Pelican Bay Leisure Pool
Structural Evaluations
Edmond, Oklahoma
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City of Edmond – Pelican Bay

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Leisure Pool Structural Evaluation

Introduction

The purpose of this evaluation is to review the present condition of the leisure pool at Pelican Bay Aquatic Center located at 1034 S. Bryant in Edmond, OK. The pool was built in 2002 and has had additions with other features since its opening. The investigation consisted of visual examination of the pool shell, gutter, deck areas, and site adjacencies. The pool was in full operation for the 2022 swim season while experiencing noticeable water loss throughout the season. During our visit, the pool was empty which gave us the opportunity to review the condition of the entire shell.

This report summarizes the present condition of the pool and surrounding deck area. It addresses immediate concerns for the shell with recommendations that can be implemented prior to next year's season. It also includes recommendations for a permanent fix when more funding is available.

Methodology

The pool evaluation consisted of on-site visual inspection of the pool shell, pool finishes, deck, exposed piping, drains, and other areas within the pool. We understand that the pool has been losing water for some time and we evaluated the shell and its condition to see where the likely failure points are located and provide a professional opinion on how they may be temporarily repaired to hold-up for the following season. This report was delayed due to lack of a geotechnical investigation and related data; however, this information has been provided and considered in the report.

Below is the pool design information with estimated values. Data such as the size of the pool was calculated using Google Maps as no drawings were available.

Pool Name	Zero entry, lap area, slide area, and lazy river
Pool Surface Area	11,500 SF Water Surface
Pool Perimeter	900 LF
Pool Total Volume (Gallons)	341,900 Gallons (calculated 0 ft to 12.5 ft deep)
Pool Turnover Rate and Time	712 GPM @ 8 Hr. Turnover (Code minimum) 1425 GPM @ 4 Hr. Turnover (Design Recommendation)
Filtration Rate	63.3 SF; 15 GPM/SF @ 950 GPM min. code 118.8 SF; 12 GPM/SF @ 1425 GPM design
Pool Water Temperature	82°F (average setting)
Pool Vessel	Concrete
Pool Finish	Painted (over plaster)
Pool Hardware	Stainless steel

Pool ADA Compliance	Not installed at time of evaluation
Pool Drains	Multiple 16”x48” or 48”x48” drain covers located in areas and walls

The review was conducted on November 2, 2022, to go over the facility and concerns about the pool. Those attending were:

Jared Prince	Recreation Manager, City of Edmond
Marina Wells	General Manager, Pelican Bay Aquatic Center
Shelly Cornelius	Structural Engineer, PE, GRAEF
Aldo Coronado	Senior Project Engineer from Water Technology Inc. (WTI)
Josh Manry	Project Manager, Water Technology Inc. (WTI)

Staff-reported Concerns

- The pool has been leaking for a long time and they were most concerned about the gutter on the north side of the lap area that appears to be sinking.
- It was mentioned that when the pool is full or operating that there is water coming out of the slope or pipe on the east side where the grade slopes beyond the fencing.
- The deck north of the lap area is low and ponding. It does not slope to drain. There are multiple concrete cracks in the area.
- The gutter lip on the north wall of the lap area is skimming more than in years past.
- The gutter lip looks to be falling into the water side of the pool in the north lap area.
- The deck near the surge tank on the east side has also dropped below the edge of the surge tank.
- Between the lap area and the slide plunge area, there are areas on the pool floor where water has infiltrated between the finish and pool shell. The staff shared a video showing the finish delaminated from the concrete and water perched under the finish.
- Waterline tile that has delaminated in many areas around the perimeter of the pool.
- The pool chemical system is scheduled to be upgraded along with other components.
- The expansion joint in the floor toward the slide area appears to have widened.

OBSERVATIONS:

During our site visit, we observed the following for each pool and noted items that may be in question or of concern.

Summary:

Pool Equipment Room, Outdoor Area, & Chemical Treatment System

The equipment room for the pool was observed, but not in-depth because it is our understanding that the chemical equipment is to be upgraded this spring, according to staff on site. We noted however, that the room had bases and acids stored next to each other. These

chemicals should be separated so as not to mix with the off gassing. The remainder of the room was observed but not reviewed, as it was not a part of the scope of the evaluation.

