KNE

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DATE: 01/29/2010	**JOB #:** 0410
PROJECT: RHA Residential Inspection	
LOCATION: 12060 Camel Rock	
CONTRACTOR:	
OWNER: Reno Housing Authority	
WEATHER: Overcast	
TEMP: 34°F	**TIME:** 8:00am
PRESENT AT SITE:	
Brian Wilcox – Kirk N. Ellis & Associates	
Kirk N. Ellis – Kirk N. Ellis & Associates	

TO: Mr. Tim O'Fallon

Reno Housing Authority

1525 East Ninth Street

Reno, NV 89512

Report Date: 02/09/2010

At the request of Tim O'Fallon of the Reno Housing Authority, this office went to conduct an Initial Structural Engineering Visual Inspection Site Visit for the residence located at 12060 Camel Rock Drive, Reno, Nevada. This residence is identified by the Washoe County Assessor as APN: 550-081-18, and listed as a Two Story, Single Family Residence built about 1997.

FIG. 1: EXTERIOR OF RESIDENCE

The following was noted:

1. The exterior of the structure is finished with horizontal lap siding. See Figure 1. The exterior face of the structure is experiencing some movement. There are many nails that are loose or are in elongated holes.

2. The exterior slab-on-grade concrete is of lesser quality concrete. Pitting and spalling exist. This type of damage normally occurs when pour quality/low strength concrete is exposed to numerous cycles of freezing and thawing. The damage at this point was cosmetic.

FIG. 2: OPENINGS PREPARED FOR PAINTING, WITH PLASTIC SHEETING.

3. The interior of the residence appeared to have a relatively new coat of primer paint. The new coat of paint is thin enough that if uncaulked cracks existed, they might have been visually evident.

4. Very few of the exterior doors and windows were available for inspection. Most of the residence had been prepared for painting. See Figure 2. Of the few openings that were available for inspection, no stiff or racked openings were observed.

5. Inspection of the storage closet under the stairs revealed a potential health safety problem. Black mold stain exists at a location that appears to have been wet for a long period of time.

See Figure 3. Inspection of the crawlspace directly below revealed an array of water pipes and an additional location of mold or wood rot. See Figure 4.

FIG. 3: APPARENT BLACK MOLD AT WATER SPOT

FIG. 4: ADDITIONAL MINOR WATER DAMAGE AND POSSIBLE MOLD.

6. Generally, the floor framing felt quite solid. Inspection of the crawl space revealed engineered/manufactured 9-1/2" I-Joists at 16-inches on-center. Dynamic jumping load tests indicated a relatively solid floor.

7. The crawlspace was reasonably clean and moisture barriers were mostly intact. The foundation wall insulation covered most of the stem wall, but there were a few sections of wall that had been exposed. Inspection of these areas revealed only typical concrete drying shrinkage and thermal cracking, and no stress or failure mode cracking was observed. The footing also exhibited this same type of cracking.

8. The exterior side of the stem wall was available for inspection for only the top 6-inches. Most of the stem wall seemed in good repair with only typical and minor drying shrinkage cracks. One corner was not typical and showed signs of excessive concrete degradation. See Figure 5. Chipping, followed by epoxy/mortar repairs are recommended.

FIG. 5: CONCRETE DEGRADATION.

FIG. 6: CEILING MOUNTED LIFT HOOKS

9. The garage slab exhibited no buckling or excessive cracking. Most of the slab cracking was controlled through crack control joints installed in the slab. Those that existed outside of the of control joints are minor, and are not structurally significant.

10. There are several ceiling mounted lift or hangers. See Figure 6. This is a common mistake of homeowners. Roof trusses and floor joists are almost never designed to carry these additional dead loads. The areas directly above these locations were not available for inspection.

11. The water heater and furnace appeared to be seismically strapped, or otherwise positively connected to the stud walls.

12. All areas accessible from the attic access point and above the insulation were inspected and appeared to be free from defect. The roof truss chords and webs did not have any visible stress fractures and no water damage was observed. The exterior gable end walls did not appear to have sheathing. There did appear to be some minor water damage at the outlookers for the gable ends. See Figure 7.

