CONDITION APPRAISAL & POST-TENSIONING SYSTEM ASSESSMENT

CHURCH & CHESTNUT STREET PARKING STRUCTURE

ROCKFORD, ILLINOIS

Prepared for:
CITY OF ROCKFORD

JULY 2012

WALKER
RESTORATION CONSULTANTS

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WRC PROJECT NO. 31-7439.00

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EXECUTIVE SUMMARY

Walker Restoration Consultants was retained to perform a condition appraisal and post-tensioning (P-T) assessment of the Church and Chestnut Street Parking Structure in Rockford, Illinois. The condition appraisal of the parking structure was performed to evaluate the present condition, recommend necessary repairs, and identify maintenance items needed. We have included our opinion of probable construction cost for the repairs and maintenance items identified.

The thirty eight year-old, three supported levels parking structure, has gone through thirty seven winter cycles since it was opened in 1974. Overall, the parking structure is generally in poor condition. The majority of the repair items are associated with corroded and broken slab post-tensioning and delaminated and/or spalled concrete on the supported level floor slabs. Overall, the concrete beams and columns which make up the main frame of the structure are in good condition. The remainder of the repairs included minor concrete patching on the beams, columns, walls, as well as failed expansion joints. These problems are typical for a structure of this age and type of exposure.

We understand that the parking structure underwent an extensive repair program in 2002 which focused on repairing broken slab tendons and delaminated top of slab concrete. Since that time, some of the repaired tendons as well as other tendons have continued to corrode and break.

In general, the primary contributing cause of the deterioration of the post-tensioning slab tendons, the concrete slab, beams, and columns is the intrusion of chloride (salt) laden water into these concrete elements. The chlorides are brought into the parking structure during the winter months by cars in the form of road salt, as well as from additional salt, likely applied directly to the slabs for de-icing purposes. Once the chloride has penetrated these concrete elements to level of the embedded steel reinforcement (reinforcing bars as well as tendons), corrosion takes place whenever moisture is present.

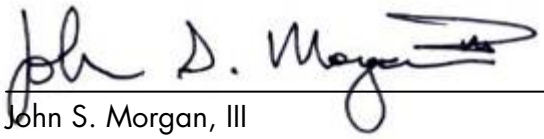
Our repair approach addresses the deteriorating slab concrete and post-tensioning slab tendons on the supported levels as a priority. Our opinion of probable construction cost for the repairs is approximately $5,600,000 in 2012 dollars with a life expectancy of 10 to 15 years. This cost includes approximately $950,000 for installing a new traffic bearing waterproofing membrane on all three supported levels. We are recommending installing a waterproofing membrane due to low concrete cover, significant ongoing corrosion, and the short life of the previous repairs which did not have a waterproofing membrane. We believe the installation of a waterproofing membrane is key to obtaining the projected life of the repairs.

We believe that the parking structure still has a significant remaining useful life provided proper repairs are performed. The recommended repairs should be started as soon as possible in order to take advantage of the construction season. Deferring or delaying the repairs will increase the repair cost. A phased approach can be used on the parking structure during the repairs in order to have partial use of the structure. We believe that the expected life of the parking structure can be extended to the ranges given, provided that regular maintenance is performed.

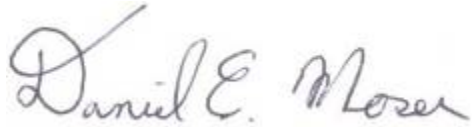
Other repair alternatives considered include:

Alternative 1 - Strengthening all areas with steel beams	$14,300,000
Alternative 2 - Replacing the concrete slabs while saving the main beams and columns	$18,600,000
Alternative 3 - Completely demolishing and replacing the structure	$21,000,000

Please see the attached discussion for a detailed report of our investigation.



John S. Morgan, III — July 10, 2012 Date



Daniel E. Moser, S.E., P.E. — July 10, 2012 Date

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INTRODUCTION

At the request of the City of Rockford, Walker Restoration Consultants (WRC) performed a Condition Appraisal and Post-Tensioning System Assessment of the Church and Chestnut Street Parking Structure in Rockford, Illinois. Site visits for the evaluation were made on June 2nd, 9th, and 10th, 2012. This report details the results of our evaluation.

OBJECTIVES

Based upon our April 17, 2012 proposal, the objectives of our evaluation were:

- Perform a complete Pre-Design Survey (Condition Appraisal) of the structure to identify and quantify the existing conditions of the structure.
- Perform an assessment of the embedded slab post-tension system.
- Review and provide conceptual repair recommendations regarding the potential repair options to extend the service life of the parking structure based on the Owner's desired remaining life, budget, and repair phasing requirements

FACILITY DESCRIPTION

The Church and Chestnut Street Parking Structure is a 4 level (3 supported level), 4-bay wide, hybrid precast/cast-in-place concrete parking structure located in Rockford, Illinois. The floor plan has overall dimensions of approximately 318 feet in the east-west direction and 246 feet in the north-south direction. The columns and beams are precast concrete elements with a cast-in-place post-tensioned (PT) concrete slab.

Drawings for the structure, prepared by Miller, Waltz, Diedrich Architects and Associates, Inc. dated November 1973, indicate that the structural system consists of precast concrete elements with cast-in-place post-tensioned floor slabs. Concrete stairs and landings are utilized in the four perimeter stair structures. There is one expansion joint separating the structure into two sections.

The floor slabs are indicated to be nominally 6 inches thick and reinforced with 0.5 inch diameter, 7-wire un-bonded mono-strand post-tensioned slab tendons. The tendons are encased in push-through preformed tubing and spaced nominally 2 feet 2 inches on center and oriented in the east-west direction. The floor slab on the roof level incorporates mild steel reinforcement, typically consisting of #4 top bars, 12 feet long at 36 inches on-center over the post-tensioned beams. The floor slab system includes transverse 7-wire un-bonded post-tensioning temperature tendons placed in the center of the slab.

RECOMMENDATIONS

Based upon our visual observations, testing, and limited analyses, we find the parking structure to be in poor condition. The poor condition of the structure is principally due to the deteriorated condition of the slab concrete and post-tensioning system. The slab post-tensioning system exhibits severe deterioration that has adversely impacted the structural capacity of the floor slabs. These recommendations will address existing deterioration and extend the life of the structure.

The structure requires significant repairs to restore the floor slabs' structural integrity, as well as to re-instate long-term durability of the structure. The structure's roof level, as well as areas on the second and third levels, should remain closed to vehicular traffic until recommended repairs can be performed to mitigate the imminently hazardous conditions due to the severely deteriorated and broken slab post tensioning.

However, we believe that with properly designed and implemented repairs, the structure can still have a significant remaining service life. To formulate our recommendations we considered the following options:

- Immediate actions
- Recommended repairs
- Typical concrete and waterproofing repairs
- Other repair alternatives

Each of these items is discussed briefly in this recommendation section and in more detail in the discussion section.