Pool Structure, Deck, and Finish

The pool shell is primarily concrete gutter walls on a concrete slab. The upper portion of the wall is tiled with the remainder of the current exposed surface, painted. The walls and floor look to have a floated surface prep or the plaster beneath the painted surface. The shell shows signs of deterioration in multiple areas with peeling paint or cracks in the floor and walls that indicate a problem with movement. The paint will show the cracking very quickly when this occurs. The transfer of movement in all pool locations is noticeable and needs to be renovated. In our experience, temporary patches will continue to fail and cause continuous maintenance issues in the future.

The largest amount of movement occurs at the northside of the lap area of the pool and south of the slide deck area. This movement includes the pool shell and deck. Since the deck is poured without deck drains and was sloped away from the pool to the grade, moisture has moved under the deck through the cracks in the gutter or deck surface and caused the slab to crack. This has caused a ponding area with the water seeping through the cracks to the underside. The sloping of all these decks all the way to the fence and into a grass area outside the fence can be the reason there is heaving of the edges. All water should be channeled away to avoid seepage under the deck.

Main Drains

Reviewing the drains for these pools and the drain covers installed the grates observed looked to be site-built with 14”x48” flat covers in the deep end. There are also many drains in other areas of the pool that also have site poured sumps. The current Virginia Graeme Baker Act (VGBA) is required to be followed for submerged suctions. If the sump is site built, there is a modification in the Suction Outlet Fitting Assembly (SOFA) testing that needs to be executed. Keep in mind that codes do change, and they may need to be reviewed periodically. Additionally grating has a lifespan which is indicated by a date bar on the grating. This should be verified every year to make sure they remain within the legal time period.

Also, if the International Building code (IBC) is adopted by the city, the International Swimming Pool and Spa Code (ISPSC) will govern future work. In this code it reiterates the need to have the SOFAs checked to make sure they follow the current law requirements.

Itemized Observations:

- We first checked to see the condition of the north lap area wall that is failing.
- The lip of the gutter on the north wall gives the impression that the gutter’s front is falling into the pool. With closer inspection, the buildup material to form the lip prior to the tile installation is delaminating from the wall concrete. The buildup material looks to be different from other portions of the gutter that have the same gutter edge detail. The material may not be the correct material or was not given enough time to cure before filling the pool.
- There is a crack at the base of the north wall showing there is a shift in the wall.

- There is no expansion joint at the back of the gutter to move separately.
- There are too few deck joints in the current pool deck, and this is why there are no control saw cuts to control cracking in the sinking area of the deck.
- The material used for the front lip build up looks like large sand and the waterproofing appears to have washed away exposing the build up to put the tile on.
- The remaining waterproofing in the gutter also does not cover the entire gutter interior. This allows the exposed concrete to get wet and soak through causing the spalling of the finishes or even the lip build up.
- The gutter detail on site has the deck sitting on the backside of the gutter that creates a continuous joint around the perimeter of the pool. We are not sure if there is a waterstop at this connection. If there was not a waterstop installed as required, the sinking pool deck would cause the open joint to expand even more.
- The location of the deck joint in the gutter has movement with the deck and has pried open the gutter concrete in areas and causing the gutter to leak. We are not sure if the deck is pinned to the gutter, but it appears like it by the size of the crack.
- The pool looks to have paint over a plaster finish or another material.
- The cracking of the gutter does stretch from the north side lap area to the east of the gutter run to toward the deep end. There is so much separation of the concrete edges adding a waterstop now would be ineffective in protecting the gutter from leaking. Regular patching will not work either and just be a band-aid until it moves again. This patch will need something special to bridge the cracks and waterproof at the same time.
- The areas where the floor finish has cracked look to be either an expansion joint or where the pool concrete pour terminated. These areas are connection points to different areas of the pool. These transition areas usually have an expansion joint at the transition point, and there may be a beefier design with bigger or more reinforcement. These joints need periodic maintenance as the material expands and contracts over time.
- The site poured in place drain sumps will need to be evaluated and signed off on by an Engineer using the test procedures that the manufactured sumps require as part of the VGBA law.
- The surge tank area on the east side near the lap area appears to be heaving, and the deck is sinking in the area. The surrounding deck has some cracked concrete.
- The joint around the surge tank needs to be sealed completely.
- There does not appear to be a bonding wire connected to the climbing wall which is showing signs of rust.
- The slide plunge pool area has a crack at the base of the south wall near the stairs.
- The lazy river area has a concrete top that is cracking throughout the wall top. There are no joints in the concrete.
- There are various areas of the waterline tile in the lazy river area that have popped off.
- The barrier base separating the spray pad area from the shallow pool area has cracks at all the barrier legs into the concrete base. The buried posts around the barrier are rusting also.
- There are multiple areas behind the grating that have chipped concrete.