FIG. 7: WATER DAMAGE AT OUTLOOKERS.

13. There is an area of additional concern. It appears that a section of the base board has been exposed to moisture. See Figure 8.

14. The site drainage is poor. At several locations, finish grade slopes are directing water towards the structure.

FIG. 8: WATER DAMAGE AT BASEBOARD.

KNE Discussion

Based on what was visually seen at the time of inspection, the current as-built/existing structural systems for this residence appears to be absent of major defects or omissions. There are, however, several locations that will require adjustments to prevent further damage. There are also several locations that should be investigated further. Please note that this was a visual inspection only. No destructive testing or structural calculations were done, no thermal insulation or finish work was removed.

There are several indicators that we look for as a marker of structural failure or movement. As a structure bends and flexes under the strain of lateral forces (wind or seismic) there tends to be a racking or twisting movement. This can be seen in the frames of doors and windows. Racking or twisting changes the shape of the opening from a rectangle to a parallelogram. The shape shifting causes doors to not fit correctly in the frames and windows become difficult to operate. Door or window operation becomes “stiff”. The sheet rock also shows these stresses at the corners in the form of compression bulges or diagonal tension cracks. If excessive and repetitive movements have occurred, the finish exterior can show signs of movement stress as well.

The residence showed no evidence of stiff or racked door openings or stiff operation or racked window openings. However, many of the doors and windows were available for inspection due to preparations for painting. There was no indication of racked openings. No compression bulges were visible, and no diagonal tension cracks were seen. The recent touch-up work and painting that had been performed might cover up any cracks, therefore, this inspection method cannot be as effectively applied. The exterior sheathing panel nails are working in some kind of movement. The nails are working their way loose, and at some locations, are elongating the original holes the nails were placed in. The nails in pull-out should be removed and replaced with wood screws or screw-nails.

Vertical/gravity load effects are typically not seen when adequately designed. Failures can usually be seen with flexural fractures and eccentricities in the structural members. Excessive deflection can also be an indication of poor construction or inadequately calculated structural members. None of this type of visual evidence was seen at this residence.

The residence generally appeared to have relatively straight and plumb interior surfaces, and the floor systems appeared to be sturdy and did not excessively deflect. Inspection of the floor systems showed no apparent stress fractures or failures. All areas of the attic area that were accessible for inspection revealed no apparent stress fractures or failures. The wall studs and columns were not available for inspection. No insulation or finishes were removed for inspection.

In the garage, there are several “hooks” and “ceiling shelves”. Often times, home owners will install these types of mechanisms thinking that the structure above will “more than handle” the load they are imparting. This is simply not true. Most structures are designed for maximum normal loads. This can include roofing materials, snow and wind loads as well as mechanical and electrical equipment. Rarely, if ever, are these members designed for lumber storage or engine blocks. Unfortunately, the areas that would be affected by the additional loads, and possibly structural failures, are not accessible. It is strongly encouraged that this be further investigated. The finish materials should be removed and the structural members assessed. Drilling into truss members is not advised.

As a concrete stem wall or footing cures, it experiences many thermal and drying shrinkage variances. The expansion and contraction of the concrete stem wall normally causes hairline fractures in the concrete. The longitudinal reinforcing in concrete stem walls and footings exists to preclude complete fracture of the footings and stem walls, so it can retain it's structural strength. Typically, temperature cracks do not exceed 1/32” and occur approximately every six to eight feet. These cracks propagate perpendicular to the length of the stem wall (shortest distance).

On the other hand, differential settlement or foundation movement cracks typically radiate 45° from point of maximum load, or 45° perpendicular to the length of the footing or stem wall. None of this type of crack was seen.

