



CITY OF FORT LAUDERDALE

RIVERWALK CENTER PARKING GARAGE

Structural Condition Assessment – Final Report

May 12, 2021

Owner

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100 North Andrews Avenue
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Structural Engineer

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EXECUTIVE SUMMARY

At the request of City of Fort Lauderdale (“Owner”), **Kimley-Horn and Associates, Inc.** completed a limited condition assessment of the Riverwalk Center Parking Garage as part of the agreement dated March 17, 2021 and signed on March 26, 2021. The limited condition assessment site walk through was performed during the days of April 8, April 21, and April 29, 2021. The purpose of the condition assessment was to observe the general condition of the parking facility, identify deficient items, and provide repair recommendations and order of magnitude cost for repairs.

The existing parking garage serves the surrounding commercial buildings and is located at 150 Southeast 2nd Street in Fort Lauderdale, Florida. The parking garage contains approximately 2,200 spaces distributed over a ground level plus 6 elevated parking levels for a total of 7 parking levels. Additionally, the parking garage has four main stair towers plus an additional staircase extending to the second level. The parking garage also contains a helipad above the 7th level that is a stand-alone structure and is not included in this scope of work. A portion of the ground floor also consists of offices and retail shops/mall on the north side. The structural system of the garage consists of a cast-in-place concrete structural frame including post-tension (P/T) slabs and beams, conventionally reinforced columns, conventionally reinforced concrete walls, and perimeter masonry bumper walls. Vehicular entrances and exits are located off SE 2nd Avenue and SE 1st Avenue on east and west sides of the garage and off SE 2nd Street, running through the garage.

In this report, the elements observed during the condition assessment are categorized into three types of systems: the primary structural framing system, operational system, and aesthetic system. The observed structural framing system consisted of the P/T slabs, P/T beams, columns, masonry bumper walls, curbs, joints, waterproofing, and sealants. The observed operational systems generally consisted of the drains, striping, and wayfinding signage. Observed aesthetics systems consisted of the exterior façade painting, and general overall appearance. No destructive or intrusive testing was performed as part of our evaluation.

Deficient items observed during the non-destructive, visual walkthrough survey have been categorized according to the recommended urgency with which the deficiencies are recommended to be addressed. *Priority 1* items have been determined to impose a more immediate impact on the parking garage and are those items that are recommended to be addressed within the next six months. *Priority 2* and *3* items are recommended to be addressed within the next 12 months and 2 years, respectively. Refer to the Opinion of Probable Cost (“OPC”) provided in **Appendix C** for the total cost of all Priorities.

No immediate, life-threatening structural issues were observed in the condition assessment. The parking garage contained floor cracks and spalls, exposed rebar, overhead spalls, sealant deterioration, and expansion joint deterioration. Also observed were masonry wall spalls, metal plate rust and waterponding areas. The extent of recommended repairs remained generally consistent throughout the parking garage. **Based on limited, non-destructive, visual observations, the overall performance rating for the parking garage was fair.** The details of these findings are discussed further in the main body of this report.

When assessing the remaining lifespan of a parking garage, there are many factors which contribute to the anticipated remaining service life. Based on our experience, water intrusion combined with subsequent exposure to the elements can accelerate deterioration related to reinforcement corrosion within the concrete structure. Based on an estimated lifespan of 50yrs to 60yrs and factoring in the current service life of approximately 37yrs, it is our professional opinion that a remaining service life of 15+yrs can be anticipated. However, in order to maximize the estimated remaining service life, regular maintenance and addressing issues identified in our report is necessary.

INTRODUCTION

SCOPE OF WORK

At the request of the City of Fort Lauderdale (“Owner”), Kimley-Horn and Associates, Inc. (Kimley-Horn) has performed a condition assessment for the existing parking garage. The objective of this report is to provide the Owner with a condition assessment report to document the general condition of the parking garage, identify deficient items, and recommend repairs to maintain and extend the service life of the parking garage. Based on our recommendations, opinion of probable repair costs is provided in **Appendix C**.

As part of the scope of services, a visual, non-destructive limited condition assessment of the parking garage’s structural components, waterproofing components, and drainage deficiencies was conducted.

In addition, Kimley-Horn completed the following tasks as part of the on-site assessment:

1. Met with Owner representatives in preparation to prepare the condition assessment and restoration scope.
2. Reviewed limited as-built architectural, structural, and striping plans provided by the Owner.
3. Reviewed previous condition assessment report by Lakdas/Yohalem Engineering Inc. dated March 5, 2019, provided by Client.

Kimley-Horn observed parking deck structural framing elements including post-tension (P/T) slabs and beams, conventionally reinforced columns, conventionally reinforced concrete walls, perimeter masonry bumper walls and cast-in-place concrete components consisting of slab-on-grade, toppings, and curbs. Kimley-Horn observed waterproofing systems including cove sealants, horizontal sealants, and horizontal and vertical expansion joints. Kimley-Horn also observed miscellaneous items including vehicular barrier systems, pipes, and drains. Observations of the exterior façade were conducted from grade level.

