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February 22, 2022

Mrs. Alyson Sternquist
FGM Architects
1211 W 22nd St., Suite 700
Oak Brook, IL 60523

Re: Visual Observation Letter
Oak Park and River Forest High School
Pool Remediation
201 Scoville Avenue
Oak Park, IL 60302
MEC Project Number: S22005

Dear Mrs. Sternquist:

Pursuant to your request, the structural engineering firm of McCluskey Engineering Corporation (MEC) visited the above referenced project site on January 11, 2022 and again on February 3, 2022. The purpose of our site visits was to observe and opine on the structural integrity of the existing concrete walls of the pools and the existing concrete framed decks around the pools.

The following discusses, and is limited to, our observations and conclusions in regards to the pool walls and surrounding decks. We have not performed a full structural analysis of the pools, nor shall our review be misconstrued as a guarantee, expressed or implied, of any specific structural element. Any adverse effect and/or implication our observations may have on architectural or serviceability criteria was not considered as part of our scope.

Observations

MEC is in receipt of three visual observation reports submitted by Larson Engineering, Inc. dated December 18, 2013, January 4, 2016, and August 10, 2021. Also provided were architectural and structural drawings for both pools, dated 1927. Non-destructive and limited destructive testing were performed by Soil and Material Consultants, Inc. (SMC) on February 10, 2022. MEC has been informed that the school wishes to replace both pools in a time period of roughly two to four years.

Basements surround both pools, providing access to the exterior (dry) face of the pool walls, but there are many obstructions. For example, observation of the floor decks above the basement and/or the upper portions of the pool walls was hindered to varying degrees by piping and conduits on the east sides of the pools, ductwork on the north sides, and equipment and piping on the south sides.

Per the existing drawings, the construction of the two pools is very similar. Their walls consist of 12” thick concrete, reinforced with ½” diameter deformed steel reinforcing bars. Vertical bars and

horizontal bars are located on each face of the wall. The vertical bars are spaced at 12" o.c. and the horizontal bars are spaced at 18" o.c. The 12" thick concrete pool floor is also reinforced with ½" diameter deformed bars. Those bars are spaced at 15" o.c. in each direction, and are located at both the top and bottom of the slab. The pool walls were placed in two pours; the first pour started at the footing below the basement floor slab and extended to the bottom of the pool floor slab. The second pour consisted of the pool floor and the upper (pool) portion of the wall. The wall reinforcement was shown to be continuous through the construction joint at the bottom of the pool floor slab. The reinforcement of the pool floor slab was shown extended into the wall and terminated with ninety-degree hooks near the exterior (dry) face of the wall. The construction joint between the two pours is clearly visible from the basement. Both pools were drawn to the same depth: four feet at the north ends and eight feet near the south ends.

General observation of the walls found evidence of leakage on all four walls of both pools. Some leaks were active at the time of our visits, leaving portions of the walls wet and creating puddles on the floor. At other locations, stains on the walls indicated where previous leaks had dried up, likely sealed by the same minerals in the water that are now observed on the surface of the wall. Efflorescence was observed at many locations on the walls of the west pool, indicating previous water penetration of the walls. Rust stains were observed at both active and inactive leaks, particularly at the west pool, indicating corrosion of the steel reinforcement inside the wall. The leaks originated at cracks and pinholes in the walls, as well as at pipe penetrations through the walls. Some cracks had been filled by epoxy injection, notably at the east pool and many of the pipe penetrations had been sealed.

In general, the walls of the east pool and the basement floor around it were relatively dry at the time of our visits. Several cracks and pipe penetrations had been sealed. While no active leaks were observed on the north wall of the east pool, some stains were noted on the white paint indicating inactive leaks. Several active leaks were noted on the east wall, both above and below the pool floor (Photo 1). Staining was present at and below the construction joint in the wall, indicating leaking from that joint. Existing patches were observed on this wall, some of them delaminating. One delaminated patch was removed with little effort using a claw hammer, exposing a corroded vertical reinforcing bar in the wall (Photos 2 and 3). It is likely that the corrosion of the rebar caused a delamination of the original concrete, leading to the current patch, and that the continued corrosion of the rebar caused the delamination of the patch. Several other patches were observed along this wall, some of them also delaminating. Large amounts of efflorescence and many inactive leaks were observed on the south wall. Several cracks had been sealed as well. The west wall of the pool was relatively dry.

