

CONDITION ASSESSMENT REPORT
of the
NORTH SHORE PARKING GARAGE
Pittsburgh, Pennsylvania

Submitted to:
**SPORTS & EXHIBITION AUTHORITY OF PITTSBURGH AND
ALLEGHENY COUNTY**

Attention:
Taylor Blice
Facilities Director
Sports & Exhibition Authority of Pittsburgh & Allegheny County
171 10th Street, 2nd Floor
Pittsburgh, PA 15222

August 7, 2017



Submitted by:



Parking Consultants
Structural Engineers
Consulting Engineers
Restoration Engineers

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August 7, 2017

Taylor Blice
Facilities Director
**SPORTS & EXHIBITION AUTHORITY
OF PITTSBURGH AND ALLEGHENY COUNTY**
171 10th Street, 2nd Floor
Pittsburgh, PA 15222

Re: **SPORTS & EXHIBITION AUTHORITY OF PITTSBURGH AND ALLEGHENY COUNTY,
PITTSBURGH, PENNSYLVANIA**
North Shore Parking Garage Condition Assessment Report

Dear Mr. Blice,

At your request, we have performed a Condition Survey of the North Shore Parking Garage located at 20 East General Robinson Street in Pittsburgh, Pennsylvania. This is the first of three surveys to be performed on a "biennial" basis over the next 5 years. The purpose of this condition survey is to provide an assessment of the current condition of the parking garage and to recommend repair measures to repair existing deterioration, as well as recommend preventive maintenance and waterproofing measures to extend the life of the garage to the greatest extent.

The inspection was performed on May 1st & 2nd, 2017 and consisted primarily of visual inspection of the parking garage. Observations were noted and photographically documented. The only testing performed as part of the inspection was limited hammer-tap sounding of selected areas of the structural framing and floor slabs. Original design drawings were made available for our review.

This report includes our observations, conclusions and repair recommendations per our survey and can be found in the following sections.

INTRODUCTION

The North Shore Parking Garage is located at the intersection of East General Robinson Street and Range Way in Pittsburgh, Pennsylvania. It is a self-park facility with eight levels of parking, one on-grade parking level with one bay of occupied space and seven supported parking levels above. The parking garage has an approximate capacity of 925 cars. The parking facility is three bays, two way traffic circulation and ninety degree parking. The parking garage was constructed in 2001.

The parking garage is constructed using a pre-stressed, precast concrete framing system. The structural floor slabs consist of pre-topped double tees with cast in place concrete pour strips at the curbs and turning bay beams. (It should be noted that the as-built construction disagrees with the original construction drawings, which indicate a field topped slab). The double tees are supported by precast spandrel beams or inverted tee beams, and precast bearing walls. Cast in place pour strips are provided at the curbs and at inverted tee girders at the turning bays.

There are three stair towers and an elevator tower that serve the parking facility. The stairs are constructed with precast concrete landings and treads. The stairwell walls consist of precast concrete wall panels. The parking garage façade consists of a combination of masonry face brick, stone block, and precast concrete façade panels. The façade panels have stamped brick inlay to mimic the look of a brick façade. There are also several metal architectural grilles, awnings, etc.

OBSERVATIONS AND RECOMMENDATIONS

The following section includes an outline of the conditions we observed in the garage, as well as recommendations for repair and preventive maintenance. Representative photos of each condition has also been provided.

SLAB SPALLS AT TEE-TEE SHEAR CONNECTORS

OBSERVATIONS:

Several slab spalls were visually identified located above the steel tee-tee shear connector assembly along the edges of precast tees, indicating the shear connector may be corroding. The shear connectors are important structural elements that transfer vehicular load across the tee joints and connect the slab diaphragm.

RECOMMENDATIONS:

Chain drag sounding should be provided along all tee-tee joints to locate all of the spalls and delaminations at the shear connectors. Provide concrete patch repairs at each of the spalls (Line Item #4) and delaminations, including cleaning corroded shear connector steel and any exposed slab reinforcement free of corrosion deposits and painting with a protective rust inhibitive coating. Replacement of failed sealants (Line Item #12/#17) and shotblast cleaning & sealing the floor slabs with water repellant sealer (Line Item #19) will go a long way to protect the shear connectors from future corrosion damage.