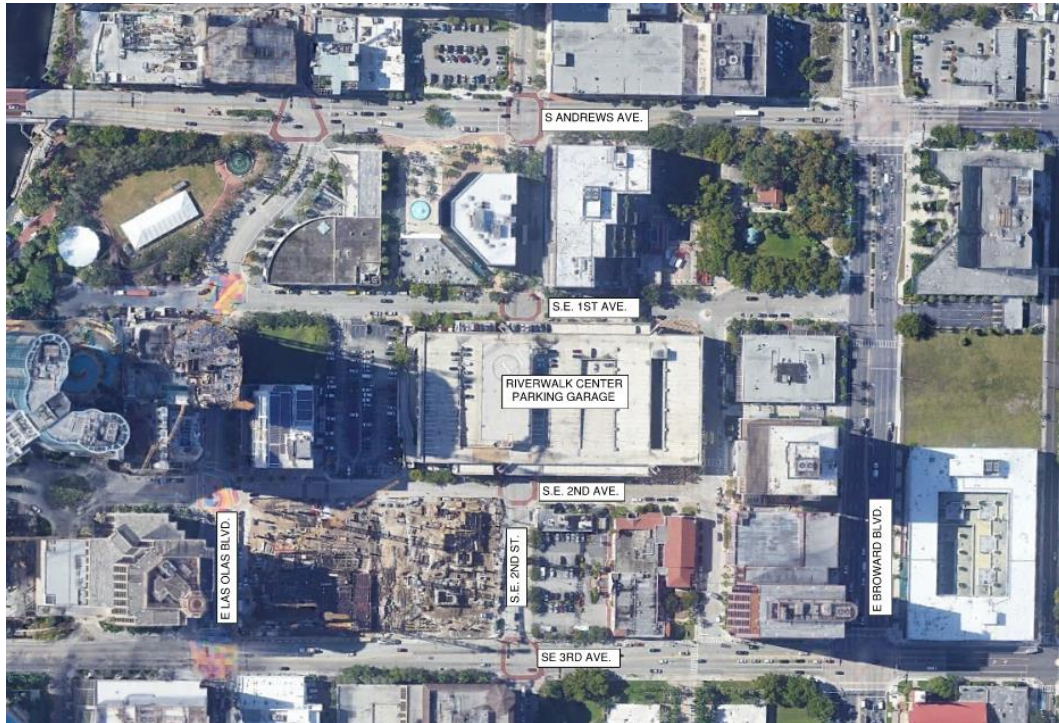
Limited hammer soundings were also performed on representative areas of concrete elements to identify delamination. Destructive and/or intrusive testing was not performed as a part of our visit.

Defining parking garage characteristics and items indicative of overall current conditions along with specific items requiring attention were documented with photographs.

GENERAL DESCRIPTION

Provided below is a general description of the Riverwalk Center Parking Garage, based on the walk-through performed and the use of Google Earth.

- **Property:** The property is located at 150 Southeast 2nd Street, Fort Lauderdale, Florida. The facility currently serves the surrounding commercial buildings.



Aerial Image Courtesy of Google Maps

- **Year Constructed:** Parking garage construction completion in 1983.
- **Construction Type:** The cast-in-place concrete structural framing components included post-tensioned slabs and beams, conventionally reinforced columns, conventionally reinforced walls, and perimeter masonry bumper walls.
- **Expansion Joints:** The parking garage has an expansion joint running east to west of the structure, on all elevated levels.
- **Parking and Vehicular Access:** The parking garage has four main ingress and egress points, which are located on SE 1st Avenue, SE 2nd Avenue, and SE 2nd Street. The functional layout of the parking garage consists of two-way traffic with 90-degree parking and two main ramps with 90-degree parking extending from levels two to seven. Four additional ramps extending from level one to two on the north and south sides are provided for ingress and egress.

RATINGS

A visual, non-destructive condition assessment of the readily accessible structural and waterproofing elements was conducted on April 8, April 21, and April 29, 2021.

The tables in this section contain categories of structural and waterproofing components that were observed during the on-site limited condition assessment with each element receiving a rating of 'Good', 'Fair', or 'Poor', which represents the average condition of all individual similar elements within that category. Rating descriptions are defined in **Appendix B**. Tables are also provided summarizing assessment ratings for several readily accessible operational and aesthetic elements.