The walls of the west pool and the basement floor around it were generally wetter than those of the east pool. The north wall had several leaks, some of them below the pool floor, and significant portions of the floor in this area were wet (Photo 4). Large amounts of efflorescence were observed on the upper portions of the east wall and the floor was wet all along the wall (Photo 5). Many active leaks with dark rust staining were noted at the construction joint, particularly at the south end of the pool (Photo 6). Portions of this joint had been previously patched, done in such a manner as to create a noticeable bulge in the surface of the wall. When a delaminated portion of this patch was removed, the rate at which the water leaked at that location increased noticeably. The south wall had previous patching, similar to the east wall, and some active leaks (Photo 7).

Previous patching was also noted on the west wall, some of it delaminating, as well as some exposed, corroded reinforcement.

Where water was observed leaking through the wall at or below the construction joint, it indicates that water had penetrated the pool floor and built up in the area below the pool, before penetrating the walls.

The reports written by Larson Engineering conclude that the "leaks and cracks in the pool walls indicate that the capacity of the walls to support the fluid pressure of the water has been compromised by the steel corrosion and concrete degradation" while acknowledging that the amount of strength lost due to the damage cannot be established by visual observation alone. To address this limitation of visual observation, Soil and Material Consultants, Inc. (SMC) was engaged to perform testing on the pool walls.

Core samples were taken from the outside (dry) face of the pool walls. The nominal size of the cores was three inches diameter by six inches long and were taken from the north, east, and south walls of both pools. While it would have been desirable to sample concrete closer to the pool side of the wall, it was determined that six inches of depth was the furthest that the walls should be penetrated. The cores were visually consistent with no cracks or discoloration observed. They were very smooth and contained very minor voids or air voids. SMC's report indicates that the compressive strength of the cores ranged from a low value of 3,130 pounds per square inch (psi) to a high of 5,375 psi, with a mean value over 4,000 psi.

A large area of all four walls of both pools was scanned with ground penetrating radar (GPR) to verify the spacing and depth of the reinforcing in the outside face of the walls. The average spacing of the vertical reinforcing for each wall was recorded. The minimum average was eleven inches, the maximum was thirteen, and the mean was twelve and one eighth inches. The mean value compares favorably with the twelve inch spacing noted in the design drawings. The average depth of the reinforcement from the outside face of the wall was recorded for each wall. That average amount of concrete cover varied from as little as one and a half inches to as much as three and a half inches. The mean value was two and two thirds inches.

Concrete was chipped away at select locations to expose vertical reinforcing bars in the outside face of the pool walls. The reinforcement was confirmed to be one-half inch diameter deformed bars. Testing locations were selected at or near delaminated concrete and/or heavy rust staining. No heavy corrosion, pitting, or significant material loss was noted on the exposed bars. Based on the test results, MEC's calculations indicate that more than 10% of the vertical reinforcing steel in the outside face of the pool walls would need to be lost due to corrosion before the flexural strength of the walls would fall below the code required minimums and be considered understrength.

The existing drawings also show the framing of the floor decks around the pools to be very similar to each other. The decks on the west side of both pools, and the north side of the east pool were constructed of 4" thick concrete slabs. The decks on the east and south sides of both pools, and the north side of the west pool, were constructed with pan formed concrete joists. The joists are 8" deep integral with a 2.5" thick slab spanning between them. The slabs and joists are all supported at

one end by the pool wall and at the other by steel beams and steel columns. The beams and columns are encased in concrete.

Around the east pool, the deck on the north side exhibited delamination of the concrete and corrosion of the reinforcement below five of the six starting blocks located on top of the deck at that end of the pool (Photo 8). The concrete below one of the blocks had been repaired (Photo 9). On the east side of the pool, several of the concrete joists showed signs of rebar corrosion. Many of the concrete joists on the south side of the pool had been repaired and appeared to be in good condition. Several were still in need of repair with the reinforcing in two joists being devoid of concrete cover for one to two feet of length (Photo 10). Portions of the deck above the west side of the pool had been repaired and appeared to be in good condition. There were several locations with exposed and corroded reinforcement that remained in need of repair.