In summary, Walker recommends a repair approach that includes immediate action to mitigate immediate structural concerns and reopen the parking structure, repairs to the slab P-T system where economical, and repairs to address general deterioration within the structure.

IMMEDIATE ACTIONS

Our slab excavations revealed the ramp leading to the roof level had multiple consecutive de-tensioned P-T tendons as well as negative moment cracking over the beams. In this area, 60% of the existing slab P-T system that was tested, was found to be ineffective. On the second and third levels, our slab excavations revealed areas that had multiple consecutive de-tensioned P-T tendons, but did not extend across an entire quadrant. Since the P-T is the primary slab reinforcement system, these areas are a structural concern and require immediate action to mitigate potentially hazardous conditions. We have recommended:

- Close the roof level of the parking structure to vehicular traffic until repairs are completed.

- Close areas of the second and third levels of the parking structure to vehicular traffic until repairs are completed. The specific areas to be closed are shown in the attached drawings.
- Any loose and/or delaminated concrete be removed by a restoration contractor to mitigate potential falling concrete hazards.

These recommendations were communicated to the City of Rockford on Monday, June 11th upon completion of our field investigation.

RECOMMENDED SLAB P-T SYSTEM REPAIRS

In addition to those areas where our slab excavations identified multiple consecutive de-tensioned tendons requiring immediate action, we also identified several areas throughout the garage with some de-tensioned tendons. Typically, these areas exhibited between 10% and 30% ineffective existing slab tendons. Typically, if three or more of the existing slab P-T tendons are no longer tensioned, the slab is significantly, locally weakened and requires immediate action to mitigate potentially hazardous conditions. In areas where there were not three consecutive de-tensioned tendons, there was no immediate structural concern. However, these areas will require repair to restore the floor slab to the original design capacity. In these areas, the existing P-T system can typically be cost-effectively repaired. To repair the existing P-T system, we recommend:

- Replace existing P-T anchors in delaminated concrete at the expansion joints with new end anchors.
- Splice in new tendon using couplers at all existing tendon breaks or at locations with severe tendon corrosion.
- Re-stress repaired P-T tendons using new intermediate stressing anchors.
- At areas with new steel beams, install limited new P-T tendons in trenches within the slab to provide minimum compression stresses within the slab to minimize slab cracking.
- Repair concrete openings for P-T repairs.

RECOMMENDED TYPICAL CONCRETE AND WATERPROOFING REPAIRS

In addition to the slab P-T system repairs discussed above, additional repairs will be required to address deterioration throughout the structure. These repairs are intended to address existing deterioration within structural elements, minimize future deterioration of structural elements, and to extend the service life of the structure. Repairs to improve aesthetics are not included. We offer the following recommended repairs:

- Repair all floor delaminations/spalls.
- Repair all delaminated/spalled ceiling, wall, beam, column, and column haunch concrete.

- Repair all delaminated/spalled stair nosings in the stair towers.
- Rout and seal random floor cracks. Install cove sealant at perimeter walls at the roof level.
- Replace existing floor expansion joints with a new elastomeric concrete edged winged compression seal.
- Replace existing expansion joints at the stair towers with a new compression seals.
- Apply a traffic bearing waterproofing membrane to the three elevated floor slabs.
- Clean and paint existing precast façade panel connections and patch concrete.

REPAIR ALTERNATIVES

The recommended approach of repairs to the existing slab P-T, concrete repairs, and waterproofing will likely include some relatively minor maintenance typerepairs every 5 to 7 years. With the recommended approach, the structure will have an anticipated useful service life between 10 and 15 years. Therefore, we offer three Repair Alternatives for your consideration. The merits of these alternatives are presented later in our report.

- Alternate 1 – New Steel Beams Beneath All Slabs. This would replace the Recommended P-T System Repairs, but would still require the Recommended Concrete and Waterproofing Repairs.
- Alternate 2 – Demolish All Elevated Floor Slabs and Replace. This would replace the Recommended P-T System Repairs and Recommended Concrete and Waterproofing Repairs.
- Alternate 3 – New Parking Structure. This includes demolition of the existing parking structure and replacing it with a new structure of similar size, construction and function. If this alternative is selected, the Recommended P-T System Repairs and Recommended Concrete and Waterproofing Repairs would not be required.

OPINION OF PROBABLE COSTS

Our opinion of probable repair costs is summarized in the following table:

Table 1 – Opinion of Probable Costs for Recommended Repairs

DESCRIPTION	EXTENSION
Install Steel Beams on Ramps to Roof Level	$ 1,300,000
Recommended P-T System Repairs	$ 1,500,000
Recommended Concrete and Waterproofing Repairs	$ 1,450,000
Construction Subtotal	$ 4,250,000
Construction General Provisions	$ 630,000
Construction Contingency	$ 420,000
Engineering Design, Contract Administration, Construction Observation, and Testing	$ 300,000
Project Total	**$ 5,600,000**

Table 2 – Opinion of Probable Costs for Repairs with Repair Alternate 1 – New Steel Beams Beneath All Slabs

DESCRIPTION	EXTENSION
Install Steel Beams on All Supported Levels	$ 9,600,000
Recommended Concrete and Waterproofing Repairs	$ 1,450,000
Construction Subtotal	$ 11,050,000
Construction General Provisions	$ 1,650,000
Construction Contingency	$ 1,100,000
Engineering Design, Contract Administration, Construction Observation, and Testing	$ 500,000
Project Total	**$ 14,300,000**

Table 3 – Opinion of Probable Costs for Repairs with Repair Alternate 2 – Demolish Existing Floor Slab and Replace

DESCRIPTION	EXTENSION
Demolish Existing Floor Slab and Replace	$ 14,150,000
Construction Subtotal	$ 14,150,000
Construction General Provisions	$ 2,125,000
Construction Contingency	$ 1,475,000
Engineering Design, Contract Administration, Construction Observation, and Testing	$ 850,000
Project Total	**$ 18,600,000**

Table 4 – Opinion of Probable Costs for Repairs with Repair Alternate 3 – Demolish Existing Floor Slab and Replace

DESCRIPTION	EXTENSION
Demolition of Existing Structure	$ 1,000,000
New 950 Space P-T Parking Structure	$ 18,000,000
Construction Subtotal	$ 19,000,000
Soft Costs (Site Survey, Engineering Design, Contract Administration, Construction Observation, and Testing	$ 1,000,000
Project Contingency	$ 1,000,000
Project Total	**$ 21,000,000**

Our cost opinions are based on estimated and projected repair quantities identified during our walk-through and historical records of similar types of work. Costs may vary due to procurement method, local economy, phasing, or other factors. An additional breakdown of the probable repair costs are presented in Table A1 in Appendix A.