Table 1. Structural Elements Ratings

Item	Rating	Description
CIP Concrete Slab-On-Grade	Good	Slab-on-grade was found in generally good condition, with a few cracks and spalls observed. Additional cracks not observed may be present upon removal of dirt and debris from powerwashing the floor surface.
CIP P/T Concrete Elevated Floor Slabs	Fair	Slabs were found in generally fair condition, with several floor cracks, floor spalls, and exposed rebars. A numerous amount of exposed rebar was observed near the depressed slab "trench" like areas running through the parking bay edges. The exposed rebar at these locations are potentially due to the decrease of concrete cover in these areas. The pourstrip areas were also observed to have many structural deficiencies. Additional cracks not observed may be present upon removal of dirt and debris from powerwashing the floor surface.
CIP P/T Concrete Beams	Good	Minimal areas of spalling and exposed rebar were observed, which is anticipated for a post-tensioned concrete structural system.
Topping/ Overlay	Good	Topping/ Overlay was observed to be in good condition. However, some areas of topping/ overlay that was meant to mitigate water towards the drains were found to be sloped improperly. The horizontal sealant at the topping/ overlay joints were also observed to be in poor condition.
CIP Concrete Walls	Good	Concrete walls were in generally good condition, with few wall spalls and cracks observed. Significant amount of previously repaired wall cracks were also observed.
CIP Concrete Columns	Poor	Columns were observed to be in generally poor condition, with various column spalls observed on the lower portion of the columns throughout the garage. Column cracks were also observed at column-beam joints on the top level.
Expansion Joint Seal System	Fair	Horizontal and vertical expansion joints were observed to be in generally fair conditions. Additionally, areas of large water ponding were observed at the expansion joints, causing debris build up and deterioration of joints.
Sealants	Fair	Horizontal joints and cove sealants were observed to be in fair condition throughout the garage. All sealants on the seventh floor were observed to be in poor condition.

Stair Towers	Good	Stair towers were found in generally good condition, with several railing post corroded, floor cracks, floor spalls, walls spalls, and exposed rebar observed.
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Table 2. Operational Elements Ratings

Item	Rating	Description
General Maintenance	Poor	Parking floor areas were observed to contain oil stains, dirt, and debris build up.
Floor Drains	Poor	Floor drains were found in generally poor condition, with missing drain grates in few locations. Significant amount of drain grates were observed to be corrected and clogged with debris build up. Drain grates were also observed to be sawcut in many locations, to allow water through the side of the drain. Sawcut of the drain grates was observed to be a result of the depressed slab “trench” like areas running through the parking bay edges.
Water Ponding	Poor	Multiple areas of significant water ponding were observed. Additional areas of waterponding not observed may be present upon rainy seasons.
Striping	Poor	Striping was observed in poor condition, various stop bar markings were illegible. Various pavement reflector markings near the stop bars were also observed to be detached.
Masonry Barrier Walls & Guardrail System	Poor	Garage barrier walls and guardrail system were found in generally poor condition. The masonry walls were observed to have some areas of spalls along the wall and mortar missing between block joints. Additionally, the guardrail system connected to the masonry barrier walls were observed to have areas of steel plate rust, loose anchors, and deteriorated wooden planks.
Pipes and Pipe Support	Fair	Several pipes and pipe supports were observed to be rusted and in need of repair or replacement.

Table 3. Aesthetic Elements Ratings

Item	Rating	Description
Façade	Good	The façade was found in generally good condition, with a few post-tension pockets and planters in need of repair.

OBSERVATIONS

Outlined below are the key findings of our limited condition assessment of the parking garage. The intent of this summary is not to list every deficiency observed or recommended for repair, but rather to provide a more detailed description of key items included in the list of elements in the ratings tables above. Representative photographs were taken to provide examples of the observed deficiencies and can be seen below.

STRUCTURAL ELEMENTS - CONCRETE AND WATERPROOFING

- CIP Concrete Slab-On-Grade

Limited quantities of cracking and spalling were observed on the slab-on-grade. Previous floor cracks and overhead floor cracks were observed to be repaired. Several of the previous repairs were observed to be in fair conditions. Additional cracks not observed may be present upon removal of dirt and debris from powerwashing the floor surface.

- CIP P/T Concrete Elevated Floor Slabs

Several quantities of cracking, delamination and spalling with exposed reinforcement were observed on the elevated floor slabs. Previous floor cracks, overhead floor cracks, and concrete spalls were observed to be repaired. Several of the previous repairs were observed to be in poor conditions. Pourstrip areas were also observed to have many structural deficiencies. Additional cracks not observed may be present upon removal of dirt and debris from powerwashing the floor surface.



Floor Cracks



Floor Cracks



Overhead Floor Cracks



Exposed Rebar



Exposed Rebar

- CIP P/T Concrete Beams

Limited quantities of cracking, delamination, and spalling with exposed reinforcement were observed on the P/T concrete beams. Previous concrete spall repairs were observed and found in poor conditions.



Exposed Rebar



Overhead Beam Spalls



Exposed Rebar



Overhead Beam Crack

- CIP Concrete Walls

Limited quantities of wall cracks and wall spalls were observed on the concrete walls. Significant amount of previously repaired wall cracks were also observed and found in fair conditions.



Concrete Wall Spall

- CIP Concrete Columns

Numerous quantities of concrete spalling were observed on the lower portion of the columns and were typically found on the exterior bays.



Column Spalls



Column Spalls



Column Spalls



Column Spall

- Expansion Joint Seal System

The expansion joints running east to west through the garage was observed to be in fair conditions. Some expansion joints were observed to be deteriorating. Additionally, areas of large water ponding were observed near the expansion joints, causing debris build up and deterioration of joints. Few plate covers installed over the expansion joint on the interior bays were observed to be detached. Vertical Joint on the exterior face of the building were observed to be in poor conditions, due to direction sun exposure.