- The spray pad tank looks to have a similar condition to the pool surge tank, and it has some perimeter deck that has separated from the deck joint.
- The west corner of the shallow entry area has a crack on the deck behind the gutter.
- The east side of the shallow area to the stairs has a long continuous crack behind the gutter. This is another area that is showing movement, specifically from the shallow area perimeter to the deep end. The gutter in the shallow area was not removed to see if it is cracked like the lap area gutter.
- The east side deck that has a crack near the shallow 2ft depth has a low spot that is ponding water. We suspect this area may be the crack that is causing the most water loss.
- The pool light j-boxes look to be too low and may be too close to water level. This needs to be checked according to the electrical code for elevation above the water's edge.

SAFETY CODES AND REGULATIONS:

Americans with Disabilities Act (ADA) Requirements
On September 15, 2010, the President signed into law provisions of the July 23, 2004, ADAAG guidelines applying to recreation facilities. Title II facilities (public entities) have had until March 15, 2012, to comply with requirements.

Water Technology, Inc.'s ADA evaluation was limited to the pool area only, and did not include perimeter walkways, doors, access, changing areas, or restrooms. We did not confirm ADA access in a ramp with rails or a chair lift. The pool has more than a 300 linear foot perimeter thus requiring two means of ADA access. There could have been some form of access but at the time we made the visit the access was not observed or installed.

Virginia Graeme Baker Act
This requirement as mentioned previously addresses the submerged suctions for pool that include, drain grating, drain sumps, and skimmer equalizers. It is a regulation that has been improved over the years and currently the latest update that is current for the ASME/ANSI A112.19.8 is the APSP-16 2017. It covers many changes to the drain sumps or Submerged Outlet Fitting Assemblies (SOFA). These requirements are stricter for the sumps and grating assemblies in order to prevent any accidents with drains or other suction points of the pool system. This will include any site built drains or any manufactured suction assemblies. These regulations were signed into law and put into effect in 2008 and have had adjustments in the past. If there are any older drains that do not comply, these regulations should be implemented to protect the pool and spa users.

State Regulations
The pool is classified as a swimming pool with an eight (8) hour turnover rate under the Oklahoma State Department of Health, Swimming Pool Regulations. The pool should meet this requirement as a minimum with the circulation system. There are a few items that need to be verified with the current code. These items are for the safety of the user, and it would benefit

the city to consider the requirements to keep the user safe. Although there is not a requirement to have a Certified Pool Operator (CPO), we would recommend the city have a trained CPO on staff that can operate and run the pool system in case it needs immediate attention. If there should be at least one, if not two, staff where their priority is the system itself.

CONCLUSIONS:

The pool has served the community and guests wonderfully for the past 20 years, but its chronic challenges as identified and documented in this report appear to have worsened recently. There have been a variety of temporary fixes implemented over the years, but these repairs haven't eliminated the challenges.

Given these issues, along with any annual reviews by the Health Department, there might be a consensus among the facility owners/operators at this time to address the ongoing issues more comprehensively. There are structural concerns with the pool shell and deck design and construction, as well as concerns with the circulation delivery system currently in place. The areas of corrosion that were observed on metals in and around the pool is evidence of potential chemical level imbalance or improper bonding of the pool. If treatment levels are not properly controlled, it can deteriorate sealants, finishes, and grout which can compromise the watertightness capabilities of the structure. There are areas where the finishes are failing rather rapidly.

Additionally, we recommend that a Certified Pool Operator (CPO) certification be maintained by a member of the staff. This certification is good for three years and is maintained thereafter by retaking the course as a refresher. Even though the systems are not complicated, learning how to operate the facilities efficiently, and recognizing signs of trouble early on, will make a significant difference in the operational cost and owner satisfaction of such a wonderful asset to the city.