IMPLEMENTATION

The recommended repair program outlined above can be competitively bid or directly negotiated with restoration contractors that have significant experienced in post-tensioning repairs. The first step in this process is to obtain a quality set of bidding documents, prepared by an experienced restoration engineering firm. This will allow for appropriately designed repairs and estimated quantities. If desired, the bidding documents could include a detailed construction phasing plan to maintain partial operation of the structure during repairs.

We estimate that the recommended repairs will require approximately 6 to 9 months to complete with the entire structure closed. Alternatively, the repairs could be phased, which will then require between 12 and 24 months to complete. Additionally, the phased repairs will require that a minimum of approximately 200 spaces be closed concurrently throughout construction. These spaces will provide a safe working area for construction and will move upward as construction progresses. The closed spaces will also provide staging areas for materials and equipment.

DISCUSSION

Parking structures are exposed to severe environmental conditions, such as vehicles, large temperature changes, and de-icing salts. Because of these severe conditions, even the best designed and constructed parking structures require routine maintenance and repairs. However, with proper maintenance, a parking structure can have a long and useful life.

Condition appraisals, such as this one, are intended to assist owners in identifying and prioritizing maintenance needs so that future repair costs can be minimized. Condition appraisals can also identify more serious issues that may need to be addressed. Condition appraisals are intended to provide an owner with general repair recommendations and an opinion of probable repair costs to be used for budgeting purposes.

This section discusses our recommended actions, evaluation methods, and the contributing causes of the distress. Specific field observations, testing, and analyses are presented in the Investigation Summary Section with additional details provided in the Appendices.

RECOMMENDED SLAB P-T SYSTEM REPAIRS

ABANDON BROKEN POST-TENSIONED SLAB TENDONS AND INSTALL STEEL BEAMS

Repairs of the existing floor slab P-T system are the most critical. At the ramps leading to and from the roof level, where the existing floor slab P-T system was severely corroded and presented a structural concern, we recommended that the existing floor P-T system be abandoned and that new steel beams be installed to support the existing slab and vehicles. The new steel beams are to be installed directly below the slab and bolted to the face of the existing concrete beams. This solution was recommended primarily because the design and installation of the steel beams could be competed much quicker than alternative repairs, thus allowing the roof level of the structure to be reopened sooner. Additionally our past experience has shown that the extensive nature of the P-T distress in these areas makes repairs to the slab P-T system more costly than the steel beam repairs.

At these areas where steel beams are being installed, we recommend the installation of a limited number of new P-T tendons to provide minimum compression stresses within the slab. This compression force is required to control cracking within the floor slab. The new tendon repairs will include chipping out a 6 inch wide trench in the existing slab at approximately 12 feet on-center. Inside each trench, new P-T tendons will be placed with new anchors at each end. The P-T tendons will be stressed to provide the required minimum compression and then final concrete will be placed in the trench.

FIX BROKEN POST-TENSIONED SLAB TENDONS

In those areas where our slab P-T evaluation identified randomly spaced, failed or severely corroded tendons, we believe that the existing P-T system can be economically repaired. The repairs will include chipping out a portion of the slab to expose the failed tendon or anchor, splicing in a section of new

tendon using couplers, replacing failed anchors, re-stressing the tendons using an intermediate stressing anchor, and then patching the concrete.

CONCRETE AND WATERPROOFING REPAIRS

The structure will require significant repairs to address current deterioration. This includes repair of concrete delaminations/spalling, replacement of failed sealants and expansion joints. We have also recommended repairs of the stair nosings within the stair towers.

A significant portion of the cost of the recommended Concrete and Waterproofing Repairs is for the installation of a new waterproofing membrane on the roof level floor surface. A new waterproofing membrane will protect the repaired elements and minimize the infiltration of moisture and chlorides into the slab. This will greatly slow the corrosion process of the embedded reinforcement as well as the slab P-T tendons and extend the life of the floor slabs. The waterproofing will require some maintenance and re-coating every 5 to 7 years to properly maintain the waterproofing effectiveness.

Our recommended concrete repairs address currently visible corrosion and concrete deterioration within structural elements. The delaminations and spalls appear to be related to the corrosion of the embedded steel reinforcing. Without repair, the embedded reinforcement is more likely to corrode and increase the deterioration. Therefore, we recommend that all concrete delaminations and spalls be repaired.

With the recommended repairs, the repaired elements should have a long life; however, if no action is taken, these elements will continue to deteriorate. The Concrete and Waterproofing Repairs can be completed simultaneously with the P-T repairs and completed in 6 to 9 months.

DISCUSSION OF ALTERNATIVE REPAIRS

ALTERNATE 1 – NEW STEEL BEAMS BENEATH ALL SLABS.

One possible alternative to the proposed repair program is to install new steel beams beneath all of the slabs in lieu of performing repairs to the existing slab P-T system. This alternative includes installing new trenches for slab P-T tendons to maintain compression in the slab to prevent cracking. This alternative offers the advantage of a longer anticipated service life. We estimate that installing new steel beams will provide an additional 20+ years of anticipated life for the structure. This alternate will require similar, minor future concrete and waterproofing maintenance repairs as the recommended slab P-T repair option.

We estimate that this option will cost approximately $14,300,000, compared to the $5,600,000 for repairing the existing P-T system (not including the required Concrete and Waterproofing repairs required by both repair approaches). Our life cycle cost analysis experience shows that over a 10 to 20 year period, the recommended P-T repairs are likely more cost effective. Beyond 20 years, the alternative steel beam repair may become cost competitive.

ALTERNATE 2 – DEMOLISH FLOOR SLAB AND REPLACE

A second alternative to the proposed repair program is to demolish the supported floor slabs and form and pour back new concrete floor slabs. This alternative is a viable candidate due to the structural framing system being precast and could remain in place while phased demolition and reconstruction takes place. This alternative offers the advantage of a longer anticipated service life when compared to repairing broken and corroded slab tendons. We estimate that the replacement of new supported floor slabs will provide an additional 30+ years of anticipated life for the structure.

We estimate that this option will cost approximately $18,600,000.

ALTERNATE 3 – NEW PARKING STRUCTURE

A third alternative to the proposed repair program is to demolish the existing parking structure and construct a new parking structure. This option can offer numerous advantages, such as: the ability to increase the parking capacity, ability to change the appearance of the structure, and an anticipated service life of 40 years. In general, we have found that construction of a new parking structure is a viable option when any one of the following conditions is satisfied:

- Repair Costs exceed 65% of the construction costs of a new parking structure. Repairing a parking structure often has significantly lower initial costs, but requires ongoing maintenance repairs and ultimately has a finite life that requires the construction of a new structure. A new parking structure will have higher initial costs, lower ongoing maintenance, and a longer anticipated life than a repaired structure. Our Life Cycle Cost Analyses experience repeatedly shows that when the cost of repairs are less than approximately 65% of the new construction costs, repairs and construction of future structure are more economical than the immediate construction of a new structure.

