/crumbling CMU pier was noted along the rear foundation wall approximately 11'-0" from the right foundation wall.
 14. Multiple steel drop girders were noted installed near the midspans of the floor joists throughout the crawlspace.
 15. Bare/exposed soils with little to no vapor barrier coverage were noted throughout the crawlspace.
 16. Evidence of moisture intrusion in the form of efflorescence and water staining was noted on the perimeter foundation walls. Multiple moisture readings were taken in the floor framing with a General MMD4E moisture meter and measured lumber moisture contents of up to 18.5%.

DISCUSSION

The cracks in the foundation walls, separations, and cracked piers noted above (Observations #10-13) are likely due to differential foundation settlement. The clay soils in this area are considered "expansive" type soils and will typically expand and contract with fluctuations in the moisture content. This expansion and contraction of load-bearing soil materials can lead to soil consolidation and foundation cracking/movement. If conditions around the foundation remain relatively dry, the likelihood of future significant settlement will be reduced, but we cannot predict the extent of future settlement. The cracks, separation, and cracked piers noted above (Observations #10f-10j and #11-13) are considered to be structural concerns. Based on the globalization and magnitude of the cracks noted, it appears that the entire foundation has been affected by differential settlement. We have provided recommendations below to stabilize the foundation at isolated locations to address the immediate areas of concern; however, further stabilization of the foundation may be required in the future if the existing cracks widen or new cracks propagate. We have also provided recommendations below to address the cracked piers in the crawlspace.

The movement of the chimney noted above (Observation #7) is also likely a result of differential foundation settlement. Per measurements from the previous inspection report, the chimney has continued to move. The continuous movement of the chimney is considered to be a structural concern. We have provided a recommendation below to address this issue.

The cracking in the parge coating in the perimeter foundation walls noted above (Observation #5) is likely the result of shrinkage and differential foundation settlement discussed above. As cement-based materials harden and dry, they typically shrink, largely due to the evaporation of excess water. This shrinkage causes a buildup of internal forces in the material, commonly resulting in minor cracking, therefore naturally alleviating the internal stresses. The parge coating is an aesthetic component installed on the foundation walls and is not a structural concern. As noted above, we have provided a recommendation below to stabilize the foundation at the immediate areas of concern.

Positive grade away from the foundation should be created to reduce moisture infiltration under the foundation. Additional soil consolidation and settlement can occur due to water infiltration into soils and subsequent drought conditions which dry out the soils below foundations. Creating positive drainage away

from the perimeter foundation wall(s) is vital to the long-term structural integrity of the foundation. Additionally, installing gutters with downspouts and leaders on the home is another preferred method to aid in stormwater evacuation along the perimeter walls of the home.

The moisture content of the floor framing noted in the home at the time of the inspection is considered elevated. Moisture levels of the framing can fluctuate based on weather conditions and seasonal changes in humidity. Prolonged elevated moisture content of the framing can lead to excessive deflection and structural damage. We have provided a recommendation below to help further dry out the crawlspace.

The crown in the floor and areas of sloped floors noted above (Observation #4) are likely the result of deflection in the floor framing below. Deflection of supporting members can occur with sustained loads. The floor framing supports the weight of the interior furnishings and walls. Deflection of the floor framing will be greater in areas with sustained loads than areas with movable (live) loads. Additionally, crowns in the floor can occur over girders/beams and walls below. The girders/beams and walls would provide more strength and less deflection than the adjacent floor joists, which can cause a high point in the floor. Due to finish materials installed above and below the locations of sloped floors on the second and third levels of the home, visual inspection of the floor framing was not feasible. Removal of finish materials will be required to evaluate these locations. We have, however, provided a recommendation below to address floor slope on the first level at the rear-right of the home, if desired.