One of the primary issues is the movement the pool has been experiencing, excessive leakage of pool water, and apparent buildup of water beneath the pool structure. The pool was not designed to resist the additional pressure of water buildup behind the walls or below the slab when the pool is empty. This is typical for pool design when there isn't static groundwater on site. When the pool is full, the pressure is equalized and not an issue, but when empty, the pressure, if present, can cause a variety of problems such as cracking and heaving. The geotechnical investigation did not indicate a shallow static groundwater level and also did not encounter expansive soils. It did however note that there are some relatively shallow areas of rock which are typically impermeable. Therefore, it is our suspicion that water is making its way below and around the structure leading to a perched condition above the relatively impermeable rock layers. When the perched water does not have a direct means of escape, the pressure will build and cause failures in the shell. These failures lead to more leaking which over time can wash out backfill and subgrade causing settlement. It's a cycle that will continue until the leaks are repaired. It is unclear what the primary source of leakage was that began the

cycle. Common sources other than cracked pool shells are pipe leaks and pool joint failures. It is possible to fix the sources, but until all sources are identified, there is still potential for the cycle to continue.

The deck may be another contributor to the perched water condition below the pool. There are areas of cracking throughout the deck which allow water to seep through into the subgrade below. Additionally, due to the geometry of the deck space, long deck runs, and ADA sloping requirements, it is difficult to achieve enough slope throughout and all around the pool without creating level or near-level areas, which then lead to ponding. Deck drains would help shorten the run and allow the water to be removed off the deck quicker. Perimeter drains are another way to effectively reduce deck drainage issues in freeform pools such as these.

If the deck concrete is repoured to address the drainage issues and sloped to deck drains, control joints should be formed in the deck at regular intervals. The current deck has very minimal deck joints to control the deck from cracking wildly on its own. The nature of concrete is for it to shrink and crack to relieve shrinkage stresses as it cures and over time. Strategically placed control joints give the concrete a location to relieve the stresses and reduce the potential for unsightly cracking. These joints can be sealed to help prevent excessive seepage in the subgrade below.

One suggestion noted in the geotechnical report is the use of mud jacking of the deck. That will temporarily address some of the flat or ponding areas but does not address the overall need for sloping of the deck or the cracks. In our experience, if mud jacking is used it can lead to accelerated erosion of the soils around the jacked areas if the drainage issues and sealing of cracks is not addressed. It is a temporary fix to address uneven toe-stubbing conditions but is not a good permanent solution over time.

Another possible source of water leakage is at the inside of the gutter. The pool was detailed/constructed with a cold joint approximately 5” below the top of the deck where the deck rests on the back wall of the gutter. If the gutter is ever full, water can escape through the cold joint and cause washout of the backfill behind the wall and eventually below the slab if this joint is not waterstopped. It is not clear if there is a waterstop between these two surfaces. The northeast corner of the lap area may be experiencing this, based on our observations of the wall movement and the large cracks that have developed along the north and east walls. We typically would run the back wall of the gutter all the way up to the top of the deck and rest the deck on bond breaker on a ledge at the back of the gutter wall with compressible filler between the deck and lip of back wall. This detailing allows the deck and pool to move independently of each other and allows the gutter to better maintain its watertightness. Some of the grating sections were wedged in place due to the detailing of the deck at the gutter. Additionally, the waterproofing slurry that is applied to the interior of the gutter does not extend all the way up the back of the gutter wall. This is another possible area of water leakage in the gutter system which occurs throughout the pool.

There are areas of tile and setting materials spalling off the concrete that are a problem in protecting the shell from getting soaked. There is either no waterproofing protecting the finishes or that it has washed away. The north wall of the lap pool has a section where the wall has cracked and it is falling off. At closer view, the mud set for the tile ledge has separated from the concrete wall structure. A mud bed or grout was used to form the lip of the gutter to place the grating upon. The setting is not protected with waterproofing that is used on rest of the interior of the gutter and it got wet enough to separate from the concrete wall. This is visible not only in that area but areas of tile that have been replaced which is still spilling off. If the tiled finish is not protected and waterproofed or use epoxy grout there will be continuous finishes that will spall off. Using the correct materials is important for the longevity of the finish and the shell itself.

Lastly, the painted finish for the pool looked to be over another finish. We could not tell if it was a plaster finish or bonding agent applied to the plaster, however some of the spalling tile in the deep end looked to be the original plaster. If the plaster is still installed it must be prepped well with a degreaser, acid etched, washed, and scrubbed. Then it needs to be completely dry prior to painting. Usually, it takes two coats but looking at how thin it looks on site it looks to be only one coat.