Horizontal Expansion Joint



Horizontal Expansion Joint



Horizontal Expansion Joint



Horizontal Expansion Joint



Horizontal Expansion Joint – Cover Plate



Horizontal Expansion Joint – Cover Plate



Vertical Expansion Joint



Vertical Expansion Joint



Vertical Expansion Joint

- Sealants

Various areas of deteriorated or missing sealant were observed, most significantly on the top level due to direct exposure to the elements. Horizontal sealants were observed on all floors at the pour strips, joints, topping areas, and planter covers and were found to be in fair conditions. Cove sealant was observed on the top floor around the barrier wall and concrete curb and was found to be in poor condition, due to direct exposure to the elements.



Horizontal Sealant



Horizontal Sealant



Cove Sealant



Horizontal Sealant at Planter

- Stairs

Several quantities of railing post corrosion were observed on all stairs.



Stair Railing Post Corrosion



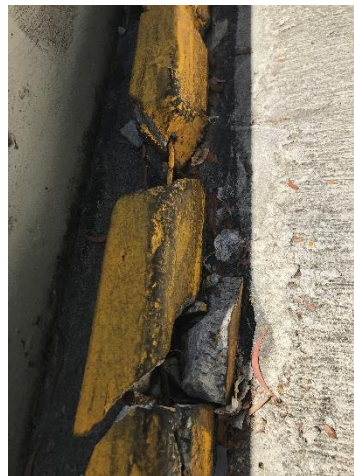
Stair Railing Post Corrosion

- Concrete Curb

Concrete curb located on the exterior ramps were observed to be severely damaged.



Damaged Curb



Damaged Curb



Damaged Curb



Damaged Curb

- Post-Tension Pockets

Post-tension pockets were observed to be missing grout. Additionally, signs of corrosion were observed on the post tension pockets located on the exterior slab edge.



Post-Tension Pockets

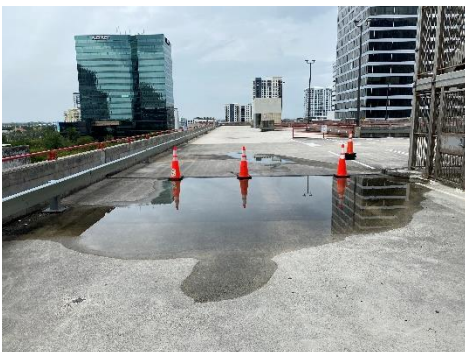


Post-Tension Pockets

OPERATIONAL ELEMENTS

- Water ponding

Numerous areas of large water ponding were observed throughout the garage, specifically near the expansion joints and bottom of ramps. Water intrusion onto the lower levels was observed to come from minor hole openings within the concrete slab and drain connections discharging onto the ramps. Additional water ponding areas were observed at the depressed slab “trench” like areas running throughout the parking bay edges. Multiple exposed rebars were also observed in this location due to a decrease of concrete cover of the slab and water ponds.



Water Ponding



Water Ponding



Water Ponding at Expansion Joint



Water Ponding at Expansion Joint



Water Ponding – Trench Area



Water Ponding – Trench Area



Pipe Discharging to Trench Area



Pipe Discharging to Trench Area

- Floor Drains

Several drains were observed to be blocked with debris preventing proper flow of the water into the system. The drain grates were also observed to be rusted or missing the drain grate.



Drain Grate



Drain Grate



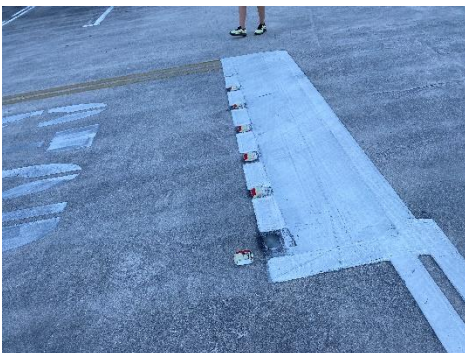
Debris in Drain



Debris in Drain

- Striping

Striping was observed to be in poor conditions, specifically on the top level due to direct weather exposure. Stop bars and striping were observed to be illegible and pavement reflector marks were observed to be detached in some locations.



Striping



Striping



Striping

- Masonry Barrier Walls

Limited quantities of wall cracks and wall spalls were observed on the masonry barrier walls. Barrier wall on the south side of level one was observed to be on a slight angle. Additionally, mortar was observed to be missing on some masonry blocks.