Around the west pool, the concrete joists on the north side had been repaired and appeared to be in good condition. Several of the concrete joists on the east side of the pool have concrete delamination and exposed, corroded reinforcement (Photo 11) and the concrete has spalled at at least two of the deck drains that penetrate the concrete structure (Photos 12 and 13). On the south side, there are many instances of joist reinforcement that is exposed and corroded. In one instance the rebar is separated from the concrete for at least two feet (Photo 14). There are also several locations where the reinforcement of the thin slab between the joists is exposed and corroded (Photo 15). The bottom surface of the 4" thick concrete slab on the west side of the pool is delaminated for a significant portion of its area (Photo 16). The exposed rebar is corroded, at times resulting in the complete loss of the bar. A disconnected deck drain appears to be responsible for some of the damage on this side of the pool.

Conclusions

The results of the field testing indicate that the concrete of the pool walls is sound and that the level of corrosion of the reinforcement observed is not currently detrimental. It is our opinion that the walls do not need to be reinforced or braced at this point in time. That said, water from the pools continues to penetrate the walls. The rust stains and delamination of the outside surface of the pool walls indicate that the steel continues to corrode. Also note, that while we do not anticipate corrosion of the reinforcement on a level greater than that observed, there is the potential for greater corrosion to be discovered during the repairs recommended below.

Water penetrating through the decks has corroded the reinforcement, leading to a reduction in the strength of the decks. The reduction is significant in localized areas.

MEC's conclusions above are based on our field observations, review of provided structural drawings, and the results of field testing.

Recommendations

The recommendations below are based on the observations and conclusions set forth in this letter.

The various walls of the pools and the decks around them will be assigned a condition rating based on scale of 1 to 5 as shown in the following table:

1. Good. No repairs are recommended at this time.
2. Acceptable. Inspect annually.
3. Repairs should be made in the next 2 to 3 years.
4. Repairs should be made now.
5. Repairs are urgent.

The north, south, and west walls of the east pool as well as the north wall of the west pool are assigned a 2 rating. Sounding of the wall's surface to detect delaminations should be included in the annual inspections, with repairs made as described below if and when they become required.

The east wall of the east pool as well as the east, south, and west walls of the west pool are assigned a 4 rating. The walls' surfaces should be sounded and all delamination or spalled concrete removed. All areas with lost concrete should be repaired in the following manner. Loose concrete should be removed and the exposed surfaces prepared according to the patching compound's manufacturer directions, including cleaning and chipping. The existing steel should be cleaned of all corrosion and analyzed for section loss due to corrosion. While we do not anticipate areas of significant steel loss due to corrosion, it does remain a possibility, now and in the future. Where corrosion has reduced the steel area by more than ten percent, supplemental reinforcement should be added as required on a case-by-case basis. The concrete should then be patched, restoring the walls to their original thickness and providing adequate cover over all reinforcement. Note that the reinforcement in the walls is likely to continue to corrode in both patched and unpatched areas so the walls' surfaces should be inspected periodically after the repairs are made.

The deck on the north side of the west pool is assigned a 1 rating.

The decks on the east and west sides of the east pool are assigned a 2 rating.

The decks on the north and south sides of the east pool, as well as the east and south sides of the west pool are assigned a 3 rating. All areas with exposed reinforcing should be repaired in the following manner. Loose concrete should be removed and the exposed surfaces prepared according to the patching compound's manufacturer directions, including cleaning and chipping. The existing steel should be cleaned of all corrosion and analyzed for section loss due to corrosion. Where corrosion has reduced the steel area by more than twenty percent, supplemental reinforcement should be added as required. The concrete should then be patched, restoring the members to their original size and shape and providing adequate cover over all reinforcement. Note that the reinforcement in the decks is likely to continue to corrode in both repaired and unrepaired areas so the decks should be inspected periodically after the repairs are made.

The deck on the west side of the west pool is assigned a 5 rating. These repairs should be made as soon as possible. They should be made in the same manner as described for the east wall of the east pool and the other walls that were assigned a 4 rating. If the pools are to be replaced in the near future, consideration may be given to shoring this deck in lieu of repairing it.

Additionally, we make the following recommendations:

We recommend that the walls and floors of both pools be lined with a waterproof membrane to stop the infiltration of water into the concrete and thus reduce the rate of deterioration.

We understand that the west pool had epoxy flooring installed on the pool deck approximately ten years ago. If the east pool is to remain in service more than two to four years, we recommend that the same treatment be applied to the east pool in order to reduce the rate of deterioration.

Due to moisture already in the concrete, the reinforcement in the decks and walls may continue to corrode, even where repaired. We recommend that the repaired areas be inspected periodically. It should be anticipated that similar repairs will be required periodically through the remainder of the life of the pools.