Overall, the shell should be salvageable with repair. Determining all the sources of leakage would be ideal, although it may not be realistic for this season, but implementing some temporary fixes now in areas we know are causing the biggest problems should help slow the water loss and allow for a successful season. The finish would need to be addressed also to be help with overall waterproofing and provide tile that matches. We are sure it has been a while since the finish was addressed. Long term, full deck replacement, gutter replacement and a pool liner would be our recommendation to remedy the issues the shell is experiencing.

RECOMMENDATIONS:

As a result of WTI's evaluation of the pool, each recommendation below was given a level of suggested priority for your consideration and is also intended to be helpful information to provide to a commercial pool contractor for a cost opinion. The priority level is assigned with one (1) being the highest priority and four (4) being considered as a lower priority. Higher priority items are items that should be done prior to opening for the season. The lower priority items should be considered at a later time and need to be done to remove the problems the pool area is having. Some areas may have to be further investigated to assess the level of urgency.

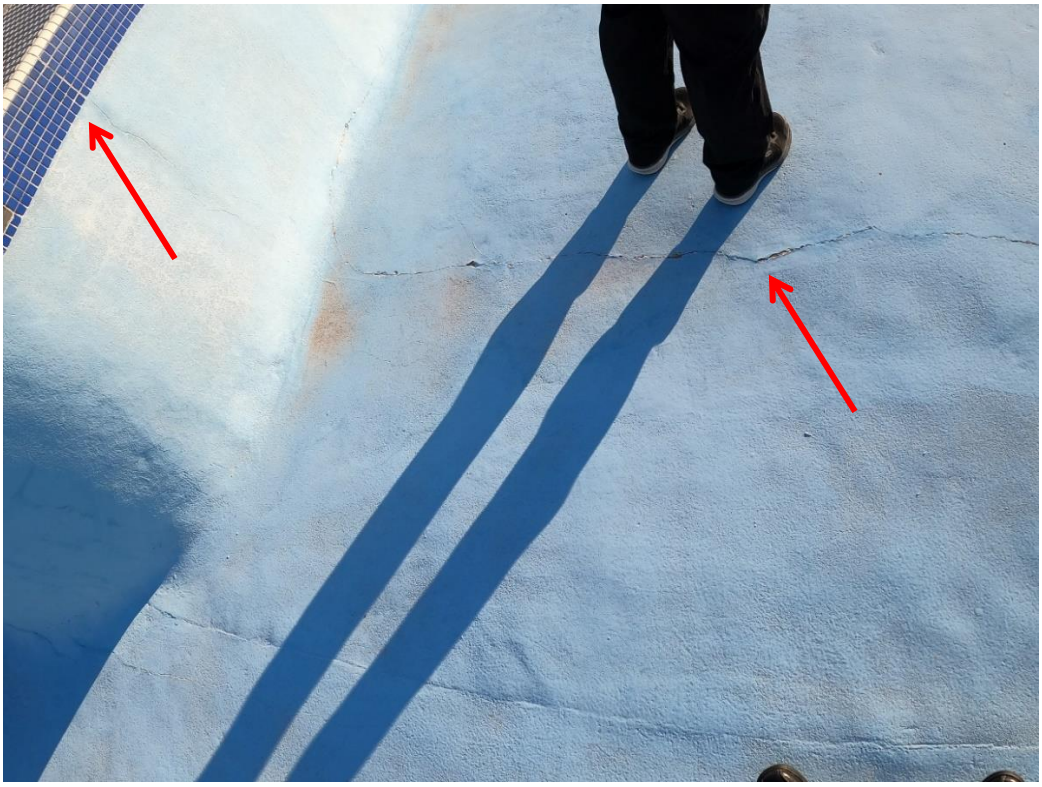
Item	Description	Priority
1	Patch cracked areas with Xypex repair.	1
2	Waterproof interior gutter and setting for gutter lip.	1
3	Repair and waterproof under al waterline tile and retile.	1