- Additional parking capacity is required. Construction of a new parking structure can allow for significant increases in the number of vehicles serviced through vertical or horizontal expansion.

- Desire to relocate the parking structure to a more favorable location.

This option is significantly more costly and would require approximately two years to complete the design and construction. We estimate that demolition of the existing parking structure and construction of a new structure, similar in size and simple façade elements, would cost approximately $21,000,000.

EVALUATION METHODS

Our evaluation included a general condition appraisal of the parking structure and a condition assessment of the floor slab P-T system. Our condition appraisal included visual observation of the exposed floors, beams, columns, column haunches, façade, and stair towers. Our visual observations documented noticeable distress such as cracks, leaks, spalls, scaling, joint deterioration, and other

similarly adverse conditions in readily viewable areas. We also performed sounding of representative structural elements to identify concrete delaminations and possible corrosion of the embedded steel reinforcement. Our sounding included a chain drag survey on representative portions of the elevated floor top surfaces and representative columns, beams, walls, and ceilings.

A condition assessment of the floor slab P-T system was performed since the P-T floor slab system is typically the critical element in parking structures and is also the most susceptible element to deterioration. Recommendations about how to best maintain a parking structure and the estimation of remaining service life cannot be made without knowledge of the embedded floor slab P-T reinforcement conditions. Visually assessing the condition of embedded P-T reinforcement is often difficult because, even when the deterioration is at a critical level, P-T slab systems typically have limited outwardly visible deterioration. Therefore, our P-T system condition assessment included excavations into the slab to remove portions of the concrete around the P-T tendons, allowing close-up examination of the tendons and in-situ testing of the tendons' tension. With a limited number of excavations, it is possible to project the approximate deterioration in other similar areas of the structure not examined. We believe that this is the most practical method of identifying the current level of deterioration of the embedded P-T within the slab.

Our evaluation included a total of 104 floor slab excavations which allowed us to review 208 slab tendons. The excavations were performed with the assistance of a restoration contractor and repaired upon completion of our evaluation. The seven locations chosen were on the: roof level along grid 3 between grids A and B, and grid 10 between grids D and E, the third level along grid 8 between grids A and B and grid 6 between grids B and C, the second level along grid 5 between grids A and B, grid 8 between grids A and B, and grid 12 between grids D and E.

The excavations were located in the top surface of the floor at the tendons' maximum height over the beams. The excavations were typically 6 inches wide by 18 inches long and to a depth required to expose the P-T tendon. At each tendon location, the protective sheathing was removed to allow visual inspection of the tendon. The visual inspection typically noted the condition of the tendon, as well as whether or not any corrosion was observed on the tendon. The concrete cover over the reinforcement was also noted, as it typically correlates to observed distress. In-situ testing of the tendons' tension consisted of the pry-bar test and screw-driver penetration test. These tests attempt to lift the tendons or separate the wires to identify a lack of tension. Because the tendons are continuous (between stressing anchors) and unbonded, the testing can help identify a break within the tendon in adjacent bays or anchors. Previous floor repairs and corrosion can affect the testing and the testing results require careful interpretation. Our evaluation determined that 75 tendons out of the 208 tendons reviewed were broken. Our evaluation also determined that 29 out of the 208 tendons reviewed were severely corroded. Overall, of the slab post-tensioned tendons tested, 50% were either broken or severely corroded.

CONTRIBUTING CAUSES OF DISTRESS

Parking structures are exposed to severe environmental conditions, such as road salts and large temperature changes. With proper design, construction, and maintenance they can have a relatively

long, trouble-free life. Our observations indicate that the primary contributing cause of distress within the parking structure stems from the generally harsh environment. Additionally, deferred maintenance in the parking structure could be considered a much lesser contributing cause.

The P-T construction details observed at the parking structure are typical of the common construction practices in the 1970's and early 1980's. The construction details used during this era provide little protection from corrosion compared to a modern P-T system installed since approximately 1985. Specifically, the sheathing was typically stopped several inches short of the anchorages and did not cover the tendon near the anchors. Finally, the anchors are not epoxy coated or otherwise protected. Overall, the system, especially near the anchors, is very susceptible to corrosion and tendon failure in the presence of moisture and chlorides.

Deterioration throughout the structure can be attributed to chloride contaminated water infiltrating through the surface of the floor slabs, beams, and columns causing corrosion within the embedded steel in those elements. In many areas throughout the structure, the measured concrete cover at the high points over the beams averaged approximately 1 inch which is less than the minimum industry standard of 1½ inches. Maintaining the construction joints and the expansion joints in a waterproof state is critical to maximizing the life of the structure.

SUMMARY

Initial on-site evaluation and testing was performed on June 2nd, 9th, and 10th, 2012. The evaluation included a visual evaluation and delamination survey of the structural floor slabs. Our evaluations also included excavations into the slab to expose a portion of 208 slab tendons to visually examine the tendons' condition and to perform in-situ testing of the tendons' tension. A summary of our significant observations and findings is presented below:

OBSERVATIONS

FLOOR SLAB SURFACES

Visual evaluation and a limited delamination survey of the floor surfaces revealed:

1. The floor surfaces appeared to be in fair condition.

2. Previous floor repairs were observed to be widespread throughout the structure. Sounding of the previous repairs revealed that most of the previous patches are now delaminated.

3. Previously broken and/or cut tendons were observed on the floor surfaces throughout the structure.

4. Cracking was observed on the supported slabs. Significant negative moment cracking was observed on the ramps leading to the roof level.

5. Concrete cover of the slab tendons at the high points over the beams averaged approximately 1 inch.

CEILINGS

Visual evaluation and a limited delamination survey of the ceilings revealed:

1. The ceilings were generally in good condition. Minor spalling and/or delaminated concrete was observed.

2. One broken tendon was observed on the underside of the second level near grid line B-9.

PRECAST BEAMS CONCRETE SURFACES

Visual evaluation and a limited delamination survey of the post-tensioned beams revealed:

1. The precast beams were generally in good condition.

COLUMNS

Visual evaluation and a limited delamination survey of the columns revealed:

1. The columns were generally in good condition.
2. There was minor delamination noted on a number of columns throughout the structure.

WATERPROOFING

Visual evaluation and a limited delamination survey of the waterproofing revealed:

1. The floor expansion joints have deteriorated and are leaking throughout the entire structure. However, limited concrete deterioration was noted near the expansion joints on the underside of the slab.
2. Construction joint sealant generally appeared to be ripped and torn at numerous locations.
3. Cove sealant around the perimeter was observed to be ripped, torn, or missing randomly throughout the upper level.

