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January 15, 2021

Clearwood Community Association
21603 N Clear Lake Blvd SE
Yelm, WA 98597
Attn: Racheal Paige

RE: Structural Examination at Clearwood Community Pool in Yelm, WA

Dear Racheal,

On Wednesday, January 6th, 2021, I visited the site of the Clearwood Community pool near 22405 Parkcrest Lane SE in Yelm, Washington upon your request. The purpose of my visit was to examine cracks in the face of a retaining wall, cracks in the surrounding concrete slabs, and to determine if repairs are necessary. I examined the slabs and retaining wall from the exterior and below the enclosed deck space. Ryan of your maintenance team was present during my visit.

You should understand that this report and the conclusions contained herein are the results of a visual examination of the property. You should be aware that no tests, calculations or measurements, except those mentioned below, were performed at the time of my visit. No finishes or soil were removed by me to observe framing or foundation elements. Therefore, the results of this examination are circumscribed by these limitations of the methods used. In other words, there may be potential problems hidden from view that are unknown at this time. If you wish a more detailed investigation, we will be pleased to submit a proposal and cost estimate.

Should additional information become available, we reserve the right to determine the impact, if any, the new information may have on our opinions and conclusions, and to revise our opinions and conclusions if necessary and warranted.

STRUCTURE DESCRIPTION

The Clearwood pool house is located at the top of a hill just east of Clear Lake and west of Parkcrest Lane. Ryan informed me that pool was constructed in the early 1980's. The pool house sits at the southeast end of the site, near 22405 Parkcrest Ln SE. The pool extends from inside the pool house out to the northwest towards the lake, approximately 9' away from the concrete masonry unit (CMU) retaining wall. The Pool is surrounded by a 4" unreinforced

concrete slab on all sides. The CMU retaining wall is 4'-0" in height at most locations over a length of approximately 80'-0".

STRUCTURAL OBSERVATIONS

The CMU retaining wall has been constructed of standard 16"x8"x8" nominal concrete masonry units which have not been staggered (not laid in running bond) or reinforced (See Figure 1). The joints have been grouted, but the cells are not grouted. This construction is not allowed for structural design, however given that it is not taller than 4', engineering was not likely required at the time of construction. 1/2" diameter bolts had been installed in the face of the CMU wall to support guard rails which have been cut off at the top of the wall in the early 2000's as I have been informed by Ryan (See Figure 2). Some time ago multiple horizontal cracks appeared in the top layer of the wall, at the same height as the guard rail post anchor bolts. The longest crack is up to 11' in length (See Figure 3) which is located towards the middle length of the wall.

The concrete slab is cracked on all sides surrounding the pool and shows signs of settlement. The westernmost corner of the slab is cracked which has caused it to separate from the rest of the slab and is now starting to slope downhill (See Figure 4). You've informed me that the rim of the pool and the slab used to be level, however there is now up to an approximate 3/4" difference in elevation. The slab is also slightly sloping downhill throughout.

DISCUSSION

The cracks in the wall are most likely due to a combination of age, insufficient design, and the post-installed guard rail post anchor bolts. The wall was constructed in the 80's along with the rest of the pool and is not protected from weathering. The wall was also likely been improperly constructed. While the orientation of the blocks is allowed, the way in which the wall should have been constructed would require reinforcement and cell grouting around the reinforcement. Standard construction around this time would likely not allow the CMU retaining wall to be built like this. The installation of the anchor bolts into the face of the wall created weak points. These weak points are most likely the source of the cracks at the top of the CMU retaining wall.

The slab damage is due to settlement. The pool area was built on soil fill, which was likely not properly compacted and has settled. Other possible causes of the settlement could be from a consistent source of pool water and rainwater in the area, which could have easily leaked through the cracks in the slab and created additional voids below. The slab settlement issues have more than likely caused by a combination of uncompacted fill and improper drainage, which caused the depressions and cracks in the slab.

STRUCTURAL RECOMMENDATIONS/CONCLUSIONS

The CMU retaining wall will eventually need to be replaced. However, the current damages to the wall and slab at this point in time are no more than a tripping hazard. Repairing the slab would likely be more costly than replacing the slab, and the wall cannot be fully repaired.

Filling the cracks in the wall with an epoxy may serve as a temporary repair, but there is no permanent repair which would suffice. The cracks in the CMU retaining wall should be epoxied, but replacement along with additional soil compaction is the only permanent solution.

If you have any questions, please contact me at (360) 754-9339.

Sincerely,
MC Squared, Inc.



Jacob A Gustafson, EIT,
Junior Engineer

Jesse M Chase, PE, SE
Principal Engineer



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