Staff Responses to Council Questions
March 22, 2016

Non-Agenda Questions

Amnesty Week set yet?

Amnesty Day has not been set yet. It's been traditionally held in the fall immediately following the Recycling Extravaganza. Staff will meet with Republic Services and identify possible dates in 2016.

Tree sale date set yet?

The tree sale date is set for Friday, May 20th and will coincide with the Public Works Open House.

6. Consent Agenda

I. Motion: Authorize Participation with the State of Illinois in Joint Purchase of Bulk Rock Salt for 2016-2017 Winter Season

One could back out from the narrative about current status, but it would be appropriate to indicate how much salt we started the season with, how much we bought in dollars and tonnage that got us to the 3,000 tons we have currently.

Before the Village placed its first order, the salt dome contained 3,200 tons of salt. The first purchase in early November 2015 brought the Village's salt total for the start of the season to 4,400 tons. The following table illustrates all salt purchases made for this winter season:

Order Date	**Vendor**	**Order Amount (in tons)**
Early November 2015	Cargill	1,200
Early January 2016	Cargill Morton	1,200 800
Early March 2016	Cargill Morton	400 800

For the season, the Village ordered a total of 4,000 tons of salt from its vendors. 2,400 tons of salt was ordered from Cargill at a rate of $64.24/ton, and 1,600 tons of salt was ordered from Morton at a rate of $70.44/ton. The costs for each vendor were $112,704, and $154,176 respectively, for a grand total of $266,880.

L. Motion: Award a contract for the Design and Oversight for Parking Deck Rehabilitation and Maintenance to Walker Parking Consultants/Engineering, Inc. dba Walker Restoration Consultants, of Elgin, Illinois in an amount of $42,460.00.

The Deck is one of our top facilities and investment. When the report is completed, we should get a full report (rather than just waiting for budget time) so that we may look at options for its useful life and funding for the future.

In 2015 the Village contracted with O&S Associates to prepare a comprehensive maintenance plan and condition assessment. The resulting report, dated 4/23/2015, is attached. The work proposed for 2016 is recommended in the report. During the Long Range Planning process to be held in the summer months, staff will propose a more thorough look at the parking facilities, related revenues and future expenses.

8. First Reading

B. Ordinance: Authorize a Special Use for 4617 Roslyn Road to Permit an Extended Family Accessory Housing Unit

How is this type of special use enforced? Do we maintain a list of these uses and check them periodically?

There are currently four Extended Family Accessory Housing Units in the Village. The Village maintains a list of these units. The Village requires the homeowner to sign an affidavit each January attesting that the unit is occupied as approved and meets the Extended Family Accessory Housing Unit standards. The affidavit provides owner consent permitting the Village the right to conduct an inspection of the property if the Village chooses.

C. An ordinance authorizing the vacation of a public alley adjacent to 4147 Venard Road

D. A motion to authorize a fee waiver in the amount of $4,901.18 for the vacation of a public alley adjacent to 4147 Venard Road.

How much was the Village on the hook for the shed at McCollum Park?

The Village paid approximately $810,000 to construct the Park District building. In exchange, the Park District provided the Village with land to be used for a Village water tower.

How much did the Village pay the Park District for its use of water detention at Washington Park? How much was waived by them?

The Village constructed approximately $660,000 in park amenities as part of this project. The cost of the Washington Park Improvements totaled $3 million. By partnering with the Park District, the Village was able to save significantly on the project to create two separate above-ground stormwater detention basins using three acres of the park. Without the partnership, costs would have exceeded $8 million, due to the fact that land acquisition equivalent to the three acres needed to construct the detention basins would have cost approximately $6.2 million. As a result of working together, a savings of $5 million was realized.

How much did the Village pay for work at Barth Pond? How much was waived?
The Village reimbursed the Park District for approximately $1,100,000 in costs related to the removal of sediment at Barth Pond, pursuant to a 1987 Intergovernmental Agreement and a 2013 Memorandum of Understanding. More information is available by clicking here: http://www.downers.us/public/docs/agendas/2013/10-08-13/AGENDA_PDFS_10_08_13/FIRST_READING/RES00_05356_MOU_BARTH_POND.pdf

ATTACHMENTS
There are no online rEmarks.
O&S Associates report

April 23, 2015

Andy Sikich
Assistant Director of Public Works - Engineering
Village of Downers Grove
5101 Walnut Avenue
Downers Grove, IL 60515

Re: RFP - Professional Services
Parking Deck Maintenance Plan
Proposal No. P-013

Dear Mr. Sikich:

At your request, we have performed a condition assessment and maintenance plan for the Village of Downers Grove Parking Garage. The purpose of this study and assessment was to identify existing deterioration and to recommend repair and maintenance actions to extend the life of the parking garage and equipment in the facility as described in the village RFP.

The assessment of existing conditions consisted of visual observations, acoustic sounding of selective, representative areas of the supported floor slabs, and testing of the concrete for chloride contamination.

This condition assessment report is a summary of observations and findings, photographic documentation, and recommendations for repair and maintenance measures for the next ten years. This provides the initial parking garage maintenance plan which includes the estimated construction budget for the maintenance and repair program. In summary, this report provides a summary of the recommended garage repairs, maintenance, and optimization of maintenance to provide a serviceable facility and extend the service life of the garage.

Should you have any questions, or require additional information, please do not hesitate to contact us at your convenience.

Respectfully,

O & S ASSOCIATES, INC.

Senior Associate

MAINTENANCE PLAN & CONDITION ASSESSMENT REPORT

FOR THE:

DOWNERS GROVE PARKING GARAGE

MOCHEL DRIVE

Downers Grove, Illinois
April 23, 2015

SUBMITTED TO:

Village of Downers Grove
5101 Walnut Avenue
Downers Grove, IL 60515

PREPARED BY:

O&S ASSOCIATES, INC.
17 NORTH STATE STREET, SUITE 1700
CHICAGO, IL 60602

TABLE OF CONTENTS

INTRODUCTION

The purpose of this study and assessment was to identify existing deterioration and to recommend repair and maintenance actions to extend the life of the parking garage and equipment in the facility as described in the village RFP. The assessment of existing conditions consisted of visual observations, acoustic sounding of selective, representative areas of the supported floor slabs, review of the construction drawings and specifications, and testing of the concrete for chloride contamination. This condition assessment report and maintenance plan provides the following key items:

- Condition Assessment of the current conditions including a summary of observations findings, and photographic documentation
- Recommendations for repair and maintenance,
- Estimate of construction budgets for the recommended repair and maintenance
- Estimated and projected construction budgets for the repairs and maintenance for the next ten years.

Structural Description

The Village of Downers Grove owns and operates a five story, seven hundred seventy eight stall parking garage in its Downtown Business District. In addition to the five stories of parking, there is an underground storm water retention facility below a portion of the first floor. Initial construction of the garage was completed in 2004, and the Village has been performing maintenance activities on an as needed basis since that time.

Figure 1- North Elevation of Parking Facility

The parking garage consists of five parking levels for public and employee parking. The first level has about half of the floor as a structural slab over the storm water retention facility and the other half is a concrete slab-on-ground. The upper four levels are a concrete structural system with cast-in-place post-tensioned floor slabs and beams supported by cast-in-place concrete columns. The façade of the parking garage is constructed with precast concrete wall panels, precast concrete column covers, concrete and concrete masonry unit (CMU) walls,

concrete stairs and curtain wall glazing panels. The precast panels generally have a "thin brick" architectural finish on the exposed exterior surfaces. The building is approximately 278' long by 187' wide.

Functional Description

The structure uses a three bay functional design with ninety degree parking. The functional circulation system is a single threaded helix with the exterior bays essentially flat and the interior bay sloped between each floor for vehicle circulation. All three bays use ninety degree parking that can accommodate two way traffic. The center bay uses two way traffic for circulation in and out of the facility. The exterior bays are signed and used as one way traffic, using one side for inbound and the other for outbound traffic.

The parking garage has open access and each space is numbered or designated for specified users. Vehicles access the garage from two entrances at the ground level at Mochel Drive on the north and east elevations. First floor parking is permit or free for public parking which is limited to four hours. Second floor is for employee permit parking. The spaces on levels three, four, and five are numbered for public parking and uses pay the daily fee at pay on foot stations. The garage provides free parking after 3:00 PM. Public overnight parking is not permitted, with no parking 2:00 A.M. to 5:00 AM. Residential and permit parking includes overnight parking. There are five pay stations. The North Stair has three stations on level one and one station at level four. The West Stair has one pay station at level one.

EXECUTIVE SUMMARY

This condition assessment evaluated existing conditions in the garage and it identifies key performance factors for maintenance and repair of this cast-in-place post-tensioned concrete parking facility. Basic maintenance and repair requirements are identified and described. The best practices for parking garage maintenance and optimization of the maintenance plan is also described. Planning and optimizing the maintenance program will preserve the inherent service life of the garage, provide reliable operations, and reduce the overall life cycle costs.

Other routine, contractual and regulatory maintenance for operations, elevators, and fire protection system are not part of this assessment. These and other general maintenance items can be found in the *Parking Garage Maintenance Manual* published by the National Parking Association, Parking Consultants Council.

Service Life of Repairs and Maintenance

Providing a parking garage repair and maintenance plan for this garage will allow the optimization of the maintenance and repair costs. Current deterioration observed and the required maintenance and repair items are generally related to normal maintenance replacements of preventive maintenance sealants and waterproofing and damage from water leakages at cracks and expansion joints. The ten year plan includes repairs to the deterioration observed and preventive maintenance items that will protect and limit damage to the garage structural system.

Continuing the normal garage preventive maintenance is expected to achieve the inherent service life of the garage that is estimated to be more than 50 years. Additional proactive maintenance items are recommended or suggested for evaluation to extend the service life and to a potential service life of more than 75 years. Service life is the time that the structure continues to provide the functions and operation required. For parking garages, the time when the floor slab requires capital expenditures to repair slab deterioration is the service life. After the repairs are completed, the structure will have a renewed service, typically extended 10 to 20 years.

Summary of Existing Conditions

The current conditions and observations are summarized by the following items:

Structural Conditions

1. The façade connection plates at column covers and wall panels have several locations with cracks or spalls at the connection plates. Cracks and spalls in the precast are due to restraint of volume change movements in the garage frame. In multiple locations the connection plates have previous repairs. These current spalls, cracks, and damage are a design/construction deficiency and they require re-engineering to correct the cause and design the repairs to accommodate the garage frame movements.

2. The expansion joint sealants between the floor slab and stair tower contain cracks and significant water leakages which have damaged electrical, doors, windows, and other equipment in the garage.

3. The concrete floor slabs contain limited cracks in localized areas primarily on the first level. Three cracks were observed at the P/T floor slab over the storm-water retention facility.
4. The stairway slab and treads contain isolated locations with cracks, scaling, aggregate pop-outs, water stains or corrosion stains.
5. The CMU walls in several locations contain "step cracks" along the block mortar joint near the wall interface with the garage frame. These cracks are related to the garage frame volume change movements each winter and they require repairs.

Preventive Maintenance and Waterproofing

6. Expansion joint sealants, caulking or joint sealants require repairs and replacements. Expected life is normally 8 to 10 years. During the first 5 to 10 years the garage has the largest amount of shrinkage and this shrinkage has caused the expansion joints to open significantly. Replacement expansion joints and other joint sealants will require increased sizes that will perform better than the original materials.

Architectural Conditions

7. Water leakages have caused significant damage to doors, windows, and other equipment in the localized areas with the leakages. Once the water leakage is corrected, the materials with damage can be cleaned, painted or repaired/replaced.

Mechanical Electrical Plumbing Fire Prevention (MEPF) Conditions

8. The floor drainage system has corrosion damage from water leakages through the floor openings and leaks in the drain pipes. These require repairs. Corrosion of the steel drain materials, pipes, and drain covers was observed in many locations.
9. Three electrical conduit runs in each stair tower have been placed in the expansion joint opening between the stair and the garage floor. Water leakages occur at each of these locations and the conduit needs to be moved out of the expansion joint opening to allow the expansion joint sealant replacement. The leakages have damaged paint on walls, doors, windows, and also caused water, corrosion, and other damage to electrical boxes, door and window frames, fire extinguisher cabinets and other equipment or signs.

Retention Vault Conditions

10. The underground retention vault was constructed as an unoccupied water retention facility. The facility is a confined space, with limited access for maintenance of the facility. The facility was examined and minor deterioration was observed that require small localized concrete repairs. The electrical lighting originally installed has water damage and is abandoned. A water supply line also appears to be winterized or abandoned. This abandoned items have minimal impact on the garage or retention facility functionality.

SUMMARY OF ESTIMATED BUDGET

TABLE 1 – SUMMARY of ESTIMATED BUDGET FOR REPAIR AND MAINTENANCE

Item	Description	Priority 1	Priority 2	Priority 3	Enhancement Alternatives
1	General Conditions	$ 30,000	$ 25,000	$ 310,000	$ 3,000
2	Concrete & Structural & Façade	$ 85,000	$ 19,000	$ -	$ -
3	Preventive Maintenance & Waterproofing	$ 177,000	$ 235,000	$ 162,000	$ 32,000
4	Architectural & Operational	$ 13,000	$ 62,000	$ 1,150,000	$ -
5	Mechanical	$ -	$ 2,000	$ -	$ -
6	Electrical	$ 73,000	$ -	$ 813,000	$ -
7	Plumbing	$ 11,000	$ -	$ 500,000	$ -
8	Fire Protection	$ 2,000	$ -	$ 1,250,000	$ -
9	Water Retention Facility	$ 10,000	$ -	$ -	$ -
	Construction Subtotal	$ 401,000	$ 343,000	$ 4,185,000	$ 35,000
	Engineering Services	$ 42,000	$ 36,000	$ 439,000	$ 4,000
	Total	$ 443,000	$ 379,000	$ 4,624,000	$ 39,000
	Enhancement Alternative Items				
Item	Description				
1	Concrete Surface Sealer	$ -	$ -	$ -	$ 336,000
	Total	$ 443,000	$ 379,000	$ 4,624,000	$ 375,000

Notes

1. Estimated construction costs presented above are in 2015 dollars.
2. Additional notes and references are provided in the line items budget tables.
3. Priority 1 – Important and schedule 1 to 3 years
4. Priority 2 – Recommended and Schedule 3 to 10 years
5. Priority 3 – Long Range Program – Schedule 10 years or more
6. Enhancements for Consideration to Extend Time Until Repairs are Needed

The Priority 1 & 2 items represent the construction budget to continue garage operations and implement preventive and proactive maintenance requirements for the garage for the next ten years. The priority 3 items include system replacements for Architectural and MEPF equipment typically required at 20 to 25 years after construction. The ten year plan is approaching this time frame.

Construction staging and phasing is further described in the main report and budget tables are included in Appendix A which includes the ten year planning sheets. The ten year plan uses a phased approach that can also be used to accommodate budgetary constraints, the prioritized items above can be allocated with expected budgets and desired time frames for the ten year phased, multi-year maintenance and repair program.

Optimizing the repair and maintenance plan is also discussed in in the report to provide addition information that can be used with the priority factors.

FINDINGS CONCLUSIONS & RECOMMENDATIONS

The findings, conclusions, and recommendations are based on field observations of materials and conditions visible during the parking garage condition assessment and our experience with similar facilities materials, construction details, and exposure conditions. Selective testing of the floor slabs was conducted with sounding (acoustic testing for hollow areas) of over 90 % of the floor slabs and representative sections (over 20%) of the columns, beams, and walls.

We also reviewed a copy of the construction drawings record documents and specifications including structural, architectural, electrical, mechanical, plumbing, fire protection, and civil design drawings issued for construction May 30, 2003.

Structural Conditions

The structural system and elements are constructed with durable materials and as should be expected, limited and localized items of structural cracking, scaling, spalling or deterioration were observed. Many of these items can be corrected with normal or nominal repairs and preventive maintenance of sealants and waterproofing. Deficiencies and damage in the brick faced precast concrete panel and column covers are not normal and require priority repairs.