4	Provide deck drainage and slope deck appropriately.	3
5	Reconstruct the backwall of gutter and separate the deck from the gutter. Add expansion joint behind the gutter.	3
6	Repair all cracking of pool walls.	2
7	Address all waterproofing for the pool for the tile, gutter, surge tank, and around areas of penetrations.	1
8	Verify that the pool drains meet the current VGB requirements for the SOFA site built sumps.	2
9	Address separation of finish at floor expansion joint between slide and lap areas.	1
10	Address cracking of floor in lap and slide areas.	2
11	Address spalling tile in various areas prior to opening season.	1
12	Clean the pool and wash the walls at lazy river and circular areas.	1
13	Address barrier between splash pad and zero entry. Remove the rust and repaint.	3
14	Verify bonding of pool and other metals in the pool and within 5 ft of the pool.	3
15	Verify that waterproofing is still installed in the surge tank. Repair or redo as needed.	2
16	Replace lazy river wall top concrete and have it slope to the pool and add sawcut joints.	3
17	Spray pad features need to be cleaned and/or re-powder coated.	4
18	The j-boxes for the pool lights look to be too low and close to water level. Verify that the j-boxes meet the electrical code for distance from water level.	3
19	Separate the chemicals into an area for the bases and the acids. Store appropriately so there will not be any mixing of the chemicals in the equipment room.	1

Photos/ Comments

North of lap area. Cracking on base of wall and tile spalling.

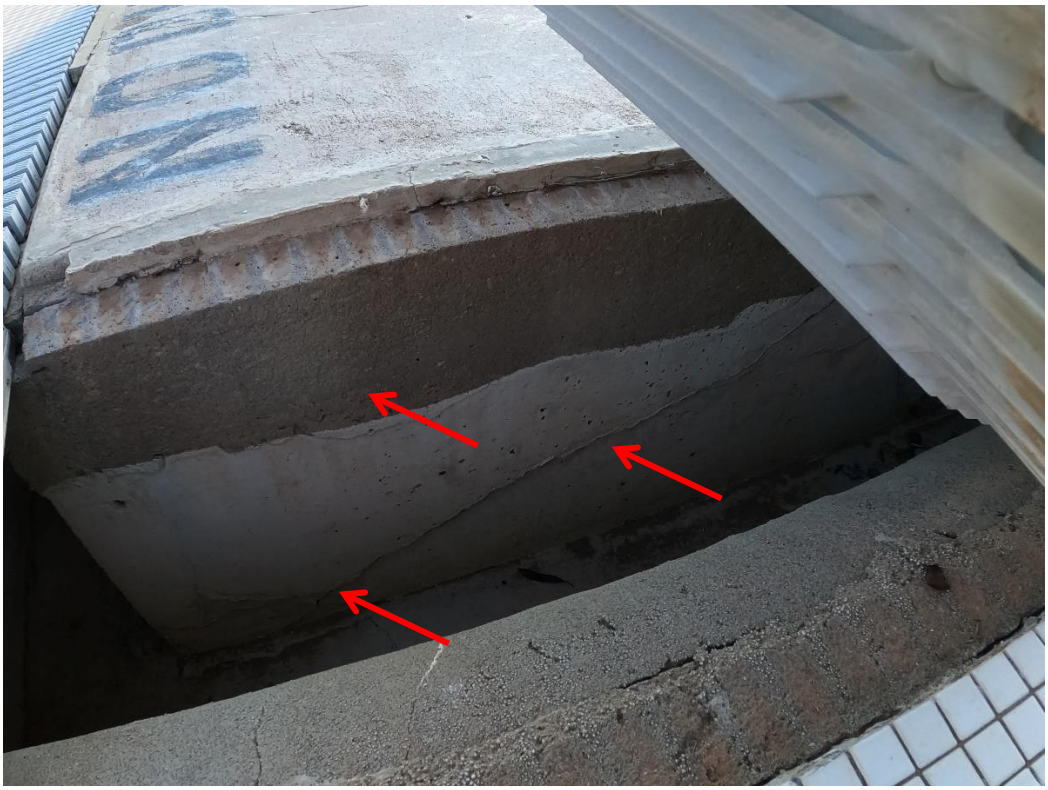
Floor patch in lap area where paint and subsurface finish has peeled off.



Cracks at shallow lap area extending from wall to floor.

Spalling tile at gutter. Appears to have waterproofing material under the tile.

