



Kimley-Horn
and Associates, Inc.

September 24, 2009

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Suite 100
1919 South Boulevard
Charlotte, North Carolina
28203-4778

Mr. John R. Buric
James, McElroy & Diehl, P.A.
600 South College Street
Charlotte, NC 28202

Re: Strain Residence
3347 Mill Race Road
Charlotte, NC
KHA No.: 015189001

Dear Mr. Buric:

In response to your request, Kimley-Horn and Associates, Inc. conducted an evaluation of owner's concerns at the subject property to determine if they represent construction deficiencies. As part of this evaluation, we conducted a site visit on July 31, 2009. The following report is a summary of Kimley-Horn's findings.

Description

The Strain residence is a two-story, wood-framed house constructed over a crawl space. The exterior walls are finished with a combination of lap siding and stone veneer, and the roof is covered with laminated asphalt composition shingles. According to Mecklenburg County's Property Ownership Land Records Information System (POLARIS), the original house was constructed in 1978. For orientation purposes, the front of the house is designated as facing northwest.

Background

During the site visit on July 31, 2009, Mr. Sean Strain provided the following information:

- The Strains purchased the subject property in April 2008.
- At the time of the purchase, the property included a two-story house constructed in the 1970s.
- The Strains purchased the property with plans to construct a new house.
- They signed a contract with da Vinci Design Group, LLC (da Vinci) in April 2008 with a commitment to begin construction on or about May 15, 2008.
- A completion date was set for February 15, 2009.
- da Vinci presented the Strains with a construction alternative that included

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- using part of the existing structure in the new house.
- da Vinci hired Dynamic Engineering Associates, P.C. to provide structural engineering services for the project.
- After construction was underway, the Strains became concerned about the condition of the house and hired Yates/Starnes Engineering, P.A. (Yates) to provide an evaluation of the structure.
- Yates provided a report of findings dated August 23, 2008. At that time, the house was in the dry, but had not been finished on the interior or exterior.
- The Yates report was provided to da Vinci to address discrepancies and deficiencies in construction.
- After construction was complete, the Strains continued to notice floors out of level, excessive spring in some floors, and extensive nail pops in gypsum board walls and ceilings.
- At the Strains' request, Yates provided a follow-up evaluation and report dated April 4, 2009. This evaluation was performed after da Vinci obtained a certificate of occupancy.
- The Strains hired Mr. Larry Frick of Laurel Creek Partners, Inc. to conduct a home inspection as part of their purchase of the subject property. Mr. Frick provided a report dated March 14, 2009.

Observations

Kimley-Horn and Associates, Inc. conducted a site visit on July 31, 2009, during which accessible areas of the interior, exterior, attic, and crawl space were observed. The site visit was attended by Sean and Sheri Strain and was conducted by Rick Moore, P.E. and Drew Wilkie, P.E. of Kimley-Horn. The following observations were made:

Exterior

- The ground surface generally sloped downward from right to left (as one faces the front of the house).
- Crawl space vent openings were located at the ground surface without vent wells.
- There were no weep holes or through-wall flashings in the stone veneer.
- Roof-wall intersections did not include properly configured diverter flashings in some locations; and in other locations, diverter flashings were missing.
- Head flashings on windows were sealed shut.
- The window bay on the front elevation exhibited missing roof-wall flashings.

Interior

- The interior was finished with hardwood floors, carpeting, and painted gypsum wallboard walls and ceilings. Bathrooms and kitchen areas included floor and wall tile.
- Nail pops were observed on wall and ceiling finishes in various areas of the house.
- The floors were out of level in the foyer, dining room, kitchen, and family rooms. Measured locations were as much as 7/8 inch out of level over a



distance of 4 feet.

- No cracks in wall and ceiling finishes were observed.
- The kitchen floor and second floor exhibited squeaking under foot loads in certain high traffic areas (i.e., just in front of the kitchen sink and in the upstairs hallway outside the rear bedroom).