Precast Concrete Spandrels and Column Covers

The precast concrete wall panels and column covers provide the architectural brick facades for the garage. The panels contain cracks and spalls from the structural support connections to the concrete structural frame of the garage. This damage is not normally expected and it requires redesign to correct the original design/construction details and defects. It appears the precast connections contained compatibility issues during the initial construction and repairs were provided at that time. The primary issue is that the structural concrete frame of the garage has lateral displacements due to shrinkage and temperature changes while the precast was installed with connections and supports that were not compatible with these movements. The initial repairs cut rigid connections and replaced them with connections that were slotted or included allowances for the structural movements. During this condition assessment, additional connections were observed that have cracked and spalled the precast concrete and require structural evaluation and repairs. Current cracking and spalling appears to be limited and localized, however, the repairs should receive priority to limit progressive damage to the precast and connections.

The design of the new repairs will need additional site evaluation and structural analysis of the existing conditions. The connection conditions are now complex since they include the original connections, connections with previous repairs that have new damages, connections with previous repairs that do not have damage, and connections that may not have been damaged before, but now have new damages. In several locations the previous repairs cut a rigid steel connector to relieve stress (pressure). The steel plates were not removed, simply cut. Unfortunately the column movement was larger than the width of the cut and the column closed the gap and applied sufficient stress to re-crack the connection.

Concrete Durabilty

A copy of the concrete mixture specifications and a portion of the mixture submittal from the original construction was provided for the condition assessment review. In summary, the supplier stated the concrete mixture provided contains cementitious materials that was equivalent to the specified mixture to provide concrete with reduced permeability. The available records for the concrete do not identify the specific cementitous materials or identify the concrete permeability, durability, or expected performance properties. Most other concrete suppliers will identify the materials used or provide the performance properties of the mixture. Based on the record data, the expected performance of the concrete is not known, however, it seems reasonable that the supplier's certification that the concrete meets specification requirements, indicates the concrete has enhanced properties to reduce permeability.

Concrete Floor Slab System

The floor slab of the garage is the largest and most critical structural system for maintenance and repair. It is the most critical because it receives the most severe loadings and exposures. The floors were visually examined and tested by acoustic sounding for hollow delaminations (chain drag) on over ninety percent of the surface. The other ten percent had parked cars. Concrete floor slab delaminations or spalls were not detected or seen. At the first level over the detention basin floor slab cracks were observed near the center of the bay. These need to be sealed to keep water out of the slab. In general, other cracks in the structural system were minimal and narrow. Cracks that are narrow in width require sealing or coating to keep water and moisture out of the structural and concrete elements. Wider cracks are repaired by routing the crack and sealing with crack sealants. Construction joints in the slab have existing joint sealants that currently need to be replaced.

The floor slab generally provides positive drainage to the floor drains. Limited, small water ponding areas were observed on the interior column lines between floor drains. The water ponding is shallow and it appears to dry within a day. Also, isolated small areas have drainage corrections (possibly during the original construction) with grinding or thin patches. The thin patches often last less than twenty years and may require interim patches over the next ten years. The repairs can be monitored, but currently, the floor system does not require repairs or supplemental floor drains.

Floor Slab P/T Reinforcement

The post tensioning (P/T) tendons and anchors provide the main reinforcement system of the supported floor slabs and beams. These P/T elements are critical elements of the structural system and they are located inside the slabs and beams. Because the P/T conditions are concealed by the concrete, parking structure assessments check for external signs of corrosion or damage. Our observations did not identify P/T damage at this time.

Many parking structures use an encapsulated corrosion protection system for the P/T tendons. This encapsulated system (electrically isolated tendon) is not a code requirement, however, the submittal details indicate an encapsulated P/T system was used. This P/T system determination is important to appropriately provide slab and P/T maintenance requirements as the parking facility ages.

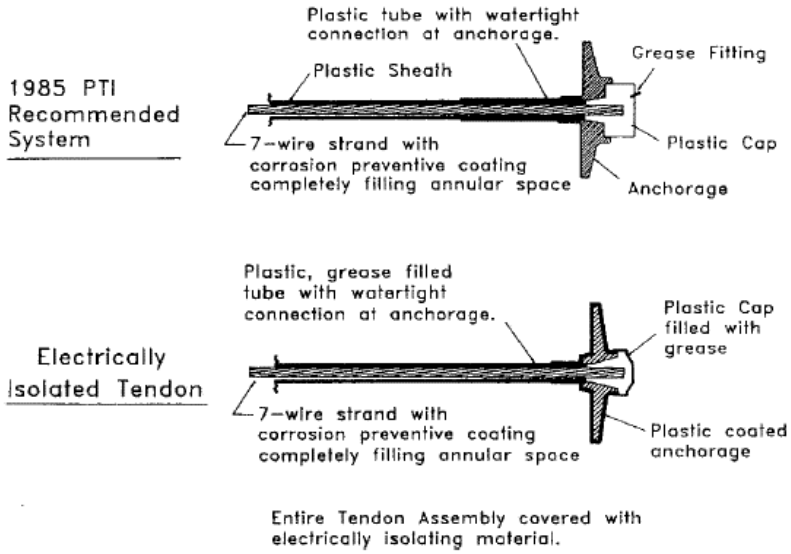


Figure 2 - P/T Corrosion protection systems - from *ACI 423 - Corrosion and Repair of Un-bonded Single Strand Tendons.*

Due to the potential for structural damage of the P/T system, which may not be readily apparent or observable in some areas, it is important that positive floor slab drainage and moisture protection systems be provided for the floor slabs. P/T tendon anchors are located along the edges of floor slabs and at the ends of P/T beams. We observed that, in several locations, the P/T anchor pockets have water stains or leaching around the perimeter of the grouted pockets. Grouted pockets that are cracked or loose need to be re-grouted.

At the perimeter of the garage, the primary slab tendon pockets are not visible at the exterior edge of the slab. The stressing pockets are covered by the façade column covers and parapet walls, which have the potential to hide damage to the tendon anchors & stressing pockets.

Post Tensioning System Background

The post-tensioning system consists of unbonded, highly stressed steel tendons anchored in the concrete slab by steel anchors along the exterior slab edges, along expansion joints, at girder ends and at intermediate construction joints in the floor slabs. These tendons provide the primary load carrying mechanism for the parking structure floor slabs and girders.

If construction defects, nicks, structural cracking, or concrete shrinkage disrupt the grout or plastic covering over the P/T system, water can enter the P/T

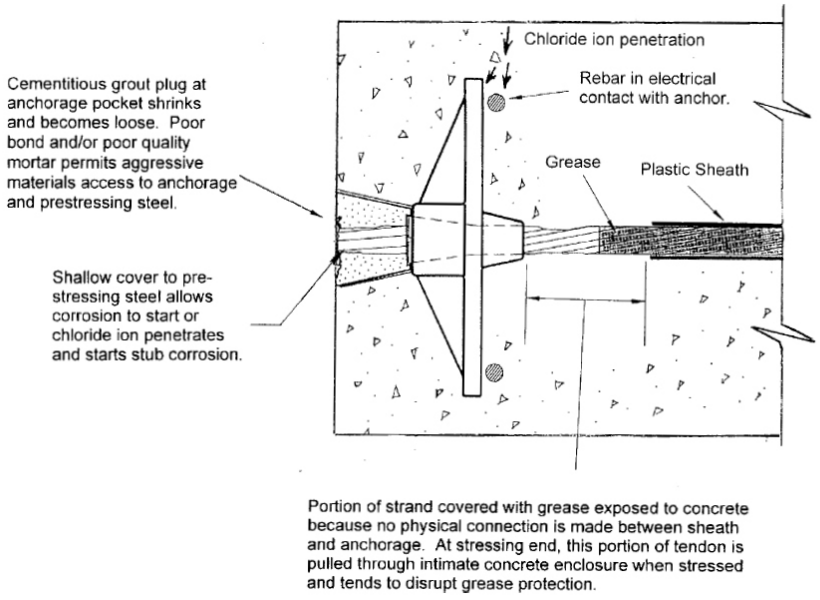


Figure 3 - Potential defects in P/T protection systems. From ACI 423.

system. Potential defects are shown in Figure 3. If a P/T cable becomes corroded due to water and salt attack, it loses part of the steel cross sectional area resulting in increased stress on the remaining cable. As the corrosion progresses, more and more stresses are induced on the remaining steel cable until the cable is no longer able to sustain the forces and breaks. This results in loss of the pre-stressing force along the entire length of the cable causing a decrease in the load-bearing capacity of the floor slab.

Short Introduction to Post-Tensioning

In a post-tensioned (P/T) structure, the post-tensioning system is the primary steel reinforcement for the concrete slabs and beams and the primary load-carrying mechanism. High-strength steel tendons (cables) are greased and encased in a plastic sheathing, draped into the slab formwork (using a very specific wave-like profile) and threaded through anchors at the end of the slabs and at intermediate stressing locations. After the concrete has hardened, the tendons are pulled with a jack to high-tension forces and wedged into the anchors to maintain the cable tension. The post-tensioning tendons are more vulnerable to corrosion due to the properties of this steel under high tension. The design and construction details typically provide protective measures and the tendons are greased and wrapped in a plastic sheathing.

Post Tension Anchor Region Illustration

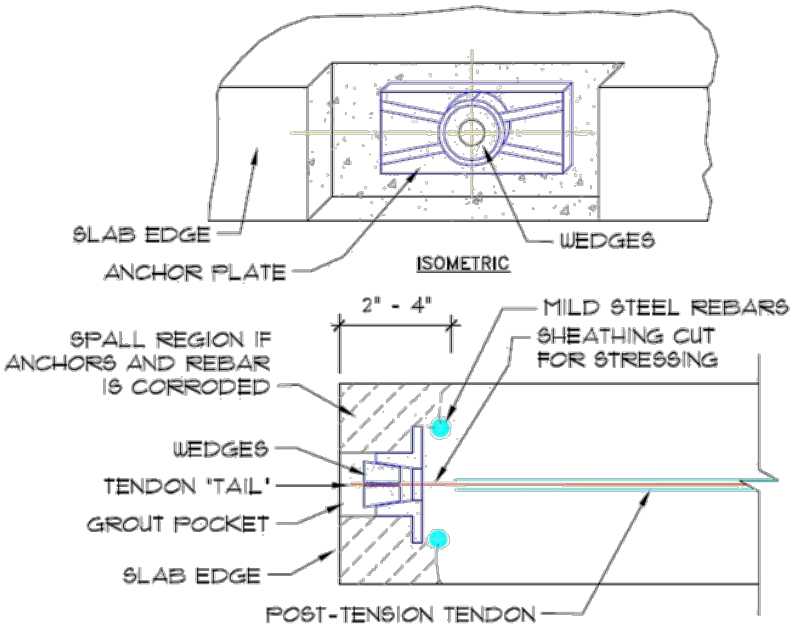


Figure 4 - P/T Anchor Schematic Details

Maintenance for P/T Slabs and Beams

In this parking garage, the P/T system is most vulnerable at the construction joints and at the slab or beam edge with P/T anchor grout pockets. Maintaining the joint sealant at the top of the construction joint with an effective joint sealant will help protect the slab, P/T anchors, and

grout pockets from infiltration of moisture and chlorides. Similarly, maintaining the cove sealants at the slab edge where the slab and vertical wall intersect will help keep moisture out of the slab and away from the tendon anchors. At this time, replacing the existing joint sealants is recommended. Construction joint sealant replacements are required on all P/T system floor slabs. Edge of slab cove sealant replacements are required at the roof level.

The P/T system was also checked at the anchorages, high points, and low points of the tendon profile in slabs and beams. These locations were examined for damage or deterioration such as: exposed tendons, cracking, water stains, and or corrosion stains. The slabs and beams have tendon anchorages with cracking around the perimeter of the anchor grout pocket that needs repair or sealing. Other deterioration at slab high or low points was not detected.

Over time, the concrete near construction joints and slab edge's tends to have cracks and other deterioration which requires additional moisture protection at the top of slab surface. A narrow strip of traffic membrane is recommended for this proactive preventive maintenance item. It is not needed at this time, however, it is shown in the ten year maintenance plan.

Floor Slab Mild Steel Reinforcement

The floor slab mild steel reinforcement is specified to have two inch concrete cover. The concrete reinforcement cover meter (pachometer) measurements during the chloride ion testing indicated two inches or more of concrete cover. Exposed reinforcement, cracking and corrosion staining was not found related to the mild steel in the slabs or beams. The project specifications require the floor slab reinforcement to be epoxy coated to provide corrosion protection.

Columns Walls and Beams

The concrete columns, walls, and beams were visually examined and sounded by hammer tapping. Relatively small spalls were observed in isolated locations. Small concrete patches are required to repair the observed concrete spalls.

CHLORIDE ION TESTING

The Chloride ion testing on each of the floor slabs indicated chlorides are generally concentrated in the first inch of the floor slab. At each test location three test samples were collected to test for chloride concentration 0″ to 1″; 1″ to 2″; and 2″ to 3″ deep into the slab. The tests indicate a chloride ion concentration of 1,900 ppm in the top inch and about 600 ppm in the second and third inch into the slab.

The uniformity of the chloride ion concentration in the second and third inch indicate the chlorides measured by the test where not from chlorides migrating from the top surface down. When chlorides migrate from the top down, the measured chlorides in the second inch would be lower than the top inch but higher than the bottom inch. In the testing completed all the test results in the 2″ to 3″ depth are about the same, indicating a background chloride content in the concrete. In the Chicago area the dolomite coarse aggregates commonly contains chlorides which generally have not caused durability issues in garages that are well maintained. The measured chloride concentrations are therefore adjusted by subtracting the estimated background chloride. The lowest measured chloride content (530 ppm) was used in the

adjustment to keep all the test results a positive number. Future testing should include an additional sample at each test location to test the background chloride detected in this testing.

The background corrected average chloride ion concentrations are as follows:

- 1,350 ppm at 0-1″;
- 118 ppm at 1-2″;
- 68 ppm at 2-3″ deep.

The floor slab concrete cover provided over the reinforcing steel and post-tensioning tendons was also checked at each chloride test. The depth of reinforcement was estimated with cover meter (pachometer) electronic readings and the noted reinforcing bar sizes on the drawings. Concrete cover generally ranged from 2″ to 2.25″. The reinforcing bars are therefore mostly located at a depth of 2″ to 3″ below the concrete slab surface.

Additional testing data and graphs are provided in Appendix B - Testing.

Estimated Time until Repairs

The chloride ion concentration at the estimated 2″ to 3″ depth of reinforcing steel is 68 ppm. This concentration is below the corrosion threshold (300 to 500 ppm). The reinforcing steel is therefore expected to be passive and protected from corrosion. Based on current chloride test data the expected service life until repairs are required in the floor slab is 30 to 50 years.

Monitoring the increase in Chloride concentrations can provide an ongoing estimate for the time to budget repairs. It should be noted that the increase is chloride concentrations typically is not linear, since the accumulation of chlorides in the top layer typically "pushes" the chlorides faster as the accumulation increases. The presence of cracks or other concrete defects also causes a progressive and increased rate of deterioration. Cracks, joints, and other defects are maintained as described in the crack and joint sealant sections of this report. In summary, checking chloride concentration increases at 10 year intervals can provide data to allow maintenance and repairs before damage is large and before accelerated deterioration rates cause large reactive repairs.

The parking industry in the United States has not established a specific service life requirement for parking structures. Based on our experience with structures following the ACI 362.1 guidelines, parking structures generally need repairs after 30 years. Based on current information about the concrete, chloride testing, and industry averages, 30 to 50 years is the estimated service life until slab repairs are needed. After repairs are completed the service life is extended until the next round of repairs.

In addition to durability from the concrete, this garage includes reinforcement durability features that include: epoxy coated mild steel reinforcement and encapsulated P/T system. Based on the details of the concrete and reinforcement, the service life (time until concrete repairs are required) of this facility is estimated to be more than 50 years with ongoing maintenance.

SEALANTS AND MOISTURE PROTECTION

Structural Sealants and Moisture Protection

The existing moisture protection for the concrete includes construction joint sealants, expansion joint sealants, floor slab sealer, and a traffic membrane system on a portion of the floor slabs. Small floor areas over rooms have a traffic bearing membrane system. The exterior expansion joint, joint sealants, and membrane systems have reached their expected service life and need to be replaced as part of routine preventive maintenance normally scheduled at ten to fifteen years.