The water that is believed to be accumulated below the pool floors should be drained. Sealing the pool floor should then reduce the recurrence of the leaks observed in the foundation walls below the pool.

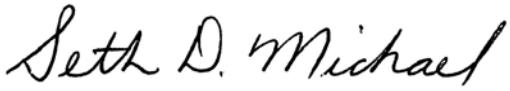
For the decks, all disconnected deck drains should be fixed and all penetrations through the deck that are currently leaking should be sealed.

If you have any questions or concerns regarding this letter, please do not hesitate in contacting our office to discuss.

Sincerely,

MC CLUSKEY ENGINEERING CORPORATION

Timothy S. Moritz, PE
Senior Project Engineer



Seth D. Michael, S.E., P.E.
Principal

Photo 1: Active Leaks.

Photo 2: Patched and Delaminated Concrete.

Photo 3: Corroded Rebar at Delaminated Patch.

Photo 4: Puddles Around the West Pool.

Photo 5: Efflorescence on the Walls and Puddles on the Floor.

Photo 6: Efflorescence Above the Control Joint and Dark Rust Stains Below.

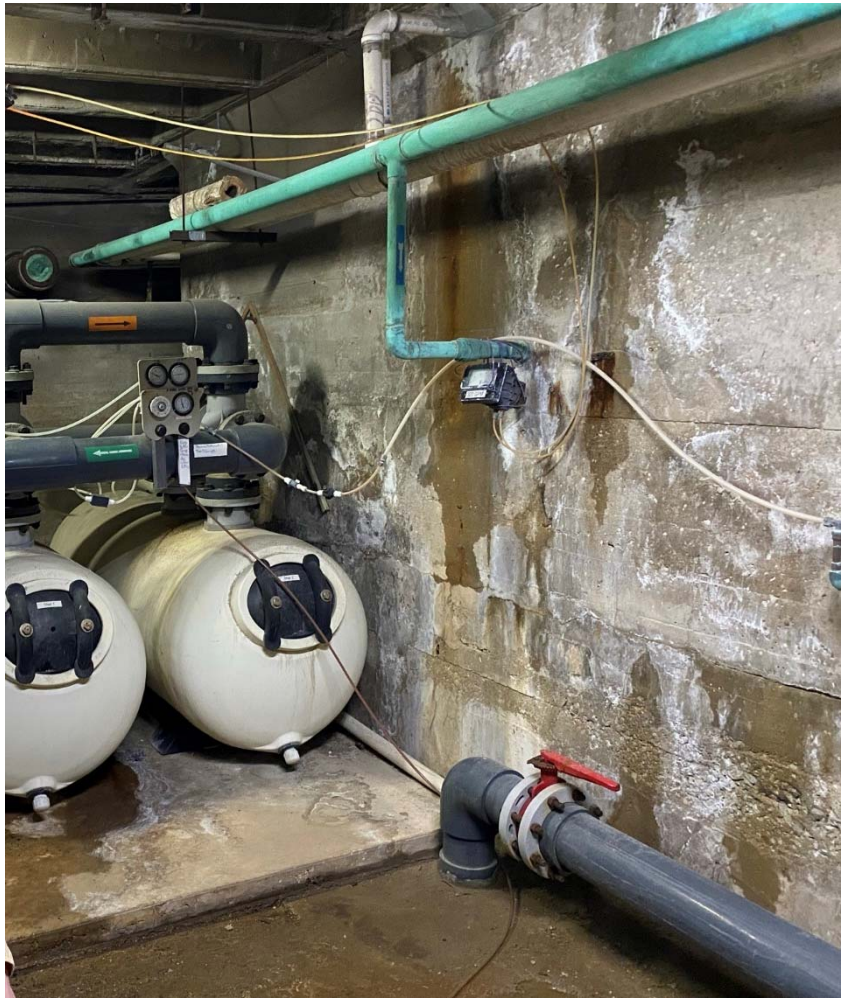


Photo 7: Active Leaks.

Photo 8: Corrosion and Delamination Below a Starter Block.

Photo 9: Repaired Concrete Below a Starter Block.

Photo 10: Exposed Reinforcing.

Photo 11: Exposed Reinforcement.

Photo 12: Spalled Concrete at Deck Drain Penetration.

Photo 13: Spalled Concrete at Deck Drain Penetration.

Photo 14: Exposed Reinforcement.

Photo 15: Corroded Reinforcement in the Thin Slab Between Concrete Joists.

Photo 16: Extensive Delamination and Corrosion.