The concrete footing and stem wall was open for inspection at a few locations from the interior crawlspace and only the top six inches from the exterior of the structure. The concrete showed no signs of excessive weathering, efflorescence, spalling or failure cracks or fractures on the interior. Concrete drying shrinkage and temperature cracks exist, but are well within expected limits. On the exterior of the structure, at the south-east corner (See Figure 5), however, there was one section of weak concrete. This concrete should be chipped away and the adjacent structural members exposed. It is important to find out if this concrete failure is systemic or just localized.

Unfortunately, the exterior concrete for commercially built or tract housing is not considered to be of a structural nature, so a lower quality concrete mix is used to conserve money. These types of exterior slabs are exposed to constant temperature changes, harsh weathering, and “freeze/thaw cycles”. Typically these exterior slabs weather quickly, and spalling will occur. This is only cosmetic at this time. The exterior concrete should be evaluated and, if desired, replaced or topped with a new finish coat.

The site drainage is poor. There are several locations where the water would drain towards the structure rather than away. This can cause additional stresses on the structure and is poor practice. This should be remedied.

The residence also had another spot that might need to be subject to further investigation. The base board in Figure 8 seems to have been exposed to prolonged moisture. The carpet and pad in this area should be "pulled-back", and the floor sheathing should be inspected for mold, rot or other water damage. If water damage is observed, the sheathing should be evaluated. The floor joists might also need to be inspected for additional water damage.

KNE Conclusions and Recommendations

As stated above, the residence located at 12060 Camel Rock Drive appears to be absent of major structural defects or omissions. There are several locations, however, that more investigation and or remedial measures should be completed. Please note that this was a visual inspection only. No destructive testing or structural calculations were done. No thermal insulation or finish work was removed. See also the Structural Inspection Memorandum.

It is our understanding that a professional residential inspection will or has been performed for problems not related to structural members. If, upon inspection, the residential inspector has any structural concerns, do not hesitate to contact our firm for additional inspections and reports.

If you have any questions or comments, please feel free to call.

Sincerely,

KIRK N. ELLIS & ASSOCIATES
STRUCTURAL & CIVIL ENGINEERS, LTD.

Brian Wilcox
Structural Inspector

REVIEWED & APPROVED

PROFESSIONAL ENGINEER - STATE OF NEVADA
KIRK N.
ELLIS
Exp: 12/31/10
CIVIL
STRUCTURAL
No. 4398

Kirk N. Ellis, S.E., P.E.
President
02/09/2010

Enclosures:
Structural Inspection Memo
Contact Sheets of all Images taken at the Site (7 Sheets Total)

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M E M O R A N D U M

TO: Clients Desiring “Structural Inspection Services”

FROM: Kirk N. Ellis & Associtates

DATE: February 5, 2010

RE: Discussion of some of the Limitations of the Visual Structural Inspection Site Visit

When most clients request a "structural inspection", their intent is usually to be assured that their building structure, or one they are contemplating buying, is "structurally sound".

Usually, however, no matter how closely a structural engineer looks at a given building, he cannot really accomplish this desired end result.

In most cases, many of the actual structural framing systems are covered up by other finish materials. The structural engineer would then try to "read" any exposed cracking or movement patterns in the finish materials, that may indicate building structure movements, which underlie these finish materials. To be able to physically see all the framing systems, the finish materials would have to be removed and replaced later. This would obviously be impractical and expensive.

Even if all framing systems are in fact fully exposed, it cannot be guaranteed that the structure is "sound" by only a simple visual observation. Sometimes, structural members and their connections exhibit no visual signs of structural distress until they are loaded well beyond safe working design loads. Even well designed structures deflect, deform, move and shift somewhat. However, there is no sure way of knowing how much "apparent deformity" was built-in during construction. For example, if a given beam is highly cambered, and then heavily loaded, it may appear quite straight, and without sag or deflection. It may not appear overloaded, until it fractured, or cracked. This occurrence would be somewhat unusual, although not impossible.

Usually, but not always, overloaded structural members do exhibit some visual signs. Just as often, however, improperly designed members can look fine, because they have not yet been subjected to a full design load level condition.