STAIR TOWERS

Visual evaluation of the stair towers revealed:

Northeast Stair Tower

1. Minor delamination of the stair nosings were observed at a number of treads.
2. Minor ceiling concrete delamination was observed at the third level.
3. One broken window was observed at the second level.

Northwest Stair Tower

1. Minor delamination of the stair nosings were observed at a number of treads.
2. Minor concrete delamination was noted on the second, third, and upper levels.
3. Corroded precast connection observed at second level.

Southeast Stair Tower

1. Corroded precast connection observed at second and third levels.

Southwest Stair Tower

1. Corroded precast connection observed at ground, second, and third levels.

2. Delaminated concrete on beam observed at the upper level.

SLAB POST-TENSIONING

We observed the following conditions within the post-tensioning system. A drawing representing layout of test locations is provided in Appendix C. Summary tables are provided in Appendix D:

1. Excavation areas are as follows:

Location	Level	Grid
"1"	Roof	3 between A & B
"2"	Roof	10 between D & E
"3"	Third	6 between B & C
"4"	Third	8 between A & B
"5"	Second	5 between A & B
"6"	Second	8 between A & B
"7"	Second	12 between D & E

2. Of the 208 tendons tested, 75 of the tendons were broken, 29 were significantly corroded, and 104 were observed to be in good condition. Concrete coverage to the top of the tendons at the high point ranged from a low of 0 inches to a high of 2 inches. Most of the tendons' cover averaged 1 with a large majority being observed at 1¼.

LIMITATIONS

This report contains the professional opinions of Walker Restoration Consultants based on the conditions observed as of the date of our site visit and documents available to us. This report is believed to be accurate within the limitations of the stated methods for obtaining information.

We have provided our opinion of probable costs from visual observations, limited testing, and field survey work. The opinion of probable repair costs is based on available information at the time of our evaluation and from our experience with similar projects. There is no warranty to the accuracy of such cost opinions as compared to bids or actual costs. This condition assessment and the recommendations therein are to be used with additional fiscal and technical judgment.

It should be noted that our renovation recommendations are conceptual in nature and do not represent changes to the original design intent of the structure. As a result, this report does not provide specific repair details or methods, construction contract documents, material specifications, or details to develop the construction cost from a contractor.

Based on the proposed scope of services, the evaluation was based on certain assumptions made on the existing conditions. Some of these assumptions cannot be verified without expanding the scope of services or performing more invasive procedures on the structure.

The recommended repair concepts outlined represents current available technology for parking facilities and other structures. This report does not provide any kind of guarantee or warranty on our findings and recommendations. Our evaluation was based on and limited to the proposed scope of work. We do not intend to suggest or imply that our appraisal has discovered or disclosed all latent conditions or has considered all possible improvement or repair concepts.

A review of the facility for compliance with the Americans with Disabilities Act (ADA) requirements was not part of the scope of this project. However, it should be noted that whenever significant repair, rehabilitation or restoration is undertaken in an existing structure, ADA design requirements may become applicable if there are currently unmet ADA requirements.

Similarly, we have not reviewed or evaluated the presence of, or the subsequent mitigation of, hazardous materials including, but not limited to, asbestos and PCB.

This report was created for the use of the City of Rockford and use of this report by others is at their own risk.

APPENDIX A
OPINION OF PROBABLE CONSTRUCTION COST

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OPINION OF PROBABLE CONSTRUCTION COST

Table A1 – Opinion of Probable Costs for Recommended Repairs

Work Item	Description		Extension
1	**Steel Beams**		
1.1	New Steel Beams – Ramps leading to and from Upper Level	$	1,225,000
1.2	New P-T Temperature Tendons	$	275,000
2	**P-T System Repairs**		
2.1	P-T System Repairs – Repair Broken and Severely Corroded Tendons	$	1,300,000
3	**Concrete Repairs**		
3.1	Floor Repair – Partial Depth / Shallow	$	196,000
3.2	Floor Repair – Stair Nosing	$	9,000
3.3	Ceiling Repair – Partial Depth / Shallow	$	39,000
3.4	Beam Repair – Partial Depth / Shallow	$	4,000
3.5	Column Repair – Partial Depth / Shallow	$	32,000
3.6	Column Haunch Repair – Partial Depth / Shallow	$	4,000
3.7	Wall Repair – Partial Depth / Shallow	$	52,000
4	**Waterproofing/Protection**		
4.1	Expansion Joints – Elastomeric Concrete Edged	$	55,000
4.2	Expansion Joints – Adhered	$	37,000
4.3	Seal Random Cracks and Construction Joints	$	14,000
4.4	Vertical Joint Sealant - Facade	$	3,000
4.5	Mechanical – Piping / Drains / Hangers / Allowance	$	4,000
4.6	Cove Sealant	$	11,000
4.7	Traffic Topping – Vehicular (Upper Level)	$	950,000
5	**Architectural/Miscellaneous Repairs**		
5.1	Clean, Paint, Patch Embedded Precast Connections	$	12,000
5.2	Remove and Reset Perimeter Railings	$	8,000
5.3	Restripe Parking Structure	$	20,000
	Repair Subtotal	$	4,250,000
	Construction General Provisions	$	630,000
	Construction Contingency	$	420,000
	Engineering Design, Contract Administration, Construction Observations, Testing	$	300,000
	Project Total	$	**5,600,000**

APPENDIX B
PHOTOGRAPHS

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PHOTOGRAPHS

Photo 1 – Typical floor delaminations found on the top level by chain dragging.

Photo 2 – Typical previous concrete floor patch.

Photo 3 – Delaminated and spalled concrete patch on roof level with standing water.

Photo 4 – Corroded and exposed P-T tendons under water.

Photo 5 – Typical ceiling concrete spalls.

Photo 6 – Typical ceiling delaminations.

Photo 7 – Delaminated concrete on haunch at column B/9.

Photo 8 – Spalled concrete at grid D/9 revealed minor corrosion of the steel plate and nuts.

Photo 9 – Missing bolt at precast clip connection on third level near grid A/8.

Photo 10 – Roof level underside leaking cracks observed near grid B/3.

Photo 11 – Typical delaminated concrete at column.

Photo 12 – Typical delaminated concrete on beam.

Photo 13 – Typical spalled concrete under railing along grids 1 and 14 (second and third levels).

Photo 14 – Typical condition of embedded precast connection plates.

Photo 15 – Close-up of embedded precast connection plates showing corrosion.

Photo 16 – Corroded precast base connections at third level between grid E/7-8.

Photo 17 – Failed expansion anchor at precast connection at grid E/7.

Photo 18 – Exposed P-T tendons on underside of slab.