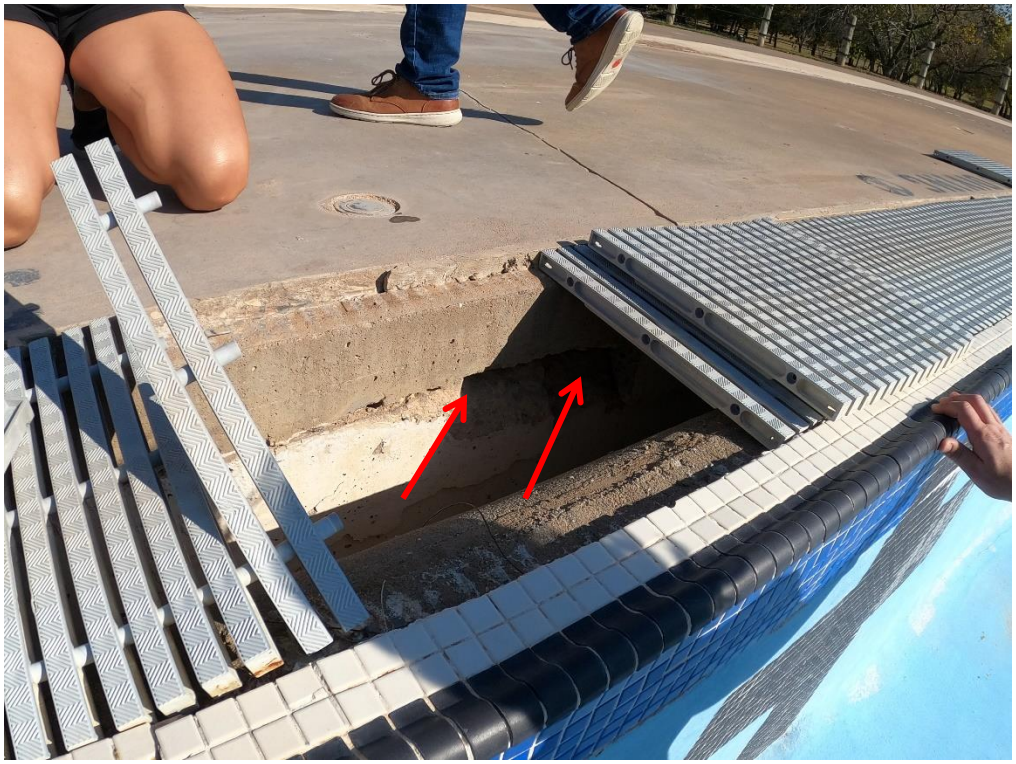
Movement at the stairs evident by cracking extending toward the deep end.



Waterproofing coating does not extend high enough on the backside of gutter. There is also cracking on the backside of the gutter.

The setting or buildup forming the front gutter wall appears to be too grainy of a grout and is not coated with waterproofing on the interior.

Large cold joint appears to be further separating between the deck and back wall of gutter. Waterproofing does not extend high on the back wall of the gutter.



There is a large horizontal crack in the back wall of the gutter on the north end of the lap area.

The crack begins roughly mid-length of wall and extends toward the stair in the lap area.

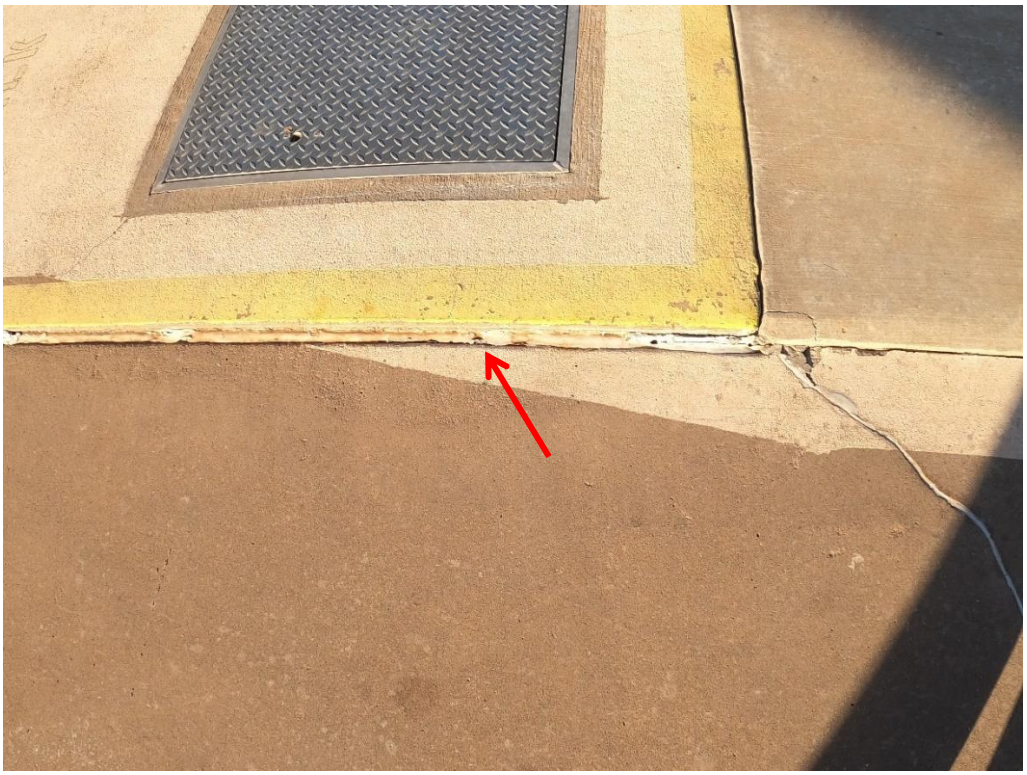
The light rings look to be corroding. It may be that the niche is not bonded.