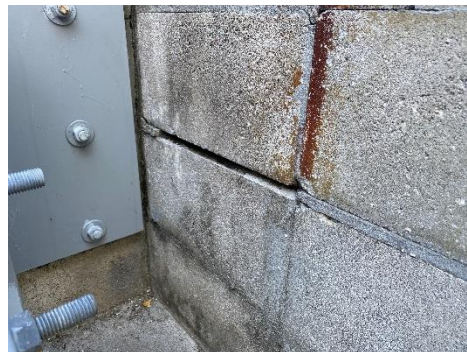
Masonry Wall Spall



Masonry Wall at Angle



Masonry Wall Crack



Masonry Mortar Missing



Masonry Wall Spall

- Guardrail System

A guardrail system consisting of steel framing with wooden panels were observed to be connect to the masonry barrier walls. The steel members base plates and I-Beams were observed to be rusted, specifically on the top level due to direct weather exposure. Additionally, various of the guardrails were observed to be on a slight angle due to the anchor bolts not fully embedded into the masonry blocks.



Anchor Bolt



Anchor Bolts



Steel Plate Rust



Steel Plate Rust



Wood Panel



Wood Panel



Steel Beam Rust



Guardrail Connection

- Pipes and Pipe Support

Several pipes and pipe supports were observed to be corroded or detached and in need of replacement.



Pipe Support



Pipe Support



Pipe Support Rust



Pipe Support Rust



Pipe Support Rust



Steel Pipe Rust

AESTHETIC ELEMENTS

- Facade

The façade was found in generally good condition, with a few post-tension pockets and planters in need of repair.



Façade



Façade

RECOMMENDATIONS

Parking garages are exposed to the environment and require diligent upkeep of waterproofing and sealing systems to maintain structural components in good condition. Anywhere water is intruding, or steel is exposed to the environment should be addressed, as ignoring these items can limit the useful life of the garage. While operational and aesthetic issues may not directly affect the deck's life span in the same way that structural issues can, they should not be ignored solely on that basis. The Owner has a vested interest in maintaining a user friendly, appealing structure in the same way it has an interest in protecting its parking investment from the effects of disregard of structural repairs. The recommendations in this report are primarily structural and waterproofing issues; however, some operational issues are also addressed.

The following repair recommendations have been prioritized according to their impact on the overall structural and waterproofing systems, operational and aesthetic systems of the parking garage. Priority 1 recommendations are typically more structural in nature and intended to repair / restore items that are now deficient or to address more impactful deficiencies observed during our assessment. A table has been prepared with action items for each priority.

Many of the recommendations listed below will require specialized design and construction. Specific repair procedures are not part of this condition assessment report. These recommendations outline items in need of repair and present limited conceptual procedures. Construction documents should be developed to address material selection and detailed methods of repairs. A firm with expertise in parking deck repairs should be retained to design and detail the specialty recommendations provided below. Once restoration construction documents are prepared, a specialty contractor should be selected to perform the work.

Table 4. Priority 1 Recommendations

Number	Description	Notes
<u>CONCRETE REPAIRS</u>		
1.1, 1.2	Concrete Floor Cracks,	Kimley-Horn recommends routing and sealing all topside slab cracks to protect embedded reinforcement and potential leakage into subsequent levels. Quantification of cracking was difficult due to dirt/debris on the deck surfaces and additional quantities may arise after powerwashing the deck. These repairs would require removal of sealant from existing routed cracks, routing both new and existing cracks, and seal all floor cracks.
1.2, 1.5, 1.8, 1.12	Overhead Floor Cracks, Column Cracks, Wall Cracks, Overhead Beam Cracks	Kimley-Horn recommends epoxy injecting all concrete overhead slab, column, wall, and overhead beam cracks. The repairs would require epoxy injecting concrete cracks.
1.3, 1.13	Concrete Floor Spalls, Exposed Rebar	Kimley-Horn recommends patching all concrete delaminations and spalls. These repairs would require removal of loose concrete at floor spalls, sandblasting repair cavity and exposed reinforcement, coat all exposed reinforcement and welded connections. Replace or supplement any reinforcement with significant section loss, and place concrete repair mortar.
1.4, 1.11, 1.14	Overhead Floor Spalls, Overhead Beam Spalls, Overhead Exposed Rebar	Kimley-Horn recommends patching all overhead concrete delaminations and spalls. The repairs would require removal of loose concrete at overhead floor spall, overhead beam spall, and overhead exposed rebar, sandblast repair cavity and exposed reinforcement, coat all exposed reinforcement and welded connections. Replace or supplement reinforcement with significant section loss, and place concrete repair mortar.
1.6	Column Cracks (Waterproofing Paint)	Kimley-Horn recommends applying a waterproofing paint to specific column cracks. The repairs would require preparing the concrete surface and applying a waterproofing paint, per the manufacture's recommendations.
1.7, 1.9	Column Spall, Wall Spall	Kimley-Horn recommends patching all concrete column/ wall delaminations and spalls. The repairs would require removal of loose concrete at wall and column spalls, sandblast repair cavity and exposed reinforcement, coat all exposed reinforcement and welded connections. Replace or supplement reinforcement with significant section loss, and place concrete repair mortar.
1.10	Wall Spall (CMU)	Kimley-Horn recommends patching and/or replacing masonry wall spalls and mortar joints at masonry barrier walls. The repair will require removal of loose concrete at wall, sandblast repair cavity and exposed reinforcement, coat all exposed reinforcement and weld connections. Replace or supplement reinforcement with significant section loss, place concrete repair mortar. For masonry wall spalls with damaged CMU blocks, the repair will require removal and reinstallation of the CMU blocks. Additionally, the repair will consist of adding new epoxy mortar to any wall voids.
1.15	Water Ponding	Kimley-Horn recommends addressing major water ponding areas. Water ponding shall be mitigated by adding floor drains, building up floor, or scoring the concrete to allow water to flow toward the drains. Additional concrete slab cores shall be grouted in order to avoid water intrusion from the top level. Clean up of debris near floor drain is also recommended in order to allow water to flow properly into the system.