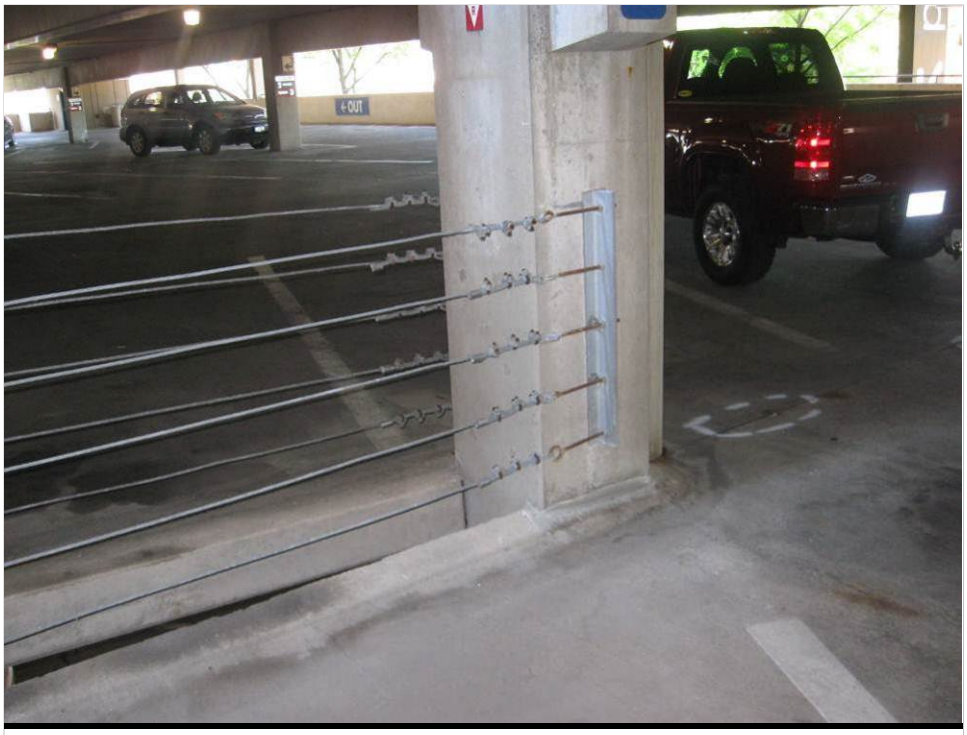

Photo 19 – Vehicular cable barrier restraint system is loose and needs re-tensioning.

Photo 20 – Cracked and broken drain pipe under second level.

Photo 21 – Missing nuts on precast connections at second level along grid E between 7 and 8.

Photo 22 – Broken P-T tendon looped out at underside of second level.

Photo 23 – Exposed wiring in ceiling spall at underside of second level.

Photo 24 – Cracked and broken drain piping at ground level.

Photo 25 – Typical delaminated concrete on stair nosings.

Photo 26 – Close-up photo of delaminated stair nosing concrete.

Photo 27 – Cracked glass in northeast stair/elevator tower.

Photo 28 – Typical deteriorated compression seal joint around stair tower.

Photo 29 – Typical deteriorated construction joint sealant.

Photo 30 – Typical deteriorated cove sealant at roof level.

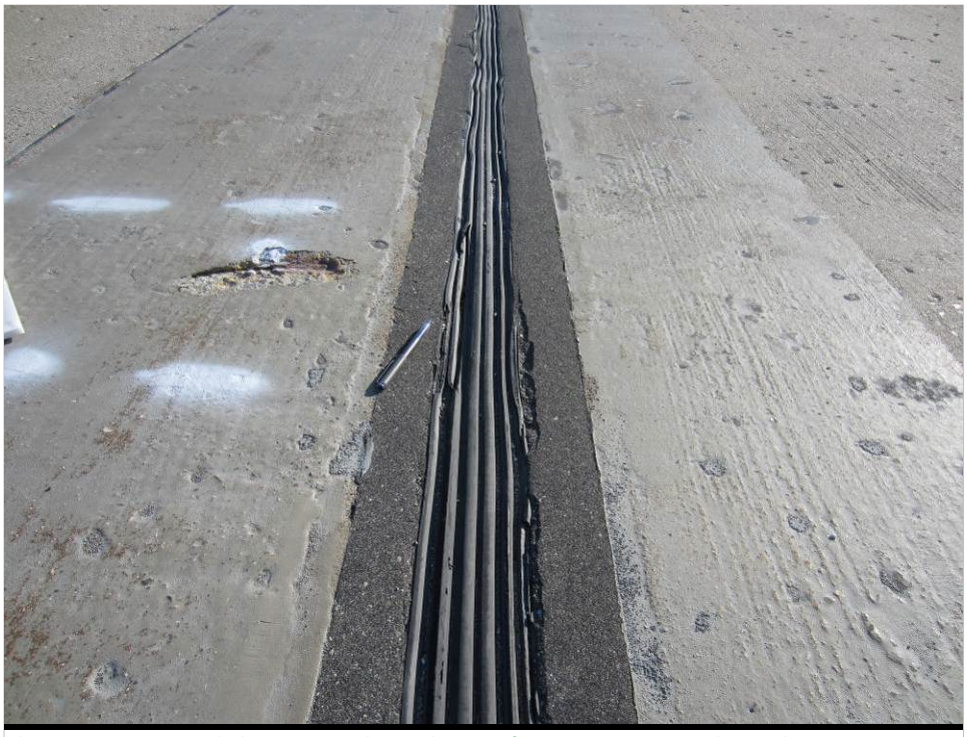

Photo 31 – Typical deteriorated condition of expansion joint throughout structure.

Photo 32 – Deteriorated caulking around flashing.

Photo 33 – Cut tendons on third level.

Photo 34 – Cut tendons observed at third level.

Photo 35 – Spalled concrete around railing in north east stair tower.