Drains are poured in place and may need to be reviewed
for updated VGB requirements for SOFAs.

The deck north of the lap area has a low spot that appears to be stained from water ponding. The number of deck joints is insufficient to control cracking.

The deck south of the slide area has low spots.
Water staining is apparent where water is not draining.

In the slide area there is movement similar to the lap area at the stairs.

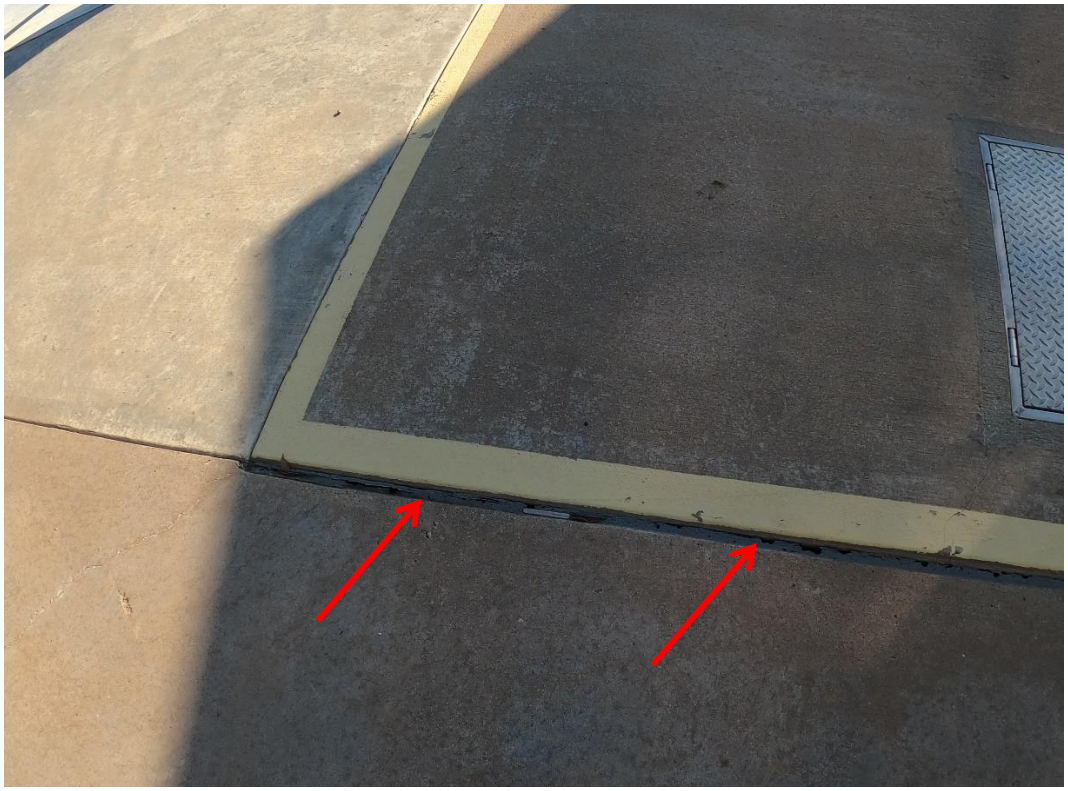


The deck around the pool surge tank has dropped and cracked.
The joint sealent has failed.

There is no bonding wire to the climbing wall and needs to be tied to the pool.

The top of the Lazy river wall has visible shrinkage cracking.

There are multiple areas of tile spalling off and cracking on top of the river wall.



The deck around splash pad tank has moved and the joint sealant needs to be addressed.