Crawl Space

- The ground surface inside the crawl space generally sloped downward from right to left (from southwest to northeast).
- The crawl space included only remnants of a ground vapor barrier (plastic sheeting) in some isolated areas.
- The left end of the crawl space was more than 5 feet high, while the right end of the crawl space was less than 18 inches from the ground surface.
- The floor frame was supported by interior masonry piers and a combination of concrete masonry unit (CMU) foundation walls and perimeter pier and curtain walls.
- The pier and curtain walls appeared to be original to the 1978 structure, while the CMU foundation walls appeared to have been added for the recent construction.
- Areas that appeared to have been added to the original building footprint included: 1) the master suite on the rear/right building corner; 2) the front porch and front bay; and 3) the garage.
- Additional piers had been added to the perimeter and interior of the crawl space, and some piers had been abandoned.
- The base of the pier and curtain walls was visible in several locations where the soil was eroded.
- The curtain wall consisted of a single wythe of brick masonry laid in a running bond atop a leveling course of concrete brick. The leveling course was laid on a bed of concrete or mortar that varied in thickness from approximately ½ inch to 2 inches.
- Some piers are missing from where the plans prepared by P. Mark Simpson, P.E. indicate they should be located.
- Some of the original perimeter piers were laid on a visible bed of concrete or mortar, similar to the curtain wall.
- Footings for the remainder of the piers were not readily visible.
- Some of the original piers and curtain walls were bonded with masonry headers.
- New piers exhibited gaps and no evidence of bonding to the curtain wall assembly.
- Some of the new CMU piers included non-grouted cells.
- Efflorescence and moist brick were observed on the interior face of the curtain walls, and the ground was moist near the base of the walls.
- The area below the kitchen foyer consisted of a closed crawl space.
- Some floor joists were connected to girders without hangers or ledgers.
- The tops of some joists were at slightly different elevations, resulting in gaps between some joists and subflooring.
- Access to the crawl space underneath the master suite (rear/right building



corner) consists of approximately 12- by 18-inch openings in the interior curtain wall.

- The exposed portions of the wood framing exhibited mildew or fungal growth, especially in areas with low ground clearance.

Research

As part of this evaluation, the following documents were reviewed, industry standards consulted and governmental office contacted:

- North Carolina State Building Code, Residential Code, 2006 Edition (hereinafter, the Code)
- ASTM E-2112, Standard Practice for Installation of Exterior Windows, Doors, and Skylights
- Plan Sheets 1 through 4, by da Vinci Design Group, sealed by P. Mark Simpson, P.E., May 14, 2008
- Plan Sheets 1 through 4, by da Vinci Design Group, sealed by P. Mark Simpson, P.E., May 29, 2008
- Report of Limited Structural Observations, A. Wynn Yates, P.E., dated August 23, 2008
- Follow-up Report of Limited Structural Observations, A. Wynn Yates, P.E., dated April 4, 2009
- Portion or draft of a contract prepared by da Vinci Design Group, LLC describing the subject property and including floor plan sketches. Sketches are dated April 11, 2008.
- Settlement Agreement and Amendment to Contract, dated June 19, 2008
- Building Permit No: B1894200, issued May 22, 2009
- Mecklenburg County Land Use and Environmental Services
- Residential Construction Performance Guidelines, National Association of Homebuilders
- Installation Instructions, Armstrong Hardwood Flooring Company

North Carolina Building Code

The following sections of the Code were noted:

Section R319 – Protection Against Decay

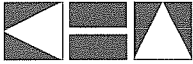
“Wood joists or the bottom of a wood structural floor when closer than 18 inches...to the exposed ground in crawl spaces” are required to consist of treated or naturally decay-resistant lumber.

Section R403.1.1 – Minimum Size of Footings

“Spread footings shall be at least 6 inches in thickness.”

Section R403.1.4 – Minimum Depth of Footings

“All exterior footings and foundation systems shall extend below the frost line specified in Table R301.2(1). In no case shall the bottom of the exterior footings



be less than 12 inches below finished grade.”