CRACKING, SPALLING, AND DEBONDING AT POUR STRIPS

OBSERVATIONS:

Many of the CIP pour strips are suffering deterioration, including cracking, debonding of the pour strip from the underlying precast girder/double tee slab, spalling and scaling. The pour strips tie the individual precast structural elements together while providing a suitable driving surface.

RECOMMENDATIONS:

We recommend patch repairs and/or removal and replacement of the deteriorated sections of pour strips (Line Item #5), with provisions for new control joints above the precast beam-tee/tee-tee joints. Cracks at locations of sound concrete should be routed and sealed. The girder pour strips at turning bays should be shot blast cleaned and protected with a traffic bearing waterproofing membrane (Line Item #16) to reduce the rate of scaling and structural deterioration. All other pour strips should be protected with a water repellant surface sealer at the less deteriorated and less vulnerable locations.



OVERHEAD SPALL AT FLOOR SLAB SOFFIT

OBSERVATIONS:

A few isolated locations of overhead spalls were observed at the floor slab soffits, due to moisture seeping through the slab and causing corrosion of the embedded reinforcing steel. The locations we identified in the field are generally under the locations of CIP pour strips and at areas of corroding slab shear connectors.

RECOMMENDATIONS:

Provide overhead patch repairs (Line Item #6) of the floor slab soffits, etc. at the locations of overhead spalls/delaminations. Patch repairs will include removing and replacing the loose concrete, cleaning and painting corroded, embedded steel reinforcement and providing new hooked anchors for additional bond capacity of the patch.



AGED AND DEBONDED TEE JOINT SEALANT

OBSERVATIONS:

All of the parking garage tee-tee joint sealants are near the end of their useful service life. The sealants are beginning to debond and leak, especially at the locations of the tee-tee shear connectors. Leakage through the slab causes the embedded connectors to corrode, and leads to corrosion related spalling of the structural double tee. Leakage is also a nuisance to garage patrons.

RECOMMENDATIONS:

We recommend complete replacement of all of the floor slab sealants throughout the garage (Line Item #12/#17). This can be done on a scheduled basis over a few years to reduce annual budget impacts if needed.



THRU SLAB LEAKAGE ALONG TEE JOINTS

OBSERVATIONS:

We observed leakage at the tee-tee joints due to failed slab sealants. Leakage through the slab causes the embedded connectors to corrode, and further deterioration of the concrete tee flange edges.

RECOMMENDATIONS:

We recommend removal and replacement of the floor slab sealants (Line Item #12/#17). It should be noted



that the sealant replacement at the roof level will require replacement of traffic bearing membrane along the tee joints to maintain membrane continuity, as it will be damaged during the sealant replacement process.

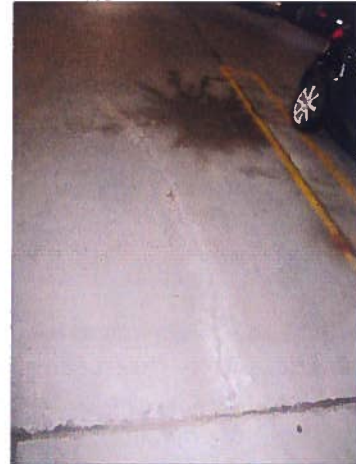
FLOOR SLAB CRACKS

OBSERVATIONS:

Numerous floor slab cracks were identified along the pretopped floor slabs. Many of the cracks have been previously repaired using an epoxy filler; however, some cracks were open and unprotected. Slab cracks are conduits for water seepage into the slab, which can lead to corrosion of reinforcing steel and subsequent concrete delaminations and spalls.

RECOMMENDATIONS:

We recommend routing and sealing the floor slab cracks with caulk sealant (Line Item #13) to prevent the ingress of moisture into the cracks.