The existing construction joint and slab joint sealants have cracks and other deterioration that require replacement of the joint sealants. New cracks, primarily in the first floor P/T slab require new routing and sealants.

The extensive leaking at the expansion joint sealants around the stairs and elevator towers has caused corrosion damage to doors, windows and other garage equipment. The joints have opened considerably due to concrete shrinkage and P/T elastic shortening, which is normal in the first 5 to 10 years. New joint sealants will need to seal joint openings as wide as 3.75″ (almost double the original 2″ joint width). These expansion joint sealants will typically see smaller movements without the initial shrinkage and shortening.

The existing floor slab sealer appears to have been a temporary sealer provided as a short term measure until the concrete mix has time to cure. Sealers are generally replaced on a 5 year to 15 year schedule depending on the exposure conditions and traffic. As previously discussed, testing the floor slab for sealer effectiveness is suggested before replacing the floor slab sealer.

Several locations of the existing membrane system have debonded and loose membrane materials need to be removed. A new membrane system is recommended to re-coat the existing membrane areas.

Architectural Sealants and Moisture Protection

Joint sealants and other existing water protection exposed to exterior conditions have reached the expected end of life and they require replacement. The architectural and façade joint sealants are primarily provided at the roof level and at joints that are near enclosed spaces like the stairs, electrical, storage, or utility rooms.

The precast panels require additional moisture protection to mitigate the cracking leaching, scaling and water staining observed and previously described. Without the cracking and concrete deterioration observed, the joint sealant replacements could be limited to the existing locations.

Joint sealants and other existing water protection inside the stairs vary in conditions. Generally the sealants inside the stairs are preforming satisfactorily in the North Stair (#1) and the South Stair (#3). At the West Stair (#2), the windows have extensive water damage from water leakages. Much of the water appears to be coming from the expansion joint leakage on the exterior surface of the stair/windows and onto the floor slab and into the stairs. There is also evidence that water leakage may be occurring at wall cracks or window assembly leakages. Replacement or new sealants are required in these locations.

ARCHITECTURAL SYSTEMS

Painting

Many of the concrete and steel surfaces in the garage have received an architectural painted finish. The paint systems generally last 15 to 25 years depending on exposure, materials, and several other conditions. For the most part, the painted surfaces are functioning satisfactorily, unless they have been subjected to water leakages. Repainting is included in the ten year plan. The concrete wall, columns and ceilings are painted in the garage and in the stairs. The surface area for painting represents the largest maintenance quantity in the garage. The walls, pipes, windows and doors subjected to water leakages have damage to the paint and in areas with the heaviest leakages there is also damage to the subsurface materials. Touch up painting is required after the leaks are repaired.

Doors, Windows & Bollards

Hollow metal steel doors and window frames in general are performing satisfactorily except in areas with water leakages. The windows and doors have varies levels of damage from water leakages. After the water leakage is repaired, the doors and windows require repairs and touch up painting. Window damage is primarily on the windows in Stair #2, the West Stair. Doors with extensive corrosion damage may be more practical to replace than to repair.

Steel bollards have corrosion damage from water leakages and contamination. These bollards require cleaning and repainting. The new paint system should be enhanced for the corrosive exposure conditions. The bollards supported on the structural floor slabs have damage to the steel plates, bolts and clamping steel that is clamped against the concrete slab. These bollards likely required dis-assembly to effectively clean and coat all the steel surfaces. The bollards with support brackets in the water retention facility have heavy corrosion on the bolts, and plates below the slab. These plates require a more corrosive resistant material due to the high humidly in the water retention vault.

Elevators

Elevators typically require regular inspections and maintenance in accordance with local requirements and the type of equipment. Refer to the NPA maintenance manual for additional operational maintenance information. The service life of elevators between modernization programs is generally 20 to 30 years. An allowance for modernization is included in the ten year plan.

Graphics & Signs

The parking facility contains painted, printed graphics, and lighted signs. Signage service life varies depending on materials and exposure conditions. The painted and printed graphics signs are general performing satisfactorily except at isolated locations. These locations often have damaged concrete, damaged P/T anchor grout pockets, or damage from water leakage. After the damage is repaired, the signs require touch up repairs. The expected service life is typically 20 to 25 years. When the garage is repainted, many of the signs may also need to be repainted or replaced.

Parking stall lane striping will last varies in life depending on materials, exposure, and traffic conditions. Latex based paint materials often last less than five years. The premium traffic materials have an expect life of about 10 years.

PARKING ACCESS AND REVENUE CONTROL SYSTEMS

The Parking Access and Revenue Control System (PARCS) consists open access to the garage entrance and exit lanes, numbered spaces for public parking, and signed permit locations. The numbered spaces use pay stations for a pay-on-foot system. The numbered public spaces switch to free parking after 3:00 PM.

The existing system has received maintenance and replacements. The original garage pay stations system included four pay stations, three at level one of the North Stair and one at the first level of the west stair. A fifth pay station was added in 2013 at the 4th floor in the North stair in 2013. These pay stations were replaced with Cale Parking Equipment in 2014. The Cale equipment is under a maintenance contract with Total Parking Solutions (TPS). The maintenance contract typically provides required maintenance and repairs. Typically these agreements provide everything needed as long as the equipment meets operational requirements. The current equipment includes payment with cash or credit cards. Typical operational requirements include security for cash collection, reports, transaction features (cash, coins, bills, credit cards), mobile device payments, and other items related to software or business features. There is also a bill change machine in the North Stair Level one area.

Changes to the US credit card transaction requirements are expected in October 2015. The major credit card companies are switching to the EMV standard (Euro Mastercad Visa Standard - which has now also included the other major credit cards). EMV is a global standard for credit cards with a chip. The primary change for transactions is related to responsibility for fraud from transactions using the "magstrip" on the card when a chip would have prevented that fraud. This is the credit card issuers effort to encourage upgrades to the newer chip cards which have much higher security that the older magstrip cards. The impact of these changes on the existing equipment and the garage operations should be reviewed with your bank or legal counsel. TPS may also be able to clarify the impact of the changes before the renewal for the maintenance agreement.

This equipment is projected to have a service life of 10 years. If the garage operational and payment requirements do not change it can be longer. The original equipment was replaced at about 10 years.

MEPF SYSTEMS

The mechanical, electrical, plumbing, and fire protection systems (MEPF) require minor repairs and maintenance primarily related to corrosion in locations subjected to water leakages through expansion joints or sleeved openings in the floor slabs.

Electrical & Lighting

Electrical conduits that were installed in the expansion joint openings around the stairs have corrosion damage from the extensive leakage they caused through the expansion joints. These

conduits need to be moved to allow replacement of the expansion joint system. The electrical receptacles that service the center of the garage have water infiltration and damage to many of these interior circuits that run vertically on the columns along column lines B&C. Replacement conduit and exterior boxes should be provided with water tight materials to avoid the damage previously caused.

The garage lighting system at the ceiling was changed to induction lighting in 2010. The directional sign lighting was changed to LED in 2010. The level indicator signs by the stairs were changed to LED in 2011.

Plumbing

The plumbing floor drains have multiple drain covers with corrosion damage or temporary drain covers that require replacements. The drainage pipes have corrosion damage near several floor slab openings. The piping requires repairs, replacement of supports and repair of the leakages through the floor slabs. A steel pipe was used to form the slab opening during the initial construction. This pipe has extensive corrosion and staining in many drain locations. Water leakage also occurs between the plumbing pipes and this sleeve and this will need to be cleaned and sealed. Flushing the piping after winter deicing salt applications would help remove residual chloride applications and reduce piping corrosion damages.

RETENTION FACILITY

The underground retention facility was constructed as an unoccupied water retention facility below the first floor parking at the street level. The facility is a confined space, with limited access for maintenance of the facility through four manholes and a wall hatch door.

The water level in the retention facility was observed to vary over several months and at the time of the examination, the facility was essentially dry. The west half of the floor was covered with debris, wet debris, and water with debris up to 4 inches thick. The drainage pipe is at the west side. The other portions of the floor had exposed concrete surfaces or shallow debris – generally dry. The humidity level in the space was observed to be high during the assessment and whenever the hatch door was opened for initial observations.

The retention facility construction includes cast-in-place concrete walls and a post-tensioned concrete slab as the ceiling. Several small spalls were observed near the top of the walls in isolated locations. The spalls appeared to be caused by water trapped in the joints near the top of the wall. In spalls where reinforcement was exposed, the reinforcement generally did not contain corrosion that would cause a spall. Replacement of the expansion joint sealants above the retention facility is recommended to reduce water trapped in the joints. The inlet pipe and outlet pipe where grouted at the wall opening during the initial installation. The grout has freeze thaw deterioration. The grouted area and the spalls require small concrete repairs.

The walls, floor and ceiling were coated with a waterproofing membrane system during the initial construction. Records indicate the membrane is CW-Barricoat by Carlisle Waterproofing. The membrane was in-place and functional on the retention facility walls and ceilings. The waterproofing system protection sheet was not observed on the walls or ceilings. The floor of the facility generally had exposed bare concrete surfaces or limited areas with thin remnants of the original waterproofing membrane. Maintenance and repair of the membrane

at the floor surface is not expected to have a significant impact on the continuing garage or water retention functions.

The electrical lighting originally installed has water damage, corrosion, and the lighting and conduits have been abandoned. Maintenance and repair does not appear important for the current function of the facility. If the electrical system is replaced, a water tight electrical system designed for moisture protection and high humidity is required.

A water supply line also was observed to be disconnected from the supply pipe coming out of the west wall. The water supply pipe appears to be disconnected and drained to winterize the pipe or to abandon the supply pipe located in this confined space.

The manhole covers, floor drains or pipes, stair rungs embedded in the walls, connection plates for the pipe bollards, and any other metal items show corrosion and corrosion stains in the retention facility. Cleaning and painting with a corrosion and moisture resistant paint system is recommended.

The repairs are relatively minor, however, the confined space access requirements will cause a premium cost for the work. The repairs should be scheduled in one phase to minimize the premium cost of access to the space.

PREVENTIVE MAINTENANCE OPTIMIZATION

The maintenance optimization uses an intuitive approach based on experience with many parking structure systems that identifies and implements obvious condition based maintenance tasks without extensive testing, analysis or data collection used in a rigorous reliability maintenance approach. This optimized maintenance approach has the four primary reliability maintenance components:

- **Reactive** (RM) is unscheduled maintenance used for non-critical items that are replaced at end of life.
- **Preventive** (PM) is used to replace or repair items subject to wear out with a known failure pattern, schedule, or run time.
- **Condition Based** (CBM) uses testing and inspections to determine or predict the maintenance requirements.
- **Proactive** maintenance includes maintenance tasks that are identified and scheduled to avoid failures that impact environment, health or safety; effect security or energy; or result in economic loss. These tasks are identified in PM or CBM maintenance work or through a facility condition assessment. The condition assessment includes evaluations and the experience of the inspector for root cause evaluation or failure mode analysis of the garage conditions.

These preventive maintenance actions are the primary elements for maintenance programs developed to reduce the life cycle cost (LCC) of a facility while continuing to allow the facility to function as intended with the required reliability and availability.

Optimizing the preventive maintenance is key to a successful parking garage maintenance program and the approach is similar to that used in other facilities and equipment. The basic difficulties include determining when to replace materials that do not follow a well-defined

end of life schedule. The plan is design to avoid replacing PM elements on a too frequent schedule that would cause overspending and often make the maintenance plan ineffective.

Proactive Waterproofing of Architectural Concrete and Structural Slabs

Enhanced water mitigation or waterproofing is recommended for portions of the concrete spandrels, columns or floor slabs to mitigate premature damage to the concrete or the embedded steel and post tensioning tendons and the collateral damage caused by water leakage through the joints or into the concrete elements.

- An architectural concrete coating is recommend for limited concrete spandrel areas that require higher protection. The areas requiring higher protection include areas with significant concrete cracking, leaching, staining, or areas with connections or embedded reinforcement that needs additional protection.
    - A portion of the precast concrete spandrel panels have cracking, leaking, leaching, and concrete deterioration that requires protection. An architectural coating is recommended on the top and back surface of the panels. A sealer is recommended for the exposed front surface.
    - The concrete columns with P/T gout pockets or cracks that have water infiltration or staining should be coated with an architectural concrete coating.
- The enhanced moisture protection is suggested for the stair floor slabs that would consist of a penetrating silane sealer and joint and crack sealants as appropriate. Silane sealers penetrate the concrete surface and bond with the concrete to reduce the moisture penetration. The stair concrete has limited localized areas with scaling damage and aggregate pop-out damage that typically can be mitigated with the sealer application.
- A traffic bearing membrane system is recommend for limited areas that require higher protection. The areas requiring higher protection include areas that would be sensitive to leakage through the floor system, or areas with connections or embedded reinforcement that needs additional protection.
    - The garage floor slab at the P/T installation openings in the slabs near the stair towers contains joints and mild steel reinforcement. These areas currently have minor leakages that may be corrected with replacement of the joint sealants at the joints. Typically these areas require more than the sealants, because the infill concrete that is cast as a secondary concrete placement to fill the openings used for P/T stressing will contain small cracks. A traffic membrane waterproofing is recommended as a proactive maintenance measure. This is a durability enhancement and it can be scheduled after primary maintenance requirements are completed.
    - The construction joints in the slab are also locations with P/T anchors and reinforcing bars that are sensitive to water leakages. The joint sealants typically keep the joint sealed during the early years of the garage operations. As the garage ages, a strip of traffic bearing membrane system above the joint

is recommended as proactive maintenance to limit water infiltration into the joints or absorption through the top surface along the joint. This is a durability enhancement and it can be scheduled after primary maintenance requirements are completed.

Concrete Floor Slab Proactive Maintenance

We have also evaluated the facility for enhanced proactive actions that may be able to further extend the service life and reduce long term repair and maintenance costs. This facility currently contains durability features in the floor slab including: concrete with cementitious materials to provide low permeability, epoxy coated reinforcement, encapsulated post-tensing system, and control joint (and expansion joint) sealant system. These materials are typically expected to provide more than 50 years of service lie. Depending on the durability properties of the concrete, the service life may be more than 75 years. Condition assessments and chloride evaluations over time will indicate how much chloride has entered the concrete and how well the concrete has performed. Testing the concrete now, may help determine if proactive maintenance now can extend the service life by reducing chloride penetration before it happens.

Testing concrete sealer effectiveness is a method to evaluate the concrete and determine the feasibility of optimizing maintenance to extend the service life of this garage. Concrete sealer effectiveness testing standard is as follows:

Testing the water absorption with ASTM D6489-99(2012) *Standard Test Method for Determining the Water Absorption of Hardened Concrete Treated With a Water Repellent Coating*. This test would establish the depth of sealer penetration and the effectiveness of a sealer application.

If the sealer test indicates a sustainable reduction in abortion, providing a concrete sealer is a common method to enhance the protection from concrete floor slab deterioration. A penetrating silane sealer, often provides effective reduction (80 to 95%) in permeability and absorptivity to reduce water and chloride contamination with normal Portland Cement concrete mixtures. Even a 50 to 60% reduction in Chloride penetration can increase the garage service life and reduce long term repair costs.

Because this project specification required a concrete mixture that would provide low permeability, the sealer test may show that a sealer will not be effective. If the testing shows the sealer is not effective, it would also provide data to confirm the concrete has low absorption properties that are not documented by the concrete supplier in the original mixture submittal. Low absorption does not necessary confirm low permeability, but it gives an indication of the durability of the concrete.

Based on the concrete and reinforcement data previously summarized, the sealer test is recommended and it is a priority two item. The testing can be completed by independent testing companies or it is also offered by at least one sealer manufacturer. More detailed information is being collected. If the testing indicates a sealer would be technically effective and financially feasible the sealer application would become an enhancement for extending the service life and budgeted after existing maintenance issues are completed.

