March 25, 2019
Revised: April 27, 2019

Dear Shannon

Thank you for the opportunity to review the property at 516 131st Ave NE in Bellevue.

As we discussed, I am a Washington State licensed professional mechanical engineer (#44394 WA). I am qualified by experience and education to assess the mechanical properties of structural systems in residential, light commercial, and multi-family residential construction.

The engineering review of the subject foundation and floor supports is within my knowledge and expertise. Further, I am experienced in construction management and financial analysis. I have 35 years of experience as an engineer in aerospace and construction industries and draw from both for my methods and recommendations. I hold a BSME from the University of New Haven and an MBA from Seattle University.

The inspection of the property occurred on March 25th at approximately 2:00 pm and lasted about 90 minutes. The purpose of this assessment is to inform, educate, and develop a rough order of magnitude work statement for recommended repairs to an existing structure where needed. No other use is intended or implied. Final work statement, calculations, permitting and engineering are beyond the scope of this assessment and/or deferred to the expertise of qualified contractors who specialize in restorative construction.

History of the property:

The building was constructed in 1960 as a single story home with high ceilings resting on a perimeter foundation with post and pier floor supports. During the mid 1980's, a 2-story addition extended the rear of the home approximately 25 ft at the rear of the home resting on it's own foundation approximately 8 ft lower (cut into a slope) than the original foundation. Each foundation is accessed through a small door and there is no direct passage between them.

Most services such as water, drains, HVAC, and major electrical for the home are accessible through the crawlspaces. The crawlspaces area ranges from about 2-5 feet in height.

The pre-sale home inspection revealed extensive incidences of structural wood in direct contact with moist soil. This condition was present to some degree in both foundations, but more extensive in the lower foundation. Modern construction methods would not, under any normal circumstance, place wood directly in contact with soil. Wood is highly susceptible to microbes and water, and is the root cause of decay. Gradual decomposition of the wood fibers will eventually reduces strength to zero. While imminent peril of structural loss is unlikely, repair and replacement of these wood members *should* be prioritized.

Due to the structural significance of these members, the soil contact *should* be mitigated. In these cases, pressure treated wood "rated" for contact with soil appears to have been used. Pressure treated wood lasts quite a bit longer than untreated wood, however, all wood products break down over time is soil and moisture. Given that the original foundation is 58 years old and the lower foundation is likely over 30 years old, replacement is likely overdue.

Upper Foundation:

A concrete wall set on an adequate footer forms the foundation around the perimeter of the original home. An additional concrete foundation supports the floor. A series of 2X8 joists (approximately 16 inches on center) span the foundation walls. Several instances of a wood support for one or more joists were set into soil.

Recommendation:

All work must be performed by a specialty contractor experienced in concrete foundations and restoration construction. Statement of work is subject to change pending concurrence with specialty contractor.

- Perform 100% inspection of all vertical wood columns and supports for contact with soil, decay, rot, or water damage and replace with equivalent support correctly placed on concrete and gusseted to the loaded beam.

Lower Foundation:

The conditions identified in the lower foundation are more consequential than the upper foundation. Instead of a concrete perimeter wall, it appears that the foundation perimeter is comprised entirely of pressure treated wood members arranged orthogonal to each other for stability. Nearly all of these members terminate below soil with no discernable concrete footer. No excavation was performed beyond poking the area with an 8-inch screwdriver. However, the underlayment may be comprised of a layer of coarse gravel supporting a wood base-plate upon which the columns are set - below soil. Perhaps the intention of this design was that the soil could be kept dry – much remains unknown.

As noted, the lower section of the home is an addition extending approximately 24 feet beyond the original structure and about 75 feet wide. A large (laminated) beam supports the second floor of the addition at about 18 feet outbound from the original structure, and a second large beam supports the bottom floor of the addition at about 12 feet outbound from the original wall. (Additional beams and supports may be present, however, HVAC equipment and very low ceiling made direct access unviable for this inspection) Each beam is supported at each end by wooden columns comprised of sandwiched 2 X 8 dimensional lumber – each column also terminates in direct contact with soil.

The moisture content of the soil in the lower crawlspace was significantly greater than the upper foundation. Water stains and preliminary degradation of wooden columns is evident. It is likely that much of the water entering a basement or crawl space is coming from outside. Likely sources of this water may be from roof and surface water drainage. If the underlayment is indeed comprised of a course gravel layer, then saturation may be enhanced in wet seasons and drainage enhanced in dry seasons. In general, a waterproofing strategy may include perimeter drains (French drains) outside the building.

Recommendation:

All work must be performed by a specialty contractor experienced in concrete foundations and restoration construction. Statement of work is subject to change pending concurrence with specialty contractor.

Option 1:

Inspect 100% of wooden posts and structural column in lower foundation for contact with soil, mold, water damage, insect damage or decay. Replace any post that is in direct contact with soil or compromised by water exposure, rot, etc.

Remove any contact with soil and introduce means for securing columns consistent with current construction practices.

Option 2:

Mitigate water content in soil as best as practical. Create a “sister-wall” of proper and modern beam, post, and concrete pier (or wall) construction next the existing “wood-set-in-soil” construction. Introduce additional beams around perimeter. Raise the building slightly to load the new sister wall relieving the load from the wooden posts. Abandon the current wooden posts in place until cosmetic replacement is required.

Observed wall cracking

While no immediate peril or concern is suggested, this topic deserves some attention due to the natural concern of owners when seeing cracks in walls. Almost all instances are located at or near the interface of the original structure and the newer addition. These cracks tend to follow a path of construction members rather than a diagonal or horizontal path (which would be indicative of a more severe condition). It is not likely that these cracks are due to settlement of either structure, rather, they are likely formed because the two segments of the building may be flexing independently of the other segment. Slight movements are more likely than not attributable to normal expansion and contraction of structural members due to moisture in the air, temperature, or the members may be constrained in different ways.

For example, if one bank of floor joists butts against a concrete foundation, any expansion that they may undergo would move in a single direction. If the bank of floor joists is free floating, then the expansion may occur in two directions. While there is no structural concern from such simple cracking, the recommended repairs to the foundation may help the two segments of the building integrate better.

Seismic retrofit:

Consider performing a seismic retrofit to the home concurrent with any substantial foundation renovations. While damage to wooden structures during seismic events is rare, many professionals and homeowners recommend at least that the building be mechanically attached to the concrete foundation. This is relatively simple improvement that performs well as a resale and insurability feature.

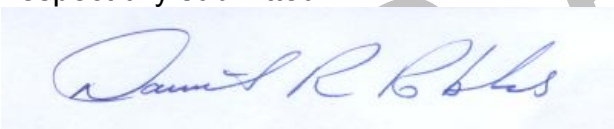
Conclusion:

The overall construction quality of the structure is above average. The home is located on the perimeter of a golf course with territorial view amenity. The home has been well maintained and shows signs of excellent attention to detail and maintenance by the prior owners. There is a likely to be a strong financial feasibility for performing a high quality and well-documented repair.

While kitchens and bathrooms are prime targets for periodic renovations and remodels, a crawlspace and foundation are not. These components serve many essential functions for a structure and should also be periodically renovated.

Despite the noted shortcomings, the existing foundations have served their purpose well but it is time to renovate and maintain these systems in order to assure another 50 years of reliable service. A relatively modest expenditure today can preserve a high-value investment and mitigate much higher repair cost in the future.

Respectfully submitted



Daniel R. Robles, PE
CoEngineers, PLLC
Edmonds, WA 98026