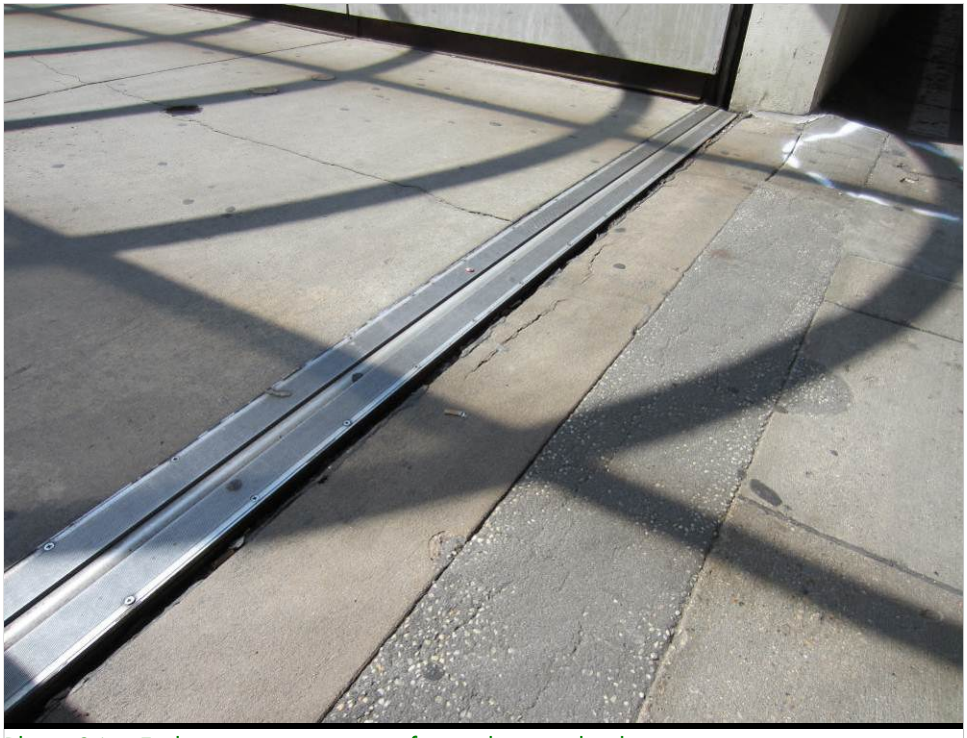

Photo 36 – Failing expansion joint for pedestrian bridge.

Photo 37 – Delaminated concrete at existing patch.

Photo 38 – Missing grout pocket at P-T temperature tendon.

Photo 39 – Broken supplemental drain grate.

Photo 40 – Failing sealant between precast panels.

Photo 41 – Typical spalled concrete at column on facade.

Photo 42 – Overall P-T excavation openings at location #1.

Photo 43 – Overall P-T excavation openings at location #2.

Photo 44 – Overall P-T excavation openings at location #3.

Photo 45 – Overall P-T excavation openings at location #5.

Photo 46 – Overall P-T excavation openings at location #6.

Photo 47 – Overall P-T excavation openings at location #7.

Photo 48 – Tendon #4A at location #1 shown in good condition – no corrosion and tendon coated with grease.

Photo 49 – Tendon #8A and #8B at location #1 shown with no concrete cover at the high point.

Photo 50 – Tendon #7A and #7B at location #3 broken somewhere along the length of the tendon.

Photo 51 – Tendon #12A at location #3 shown with severe corrosion and tendon #12B shown with 1 broken wire.

Photo 52 – Tendon #9A and #9B at location #4. Tendon #9B in green sheathing has been replaced at some point and in good condition.

Photo 53 – Tendon #3A and #3B at location #6 shown with severe corrosion and broken in opening.

Photo 54 – Tendon #4A and #4B at location #6. Tendon #4B in white sheathing has been replaced at some point and in good condition while #4A has severe corrosion.

Photo 55 – Tendon #3A and #3B at location #5 shown with severe corrosion while under tension.

Photo 56 – Tendon #15A and #15B at location #4. Tendons are severely corroded and broken in patch.

APPENDIX C
TYPICAL FLOOR PLAN SHOWING P-T OPENINGS

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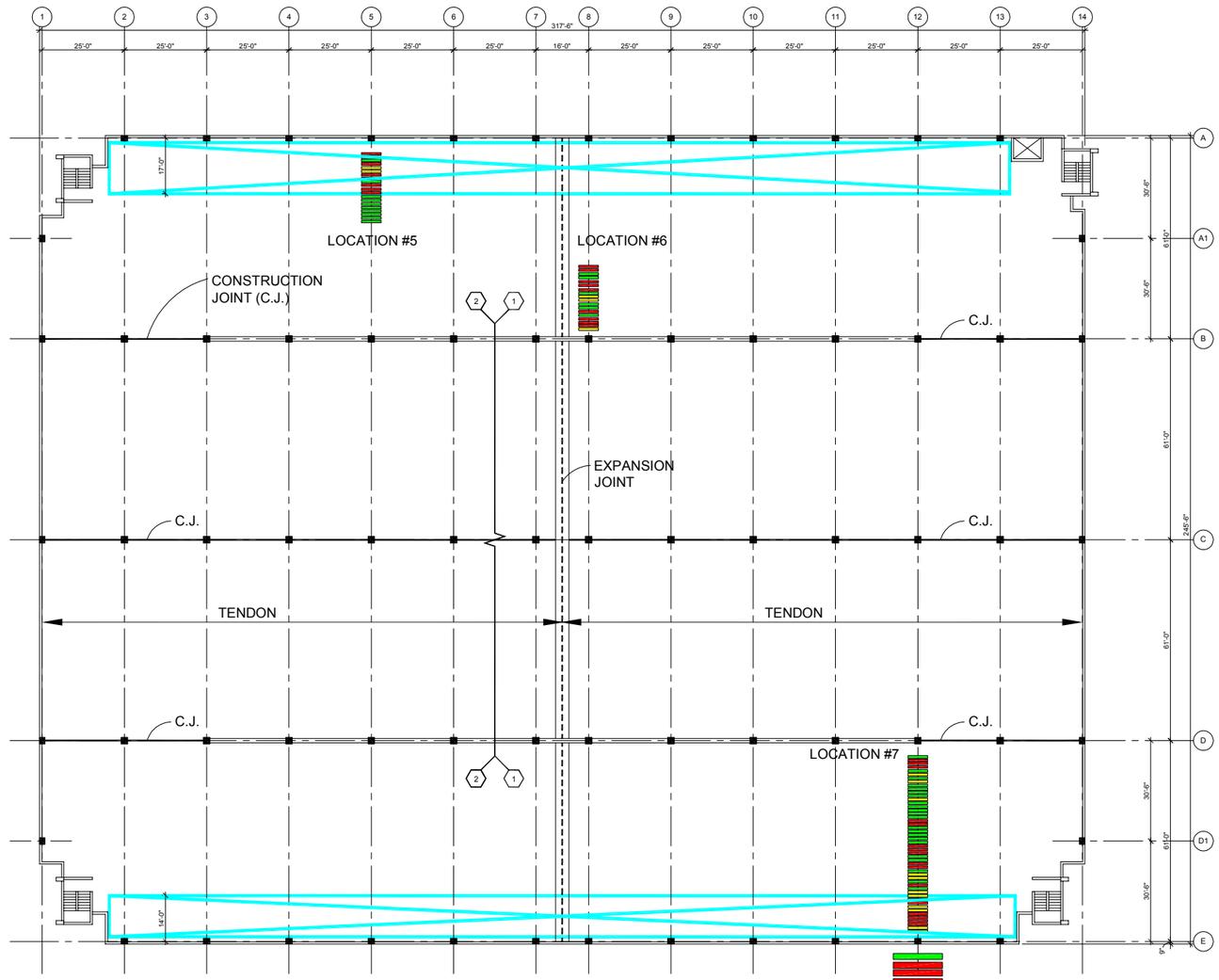
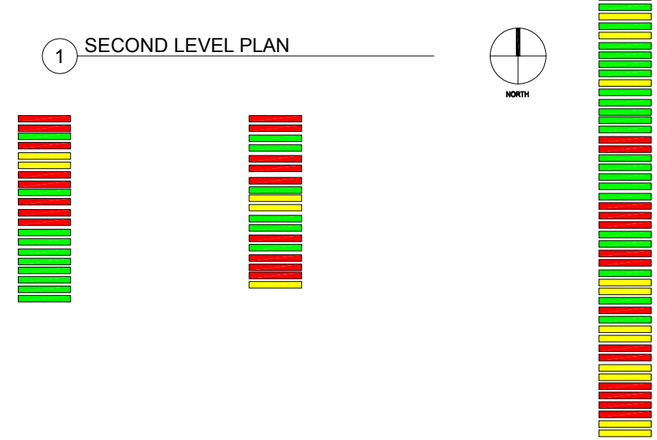