The records indicate a sealer was purchased during the original construction. The location of the application was not indicated. This sealer may have been a temporary application intended for the first winter. It is noted that during the original construction, the supplementary cementitious materials take time to react, cure and fill the concrete pore space. It is common, therefore to provide a minimal surface sealer to provide moisture protection for the first winter when the curing of the concrete system is incomplete.

PREVENTIVE MAINTENANCE & REPAIR APPROACHES

Proactive maintenance differs from routine or preventive maintenance as it consists of recommendations for protective measures & waterproofing for the conditions that exist in the parking garage. In this parking facility, water leakages and moisture penetration into the concrete are causing deterioration in the concrete, leaching of minerals, and corrosion of equipment, embedded reinforcement, or connector plates, etc. The end point for concrete repairs, P/T tendon or anchor repairs, and other structural conditions and maintenance for these items cannot be definitively characterized.

We do know from experience with many garages that when they are allowed to run to failure, the economic impact is large and the effects on garage operations and garage safety are also large. Parking garage structural deterioration is cumulative due to weather exposure, temperature fluctuations, vehicle loadings, moisture, rain, or deicing chlorides. The basic economic and operational impacts of several maintenance and repair approaches are shown graphically in the following figure:

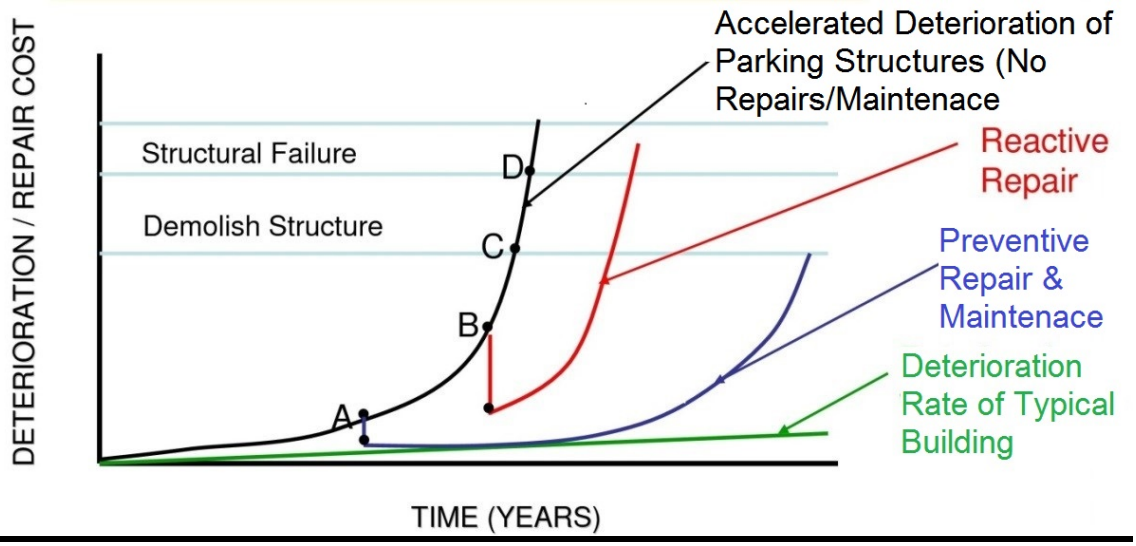


Figure 5 - Maintenance & Repair Approach

The relative impact of maintenance for each of the maintenance approaches is as follows:

1. Without maintenance, the rate of structural deterioration is initially slow, and it increases with time as shown by the black line in the graph. Structural safety becomes an issue between points “C” and “D” which often occurs about 30 years for the exposure conditions in this garage.

2. Providing reactive repairs corrects the deterioration and allows the facility to continue operations as shown at point "B". Because of the cumulative impact, the rate of deterioration is high. After repair, the deterioration continues at the previous high rate and the rate increases. After the repairs at point B, the parking structure expected life is only incrementally extended and a large capital expenditure was required.
3. Providing preventive maintenance and repairs as shown at point "A" decreases the magnitude of the capital expenditures for repairs. Since the maintenance is implemented when the deterioration rate is low, the garage continues on a low rate of deterioration shown by the blue line. The service life is significantly longer than the facility without maintenance. Repeating this process allows significant reductions in the life cycle cost of the garage.
4. For newer facilities, like this garage, optimizing the maintenance plan for the specific materials and conditions allows the overall maintenance plan to achieve the best practice performance. For this facility, an optimized maintenance plan will use preventive, condition based, and predictive testing or inspections to select maintenance tasks which may also include proactive measures to extend the service life and lower life cycle costs.

The garage is in generally good condition with noted localized maintenance and repair items at this time. The garage can be considered to be approaching point A on the graph. It is an opportune time to implement a preventive maintenance plan because our condition assessment of the garage identified items in need of repair and maintenance. It is also a good time to implement an optimized maintenance plan that includes proactive maintenance for several deterioration conditions described in the condition assessment. These measures, correctly installed and maintained will serve to divert the garage's deterioration rate from uncontrolled and reactive maintenance (black and red lines) to the optimized and lowest life cycle cost approach characterized by the blue and green lines in the graph.

As noted, the maintenance plan has been planned for phasing over ten years without negatively impacting the overall lifetime performance of the garage.

LIFE CYCLE COST OF PROACTIVE MAINTENANCE

The recommended repair maintenance measures and proactive items will cause an initial increase in the maintenance costs. A detailed life cycle cost (LCC) analysis is typically used to compare the cost and benefits for these repairs and the alternatives of deferring the recommendations. The difficulty in preparing a LCC, is predicting the time and magnitude of damages if maintenance and repairs are deferred. Many of the damages do not have well defined end of life end points. Corrosion or reinforcement and water related damages typically do not follow a calendar or hours of serve schedule, but the graphs as discussed in the previous section are representative of the damage and costs based on many parking structures. Therefore, based on similar projects the following items are provided to summarize the rational optimization approach without attempting a detailed LCC analysis:

1. A portion of the recommended items correct or mitigate design and construction conditions that can cause premature deterioration and damage. These include the

expansion joints, the cracked CMU walls, and the cracked precast column cover panels and connections. The initial cost for these repairs typically show a LCC savings when compared to the long term damage without the repairs.

2. The floor slab sealers and control joint /crack sealants typically show a LCC savings compared to letting the water leakages run until structural concrete repairs are required. Concrete sealers have a service life expectancy that ranges from 5 years to more than 20 years. Since the sealers penetrate and bond to the concrete, the wear of the concrete surface is the primary determination of the life. In bridge decks it is generally accepted that truck traffic gives the sealers a life of 5 years. The service life in garages is less documented, however, one manufacturer has documentation showing sealer effectiveness beyond 15 years.
3. The deterioration and repair cost graph has been confirmed for many parking projects. Although the exact time and magnitude of concrete repairs is difficult to predict, the savings from proactive maintenance always look very attractive when facing concrete repair costs at 30 to 50 years when the maintenance was deferred.
4. The recommended proactive repair and maintenance program is expected to provide the maintenance items needed for the next 10 years when preventive maintenance is continued. This plan is expected to keep deterioration rates low and minimize the long term life cycle cost. The garage is expected to have a high reliably to function as needed for the Village required operations.

SERVICE LIFE OF REPAIRS

The current repairs are primarily preventive maintenance with a small portion of reactive repairs and maintenance. Past repairs have been limited and on as needed basis. The required repairs and expected service life are expected to extend the useful life of the facility and match well with the structural, functional, and economic service life requirements for the facility.

The service life of sealants and waterproofing generally follow a 10 to 15 year cycle. The ten year budget has included replacement of sealant as priority 1 in the first years of the maintenance plan. The critical sealants and expansion joints should also be budgeted again at ten years. They are shown again in the priority 3 items because budgeting needs to be planned for these items again at ten years.

CONDITION BASED ASSESSMENTS

The cost tables should be updated as the repair and maintenance projects are completed. Many of the sealant and waterproofing materials have a service life of 10 years and assessments should be planned to permit these items to be evaluated and replaced before leaks and consequential damages occur. Updating concrete assessments should also occur at 10 year intervals or more frequently as the facility ages.

RECOMMENDED REPAIR PROGRAM

Following is the recommended repair and maintenance program for the parking garage. This program includes the repairs, preventive maintenance, and proactive maintenance described

in the recommendations based on the observed conditions, age and exposure conditions of the garage.

TABLE 2 – LINE ITEM - ESTIMATED BUDGET FOR MAINTENANCE AND REPAIR

No.	DESCRIPTION	Estimated Cost Priority	Estimated Cost Priority	Estimated Cost Priority 3	Enhancement Alternatives	Priority
	GENERAL CONDITIONS & TEMPORARY PROTECTION ETC.					
1	Contractor's General Conditions	$30,000	$25,000	$310,000	$3,000	
	Subtotal General Conditions & Temporary Protection Etc.	*$30,000*	*$25,000*	*$310,000*	*$3,000*	
	STRUCTURAL & FAÇADE					
2	P/T Tendon anchor pocket grout	$9,000				1
3	Precast Column Cover; Panel evaluation and repairs	$50,000				1
4	Precast Concrete Lift pockets, and misc. repairs		$11,000			2
5	CMU Wall at first Level security and electrical rooms		$8,000			2
6	Structural concrete repairs including Column Spalls, vertical and overhead repairs	$26,000				1
	Subtotal Structural & Façade	*$85,000*	*$19,000*	*$0*	*$0*	
	PREVENTIVE MAINTENANCE & WATERPROOFING					
7	Replace Expansion Joints Level 1	$38,000		$38,000		1
8	Replace Expansion joint seals at Stairs levels 2 thru 5	$76,000		$76,000		1
9	Replace Expansion Joint Cover Plates Doors	$4,000		$4,000		1
10	Replace Expansion Joint Cover Plates Roof	$14,000		$14,000		1
11	Rout and Seal Construction Joints	$4,000		$4,000		1
12	Rout & Seal existing cracks on all supported levels	$3,000		$3,000		1
13	Rout & Seal existing cracks and joints on Ground Level		$9,000			2
14	Cove Sealants - Perimeter at roof only		$15,000			2
15	Cove Sealants - interior barrier walls - all floors		$13,000			2
16	Traffic bearing waterproofing membrane - Replace Existing	$12,000		$12,000		1
17	Traffic bearing waterproofing membrane at P/T stressing				$18,000	4
18	Traffic bearing waterproofing membrane at P/T Construction Joints				$14,000	4
19	Water repellant penetrating surface sealer stairway treads and slabs	$8,000				1
20	Façade Sealants	$11,000		$11,000		1
21	Façade Sealants wide 2" to 3"		$26,000			2
22	Sealants at Column Covers and Precast Walls		$7,000			2
23	Coating at Top and back of Precast Panels - roof level		$17,000			2
24	Coating at Top and back of Precast Panels - levels 2, 3, 4		$42,000			2
25	Glazing Sealants - replace Stair tower#2 West Stair	$5,000				1
26	Window Sealants - replace Stair tower#2 West Stair	$2,000				1
27	Clean & Seal Façade precast and Brick Panels		$106,000			2
	Subtotal Preventive Maintenance & Waterproofing	*$177,000*	*$235,000*	*$162,000*	*$32,000*	
	ARCHITECTURAL & OPERATIONAL					
28	Refurbish - Clean and Paint Bollards - Structural Slab		$14,000			2
29	Clean and Paint Bollards - Grade Level permanent mount		$8,000			2
30	Clean and Paint Architectural Screen and Grade Level		$11,000			2
31	Stair Tower Doors - Replace	$6,000				1
32	Stair Tower Doors - clean and Paint		$6,000			2
33	Clean & Paint Hollow metal Curtain Wall Framing - Stair #2 - West	$5,000				1
34	Parking Lines Restriping		$15,000			2
35	Painting Concrete Ceilings, Columns, Walls			$560,000		3

Priority Legend:

Priority 1 - Important : Work recommended within 1 - 3 years
Priority 2 - Work recommended within 3-10 years
Priority 3 - Programmed : Work recommended 10 years or more
Priority 4 - Programmed : Enhancement Work

Estimated Budget Continued next Page

Table 2 - Estimated Budget Continued from previous Page

35	Painting Concrete Ceilings, Columns, Walls			$560,000		3
36	Painting - Stair / Elevator Tower Walls & Ceilings			$140,000		3
37	Repair Signs applied to Columns	$2,000				2
38	Signage and Graphics Rehabilitation			$140,000		3
39	Rolling Gates - refurbish		$5,000			2
40	Elevators - maintenance, repair and modernization			$250,000		3
41	Pay Stations - rehabilitation			$60,000		3
42	Replace Existing Floor Coating - First Level		$3,000			2
	Subtotal Architectural & Operational	*$13,000*	*$62,000*	*$1,150,000*	*$0*	
	MECHANICAL					
43	Fans & vents Misc. Allowance		$2,000			2
	Subtotal Mechanical	*$0*	*$2,000*	*$0*	*$0*	
	Electrical					
44	Move Electrical Lines in Expansion Joints	$34,000				1
45	Repair Electrical Conduit and Outlets on Column Line B& C	$27,000				1
46	Repair Electrical boxes and Conduit with water damage	$12,000				
47	Rehabilitation of Lighting System			$813,000		3
	Subtotal Electrical	*$73,000*	*$0*	*$813,000*	*$0*	
	PLUMBING					
48	Rehabilitation of Plumbing System			$500,000		3
49	Repair and Paint Pipe Guards	$3,000				1
50	Repair Drainage Piping sleeves, drains, drain covers, sediment buckets	$8,000				1
	Subtotal Plumbing	*$11,000*	*$0*	*$500,000*	*$0*	
	FIRE PROTECTION					
51	Sprinklers System Rehabilitation			$750,000		3
52	Fire Alarm System Rehabilitation			$500,000		3
53	Fire Extinguisher Cabinets Repair or Replacement Damaged Units	$2,000				1
	Subtotal Fire Protection	*$2,000*	*$0*	*$1,250,000*	*$0*	
	WATER RETENTION FACILITY					
54	Concrete Spall repairs, Concrete pipe grout repairs, Corrosion Protection metal ladder & Manholes	$10,000				1
	Subtotal Water Retention Facility	*$10,000*	*$0*	*$0*	*$0*	
	SUB-TOTAL ESTIMATED CONSTRUCTION COSTS	**$401,000**	**$343,000**	**$4,185,000**	**$35,000**	
a)	Engineering Design, Repair Drawings & Specifications	$18,000	$15,000	$188,000	$2,000	
b)	Construction Administration & Technical Supervision	$24,000	$21,000	$251,000	$2,000	
	GRAND TOTAL ESTIMATED CONSTRUCTION COSTS	**$443,000**	**$379,000**	**$4,624,000**	**$39,000**	
	ENHANCEMENT ALTERNATIVE PREVENTIVE MAINTENANCE					
1	Water repellant penetrating surface sealer all supported floor slabs				$336,000	

Priority Legend:

Priority 1 - Important : Work recommended within 1 - 3 years
Priority 2 - Work recommended within 3-10 years
Priority 3 - Programmed : Work recommended 10 years or more
Priority 4 - Programmed : Enhancement Work

The preceding recommended repair programs & budget estimates assumes the following:

1. Work is presented in 2015 dollars.
2. Contingency funds have not been included in the cost estimate above.

The Priority 1 & 2 items represent the construction budget to continue garage operations and implement preventive and proactive maintenance requirements for the garage for the next ten years.

The priority 3 items include system replacements for Architectural and MEPF equipment typically required at 20 to 25 years after construction. The ten year plan is approaching this time frame.

BUDGETING for PHASED CONSTRUCTION

Construction staging and phasing is required for most garages of this age to allow continued operations for the parking customers and provide revenue for the owner. The construction areas need to be separated from the garage areas in operation for the safety of the patrons and to allow reasonable productivity for the contractor. This garage has a high occupancy rate from the Metra commuters and customers and employees for the downtown businesses. Taking parking spaces away from these paring users will reduce garage revenue, but can also have financial consequences on the businesses and commuters. During the design of garage repairs, the staging and phases plans will need to evaluate the extent of parking spaces removed from service and potential means to relocate or provide temporary alternatives.