The interior drywall cracks and interior movement noted above (Observations #1-3) are likely the result of a combination of the supporting members contracting/deflecting and differential foundation settlement discussed above. Minor drywall cracking and finish carpentry separations are typically associated with changes in weather, temperature, and humidity causing wood to shrink and swell with the seasons. When moisture is taken away from wood it has a tendency to contract thus resulting in deflection (or sagging). Any walls, windows or doors bearing on the deflected members will also move. As discussed above, we have provided a recommendation below to stabilize the foundation at isolated locations.

The recommendations presented in this report are based on our experience and understanding of the concerns to provide a reasonable solution based on the conditions that were visible and/or known to us on the date of inspection. As this report is based on the circumstances at one point in time, conditions may change which may result in additional repair recommendations. Further, the recommendations are the opinion of the Engineer to address significant structural-related concerns and may not rectify cosmetic issues.

RECOMMENDATIONS

If there are any questions or concerns regarding location or method of repair contact the engineer prior to construction.

1. We recommend installing new helical piers or equivalent push piers system under the perimeter foundation walls (see attached sketch). Ten (10) helical piers should be sufficient to stabilize the immediate areas of concern noting that further stabilization may be required in the future if further movement is noted.
 - a) Helical piers are to be installed up to 6'-0" on-center and not be installed directly below doors and windows (unless otherwise noted).
 - b) Provide a minimum of 15 kips allowable bearing capacity per helical pier. Helical piers should be installed concentrically below the subject-bearing footing. This may require



- require chipping/removal of sections of concrete footing as needed such that the bearing bracket for each helical pier is not offset from the bearing wall.
- c) Installation of steel angle (L6x6x3/8" or equivalent) is required at the location described in the attached sketch. Steel bridging may be required at other locations depending on the condition of the footing.
 - d) The contractor should also provide a lifetime transferable warranty on the stabilized portion of the foundation.
 - e) During excavation for the helical/push pier installation, should steps in the footings/foundations (or other unforeseen structural concerns) be discovered, notify the Engineer prior to proceeding with repairs.
 - f) Should a reinspection by Giles Flythe Engineers be desired to inspect the helical pier installation, the piers should be fully installed and bearing brackets fully exposed upon our arrival.
2. We recommend consulting with the contractor who installed the piers under the chimney to perform necessary adjustment to ensure the piers are in full contact with the footing.
 3. In regards to the damaged piers noted above (Observations #12-13), we recommend removing and replacing the piers with new mortared 8"x16" CMU block piers. The new piers should be grouted fully solid and bear on new 24"x24"x12"-thick concrete footings. Install flat, pressure-treated wood blocking and/or metal shims to provide full-width uniform bearing of the floor girder onto the new piers below.
 - a) We recommend doweling into the existing perimeter concrete footing with (3) #4 18"-long bars set 6" into the existing footing with Simpson SET-3G Epoxy (or equivalent).
 4. If desired, to help alleviate floor slope, we recommend installing a new 3-2x8 drop girder at the midspan of the floor joists at the rear-right of the home. The new drop girder should be supported by mortared 8"x16" CMU block piers spaced at 6'-0" O.C. (16" cantilever allowed). The piers should bear on new 20"x20"x8"-thick concrete footings. Install flat, pressure-treated wood blocking and/or metal shims to provide full-width uniform bearing of the drop girder onto the piers below.
 5. To help further reduce and regulate moisture levels in the crawlspace, we recommend installing a new vapor barrier throughout the crawl space that covers 100% of the exposed soils. If moisture levels remain high (greater than 15%), an appropriately sized dehumidification system may be required.
 6. Closely monitor the cracks in the foundation walls. If the cracks widen significantly (expand by an additional 1/8") or additional significant cracks (greater than 1/4" wide) propagate, then further evaluation by a structural engineer and stabilization of other locations of the perimeter foundation walls will likely be required at that time.
 7. We also recommend ensuring that stormwater drains positively away from the home to minimize the risk of future water infiltration. This can be accomplished by installing downspouts on the home with downspouts and leaders to properly direct the drainage away from the home. Also, creating a positive grade around the perimeter of the home will aid in stormwater evacuation. Water infiltration can cause further undermining of the soil and foundation settlement.