1.16	CMU Wall Replacement	Kimley-Horn recommends removing and replacing a span of masonry barrier wall at the south portion of level one. The repair would include the demolition of the existing wall and reconstruction of a new masonry barrier wall.
1.17	Damaged Curb	Kimley-Horn recommends replacing severely damaged concrete curbs at exterior ramps.
1.18, 1.19, 1.20	Exposed Tendon, Damaged Tendon, Overhead Damaged Tendon	Kimley-Horn recommends repair and/or replacing post-tension tendons.
1.21	Post Tension Pockets	Kimley-Horn recommends repairing post tension pockets. The repair will consist of re-grouting post tension pockets and removing corrosion from end of tendons.
<u>EXPANSION JOINTS</u>		
2.1, 2.2	Expansion Joint - Horizontal Vertical Joint - Horizontal	Kimley-Horn recommends replacing exterior vertical expansion joints and few horizontal expansion joints. The repairs would include removing and replacing joints, with minimal damage to the concrete.
<u>SEALANTS</u>		
3.1, 3.2, 3.3, 3.4	Cove Sealant, Horizontal Sealant, Horizontal Sealant – Planter, Pour Strip/ Cold Joint Sealant	Kimley-Horn recommends full replacement of top-level cove sealant and horizontal sealants throughout the garage as priority 1. Horizontal sealants at pour strips, joints, topping, existing repairs, and planters are also recommended to be repaired. The repairs would include removal of existing cove and horizontal sealants along the top-level perimeter, pour strips, joints, existing repairs, and planer areas. Install backer rod where necessary and apply new sealants.
<u>WATERPROOFING</u>		
4.1	Deck Coating	Kimley-Horn recommends installing deck coating at all depressed slab “trench” like areas running throughout the parking bay edges, in order to prevent additional exposed rebar deficiencies. Kimley-Horn also recommends installing deck coating at various pour strip or joint locations were spider like cracks were observed. These repairs would include application of deck coating in areas described above.
4.2	Powerwash	Kimley-Horn recommends powerwashing all garage levels as a Priority 3 item.
<u>GERNERAL</u>		
5.1	Drain Grate Replacement	Kimley-Horn recommends replacing or installing new drain grates where applicable.
5.2	Guardrail System Anchors	Kimley-Horn recommends re-tightening guardrail system anchor bolt, which are embedded into the masonry barrier walls. This repair will consist of re-tightening the anchors into the masonry blocks to allow for proper connection of the guardrail system.
5.3	Steel Raining Anchors	Kimley-Horn recommends re-installing steel anchor railings. This repair will consist of re-anchoring existing steel railings into the concrete island.
5.4	Pipe Guard Connections,	Kimley-Horn recommends reinstalling or replacing the steel pipe guard connections. The repair will consist of replacing/ reinstalling any corroded or damaged connection of the pipe guard supports.

5.5, 5.6, 5.7	Steel Plate Rust, Steel Beam Rust, Pipe Support Rust	Kimley-Horn recommends cleaning corroded steel plates and beam of the guardrail system and steel pipe protections. The repair will consist of blast cleaning all steel surface and paint with a high-performance coating.
5.8	Guardrail System Wooden Planks	Kimley-Horn recommends replacing the deteriorated wood planks that are part of the guardrail system.
5.9	Railing Post Corrosion	Kimley-Horn recommends cleaning corroded stair railing posts. The repair will consist of blast cleaning all steel surface and paint with a high-performance coating.

APPENDIX A - LIMITATIONS

Kimley-Horn and Associates, Inc. endeavors with this report to assist the Owner in the understanding of the existing conditions of the parking facilities in an effort to plan for the repair and maintenance of the structures. This report is based on the specific observations made and the professional opinion and experience of Kimley-Horn. Our recommendations do not provide specific repair details or specifications. The report is not a warranty or guarantee of the items noted. The extent of our evaluation was limited, and we cannot guarantee that the assessment discovered every possible conditions that has or will occur.

Throughout the parking structure's service life it will be exposed to environmental conditions detrimental to the structural integrity and the aesthetic and operation system conditions. Kimley-Horn cannot guarantee further deterioration will not occur over time. However, preventative maintenance performed by the Owner can help to minimize the long-term repair needs.

This report has been prepared in accordance with the professional standard of care. No other warranties or guarantees, express or implied, are made or intended. This report has been prepared solely for Broward County for the purpose stated herein and should not be relied upon by any other party for any other purpose. Specifically, this report may not be used in connection with actual renovation or construction of any kind. The conclusions in this report are based on the limited investigation described above. Any reliance on this report by any party other than Broward County shall be without liability to Kimley-Horn and Associates, Inc. or its employees.