Since the garage is closed at night, night time work is the most logical approach to giving the contractor large work areas in the garage. Since the garage is located adjacent to a residential building, the construction plan will need to include provisions for noise and dust control that are acceptable to the neighbors and village ordnances. There is typically a mix of work that needs to be done during the day and work that can shifted to night time hours. These are common requirements for garage repairs. The budgeting provided is based on a focus toward night time work and restoration contractors are familiar with means and methods to provide a successful project.

Appendix A includes the Budget Tables for this project.

- Table 2 is a large sheet copy of table 2 in the report to show all items on one page.
- Table 3 provides the ten year budget plan. The budget shows staging and phasing of the work.
- Table 4 includes the cost of general inflation on the ten year plan shown in Table 3. The inflation rate has been low for the last 5 years with a high of 3.2 in 2011 and lows near 1.6 in in 2010, 2013, and 2014. The 5 year average is 2.0. A general inflation rate of 2.5% was used in the table to provide less sensitivity to changes from the 3 years with low inflation rates. After 8 years the costs have increased 20% and after ten years the increase is more than 30%. The Table can be repopulated for alternative rates if desired. Rates in this discussion are based on Table 24 from the Historical Consumer Price Index that provides an annual average of all items.
- Table 5 identifies an example of alternative phasing that would be not be preferred, but would allow a budget item to be phased over two years. For example the expansion joints would include two stairs one year and one stair the next year. This typically results in increased cost due to two mobilizations by a contractor and if two separate bid packages are required by the budget - it can result in two different types of materials. There are many variables to consider and some of these are not under

control of the owner or designer (ie market conditions). In general it is best to construct the maintenance items in the largest packages the budget can accommodate to get the best pricing and keep the materials the same for easier maintenance.

- Table 6 provides a summary of the remaining economic useful life for the various building elements and components. For the waterproofing systems the end of life typically represents preventive maintenance replacements of the element. For the concrete systems, the economic life typically includes capital expenditures for limited repairs to the concrete. It is different than the service life definition that indicates the time until the concrete needs repair.

The budget estimate tables have included our experience with other parking structures that are typically similar to this facility. Some of the work items will be more sensitive to small work areas or night time work than others. Re-painting the large surface areas in this garage is one such example. The lowest cost result when the contractor has large work areas and is not encumbered with protective barriers or partitions at the perimeter of his work area to protect the ongoing garage operations. For this garage, these conditions may be best approached at night when the garage is closed or weekends with lower occupancy. Painting the stairways that are enclosed should be able to be staged and completed without much difficulty at night or at low occupancy. The garage ceiling and columns likely will work best at night. These details are developed during the repair design. Assuming that staging and phasing will match typical garage maintenance and restoration programs, an average budget has been used that is between the worst and best case conditions.

SUMMARY

In summary, this garage requires normal repairs and maintenance to provide a serviceable facility that can continue operations with normal parking garage maintenance.

APPENDIX A - ESTIMATED CONSTRUCTION BUDGETS

BUDGET TABLES

TABLE 2 – LINE ITEM - ESTIMATED BUDGET FOR MAINTENANCE AND REPAIR

No.	DESCRIPTION	Estimated Cost Priority	Estimated Cost Priority	Estimated Cost Priority 3	Enhancement Alternatives	Priority
	GENERAL CONDITIONS & TEMPORARY PROTECTION ETC.					
1	Contractor's General Conditions	$30,000	$25,000	$310,000	$3,000	
	Subtotal General Conditions & Temporary Protection Etc.	*$30,000*	*$25,000*	*$310,000*	*$3,000*	
	STRUCTURAL & FAÇADE					
2	P/T Tendon anchor pocket grout	$9,000				1
3	Precast Column Cover; Panel evaluation and repairs	$50,000				1
4	Precast Concrete Lift pockets, and misc. repairs		$11,000			2
5	CMU Wall at first Level security and electrical rooms		$8,000			2
6	Structural concrete repairs including Column Spalls, vertical and overhead repairs	$26,000				1
	Subtotal Structural & Façade	*$85,000*	*$19,000*	*$0*	*$0*	
	PREVENTIVE MAINTENANCE & WATERPROOFING					
7	Replace Expansion Joints Level 1	$38,000		$38,000		1
8	Replace Expansion joint seals at Stairs levels 2 thru 5	$76,000		$76,000		1
9	Replace Expansion Joint Cover Plates Doors	$4,000		$4,000		1
10	Replace Expansion Joint Cover Plates Roof	$14,000		$14,000		1
11	Rout and Seal Construction Joints	$4,000		$4,000		1
12	Rout & Seal existing cracks on all supported levels	$3,000		$3,000		1
13	Rout & Seal existing cracks and joints on Ground Level		$9,000			2
14	Cove Sealants - Perimeter at roof only		$15,000			2
15	Cove Sealants - interior barrier walls - all floors		$13,000			2
16	Traffic bearing waterproofing membrane - Replace Existing	$12,000		$12,000		1
17	Traffic bearing waterproofing membrane at P/T stressing				$18,000	4
18	Traffic bearing waterproofing membrane at P/T Construction Joints				$14,000	4
19	Water repellant penetrating surface sealer stairway treads and slabs	$8,000				1
20	Façade Sealants	$11,000		$11,000		1
21	Façade Sealants wide 2" to 3"		$26,000			2
22	Sealants at Column Covers and Precast Walls		$7,000			2
23	Coating at Top and back of Precast Panels - roof level		$17,000			2
24	Coating at Top and back of Precast Panels - levels 2, 3, 4		$42,000			2
25	Glazing Sealants - replace Stair tower#2 West Stair	$5,000				1
26	Window Sealants - replace Stair tower#2 West Stair	$2,000				1
27	Clean & Seal Façade precast and Brick Panels		$106,000			2
	Subtotal Preventive Maintenance & Waterproofing	*$177,000*	*$235,000*	*$162,000*	*$32,000*	
	ARCHITECTURAL & OPERATIONAL					
28	Refurbish - Clean and Paint Bollards - Structural Slab		$14,000			2
29	Clean and Paint Bollards - Grade Level permanent mount		$8,000			2
30	Clean and Paint Architectural Screen and Grade Level		$11,000			2
31	Stair Tower Doors - Replace	$6,000				1
32	Stair Tower Doors - clean and Paint		$6,000			2
33	Clean & Paint Hollow metal Curtain Wall Framing - Stair #2 - West	$5,000				1
34	Parking Lines Restriping		$15,000			2
35	Painting Concrete Ceilings, Columns, Walls			$560,000		3
36	Painting - Stair / Elevator Tower Walls & Ceilings			$140,000		3
37	Repair Signs applied to Columns	$2,000				2
38	Signage and Graphics Rehabilitation			$140,000		3
39	Rolling Gates - refurbish		$5,000			2
40	Elevators - maintenance, repair and modernization			$250,000		3
41	Pay Stations - rehabilitation			$60,000		3
42	Replace Existing Floor Coating - First Level		$3,000			2
	Subtotal Architectural & Operational	*$13,000*	*$62,000*	*$1,150,000*	*$0*	
	MECHANICAL					
43	Fans & vents Misc. Allowance		$2,000			2
	Subtotal Mechanical	*$0*	*$2,000*	*$0*	*$0*	
	Electrical					
44	Move Electrical Lines in Expansion Joints	$34,000				1
45	Repair Electrical Conduit and Outlets on Column Line B& C	$27,000				1
46	Repair Electrical boxes and Conduit with water damage	$12,000				
47	Rehabilitation of Lighting System			$813,000		3
	Subtotal Electrical	*$73,000*	*$0*	*$813,000*	*$0*	
	PLUMBING					
48	Rehabilitation of Plumbing System			$500,000		3
49	Repair and Paint Pipe Guards	$3,000				1
50	Repair Drainage Piping sleeves, drains, drain covers, sediment buckets	$8,000				1
	Subtotal Plumbing	*$11,000*	*$0*	*$500,000*	*$0*	
	FIRE PROTECTION					
51	Sprinklers System Rehabilitation			$750,000		3
52	Fire Alarm System Rehabilitation			$500,000		3
53	Fire Extinguisher Cabinets Repair or Replacement Damaged Units	$2,000				1
	Subtotal Fire Protection	*$2,000*	*$0*	*$1,250,000*	*$0*	
	WATER RETENTION FACILITY					
54	Concrete Spall repairs, Concrete pipe grout repairs, Corrosion Protection metal ladder & Manholes	$10,000				1
	Subtotal Water Retention Facility	*$10,000*	*$0*	*$0*	*$0*	
	SUB-TOTAL ESTIMATED CONSTRUCTION COSTS	**$401,000**	**$343,000**	**$4,185,000**	**$35,000**	
a)	Engineering Design, Repair Drawings & Specifications	$18,000	$15,000	$188,000	$2,000	
b)	Construction Administration & Technical Supervision	$24,000	$21,000	$251,000	$2,000	
	GRAND TOTAL ESTIMATED CONSTRUCTION COSTS	**$443,000**	**$379,000**	**$4,624,000**	**$39,000**	

	ENHANCEMENT ALTERNATIVE PREVENTIVE MAINTENANCE					
1	Water repellant penetrating surface sealer all supported floor slabs				$336,000	

Priority Legend:

- Priority 1 - Important : Work recommended within 1 - 3 years
- Priority 2 - Work recommended within 3-10 years
- Priority 3 - Programmed : Work recommended 10 years or more
- Priority 4 - Programmed : Enhancement Work

TABLE 3 - TEN YEAR BUDGET FOR ESTIMATED REPAIR AND MAINTENANCE PLAN (no-Escalation)

No.	DESCRIPTION	Estimated Cost Priority 1			Estimated Cost Priority 2								Priority 3	Enhancement Alternatives	Priority
		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026			
	Year of Construction/ Age 2004	12	13	14	15	16	17	18	19	20	21	22			
	GENERAL CONDITIONS & TEMPORARY PROTECTION ETC.														
1	Contractor's General Conditions	$14,000	$7,000	$6,000	$6,000	$3,000	$2,000	$2,000	$8,000	$3,000	$0	$0	$312,000	$3,000	
	Subtotal General Conditions & Temporary Protection Etc.	*$14,000*	*$7,000*	*$6,000*	*$6,000*	*$3,000*	*$2,000*	*$2,000*	*$8,000*	*$3,000*	*$0*	*$0*	*$312,000*	*$3,000*	
	STRUCTURAL & FAÇADE														
2	P/T Tendon anchor pocket grout			$9,000											1
3	Precast Column Cover; Panel evaluation and repairs	$50,000													1
4	Precast Concrete Lift pockets, and misc. repairs				$11,000										2
5	CMU Wall at first Level security and electrical rooms				$8,000										2
6	Structural concrete repairs including Column Spalls, vertical and overhead repairs		$26,000												1
	Subtotal Structural & Façade	*$50,000*	*$26,000*	*$9,000*	*$19,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	
	PREVENTIVE MAINTENANCE & WATERPROOFING														
7	Replace Expansion Joints Level 1		$38,000										$38,000		1
8	Replace Expansion joint seals at Stairs levels 2 thru 5	$76,000											$76,000		1
9	Replace Expansion Joint Cover Plates at Doors	$4,000											$4,000		1
10	Replace Expansion Joint Cover Plates Roof	$14,000											$14,000		1
11	Rout and Seal Construction Joints		$4,000										$4,000		1
12	Rout & Seal existing cracks on all supported levels	$3,000											$3,000		1
13	Rout & Seal existing joints on Ground Level							$9,000							2
14	Cove Sealants - Perimeter at roof only				$15,000										2
15	Cove Sealants - interior barrier walls - all floors					$13,000									2
16	Traffic bearing waterproofing membrane - Replace Existing			$12,000									$12,000		1
17	Traffic bearing waterproofing membrane at P/T stressing													$18,000	4
18	Traffic bearing waterproofing membrane at P/T Construction Joints													$14,000	4
19	Water repellant penetrating surface sealer stairway treads and slabs						$8,000								2
20	Façade Sealants			$11,000									$11,000		1
21	Façade Sealants wide 2" to 3"			$26,000											1
22	Sealants at Column Covers and Precast Walls					$7,000									2
23	Coating at Top and back of Precast Panels - roof level							$17,000							2
24	Coating at Top and back of Precast Panels - levels 2, 3, 4									$42,000					2
25	Glazing Sealants - replace Stair tower#2 West Stair			$5,000											1
26	Window Sealants - replace Stair tower#2 West Stair			$2,000											1
27	Clean & Seal Façade precast and Brick Panels								$106,000						2
	Subtotal Preventive Maintenance & Waterproofing	*$97,000*	*$42,000*	*$56,000*	*$15,000*	*$20,000*	*$8,000*	*$26,000*	*$106,000*	*$42,000*	*$0*	*$0*	*$162,000*	*$32,000*	
	ARCHITECTURAL & OPERATIONAL														
28	Refurbish - Clean and Paint Bollards - Structural Slab					$14,000									2
29	Clean and Paint Bollards - Grade Level permanent mount						$8,000								2
30	Clean and Paint Architectural Screen and Grade Level						$11,000								2
31	Stair Tower Doors - Replace			$6,000											1
32	Stair Tower Doors - clean and Paint				$6,000										2
33	Clean and Paint Hollow metal Curtain Wall Framing - Stair #2 - West Stair			$5,000											1
34	Parking Lines Restriping				$15,000										2
35	Painting Concrete Ceilings, Columns, Walls												$560,000		3
36	Painting - Stair / Elevator Tower Walls & Ceilings												$140,000		3
37	Repair Signs applied to Columns			$2,000											2
38	Signage and Graphics Rehabilitation												$140,000		3
39	Rolling Gates - refurbish				$5,000										2
40	Elevators - maintenance, repair and modernization												$250,000		3
41	Pay Stations - rehabilitation												$60,000		3
42	Replace Existing Floor Coating - First Level				$3,000										2
	Subtotal Architectural & Operational	*$0*	*$0*	*$13,000*	*$29,000*	*$14,000*	*$19,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$1,150,000*	*$0*	

Continued - TABLE 3 - TEN YEAR BUDGET FOR ESTIMATED REPAIR AND MAINTENANCE PLAN (no-Escalation)

	MECHANICAL														
43	Fans & vents Misc. Allowance										$2,000				2
	Subtotal Mechanical	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$2,000*	*$0*	*$0*	*$0*	
	Electrical														
44	Move Electrical Lines in Expansion Joints	$34,000													1
45	Repair Electrical Conduit and Outlets on Column Line B& C												$27,000		3
46	Repair Electrical boxes and Conduit with water damage				$12,000										2
47	Rehabilitation of Lighting System												$813,000	$0	3
	Subtotal Electrical	*$34,000*	*$0*	*$0*	*$12,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$840,000*	*$0*	
	PLUMBING														
48	Rehabilitation of Plumbing System												$500,000	$0	3
49	Repair and Paint Pipe Guards		$3,000												1
50	Repair Drainage Piping, supports sleeves, drains, drain covers, sediment buckets		$8,000												1
	Subtotal Plumbing	*$0*	*$11,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$500,000*	*$0*	
	FIRE PROTECTION														
51	Sprinklers System Rehabilitation												$750,000	$0	3
52	Fire Alarm System Rehabilitation												$500,000	$0	3
53	Fire Extinguisher Cabinets Repair or Replacement of Water Damaged Units			$2,000											1
	Subtotal Fire Protection	*$0*	*$0*	*$2,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$1,250,000*	*$0*	
	WATER RETENTION FACILITY														
54	Concrete Spall repairs, pipe grout, Corrosion Protection metal ladder & Manholes		$10,000												1
	Subtotal Water Retention Facility	*$0*	*$10,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*			
	SUB-TOTAL ESTIMATED CONSTRUCTION COSTS	**$195,000**	**$96,000**	**$86,000**	**$81,000**	**$37,000**	**$29,000**	**$28,000**	**$114,000**	**$45,000**	**$2,000**	**$0**	**$4,214,000**	**$35,000**	
a)	**Engineering Design, Repair Drawings & Specifications**	**$9,000**	**$4,000**	**$4,000**	**$4,000**	**$2,000**	**$1,000**	**$1,000**	**$5,000**	**$2,000**	**$0**	**$0**	**$190,000**	**$2,000**	
b)	**Construction Administration & Technical Supervision**	**$12,000**	**$6,000**	**$5,000**	**$5,000**	**$2,000**	**$2,000**	**$2,000**	**$7,000**	**$3,000**	**$0**	**$0**	**$253,000**	**$2,000**	
	GRAND TOTAL ESTIMATED CONSTRUCTION COSTS	**$216,000**	**$106,000**	**$95,000**	**$90,000**	**$41,000**	**$32,000**	**$31,000**	**$126,000**	**$50,000**	**$2,000**	**$0**	**$4,657,000**	**$39,000**	