CRACKED AND DEBONDED POUR STRIPS AT PRECAST STAIRS

OBSERVATIONS:

Nearly all of the pour strips at the precast stairs have cracked, debonded and spalled. Some additional spalls were identified around the pour strips due to water seepage around the perimeter of the pour strip. The spalls and debonded concrete indicate underlying steel connections may be corroding. The steel connections are important structural elements as they connect the individual sections of the precast stairs & landings together.



RECOMMENDATIONS:

The debonded and cracked pour strips should be removed and replaced (Line Item #8). Once the concrete has been removed and the underlying steel connections are exposed, the steel should be protected with a rust inhibitive coating. In order to prevent future damage, we recommend the pour strips are coated with a pedestrian grade waterproofing membrane.

LEAKAGE INTO STAIR

OBSERVATIONS:

We observed some water ingress into the stair. Generally this was a nuisance issue at this time, however some corrosion of the metal railings and some instance of minor spalls appear to possibly be caused by the moisture ingress. The leakage could eventually lead to structural spalls and

delaminations of the precast stairs, etc.

RECOMMENDATIONS:

We recommend that new, supplemental drains be provided in front of the stair tower doors to collect the water and prevent seepage into the stair tower (Line Item #21). It should be noted that some drains have already been installed in front of some of the stair tower doors.



LEAKAGE AT DRAINS

OBSERVATIONS:

Supplemental (assumed) drains in front of some of the stair doors were observed to be leaking. The leakage appear to be occurring between the drain and the slab, and not the drain itself. Concrete deterioration along the perimeter of the drains were observed.

RECOMMENDATIONS:

We recommend routing and sealing the perimeter of the floor drain (Line Item #23). If this does not have the effect of repairing the leak, the drain may need to be removed and reset.



CORROSION AT STAIR RAILING

OBSERVATIONS:

Corrosion damage at several of the stair railing supports was observed. This is unsightly and allowed to progress, will eventually fail the railing support.

RECOMMENDATIONS:

We recommend cleaning the railing free of corrosion damage and painting the corroded sections of the railing with protective rust inhibitive paints (Line Item #22). The rest of the railing appear to be generally in good conditions, and comprehensive repainting of all railing is not needed at this time.



CRACKED AND SPALLED BRICK AT FAÇADE

OBSERVATIONS:

Face brick masonry has cracked and spalled throughout the first and second floor façade of the parking garage. The spalled face of the brick is a potential falling hazard and the damaged bricks allow water to penetrate the façade and exacerbate the rate of deterioration of the façade. It should be noted that the majority of the deteriorated face brick is located at the 1st and 2nd floor façade.



RECOMMENDATIONS:

We recommend that the spalled and cracked bricks be replaced (Line Item #7), and the façade be protected with a water repellent sealer (Line Item #14 & #18). A masonry sealer will reduce the amount of water absorption and reduce the rate of future deterioration of the masonry wall. If desired, a short term solution of removal of the spalled brick faces can be performed to mitigate the falling hazard if immediate funds are not available for the replacement of the deteriorated brick.

CRACKED STONE PANEL FAÇADE

OBSERVATIONS:

Several of the stone blocks located along the front elevation of the façade have cracked. The cracked stones allow water to seep into the façade causing further deterioration of the wall.



RECOMMENDATIONS:

The cracked stones should be removed and replaced (Line Item #10), followed by protection with a water repellent surface sealer (Line Item #14). If a lower cost option would be desired, the cracks could be routed and sealed with a new polyurethane sealant; however this option is generally considered unsightly and is not recommended.

CRACKED AND DEBONDED FAÇADE SEALANTS

OBSERVATIONS:

All of the façade sealants have failed at this time. Failed sealants are a direct access point for water to penetrate the façade, causing damage to structural connections, and possible deterioration of interior finishes in occupied spaces.

RECOMMENDATIONS:

The façade sealants require comprehensive replacement at this time (Line Item #15).