Rating Guidelines:

The following narrative provides a summary of the rating guidelines and brief definitions of some items that were observed in the garage and noted in this report.

Good – rating denotes no life-safety issues, no immediate losses of strength or performance, including aesthetics, and no short term changes in performance with regular maintenance and observation. A structural system is said to be in good condition if there is minor concrete damage, minimal rust, and no leaks or leaching. An operational system is said to be in good condition if the system is in good working order with minor cleaning or routine maintenance required.

Fair – rating denotes no life-safety issues and functional performance but repairs are needed to maintain the current level of service. There are some aesthetic issues and inconveniences to patrons. Without repairs, the deterioration will continue to accelerate. Fair condition is assigned to the structural system if moderate damage, rust, leaks, or leaching is found in several locations or if severe damage is found in a few locations.

Poor – rating denotes obvious problems, even to the casual observer, that without immediate remediation will result in further loss of structural member capacity. This condition can produce noticeable deflections in members, cause loose concrete to spall away, and presents the possibility of an unsafe condition to vehicles and/or pedestrians in the near future. The system may still be functioning at this state but repair costs will increase rapidly with the amount of time that passes before the item is corrected. The structural system is considered poor if severe damage is found in several locations. A poor assessment is assigned to any operational system that requires replacement.

N/A – Not Applicable to this garage. While typically included as a part of our normal condition assessment, this particular category of items was not originally installed in this garage or was not part of the scope of this evaluation.

Definitions:

The photographs provided in Appendix B are sample representative photographs of each definition.



Figure 1: Failing Concrete Patch

1. Patches – Repairs to concrete that require a filler material, usually grout or repair mortar. Patches may be required due to the following causes: reinforcing steel corrosion, concrete spalling, concrete delaminations, failing grout pockets, or external forces, such as automobile collisions. See Figure 1.



Figure 2: Concrete Delamination

2. Delamination – A delamination of concrete occurs when bleed (excess) water rises in concrete to just below the concrete surface as the concrete is curing. This process leaves a thin layer of concrete that separates from the concrete body. Delaminations are detectable by sounding the suspected concrete with a metal object, such as a chain or hammer, and listening for the distinctive dead/hollow sound produced. The sounding instrument will produce a crisp metal ring when sounding over solid concrete. See Figure 2.



Figure 3: Concrete Spall

3. Spall – A spall is generally a piece of concrete that separates from the main body of the concrete member. Examples include a grout patch that has shrunk away from its pocket or a corner of a member that has broken off and is in the process of falling away or has fallen away already. See Figure 3.



Figure 4: Fine Crack



Figure 5: Medium Crack



Figure 6: Wide Crack



Figure 7: Leaking and Leaching Concrete

4. Cracking – Cracks are qualitatively assigned values of Fine (F), Medium (M) or Wide (W). A fine crack is a hairline crack less than 0.01” thick and can sometimes be very hard to see. A medium crack is in between 0.01” and 1/32” wide and a wide crack is anything greater than 1/32” wide. Cracks are qualitatively rated according to their dominant characteristics. See Figure 4, Figure 5, and Figure 6.

5. Leaking – Leaking is determined by any observable sign of fluid flow through a crack or joint. See Figure 7.

6. Leaching – Leaching occurs when water flows through a crack, thereby dissolving away the components of the concrete, mainly calcium, and depositing it in the form of a whitish film or stalactite on the surface. The whitish film is also called efflorescence. See Figure 7.



Figure 8: Ponding Water

7. Ponding – Ponding water is the settling of water in low areas where it has no way to drain. This standing water not only presents a pedestrian safety hazard, but as water penetrates the concrete the deterioration mechanism is accelerated. See Figure 8.



Figure 9: Structural Steel Rust and Scaling

8. Rust and Scaling – Rust occurs when steel is oxidized. Air, water, and chlorides are some agents that typically cause steel to rust. Scaling is a more advanced condition of rust and occurs when rust is deeper than the surface and flakes off in pieces or ‘scales’. See Figure 9.

APPENDIX C – OPINION OF PROBABLE COSTS

In addition to the cost summary below, we recommend additional assessments be performed on the electrical, lighting, elevator, and fire suppression systems within the structure. Costs related to these services and subsequent repairs are not included in our pricing. The unit prices provided herein are for budgetary planning purposes and should be verified by the contractor.

Kimely-Horn has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Consultant at this time and represent only the Consultant's judgment as a design professional familiar with the construction industry. The Consultant cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

The structural and waterproofing deficiencies listed in the Opinion of Probable Cost table are based on the limited investigation described within this report. Our repair recommendations are based on effective methods to ensure durability and considered the most desirable and cost-effective repair techniques based on our experience with similar parking garage restoration projects.