	ENHANCEMENT ALTERNATE PREVENTIVE MAINTENANCE														
1	Water repellant penetrating surface sealer all supported floor slabs													$336,000	E

Priority Legend:

Priority 1 - Important : Work recommended within 1 - 3 years

Priority 2 - Work recommended within 3-10 years

Priority 3 - Programmed : Work recommended 10 years or more

Priority 4 - Programmed : Enhancement Work

TABLE 4 - TEN YEAR BUDGET FOR ESTIMATED REPAIR AND MAINTENANCE PLAN – (Escalation Included)

No.	DESCRIPTION	Estimated Cost Priority 1			Estimated Cost Priority 2								Estimated Priority 3	Enhancement Alternatives	Priority
	YEAR	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026			
	Age Based on 2004 Construction Year	12	13	14	15	16	17	18	19	20	21	22	23+		
	GENERAL CONDITIONS & TEMPORARY PROTECTION ETC.														
1	Contractor's General Conditions	$14,350	$7,354	$6,461	$6,623	$3,394	$2,319	$2,377	$9,747	$3,747	$0	$0	$419,605	$3,000	
	Subtotal General Conditions & Temporary Protection Etc.	*$14,350*	*$7,354*	*$6,461*	*$6,623*	*$3,394*	*$2,319*	*$2,377*	*$9,747*	*$3,747*	*$0*	*$0*	*$419,605*	*$3,000*	
	STRUCTURAL & FAÇADE														
2	P/T Tendon anchor pocket grout	$0	$0	$9,692	$0	$0	$0	$0	$0	$0	$0	$0	$0		1
3	Precast Column Cover; Panel evaluation and repairs	$51,250	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		1
4	Precast Concrete Lift pockets, and misc. repairs	$0	$0	$0	$12,142	$0	$0	$0	$0	$0	$0	$0	$0		2
5	CMU Wall at first Level security and electrical rooms	$0	$0	$0	$8,831	$0	$0	$0	$0	$0	$0	$0	$0		2
6	Structural concrete repairs including Column Spalls, vertical and overhead repairs	$0	$27,316	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		1
	Subtotal Structural & Façade	*$51,250*	*$27,316*	*$9,692*	*$20,972*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	
	PREVENTIVE MAINTENANCE & WATERPROOFING														
7	Replace Expansion Joints Level 1	$0	$39,924	$0	$0	$0	$0	$0	$0	$0	$0	$0	$51,106		1
8	Replace Expansion joint seals at Stairs levels 2 thru 5	$77,900	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$102,212		1
9	Replace Expansion Joint Cover Plates at Doors	$4,100	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5,380		1
10	Replace Expansion Joint Cover Plates Roof	$14,350	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$18,828		1
11	Rout and Seal Construction Joints	$0	$4,203	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5,380		1
12	Rout & Seal existing cracks on all supported levels	$3,075	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$4,035		1
13	Rout & Seal existing joints on Ground Level	$0	$0	$0	$0	$0	$0	$10,698	$0	$0	$0	$0	$0		2
14	Cove Sealants - Perimeter at roof only	$0	$0	$0	$16,557	$0	$0	$0	$0	$0	$0	$0	$0		2
15	Cove Sealants - interior barrier walls - all floors	$0	$0	$0	$0	$14,708	$0	$0	$0	$0	$0	$0	$0		2
16	Traffic bearing waterproofing membrane - Replace Existing	$0	$0	$12,923	$0	$0	$0	$0	$0	$0	$0	$0	$16,139		1
17	Traffic bearing waterproofing membrane at P/T stressing	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$18,000	4
18	Traffic bearing waterproofing membrane at P/T Construction Joints	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$14,000	4
19	Water repellant penetrating surface sealer stairway treads and slabs	$0	$0	$0	$0	$0	$9,278	$0	$0	$0	$0	$0	$0		1
20	Façade Sealants	$0	$0	$11,846	$0	$0	$0	$0	$0	$0	$0	$0	$14,794		1
21	Façade Sealants wide 2" to 3"	$0	$0	$27,999	$0	$0	$0	$0	$0	$0	$0	$0	$0		1
22	Sealants at Column Covers and Precast Walls	$0	$0	$0	$0	$7,920	$0	$0	$0	$0	$0	$0	$0		2
23	Coating at Top and back of Precast Panels - roof level	$0	$0	$0	$0	$0	$0	$20,208	$0	$0	$0	$0	$0		2
24	Coating at Top and back of Precast Panels - levels 2, 3, 4	$0	$0	$0	$0	$0	$0	$0	$0	$52,452	$0	$0	$0		2
25	Glazing Sealants - replace Stair tower#2 West Stair	$0	$0	$5,384	$0	$0	$0	$0	$0	$0	$0	$0	$0		1
26	Window Sealants - replace Stair tower#2 West Stair	$0	$0	$2,154	$0	$0	$0	$0	$0	$0	$0	$0	$0		1
27	Clean & Seal Façade precast and Brick Panels	$0	$0	$0	$0	$0	$0	$0	$129,151	$0	$0	$0	$0		2
	Subtotal Preventive Maintenance & Waterproofing	*$99,425*	*$44,126*	*$60,306*	*$16,557*	*$22,628*	*$9,278*	*$30,906*	*$129,151*	*$52,452*	*$0*	*$0*	*$217,872*	*$32,000*	
	ARCHITECTURAL & OPERATIONAL														
28	Refurbish - Clean and Paint Bollards - Structural Slab	$0	$0	$0	$0	$15,840	$0	$0	$0	$0	$0	$0	$0		2
29	Clean and Paint Bollards - Grade Level permanent mount	$0	$0	$0	$0	$0	$9,278	$0	$0	$0	$0	$0	$0		2
30	Clean and Paint Architectural Screen and Grade Level	$0	$0	$0	$0	$0	$12,757	$0	$0	$0	$0	$0	$0		2
31	Stair Tower Doors - Replace	$0	$0	$6,461	$0	$0	$0	$0	$0	$0	$0	$0	$0		1
32	Stair Tower Doors - clean and Paint	$0	$0	$0	$6,623	$0	$0	$0	$0	$0	$0	$0	$0		2
33	Clean and Paint Hollow metal Curtain Wall Framing - Stair #2 - West Stair	$0	$0	$5,384	$0	$0	$0	$0	$0	$0	$0	$0	$0		1
34	Parking Lines Restriping	$0	$0	$0	$16,557	$0	$0	$0	$0	$0	$0	$0	$0		2
35	Painting Concrete Ceilings, Columns, Walls	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$753,138		3
36	Painting - Stair / Elevator Tower Walls & Ceilings	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$188,284		3
37	Repair Signs applied to Columns	$0	$0	$2,154	$0	$0	$0	$0	$0	$0	$0	$0	$0		2
38	Signage and Graphics Rehabilitation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$188,284		3
39	Rolling Gates - refurbish	$0	$0	$0	$5,519	$0	$0	$0	$0	$0	$0	$0	$0		2
40	Elevators - maintenance, repair and modernization	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$336,222		3
41	Pay Stations - rehabilitation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$80,693		3
42	Replace Existing Floor Coating - First Level	$0	$0	$0	$3,311	$0	$0	$0	$0	$0	$0	$0	$0		2
	Subtotal Architectural & Operational	*$0*	*$0*	*$14,000*	*$32,011*	*$15,840*	*$22,034*	*$0*	*$0*	*$0*	*$0*	*$0*	*$1,546,622*	*$0*	

(Continued) TABLE 4 - TEN YEAR BUDGET FOR ESTIMATED REPAIR AND MAINTENANCE PLAN – (Escalation Included)

	MECHANICAL														
43	Fans & vents Misc. Allowance										$2,000				2
	Subtotal Mechanical	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$2,000*	*$0*	*$0*	*$0*	
	Electrical														
44	Move Electrical Lines in Expansion Joints	$34,850	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		1
45	Repair Electrical Conduit and Outlets on Column Line B& C	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$36,312		3
46	Repair Electrical boxes and Conduit with water damage	$0	$0	$0	$13,246	$0	$0	$0	$0	$0	$0	$0	$0		2
47	Rehabilitation of Lighting System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,093,395	$0	3
	Subtotal Electrical	*$34,850*	*$0*	*$0*	*$13,246*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$1,129,707*	*$0*	
	PLUMBING														
48	Rehabilitation of Plumbing System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$672,444	$0	3
49	Repair and Paint Pipe Guards	$0	$3,152	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		1
50	Repair Drainage Piping, supports sleeves, drains, drain covers, sediment buckets	$0	$8,405	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		1
	Subtotal Plumbing	*$0*	*$11,557*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$672,444*	*$0*	
	FIRE PROTECTION														
51	Sprinklers System Rehabilitation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,008,667	$0	3
52	Fire Alarm System Rehabilitation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$672,444	$0	3
53	Fire Extinguisher Cabinets Repair or Replacement of Water Damaged Units	$0	$0	$2,154	$0	$0	$0	$0	$0	$0	$0	$0	$0		1
	Subtotal Fire Protection	*$0*	*$0*	*$2,154*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$1,681,111*	*$0*	
	WATER RETENTION FACILITY														
54	Concrete Spall repairs, Concrete pipe grout repairs, Corrosion Protection metal ladder & Manholes	$0	$10,506	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		1
	Subtotal Water Retention Facility	*$0*	*$10,506*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*		
	SUB-TOTAL ESTIMATED CONSTRUCTION COSTS	**$199,875**	**$100,860**	**$92,613**	**$89,409**	**$41,862**	**$33,631**	**$33,283**	**$138,898**	**$56,199**	**$2,000**	**$0**	**$5,667,362**	**$35,000**	
a)	Engineering Design, Repair Drawings & Specifications	$9,225	$4,203	$4,308	$4,415	$2,263	$1,160	$1,189	$6,092	$2,498	$0	$0	$255,529	**$2,000**	
b)	Construction Administration & Technical Supervision	$12,300	$6,304	$5,384	$5,519	$2,263	$2,319	$2,377	$8,529	$3,747	$0	$0	$340,257	**$2,000**	
	GRAND TOTAL ESTIMATED CONSTRUCTION COSTS	**$221,400**	**$111,366**	**$102,305**	**$99,343**	**$46,388**	**$37,110**	**$36,849**	**$153,519**	**$62,443**	**$2,000**	**$0**	**$6,263,147**	**$39,000**	

	ENHANCEMENT ALTERNATE PREVENTIVE MAINTENANCE														
1	Water repellant penetrating surface sealer all supported floor slabs													$336,000	E

Priority Legend:

Priority 1 - Important : Work recommended within 1 - 3 years
Priority 2 - Work recommended within 3-10 years
Priority 3 - Programmed : Work recommended 10 years or more
Priority 4 - Programmed : Enhancement Work

TABLE 5 - TEN YEAR BUDGET FOR ESTIMATED REPAIR AND MAINTENANCE PLAN

(Alternative phasing)

No.	DESCRIPTION	Estimated Cost Priority 1			Estimated Cost Priority 2								Estimated Cost Priority 3	Enhancement Alternatives	Priority
		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026			
	Year of Construction/ Age 2004	12	13	14	15	16	17	18	19	20	21	22	23+		
	GENERAL CONDITIONS & TEMPORARY PROTECTION ETC.														
1	Contractor's General Conditions	$11,000	$7,000	$9,000	$6,000	$3,000	$2,000	$2,000	$8,000	$3,000	$0	$0	$312,000	$3,000	
	Subtotal General Conditions & Temporary Protection Etc.	*$11,000*	*$7,000*	*$9,000*	*$6,000*	*$3,000*	*$2,000*	*$2,000*	*$8,000*	*$3,000*	*$0*	*$0*	*$312,000*	*$3,000*	
	STRUCTURAL & FAÇADE														
2	P/T Tendon anchor pocket grout			$9,000											1
3	Precast Column Cover; Panel evaluation and repairs	$50,000													1
4	Precast Concrete Lift pockets, and misc. repairs				$11,000										2
5	CMU Wall at first Level security and electrical rooms				$8,000										2
6	Structural concrete repairs including Column Spalls, vertical and overhead repairs		$26,000												1
	Subtotal Structural & Façade	*$50,000*	*$26,000*	*$9,000*	*$19,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	
	PREVENTIVE MAINTENANCE & WATERPROOFING														
7	Replace Expansion Joints Level 1			$38,000									$38,000		1
8	Replace Expansion joint seals at Stairs levels 2 thru 5	$50,667	$25,308										$76,000		1
9	Replace Expansion Joint Cover Plates at Doors	$2,667	$1,332										$4,000		1
10	Replace Expansion Joint Cover Plates Roof	$9,333	$4,662										$14,000		1
11	Rout and Seal Construction Joints		$4,000										$4,000		1
12	Rout & Seal existing cracks on all supported levels	$3,000											$3,000		1
13	Rout & Seal existing joints on Ground Level							$9,000							2
14	Cove Sealants - Perimeter at roof only				$15,000										2
15	Cove Sealants - interior barrier walls - all floors					$13,000									2
16	Traffic bearing waterproofing membrane - Replace Existing			$12,000									$12,000		1
17	Traffic bearing waterproofing membrane at P/T stressing													$18,000	4
18	Traffic bearing waterproofing membrane at P/T Construction Joints													$14,000	4
19	Water repellant penetrating surface sealer stairway treads and slabs						$8,000								2
20	Façade Sealants			$11,000									$11,000		1
21	Façade Sealants wide 2" to 3"			$26,000											1
22	Sealants at Column Covers and Precast Walls					$7,000									2
23	Coating at Top and back of Precast Panels - roof level							$17,000							2
24	Coating at Top and back of Precast Panels - levels 2, 3, 4									$42,000					2
25	Glazing Sealants - replace Stair tower#2 West Stair			$5,000											1
26	Window Sealants - replace Stair tower#2 West Stair			$2,000											1
27	Clean & Seal Façade precast and Brick Panels								$106,000						2
	Subtotal Preventive Maintenance & Waterproofing	*$65,667*	*$35,302*	*$94,000*	*$15,000*	*$20,000*	*$8,000*	*$26,000*	*$106,000*	*$42,000*	*$0*	*$0*	*$162,000*	*$32,000*	
	ARCHITECTURAL & OPERATIONAL														
28	Refurbish - Clean and Paint Bollards - Structural Slab					$14,000									2
29	Clean and Paint Bollards - Grade Level permanent mount						$8,000								2
30	Clean and Paint Architectural Screen and Grade Level						$11,000								2
31	Stair Tower Doors - Replace			$6,000											1
32	Stair Tower Doors - clean and Paint				$6,000										2
33	Clean and Paint Hollow metal Curtain Wall Framing - Stair #2 - West Stair			$5,000											1
34	Parking Lines Restriping				$15,000										2
35	Painting Concrete Ceilings, Columns, Walls												$560,000		3
36	Painting - Stair / Elevator Tower Walls & Ceilings												$140,000		3
37	Repair Signs applied to Columns			$2,000											2
38	Signage and Graphics Rehabilitation												$140,000		3
39	Rolling Gates - refurbish				$5,000										2
40	Elevators - maintenance, repair and modernization												$250,000		3
41	Pay Stations - rehabilitation												$60,000		3
42	Replace Existing Floor Coating - First Level				$3,000										2
	Subtotal Architectural & Operational	*$0*	*$0*	*$13,000*	*$29,000*	*$14,000*	*$19,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$1,150,000*	*$0*	

TABLE 5 - TEN YEAR BUDGET FOR ESTIMATED REPAIR AND MAINTENANCE PLAN
(Alternative phasing)