General Notes:

- All new lumber should be SYP No.2 or equivalent. All lumber exposed to concrete/masonry or weather must be pressure treated. All metal components exposed to weather or pressure-treated lumber shall be galvanized.
- Install pressure-treated blocking to provide full uniform bearing of the above floor framing onto the new/existing block piers.
- All new concrete is to have a minimum 28-day compressive strength of 3000 psi.
- New concrete footings are to be installed a minimum 12" below grade (to the bottom of the footing) and in no case less than frost depth.
- Soils below new foundation components to be contractor verified to be a minimum 2000 psf bearing capacity.
- The unsupported height for hollow masonry piers must be no greater than 4 times the least dimension. If all cells of the masonry pier are fully grouted, the unsupported height may be increased to 10 times the least dimension.
 - 8"x16": Max. Hollow Height = 2'-8", Max. Fully Grouted Height = 6'-8"
 - 16"x16": Max. Hollow Height = 5'-4", Max. Fully Grouted Height = 13'-4"
- All new metal hangers/ties/clips to be installed per manufacturer specifications.
- All fastening shall conform to R602.3(1) in the 2018 NC Building Code: Residential Code.
- Installation of the above recommended repairs may require temporary shoring of the in-place structural components. Shoring methods are the responsibility of the contractor.
- With any structural changes, finish material cracks and minor movements are typical and expected. These are associated with settlement and allowable deflection generally observed after construction of an addition, significant remodel, or repair.

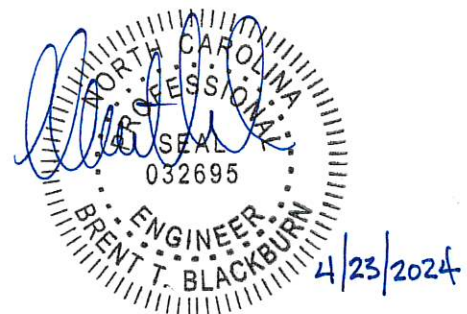
CONCLUSION

We trust that this report provides the information you require. Please contact us at (919) 465-3801 if you have any questions. Thank you for the opportunity to be of assistance to you.

Sincerely,



Evan L. Rimer, EI
Project Engineer
Giles Flythe Engineers Inc.
NC Lic. No. C-2871



Brent T. Blackburn, PE
Project Manager
Giles Flythe Engineers Inc.
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Enclosed: Location Sketch
 Limited Photo Log





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LOCATION SKETCH

(NOT TO SCALE)