Section R404.1.5.1 – Pier and Curtain Walls

“Curtain walls 4-inch minimum thickness between piers and bonded into piers supported on concrete footings poured integrally with pier footings may be used for frame construction and for masonry veneer frame construction not more than two stories in height subject to the following limitations: 1) All load-bearing wall shall be placed on continuous concrete footings placed integrally with the exterior wall footings; 2) The minimum actual thickness of a load-bearing masonry wall shall be not less than 4 inches nominal or 3-3/8 inches actual thickness, and shall be bonded integrally with piers...”

Section R404.1.5.2 – Piers

“The unsupported height of masonry piers shall not exceed 10 times their least dimension. When structural clay tile or hollow concrete masonry units are used for isolated piers to support beams and girders, the cellular spaces shall be filled solidly with concrete or Type M or S mortar, except that unfilled hollow piers may be used if their unsupported height is not more than four times their least dimension.”

Section R408.1.2 – Foundation Vent Location

“Vent dams shall be provided when the bottom of the foundation vent opening is less than 4 inches above the finished exterior grade.”

Section R408.2 – Ground Vapor Retarder

“Wall vented crawl spaces require full coverage ground vapor retarders. Wall vented crawl spaces shall be protected from water entry by the evaporation of water from the ground surface. A minimum 6-mil polyethylene vapor retarder or equivalent shall be installed to cover all exposed earth in the crawl space...”

Section R408.3 – Wall Dampproofing

“Where the outside grade is higher than the inside grade, the exterior walls shall be dampproofed from the top of the footing to the finished grade...”

Section R408.8 – Crawl Space Access

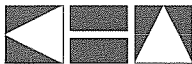
“A minimum access opening measuring 18 inches by 24 inches shall be provided to the crawl space.”

Section R703.7.5 – Flashing for Stone and Masonry Veneer

“Flashing of 6-mil poly or other corrosion-resistive material shall be located beneath the first and second course of masonry above finished ground level above the foundation wall or slab and at other points of support, including structural floors... Top of base flashing shall be installed with a minimum 2 inch lap behind building paper or water repellent sheathing.”

Section R703.7.6 – Weepholes

“Weepholes shall be provided in the outside wythe of masonry walls at a



maximum spacing of 48 inches on center. Weepholes shall be located immediately above the flashing.”

Section R703.8 – Flashing

“Approved corrosion-resistive flashing shall be provided in the exterior wall envelope...” “Install flashing per ASTM E-2112 – Standard Practice for Installation of Exterior Windows, Doors, and Skylights, or in accordance with the manufacturer’s supplied written instructions.” “Approved corrosion-resistant flashings shall be installed at all of the following locations: 1) At top of all exterior window and door openings...; 2) At the intersection of chimneys or other masonry construction...; 3) Under and at the ends of masonry, wood or metal copings and sills; 4) Continuously above all projecting wood trim; 5) Where exterior porches, decks or stairs attach to a wall...; 6) At wall and roof intersections; 7) at built-in gutters.”

Section R903.2.1 – Flashing

“Flashings shall be installed at wall and roof intersections...”

ASTM E-2112: Standard Practice for Installation of Exterior Windows, Doors, and Skylights

Figure 29, a section view of flashing at the head of a window, states, “Do not seal gap,” referring to the space between the head flashing and the siding above the window.

Conclusions

Based on our observations and research, we submit the following conclusions for your consideration. The Strain residence has construction deficiencies that represent deviations from industry standards, and in some cases, are a violation of the North Carolina Building Code. In addition, A. Wynn Yates, P.E. and Larry R. Frick documented deficiencies in the Strain residence contemporaneously with the construction of the house.

Nail Pops

The interior wall and ceiling finishes exhibited extensive nail pops in painted gypsum wallboard. The nail pops are likely the result of changes in moisture content of the building materials. As the hygroscopic framing materials dried, the resulting shrinkage caused movement of fastener heads relative to the finished wall and ceiling surfaces. Managing indoor temperature and humidity during construction is essential to minimizing the effects of shrinkage.