	MECHANICAL														
43	Fans & vents Misc. Allowance										$2,000				2
	Subtotal Mechanical	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$2,000*	*$0*	*$0*	*$0*	
	Electrical														
44	Move Electrical Lines in Expansion Joints	$22,667	$11,333												1
45	Repair Electrical Conduit and Outlets on Column Line B& C												$27,000		3
46	Repair Electrical boxes and Conduit with water damage				$12,000										2
47	Rehabilitation of Lighting System												$813,000	$0	3
	Subtotal Electrical	*$22,667*	*$11,333*	*$0*	*$12,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$840,000*	*$0*	
	PLUMBING														
48	Rehabilitation of Plumbing System												$500,000	$0	3
49	Repair and Paint Pipe Guards		$3,000												1
50	Repair Drainage Piping, supports sleeves, drains, drain covers, sediment buckets		$8,000												1
	Subtotal Plumbing	*$0*	*$11,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$500,000*	*$0*	
	FIRE PROTECTION														
51	Sprinklers System Rehabilitation												$750,000	$0	3
52	Fire Alarm System Rehabilitation												$500,000	$0	3
53	Fire Extinguisher Cabinets Repair or Replacement of Water Damaged Units			$2,000											1
	Subtotal Fire Protection	*$0*	*$0*	*$2,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$1,250,000*	*$0*	
	WATER RETENTION FACILITY														
54	Concrete Spall repairs, Concrete pipe grout repairs, Corrosion Protection metal ladder & Manholes		$10,000												1
	Subtotal Water Retention Facility	*$0*	*$10,000*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*			
	SUB-TOTAL ESTIMATED CONSTRUCTION COSTS	**$149,333**	**$100,635**	**$127,000**	**$81,000**	**$37,000**	**$29,000**	**$28,000**	**$114,000**	**$45,000**	**$2,000**	**$0**	**$4,214,000**	**$35,000**	
a)	**Engineering Design, Repair Drawings & Specifications**	**$7,000**	**$5,000**	**$6,000**	**$4,000**	**$2,000**	**$1,000**	**$1,000**	**$5,000**	**$2,000**	**$0**	**$0**	**$190,000**	**$2,000**	
b)	**Construction Administration & Technical Supervision**	**$9,000**	**$6,000**	**$8,000**	**$5,000**	**$2,000**	**$2,000**	**$2,000**	**$7,000**	**$3,000**	**$0**	**$0**	**$253,000**	**$2,000**	
	GRAND TOTAL ESTIMATED CONSTRUCTION COSTS	**$165,333**	**$111,635**	**$141,000**	**$90,000**	**$41,000**	**$32,000**	**$31,000**	**$126,000**	**$50,000**	**$2,000**	**$0**	**$4,657,000**	**$39,000**	

	ENHANCEMENT ALTERNATE PREVENTIVE MAINTENANCE														
1	Water repellant penetrating surface sealer all supported floor slabs													$336,000	E

Priority Legend:

Priority 1 - Important : Work recommended within 1 - 3 years

Priority 2 - Work recommended within 3-10 years

Priority 3 - Programmed : Work recommended 10 years or more

Priority 4 - Programmed : Enhancement Work

TABLE 6 – OPINION OF REMAINING USEFUL ECONOMIC LIFE

No.	Component	Construction Date	Major Repair or Replacement	Age (years) 2015	Expected Economic Useful Life	Remaining Life (years)	Expected Service Life Until Repairs	Budget Repairs (years)	Comments
STRUCTURAL & FAÇADE									
1	Foundations	2004		11	Life	Life	Life		
3	Grade Level Slabs	2004		11	50	39	50	39	Repairs at 50 yrs, Economic Life includes repairs
5	Garage P/T Slabs & Beams	2004		11	70	59	50	39	Repairs at 50 yrs, Economic Life includes repairs
6	Columns	2004		11	70	59	50	39	Repairs at 50 yrs, Economic Life includes repairs
7	Precast Façade Panels with Brick	2004		11	60	49	50	39	Repairs at 50 yrs, Economic Life includes repairs
PREVENTIVE MAINTENANCE & WATERPROOFING									
8	Expansion Joints - Slab Level 1	2004		11	10	-1			
9	Expansion Joints at Stairs	2004		11	8	-3			
10	Construction Joints Slab on Grade	2004		11	10	-1			
11	Construction Joints & Cove Sealants Structural Slab	2004		11	10	-1			
12	Sealant - Open Joint At Slab and Spandrel - Roof	2004		11	8	-3			
13	Traffic bearing waterproofing membrane - Existing Rooms	2004		11	10	-1			
14	Façade Sealants	2004		11	8	-3			
15	Façade Sealants wide 2" to 3"	2004		11	8	-3			
16	Sealants at Column Covers and Precast Walls	2004		11	8	-3			
ARCHITECTURAL & OPERATIONAL									
17	Painted Finishes	2004		11	25	14			
18	Stairs	2004		11	50	39			
19	Stair Tower Doors	2004		11	30	19			
20	Stair Windows and Curtain Walls	2004		11	30	19			
21	Elevators	2004		11	50	39	30	19	Modernization is expected at 30 years
22	Bollards	2004		11	30	19			
23	Architectural Screen and Grade Level	2004		11	30	19			
24	Parking Lines Striping	2004		11	10	-1			
25	Painting Concrete Ceilings, Columns, Walls	2004		11	25	14			
26	Painting - Stair / Elevator Tower Walls & Ceilings	2004		11	25	14			
27	Signage and Graphics	2004		11	15	4			
28	Rolling Gates	2004		11	15	4			
PARKING EQUIPMENT									
29	Pay Stations	2004	2014	1	10	9			
MECHANICAL									
30	Unit Heaters in Stairs and Rooms	2004		11	20	9			
31	Fans & Vents Misc. Allowance	2004		11	20	9			
Electrical									
32	Electrical Lighting	2004	2010	5	20	15			
33	Electrical Generator	2004		11	25	14			
34	Lighted Signs	2004	2010	5	20	15			
PLUMBING									
35	Plumbing Drains and Drainage System	2004		11	25	14			
36	Plumbing Pumps	2004		11	25	14			
FIRE PROTECTION									
37	Sprinklers System	2004		11	25	14			
38	Fire Alarm System	2004		11	25	14			
39	Fire Extinguisher Cabinets	2004		11	20	9			
WATER RETENTION FACILITY									
40	Concrete Walls, Pier Floors	2004		11	70	59			
41	Waterproofing Floor	2004		11	10	-1			Waterproofing not vital to garage or water retenion functions
42	Waterproofing Walls & Ceiling	2004		11	15	4			
43	Electrical Lighting System	2004		11	N/A	N/A			Electrical System Disconnected and Abandoned

Notes

1. The Concrete Floor Slab Maintenance Plan requires budgeting for repairs at a time when floor slab spalls are sufficient to disrupt operations. Based on current information, this is estimated for 39 years. Repairs are expected to provide another 20 years of expected life.
2. Elevators typically are budgeted for Modernization at 25 to 30 years to archive an additional 20 years of service.
3. Other components or materials typically are replaced or rehabilitated at the end of economic useful life.

APPENDIX B - TESTING

Condition Assessment testing consisted of on-site examinations, testing, and collection of concrete samples for testing laboratory testing.

On-Site Examinations and Testing

- Chain Drag and Hammer Sounding
- Concrete Cover over Reinforcement
- Drilling of Powder samples for chloride ion concentration testing

The on-site examinations and testing consisted of sounding concrete surfaces for delaminations. The sounding included chain drag testing and hammer sounding. When the concrete surface is sounded, the presence of delamination or cracks below the concrete surface can be heard as "hollow" sounds. The chain drag on the floor surfaces did not detect hollow areas on the parking floor slabs. The hammer sounding of columns and beams detected small areas of delamination or spalls that require repairs.

The floor slab was drilled to collect powder samples of concrete to send to the testing laboratory for chloride ion concentration. Before drilling into the P/T slab surface a pachometer was used to locate steel bars or P/T tendons. The depth of the reinforcing bars was estimated based on the design drawing bar size and the depth estimate on the pachometer for that bar size. The pachometer generally located four bars at the boundary of the location used for drilling. Table B1 lists the average depth for the four bars at each location.

Excavations to confirm the Non-Destructive Testing (NDT) results were not in the scope of work for this condition assessment.

Location Drawing for Chloride Testing

A schematic floor plan is show and the sample collection locations are indicated for each floor in the parking structure.

Laboratory Testing

Concrete powder samples collected from each level of the parking facility were sent to Universal Construction Testing (UCT) for testing of the chloride ion concentration. The following pages include the testing results and analysis of the data.

- Summary of Acid Soluble Chloride in Content Concrete
- Summary of Acid Soluble Chloride in Content Concrete (Corrected for Baseline Chloride)
- UCT Testing Report

FIGURE B1 - CHLORIDE ION TESTING LOCATIONS

Floor Slab Locations

- **Chloride Testing**
- **Reinforcement Cover**

Location Key

A – Level 5
A – Level 3
A - Level 2
A – Level1

B – Level 5
B – Level 4

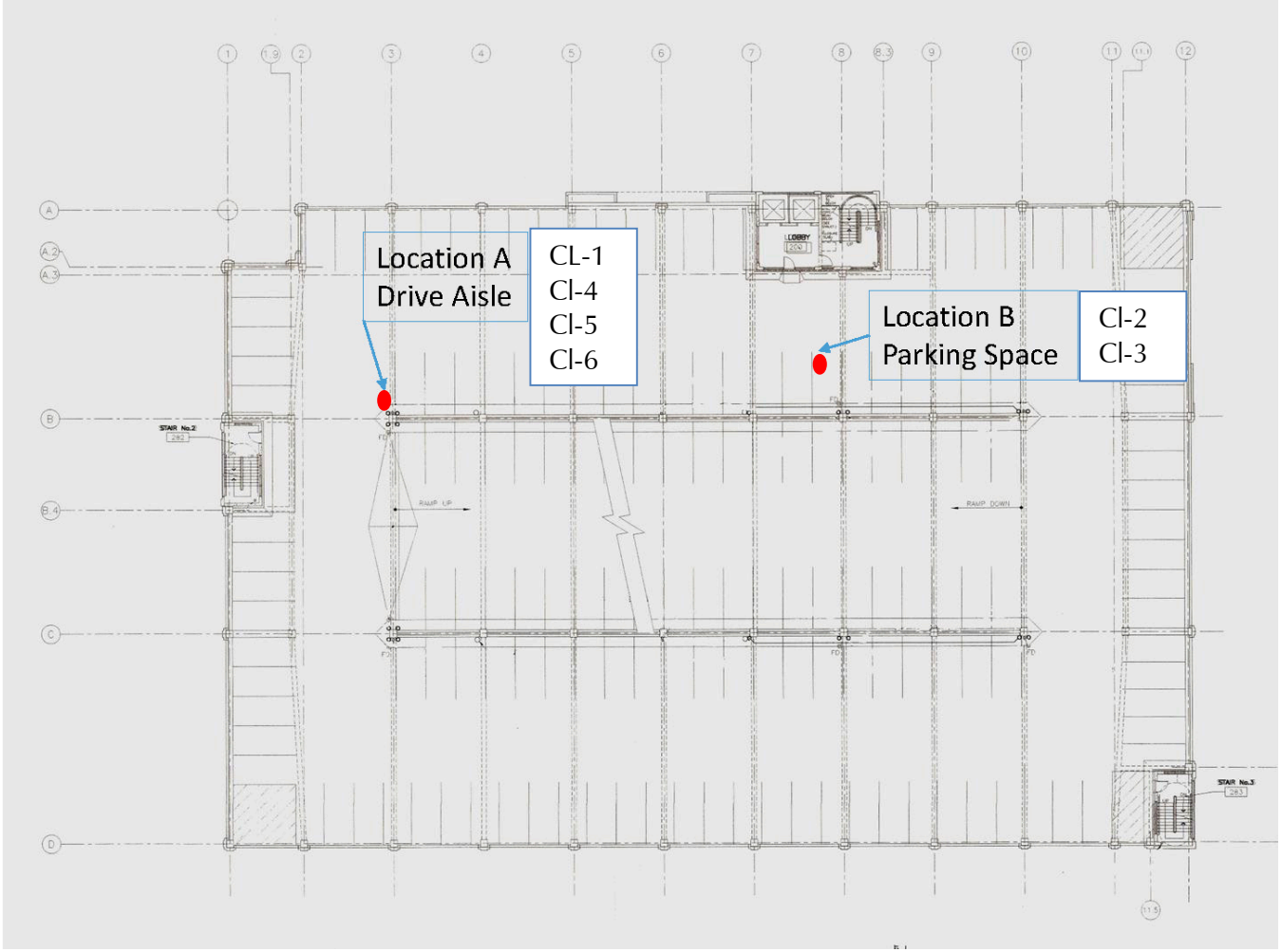


TABLE B1 - SUMMARY OF CHLORIDE ION TESTING RESULTS

Chloride Ion Concentration (ppm)

ID	Level	Location	Depth 0"-1"	Depth 1" - 2"	Depth 2"-3"	Avg Steel Depth (in)
CL1	Roof	Drive	2,690	630	530	2.13
CL2	Roof	Parking	2,020	600	560	1.98
CL3	4th	Parking	1,520	690	600	2.38
CL4	3rd	Drive	2,390	690	640	2.21
CL5	2nd	Drive	1,280	640	630	2.32
CL6	1st	Drive	1,380	640	630	2.09
		Average	1,880	648	598	2.18
					Low	1.90
					High	2.52

Table B1 summarizes the testing locations, chloride ion concentration and depth of concrete cover over reinforcement.

TABLE B2 - SUMMARY OF TESTING RESULTS

The chloride ion concentration in table B1 indicate a consistent chloride level of about 600 ppm in all the samples at the 2″ to 3″ depth. The 1″ to 2″ depth also has a consistent level of about 650 ppm. The table below has subtracted an assumed baseline level of chlorides of 530 ppm.

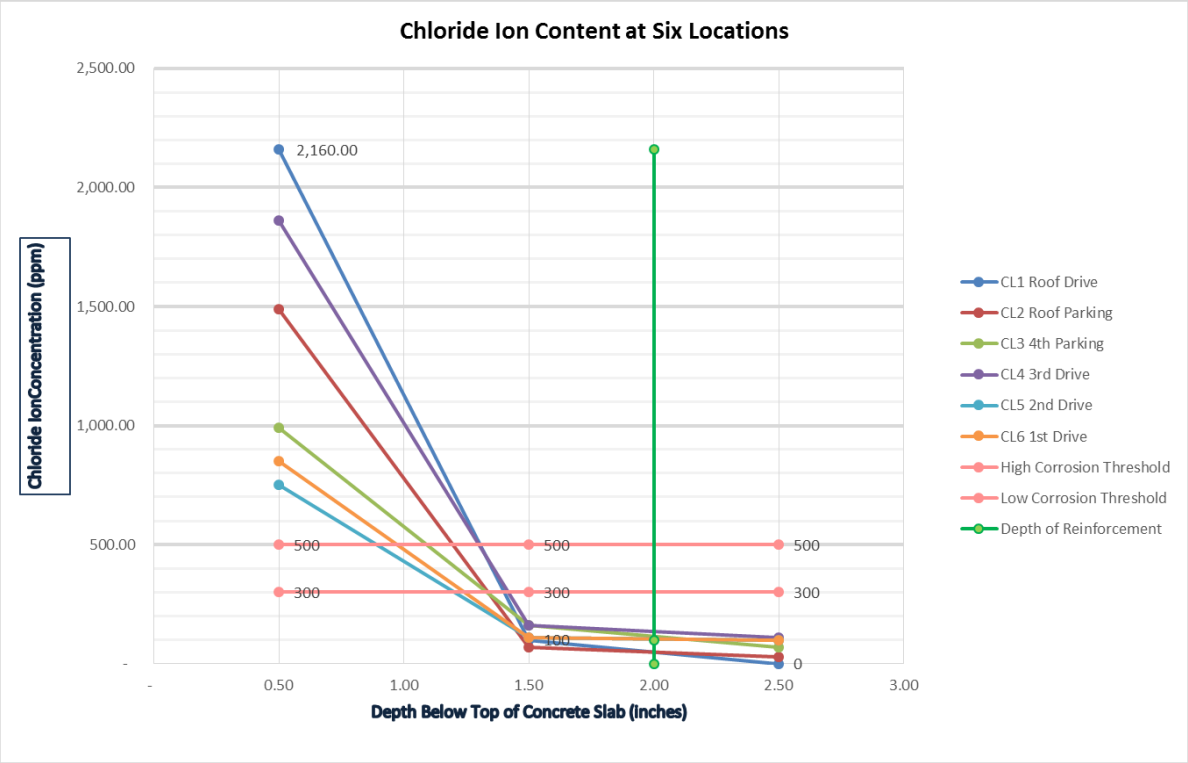
Table B2 summarizes the testing locations and chloride ion concentration – after correction for a baseline chloride of about 530 ppm.