STAINED STONE PANEL FAÇADE

OBSERVATIONS:

Staining due to dirt, grime, water and organic growth was observed at the stone façade. Primarily at ledges and reliefs where water can be retained. The condition is unsightly, and indicated saturation of the stone, which may cause deterioration over time.

RECOMMENDATIONS:

The stone should be powerwash cleaned with a proper stone cleaner to remove as much of the existing staining as possible (Line Item #14). The stone should then be sealed with a water repellent sealer to protect the stone and also reduce the rate of future staining. It should be noted that cleaning of stone is partly a trial and error process and that some of the staining is likely "set-in" and will not be able to be removed without complete removal of the stone.



CRACKED AND DEBONDED MORTAR JOINTS

OBSERVATIONS:

Several cracked and debonded mortar joints were observed at both the brick and stone façades. Cracked and debonded mortar joints are a main source of water entry into the building walls and also is a weakening of the overall strength of the façade.

RECOMMENDATIONS:

We recommend repointing the cracked and deteriorated mortar joints using a properly engineered mortar mix (Line Item #9/#11). After the mortar joints are repointed, the façade should be sealed and protected with a water repellent surface sealer (Line Item #14 &



#18), which will protect the mortar joints and reduce the rate of future deterioration.

CRACKED AND DEBONDED SEALANT AT SIDEWALK

OBSERVATIONS:

Caulk sealants at the joint between the sidewalks and the garage façade have failed. The open joints allow water to penetrate causing deterioration of the brick masonry, and concrete sidewalk and potentially the foundations.

RECOMMENDATIONS:

We recommend replacement of the sidewalk joint sealants (Line Item #15).



DETERIORATED AND SPALLED NOSING AT EXPANSION JOINT SEAL

OBSERVATIONS:

The nosing along the expansion joint between the slab-on-grade and supported floor slabs has cracked and spalled. This condition is likely allowing leakage through the seal, which may lead to structural deterioration along the joint.

RECOMMENDATIONS:

We recommend removal and replacement of the nosing compound (Line Item #20). Once the nosing has been removed, the seal can be inspected and may be determined that it also needs to be replaced.





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PITTSBURGH, PA
AUGUST 7, 2017
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In summary, we recommend a comprehensive parking garage repair and preventive maintenance program be implemented at this time. The repair program will be designed to repair the observed deterioration and provide the recommended preventive maintenance and waterproofing items to extend the life of the parking garage. On the following pages is our recommended repair program for restoration of the garage. Also included is our recommended 2017, Phase 1 repair project that was developed ahead of this report and sent under separate cover. It has been provided here for reference and convenience. Future phases can be developed at request, based on the attached comprehensive program. The comprehensive, prioritized recommended repair program for all work still includes the work that is proposed for the 2017 repair phase.

We hope that the above is sufficiently responsive to your needs. Please do not hesitate to contact us if you need further information or assistance.

Very Truly Yours,
O&S ASSOCIATES, INC.