STRUCTURAL CALCULATIONS AND REVIEW OF BUILDING CONSTRUCTION PLANS

THE NEXT STEP-

Obviously, there are many limitations to the "structural visual inspection". Some have been discussed above. If the client desires a higher level of comfort or assurance, I would recommend that a design review study be commissioned. This would require that structural analysis and design calculations be performed on the structural members and details which are shown on the "Construction Documents". Once check calculations have been performed, and key problem areas have been identified, a structural engineer will be much better informed. He will then be in a much better position to advise his client, the Owner.

However, there is always the nagging question of just how closely does the as-built construction match the drawings and plans? What materials stress grades were actually supplied? Was the workmanship substandard? Remember, a lot of this will be either visually concealed, or not subject to simple visual evaluation. If construction plans are not available for us to review, as-built drawings become necessary. These efforts provide the next higher level of assurance, but still there are no guarantees.

Unless otherwise stated, visual structural inspections do not include calculations, plan reviews, preparation of as-built drawings, material testing, etc.

Most often, the purpose for the inspection is quite specific. Therefore, unless otherwise stated, it should be understood by all parties that the "structural inspection" covers only the specific requested subject, and usually is not a general inspection of the entire structure.

CONCLUSION

The structural engineer performing a "structural inspection" is simply looking for visual indications that the structural framing elements may have been subjected to a loading or deformation which has caused some kind of distress: cracking patterns, fractures in structural materials, sagging or deflecting, heaving or bulging, tearing, racked or deformed window and door openings, etc.

Given the complexities of modern building codes, and the limitations of a visual inspection, is not possible to state, "this structure is sound". It is only possible to report what is observed, and the possible structural implications of same. Nothing more, and nothing less.

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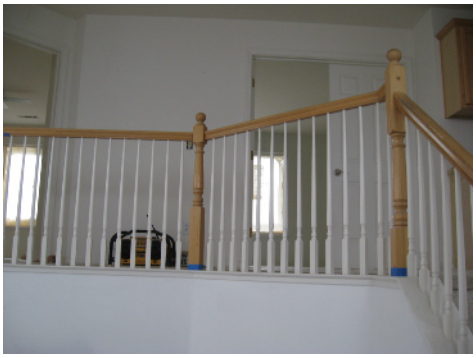

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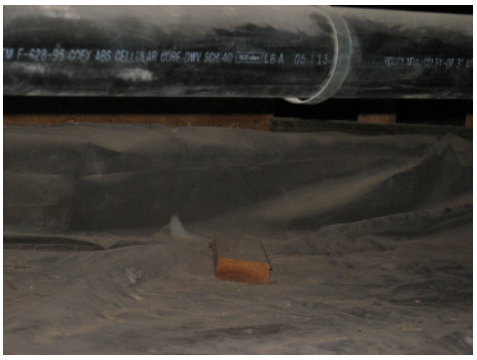

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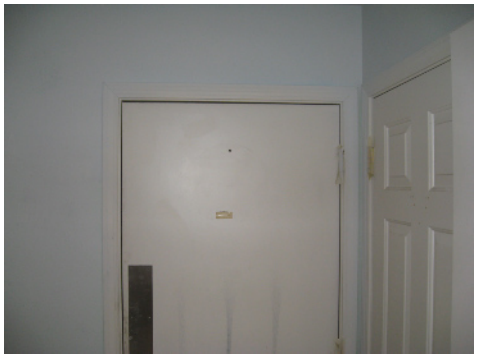

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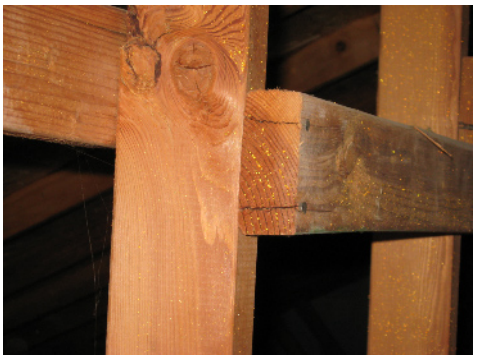

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