Chloride Ion Concentration (ppm)

(Corrected for baseline Chloride)

ID	Level	Location	Depth 0"-1"	Depth 1" - 2"	Depth 2"-3"
CL1	Roof	Drive	2,160	100	0
CL2	Roof	Parking	1,490	70	30
CL3	4th	Parking	990	160	70
CL4	3rd	Drive	1,860	160	110
CL5	2nd	Drive	750	110	100
CL6	1st	Drive	850	110	100
		Average	1,350	118	68

Figure B2 Graph of Chloride Ion Concentration Vs Depth Into Floor Slab



Each test location is identified in the Key Legend on the right side of the graph. The legend also identifies the corrosion threshold for reinforcing bars in concrete and the reinforcing bar location.

The Depth is shown on the horizontal axis at the bottom of the graph. At each test location three test samples were collected to test for chloride concentration for three depths into the concrete floor slab:

0″ to 1″ – the midpoint is 0.5″ in the graph above
1″ to 2″ – the midpoint is 1.5″ in the graph above
2″ to 3″ – the midpoint is 2.5″ in the graph above

The chloride ion concentration is shown on the vertical axis.

1. From the graph it is clear that the chloride ion concentrations are above the corrosion threshold at the 0″ to 1″ tests for all six sample locations. The reinforcing bars are not in this location.
2. From the graph, it is clear that all six location have chloride concentrations below the corrosion threshold of 300 to 500 ppm at the depths from 1″ to 3″. Reinforcing bars are located below 2″ cover which is the range of the 2″ to 3″ test zone. Corrosion of reinforcement is not expected. The concrete cover appears to be satisfactorily protecting the steel. Excavations to confirm the Non-Destructive Testing (NDT) results were not in the scope of work for this condition assessment.

UNIVERSAL CONSTRUCTION TESTING
a Radarview company

CHICAGO
61 Garlisch Dr.
Elk Grove Village, IL 60007
P 847-459-9090
F 847-459-9015

DALLAS / FT WORTH 972.432.6666
SAN ANTONIO / SO. TEXAS 210.775.1637
AUSTIN / WACO 512.551.0336
HOUSTON 281.446.7363
MIAMI 954.676.4147

Mr. Larry D. Church P.E.
lchurch@oandsassociates.com
Senior Associate
O & S Associates, Inc.
17 North State Street, Suite 1700
Chicago, IL 60602

Re: Laboratory Testing of Concrete Powder Samples
Downers Grove Parking Facility
O & S *Project Number 05-140053*

Dear Mr. Church:

Enclosed please find the results of chloride content analyses of the eighteen (18) concrete powder samples delivered to our laboratories on December 17, 2014, with reference to the aforementioned project.

The acid-soluble chloride ion content was determined according to the applicable provisions of Standard Method ASTM C1152 “Standard Test Method for Acid-Soluble Chloride in Mortar and Concrete”.

The obtained test results are compiled in Table 1 below.

Based upon the present state of knowledge, 0.06% and 0.15% maximum water-soluble chloride contents expressed by weight of cement are suggested by American Concrete Institute to minimize the risk of chloride-induced corrosion in prestressed and conventionally reinforced concretes, respectively.

****

We appreciate the opportunity to be of continued service to you.

Sincerely yours,
Universal Construction Testing, Ltd.

Elena Emerson

Elena Emerson
Director of Laboratory Services

Table 1. Chloride Content of Concrete

ASTM C1152 (*Acid Soluble*)

Sample Number	Location in Structure	Level tested, inch from top	Chloride ion (CL^-) Content		
			by weight of concrete %	by weight of cement* %	by weight of concrete (PPM)*
Downers Grove Parking Facility					
CL1	Roof Level	0-1	0.269	1.70	2690
	Drive Aisle	1-2	0.063	0.40	630
		2-3	0.053	0.33	530
CL2	Roof Level	0-1	0.202	1.28	2020
	Parking Space	1-2	0.060	0.38	600
		2-3	0.056	0.35	560
CL3	4th Level	0-1	0.152	0.96	1520
	Parking Space	1-2	0.069	0.43	690
		2-3	0.060	0.38	600

Remarks: *) Assumed cement content 600 lbs/cu.yd. and U.W. = 3800 pcy.

Table 1. Chloride Content of Concrete

ASTM C1152 (*Acid Soluble*)

Sample Number	Location in Structure	Level tested, inch from top	Chloride ion (CL^-) Content		
			by weight of concrete %	by weight of cement* %	by weight of concrete (PPM)*
Downers Grove Parking Facility					
CL4	3rd Level	0-1	0.239	1.51	2390
	Drive Aisle	1-2	0.069	0.43	690
		2-3	0.064	0.41	640
CL5	2nd Level	0-1	0.128	1.78	1280
	Drive Aisle	1-2	0.064	0.41	640
		2-3	0.063	0.40	630
CL6	1st Level	0-1	0.138	0.87	1380
	Drive Aisle	1-2	0.064	0.41	640
		2-3	0.063	0.40	630

Remarks: *) Assumed cement content 600 lbs/cu.yd. and U.W. = 3800 pcy.

APPENDIX C – PHOTOGRAPHS OF EXISTING CONDITIONS

PHOTOGRAPHS TABLE OF CONTENTS

APPENDIX D – RECORD DOCUMENTS

RECORD DOCUMENTS TABLE OF CONTENTS

PROJECT MANUAL – SPECIFICATIONS

VILLAGE OF DOWNERS GROVE
PARKING FACILITY
Downers Grove, Illinois
Project No. 20123
March 7, 2003

TABLE OF CONTENTS

PART A – BIDDING REQUIREMENTS, CONTRACT FORMS AND GENERAL CONDITIONS

PART B – TECHNICAL SPECIFICATIONS

PROJECT MANUAL – SPECIFICATIONS - Continued

PROJECT MANUAL – SPECIFICATIONS - Continued

Division 9 – Finishes

Section 09900	-	Painting

Division 10 – Specialties

Section 10200	-	Louvers
Section 10400	-	Non-Illum. Signs, Graphics and Supports
Section 10410		Illuminated Signs
Section 10520	-	Fire Extinguishers and Cabinets

Division 14 – Conveying Systems

Section 14240	-	Hydraulic Elevators

Division 15 – Mechanical

Section 15010	-	Basic Mechanical Requirements
Section 15020	-	Shop Drawings, Products Data, Samples
Section 15100	-	Valves & Strainers
Section 15120	-	Piping Specialties
Section 15140	-	Supports & Hangers
Section 15150	-	Sanitary Waste & Vent Piping
Section 15190	-	Mechanical Identification
Section 15300	-	Fire Protection
Section 15410	-	Plumbing Piping
Section 15430	-	Plumbing Specialties

Division 16 – Electrical

Section 16010	-	Basic Electrical Requirements
Section 16070	-	Electrical Hangers & Supports
Section 16075	-	Electrical Identification
Section 16123	-	Building Wire & Cable
Section 16130	-	Raceway & Boxes
Section 16131	-	Cabinets & Enclosures
Section 16140	-	Wiring Devices
Section 16150	-	Wiring Connections
Section 16210	-	Electrical Utility Services
Section 16411	-	Enclosed Switches
Section 16421	-	Enclosed Controllers
Section 16441	-	Switchboards
Section 16442	-	Panelboards
Section 16451	-	Grounding & Bonding
Section 16461	-	Dry Type Transformers
Section 16491	-	Fuses
Section 16510	-	Garage Lighting
Section 16530	-	Emergency Lighting
Section 16721	-	Fire Alarm System
Section 16950	-	Electrical Testing

DRAWINGS - ISSUED FOR CONSTRUCTION

LIST OF DRAWINGS

ARCHITECTURAL/CIVIL

Cover Sheet
Plat of Survey

C-000	-	Project Scope
C-001	-	Site Plan
C-002	-	Column Grid Location Plan
C-003	-	General Civil Notes
C-004	-	Removal Plan
C-005	-	Geometric Plan
C-006	-	Traffic Control/Signage Plan
C-007	-	Utility Plan
C-008	-	Grading Plan
C-009	-	Plan & Profile
C-010	-	Site Access Plan
C-011	-	Retaining Wall Plan
C-012	-	Underground Utility Plan
C-013	-	Details
C-014	-	Details
C-015	-	Details
A-001	-	General Notes, Abbreviations, Symbols and Parking Data
A-100	-	Isometric Diagram
A-101	-	Architectural – Ground Level Plan
A-101a	-	Water Detention Basin Plan
A-102	-	Architectural – Second Level Plan
A-103	-	Architectural – Third Level Plan
A-104	-	Architectural – Fourth Level Plan
A-105	-	Architectural – Roof Level Plan (5^{th})
A-201	-	North & West Building Elevations
A-202	-	South & East Building Elevations
A-301	-	Building Sections
A-401	-	Stair/Elevator Tower No. 1 Enlarged Plans
A-402	-	Stair/Elevator Tower No. 1 Elevations
A-403	-	Stair/Elevator Tower No. 1 Sections
A-404	-	Stair/Elevator Tower Nos. 2 & 3 Enlarged Plans
A-405	-	Stair No. 2 Elevations and Section
A-406	-	Stair No. 3 Elevations and Section
A-407	-	Arch No. 1 Enlarged Plans and Elevation
A-408	-	Arch No. 2 Enlarged Plans and Elevation
A-601	-	Wall Sections
A-602	-	Wall Sections
A-701	-	Railing Details

DRAWINGS - ISSUED FOR CONSTRUCTION - Continued

A-702	-	Door and Window Details
A-703	-	Door and Window Details
A-704	-	Miscellaneous Details
A-801	-	Signs and Mounting Details
A-901	-	Door and Room Finish Schedule

STRUCTURAL

S-001	-	Structural General Notes
S-002	-	Typical Details
S-003	-	Typical Details
S-004	-	Post Tensioning Details
S-101	-	Foundation & Detention Basin Floor Plan
S-101a	-	Water Retention – Alternate No. 3
S-102	-	Foundation Sections & Details
S-103	-	Foundation Sections & Details
S-104	-	Foundation Sections & Details
S-105	-	Partial Building Elevations & Sections
S-201	-	Structural – Ground Level Plan
S-202	-	Structural – Second Level Framing Plan
S-203	-	Structural – Third Level Framing Plan
S-204	-	Structural – Fourth Level Framing Plan
S-205	-	Structural – Roof Level Framing Plan (5^{th})
S-206	-	Sections & Elevations
S-301	-	Stair/Elevator Tower No. 1 Framing Plans
S-302	-	Stair/Elevator Tower No. 1 Sections
S-303	-	Stair No. 2 & 3 Framing Plans
S-304	-	Stair No. 2 & 3 Sections
S-305	-	Stair Tower No. 3 Sections
S-306	-	Sections & Details
S-400	-	Column Schedule and Details
S-401	-	Beam and Girder Schedule
S-402	-	Conventional Reinforced Beam Schedule and Details
S-403	-	Typical P.T. Placement Diagrams
S-404	-	Typical P.T. Placement Diagrams & Details For 2-Way Slabs
S-501	-	Plaza Lid Details

MECHANICAL

M-101	-	Ground Level Mechanical Plan

DRAWINGS – ISSUED FOR CONSTRUCTION -Continued

M-102	-	Mechanical Schedule and Details

PLUMBING

P-001	-	Plumbing General Notes Symbols & Abbreviations
P-101	-	Underground Level Plumbing Plan
P-201	-	Ground Level Plumbing Plan
P-202	-	Second & Third Level Plumbing Plan
P-203	-	Fourth Level Plumbing Plan
P-204	-	Roof Level (5th) Plumbing Plan
P-205	-	Plumbing Riser Diagrams and Details
P-206	-	Plumbing Riser Diagrams and Details

ELECTRICAL

E-001	-	Electrical General Notes, Symbols & Abbreviations
E-100	-	Power Site Plan Underground Conduit
E-101	-	Ground Level Electrical Plan
E-102	-	Second Through Fourth Level Electrical Plan
E-103	-	Roof Level (5th) Electrical Plan
E-104	-	Elevator Room Enlarged Plan
E-105	-	Stairs Enlarged Plans
E-201	-	Ground Level Special Systems Conduits Plan
E-202	-	Typical Second Thru Fourth Level Special Systems Conduit Plans
E-203	-	Roof Level (5th) Special Systems Conduits Plan
E-300	-	Riser Diagrams Special Systems
E-301	-	Single Line Risers Diagram
E-400	-	Electrical Schedules
E-401	-	Light Fixtures & Equipment Schedules
E-402	-	Electrical Details

FIRE PROTECTION

FP-001	-	Fire Protection General Notes, Symbols & Abbreviations
FP-101	-	Ground Level Fire Protection Plan
FP-102	-	Typical Second Thru Fourth Level Fire Protection Plan
FP-103	-	Roof Level (5th) Fire Protection Plan
FP-104	-	Fire Protection Details

RECORD FILES & SUBMITTALS

Index of Records Provided for the Condition Assessment

1. List of Subcontractors
2. Carlisle Waterproofing 5 year Warranty – Retention Basin
3. Chicagoland – waterproofing changes
4. Colman – Hollow metal Doors and Windows
5.
6. Sika – Carbon Fiber Repairs during construction
7. Parking Equipment
8. Vanguard PARCS Equipment
9. Plumbing Submittals – Water and pumps
10. Electrical Submittals – switching
11.
12. Prairie – Concrete Submittals
13. Degussa – sealer testing
14. Precast Concrete – Spandrel Panels
15. Expansion Joint Submittals
16. Structural Steel Submittals
17.
18. P/T Tendon Submittal

APPENDIX E - REFERENCES AND DOCUMENTATION

Records from Construction

1. Project Drawings – Issued for Construction.
2. Project Manual (Specifications)
3. Available project submittals and record files as provided.

Reverenced Design Codes and Standards from Construction

4. The BOCA National Building Code /1996, Building Officials & Code Administrators International, Inc., Country Club Hills, IL and Village of Downers Grove Amendments.
5. ACI 318-99, *Building Code Requirements for Structural Concrete* and Commentary and updated versions from, 2002, 2005, 2008, and 2011; by the American Concrete Institute, Farmington Hills MI.

Industry References and Standards for Maintenances of Parking Structures

6. *Parking Garage Maintenance Manual* by Parking Consultants Council, National Parking Association, 2004, Washington DC.
7. ACI 362.1R-12, *Guide for the Design of Durable Parking Structures*
8. ACI 362.2R-00, *Guide for Structural Maintenance of Parking Structures*
9. ACI 201 - *Guide for Making a Condition Survey of Concrete in Service*
10. ACI 222R-01, *Protection of Metals in Concrete Against Corrosion*,
11. ACI 224.3R-95, *Joints in Concrete*,
12. ACI 423.4R-98, Corrosion and Repair of Unbonded Single Strand Tendons,
13. ACI 515.2R13 *Guide to Selecting Protective Treatments for Concrete*, 2013
14. *The Dimensions of Parking* by the Urban Land Institute, 5th Edition.
15. 2006 International Building Code with Village of Downers Grove Amendments
16. 2006 International Property Maintenance Code with Village of Downers Grove Amendments

Testing in this Condition Assessment

17. UCT Laboratories Report, Chloride Ion Content Analysis

Previous Maintenance, Repairs and Condition Assessments

18. Operational Maintenance: as needed, no documentation available
19. Repairs: as needed, no documentation available
20. Condition Assessments: None