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RIVERWALK CENTER PARKING GARAGE

Opinion of Probable Cost - Structural & Waterproofing Restoration

REPAIR LIST				PRIORITY 1		PRIORITY 2		PRIORITY 3		COMMENTS	
Number	Item	Unit Price	Quantity	Est. Cost	Quantity	Est. Cost	Quantity	Est. Cost			
Concrete Repair											
1.1	FC	Floor Crack	\$5.60	LF	3900	\$21,840	5800	\$32,480		*Priority 1 - Level 7 (Exposed), P2-Level 6-1	
1.2	OFC	Overhead Floor Crack	\$42.50	LF			300	\$12,750			
1.3	FS	Floor Spall	\$66.50	SF	450	\$29,925					
1.4	OFS	Overhead Floor Spall	\$146.00	SF	90	\$13,140					
1.5	CC	Column Crack	\$35.00	LF			50	\$1,750			
1.6	CC(P)	Column Cracks (Waterproof Paint)	\$6.00	SF			800	\$4,800			
1.7	CS	Column Spall	\$139.00	SF	320	\$44,480					
1.8	WC	Wall Crack	\$35.00	LF			480	\$16,800			
1.9	WS	Wall Spalls	\$95.00	SF	80	\$7,600					
1.10	WS (CMU)	Wall Spall (CMU)	\$95.00	SF	50	\$4,750					
1.11	OBS	Overhead Beam Spall	\$144.00	SF	70	\$10,080					
1.12	OBC	Overhead Beam Cracks	\$47.50	LF	10	\$475					
1.13	ER	Exposed Rebar	\$66.50	LF	750	\$49,875					
1.14	OER	Overhead Exposed Rebar	\$146.00	LF	50	\$7,300					
1.15	WP	Waterponding	\$19.00	SF	15000	\$285,000					
1.16	CMU	CMU Wall Replacement	\$50.00	LF	30	\$1,500					
1.17	DC	Damaged Curb	\$50.00	SF			30	\$1,500			
1.18	ET	Exposed Tendon	\$150.00	LF	1	\$150					
1.19	DT	Damaged Tendon	\$950.00	EACH	1	\$950					
1.20	ODT	Overhead Damaged Tendon	\$950.00	EACH	2	\$1,900					
1.21	PTP	Post Tension Pocket	\$50.00	EACH		\$0	20	\$1,000			
Expansion Joints											
2.1	EJH	Exp. Joint - Horizontal	\$145.00	LF	150	\$21,750	200	\$29,000	400	\$58,000	*Priority 1 - Level 7 & exposed areas, P2-Level 6-1
2.2	EJV	Exp. Joint - Vertical	\$90.00	LF	350	\$31,500	150	\$13,500	650	\$58,500	
Sealants											
3.1	CSL	Cove Sealant	\$6.05	LF	2300	\$13,915					
3.2	HS	Horizontal Sealant	\$8.00	LF	550	\$4,400	850	\$6,800		*Priority 1 - Level 7, Priority 2 & 3 - Levels 6-1	
3.3	HS-P	Horizontal Sealant - Planters	\$8.00	LF	1400	\$11,200			10000	\$80,000	*Priority 1 - Level 7, Priority 3 - Levels 6-3
3.4	PS	Pour Strip/ Cold Joint Sealant	\$8.00	LF	1800	\$14,400	6000	\$48,000			*Priority 1 - Level 7, Priority 2 - Levels 6-1
Waterproofing											
4.1	DC	Deck Coating	\$5.18	SF	29325	\$151,757				*Priority 1 - Levels 7-2 at slab "tench" like areas and pour strips.	
4.2	PW	Powerwash Floor	\$0.25	SF					950000	\$237,500	
General											
5.1	DG	Drain Grate Replacment	\$250.00	EACH			25	\$6,250			
5.2	GSA	Guardrail System Anchors	\$30.00	EACH			40	\$1,200			
5.3	SR	Steel Railing Anchor	\$30.00	EACH			10	\$300			
5.4	PG	Pipe Guard Connections	\$60.00	EACH			90	\$5,400			
5.5	SPR	Steel Plate Rust	\$40.00	EACH			450	\$18,000	1,802	\$72,080	*Priority 2 - Level 7, Priority 3 - Levels 6-1
5.6	SBR	Steel Beam Rust	\$40.00	LF			30	\$1,200			
5.7	RP	Pipe Support Rust	\$25.00	EACH					10	\$250	
5.8	GSW	Guardrail System Wooden Planks	\$150.00	EACH			300	\$45,000	200	\$30,000	*Priority 2 - Severaly Damaged, Priority 3 - Damaged
5.9	RPC	Railing Post Corrosion	\$20.00	EACH			120	\$2,400			
Sub-Total:					\$727,887		\$174,630		\$434,000		
General Conditions				15%	\$109,183		\$26,195		\$65,100		
Total Estimated Hard Cost					\$837,070		\$200,825		\$499,100		
Contingency				20%	\$145,577		\$34,926		\$86,800		
Engineering Fee/Testing & Inspections				18%	\$131,020		\$31,433		\$78,120		
Total Estimated Cost:					\$1,113,667		\$267,184		\$664,020		