Phillip Haley
Project Manager



RECOMMENDED REPAIR PROGRAM

PRIORITIZED, RECOMMENDED REPAIR & PREVENTIVE MAINTENANCE PROGRAM & BUDGET COST ESTIMATE

NORTH SHORE PARKING GARAGE

SPORTS & EXHIBITION AUTHORITY OF PITTSBURGH AND ALLEGHENY COUNTY

August 7, 2017

No.	DESCRIPTION	EST. COST	PRIORITY
GENERAL CONDITIONS			
1	Mobilization & Demobilization	\$15,000	
2	Work Access (Swingsstage, Scaffolding, Hydraulic Lifts), Temporary Protection, Etc.	\$75,000	
3	General Conditions, Permits	\$35,000	
<i>Subtotal General Conditions</i>		\$125,000	
STRUCTURAL & FAÇADE REPAIRS			
4	Partial depth patch repair at floor slab spalls, primarily at locations of tee-tee shear connectors	\$10,500	1 - Important
5	Replacement of selected debonded, spalled and heavily scaled sections of the CIP pour strips	\$75,000	1 - Important
6	Overhead patch repairs at the floor slab soffits, etc.	\$19,000	1 - Important
7	Remove spalled/loose material from the face of bricks at the first & second floors. Existing Brick to remain	\$9,000	1 - Important
8	Replace spalled & debonded pour strips at the precast stairs, including patch repairs of the precast stairs adjacent to the pour strips. Clean and paint embedded steel connections, etc.	\$16,500	1 - Important
9A	Repoint selected and cracked mortar joints at the first & second floors - Stone Façade (LF unit price)	\$30,000	1 - Important
9B	Repoint selected and cracked mortar joints at the first & second floors - Brick Façade (SF unit Price)	\$10,000	1 - Important
10	Remove and replace cracked stone blocks at the first & second level of the garage	\$26,500	2 - Short Term
11	Remove and replace cracked & spalled face bricks at the first & second floors	\$55,000	2 - Short Term
12	Repoint selected mortar joints, replace selected cracked bricks at the stair towers and column screen walls at the upper floors of the garage (Level 3 through 8) (Allowance)	\$75,000	3 - Programmed
<i>Subtotal Structural & Façade Repairs</i>		\$326,500	

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RECOMMENDED REPAIR PROGRAM (CONT.)

CONTINUED FROM PREVIOUS PAGE.

PRIORITIZED, RECOMMENDED REPAIR & PREVENTIVE MAINTENANCE PROGRAM & BUDGET COST ESTIMATE (CONT.)			
NORTH SHORE PARKING GARAGE			
SPORTS & EXHIBITION AUTHORITY OF PITTSBURGH AND ALLEGHENY COUNTY			
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PREVENTIVE MAINTENANCE AND RECOMMENDED WATERPROOFING			
13	Remove and Replace Tee-Tee joint sealants at leaking tee-tee joints. Provide new waterproofing membrane strips over the replaced sealant at locations of existing waterproofing membrane	\$15,000	1 - Important
14	Rout & Seal selected floor slab cracks	\$12,000	1 - Important
15	Powerwash and seal first & second floor façade with water repellent sealer. Provide heavy duty powerwash with cleaner at stone façade	\$55,500	1 - Important
16	Replace façade sealants	\$127,500	2 - Short Term
17	Provide traffic bearing waterproofing membrane over the pour strips at the turning bays	\$48,000	2 - Short Term
18	Remove and replace all floor slab sealant, including all tee-tee joints & pour strip joints	\$440,000	2 - Short Term
19	Powerwash and seal masonry façade at the upper floors of the garage (Level 3 through 8) with water repellent sealer	\$90,000	3 - Programmed
20	Shotblast and seal Level 2 to Level 7 supported floor slabs with water repellent surface sealer	\$375,000	3 - Programmed
<i>Subtotal Preventive Maintenance And Recommended Waterproofing</i>		\$1,163,000	
DRAINAGE, MISCELLANEOUS			
21	Replace cracked nosing at the expansion joint seal	\$3,000	1 - Important
22	Supplemental floor drains at areas of leakage into stairs	\$12,500	2 - Short Term
23	Touch up painting of corroded stair railings	\$6,000	2 - Short Term
24	Rout and seal perimeter of leaking drains, replace drains as needed (Allowance)	\$10,000	2 - Short Term
<i>Subtotal Drainage, Miscellaneous</i>		\$31,500	
SUB-TOTAL ESTIMATED CONSTRUCTION COSTS		\$1,646,000	
a)	Engineering Design, Repair Drawings & Specifications	\$66,000	
b)	Estimated Contract Administration & Technical Supervision, including Site Visits	\$45,000	
GRAND TOTAL ESTIMATED CONSTRUCTION COSTS		\$1,757,000	

Priority Legend:

Priority 1 - Important : Work recommended within 1 year	\$295,000
Priority 2 - Short Term : Work recommended within 1-3 years	\$838,000
Priority 3 - Programmed : Work recommended within 3-5 years	\$624,000