Hardwood Floors

The floor exhibits several areas that are out of level by nearly 1 inch over a



distance of 4 feet. This condition is indicative of poor workmanship and may represent previous or ongoing movement of the structure, its foundations, and the connection between individual structural members. It is our opinion that the levelness issue is partly the result of complications encountered during the re-use of foundations from the original 1978 structure, the majority of which was demolished in preparation for construction of the existing residence. The flatness/levelness of the floors is deficient relative to industry standards, including those of the National Association of Homebuilders and hardwood flooring manufacturers.

Flashings

The exterior walls and roofs exhibit missing flashings at roof/wall intersections and at the base of masonry veneer. We believe the lack of adequate flashings is a violation of the Code.

Foundations

Portions of the exterior pier and curtain wall foundations do not extend below the minimum depth required for freeze-protection. This condition makes the structure increasingly prone to soil movement associated with freezing and with changes in soil moisture content. The lack of adequate footing depth is a violation of the Code. We do not know if the structural engineer of record, Mr. P. Mark Simpson, P.E., approved the original foundations for re-use.

Piers and Curtain Walls

The pier and curtain wall assemblies provide non-standard support for the overlying structural members. In some locations, we observed the curtain walls do not include an adequate footing, and the footing is not integrally connected to the pier footings. In addition, the curtain walls are not properly anchored or bonded to the newly constructed piers despite the foundation note on the plan which designated the perimeter foundations as a pier and curtain assembly. The plans, however, do not include detailed information about bonding the piers and curtain walls.

The tops of many of the newly constructed piers are lower than the floor framing they are designed to support; therefore, the piers are ineffective at supporting applied loads. These conditions have rendered the foundations functionally deficient relative to industry standard and to repair design.

Ground Vapor Barrier

The lack of an adequate ground vapor barrier is a violation of the Code. This condition is a contributing factor in the formation of mildew or fungal growth on the exposed floor frame. Left uncorrected, this condition could lead to decay of structural members.



Crawl Space Ground Clearance

The floor framing in a portion of the crawl space is located closer to the ground surface than allowed by the Code, and the framing in this area does not consist of pressure-treated or otherwise decay-resistant lumber. This is a violation of the Code and is a contributing factor in the formation of mildew or fungal growth on the floor frame. Left uncorrected, this condition also can lead over time to decay of structural members.

Use of Original Foundations

The re-use of original foundations from the 1978 structure is a significant contributing factor in the excessive out-of-level condition of the floors. We believe the original foundations should have been completely removed and replaced to meet the Code-prescribed applied loads and to meet industry standards for masonry construction and for floor levelness.

Summary

In summary, the Strain residence has Code deficiencies and workmanship problems that require repair. This report does not make recommendations for repair as additional evaluation will be necessary to determine the appropriate measures to correct the deficiencies noted.

Closure

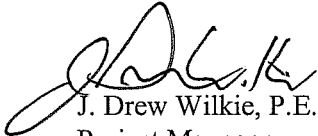
This report has been prepared in accordance with the applicable professional standard of care. No other warranties or guarantees, express or implied, are made or intended. This report has been prepared solely for James, McElroy & Diehl, P.A. for the purpose stated herein and should not be relied upon by any other party or for any other purpose. Specifically, this report may not be used in connection with actual renovation or construction of any kind. The conclusions in this report are based on the limited investigation described above. Any reliance on this report by any party other than James, McElroy & Diehl, P.A. shall be without liability to Kimley-Horn and Associates, Inc. or its employees.

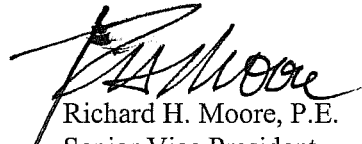


Please call us at (704) 335-0210 if you have any questions regarding this report.

Very truly yours,

KIMLEY-HORN AND ASSOCIATES, INC. (NC License No. F-0102)


J. Drew Wilkie, P.E.
Project Manager


Richard H. Moore, P.E.
Senior Vice President

Attachments: Photographs