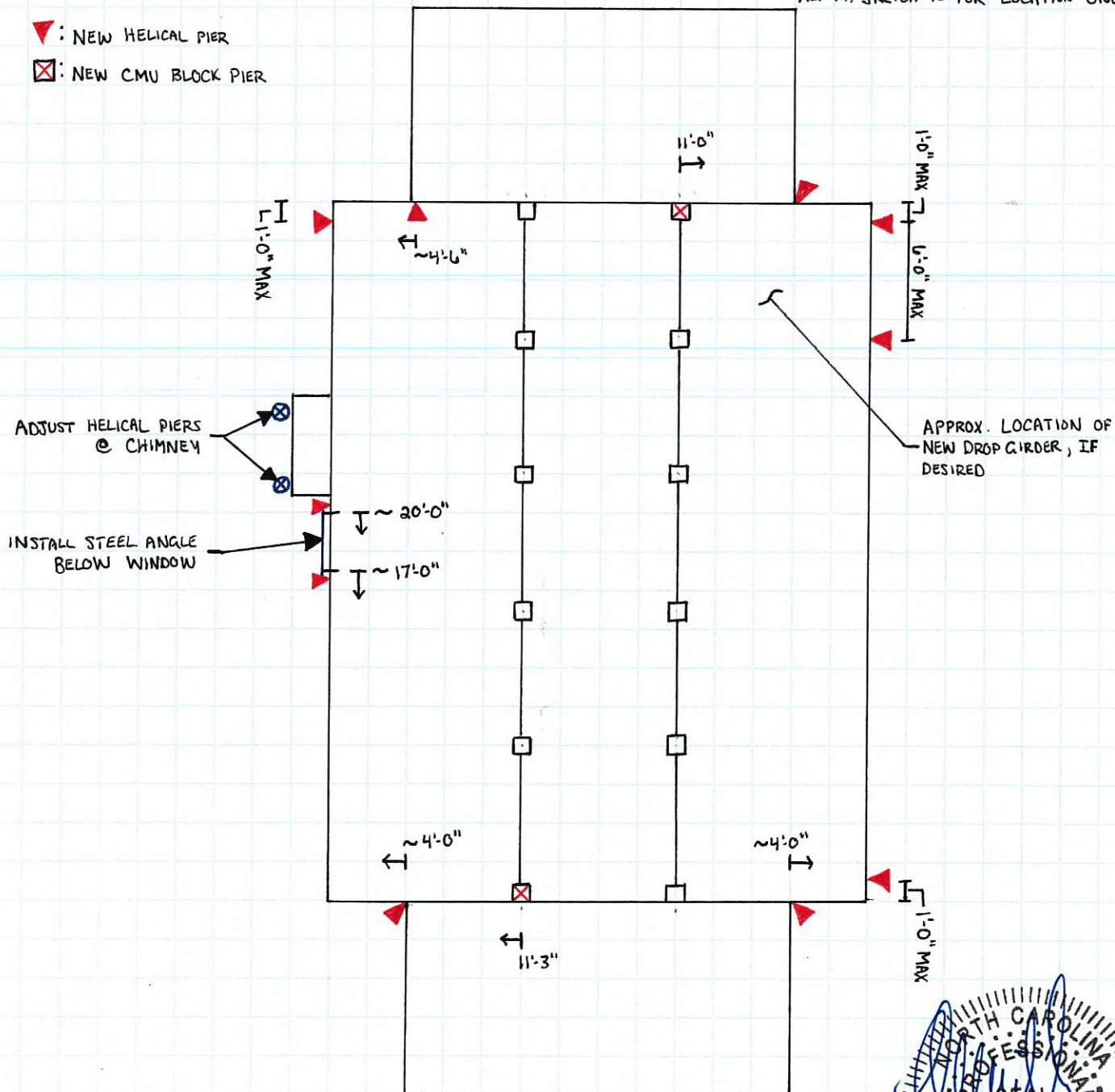
1188 TURNER ROAD

CREEDMOOR, NC

* REPAIRS TO BE MADE PER THE ATTACHED
REPORT. SKETCH IS FOR LOCATION ONLY.

▼: NEW HELICAL PIER

☒: NEW CMU BLOCK PIER



4/23/2024

Description

Front elevation of
the home.



Photo No.
1

Description

Typical view of a
crack in the drywall
finish materials.



Photo No.
2

Description Typical view of a crack in the drywall finish materials.	
Photo No. 3	

Description Typical view of floor slope throughout the home.	
Photo No. 4	

Description

View of floor slope
adjacent to the
crown on the first
level.

Photo No.
5



Description

View of a crack in
the parge coating.

Photo No.
6



Description

Measured view of a crack in the parge coating.



Photo No.
7

Description

Typical view of a minor crack in the parge coating.



Photo No.
8

Description View of separation of the chimney from the home.	
Photo No. 9	

Description View of out of plumb chimney.	
Photo No. 10	

Description

Typical view of a minor crack in the foundation walls.



Photo No.
11

Description

View of a crack in the left foundation wall.



Photo No.
12

Description Measured view of a crack.	
Photo No. 13	

Description View of a crack in the front foundation wall.	
Photo No. 14	

Description Measured view of a crack.	
Photo No. 15	

Description View of separation at the front to left foundation wall transition.	
Photo No. 16	

Description

View of a cracked pier.

Photo No.
17



Description

View of a cracked pier.

Photo No.
18