1 SECOND LEVEL PLAN



LEGEND:

- TENDON OBSERVED BROKEN
- TENDON OBSERVED WITH SIGNIFICANT CORROSION
- TENDON OBSERVED WITH MINOR OR NO CORROSION
- RECOMMEND CLOSING AREA IMMEDIATELY DUE TO SIGNIFICANT NUMBER OF BROKEN TENDONS AND/OR SIGNIFICANT SLAB CRACKING

TOTALS
75 BROKEN
29 CORRODED
104 GOOD
208 TENDONS TESTED

LOCATION #5
8 BROKEN
2 CORRODED
10 GOOD

LOCATION #6
9 BROKEN
3 CORRODED
6 GOOD

LOCATION #7
17 BROKEN
11 CORRODED
22 GOOD

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CHURCH AND CHESTNUT STREET
PARKING STRUCTURE P-T ASSESSMENT
ROCKFORD, ILLINOIS

NO.	DATE	DESCRIPTION

PROJECT NO: 31-7439.00
DRAWN BY: JSM
CHECKED BY: DEM
SHEET TITLE:
SECOND LEVEL PLAN

R-102

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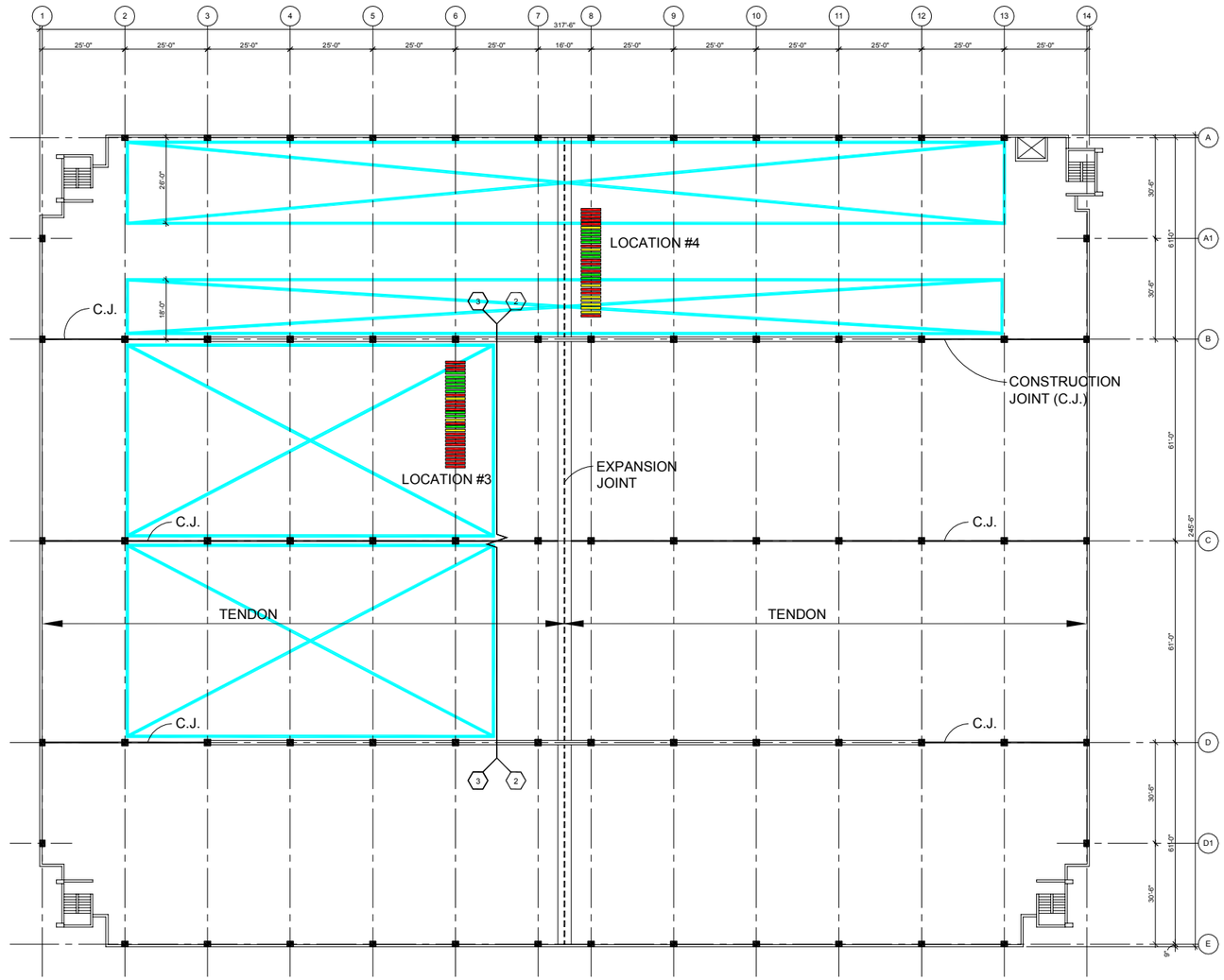
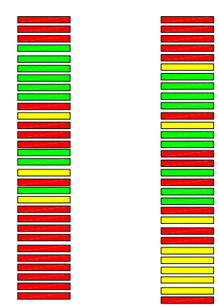


1 THIRD LEVEL PLAN



LOCATION #3
18 BROKEN
3 CORRODED
9 GOOD

LOCATION #4
13 BROKEN
8 CORRODED
9 GOOD

LEGEND:

- TENDON OBSERVED BROKEN
- TENDON OBSERVED WITH SIGNIFICANT CORROSION
- TENDON OBSERVED WITH MINOR OR NO CORROSION
- RECOMMEND CLOSING AREA IMMEDIATELY DUE TO SIGNIFICANT NUMBER OF BROKEN TENDONS AND/OR SIGNIFICANT SLAB CRACKING

TOTALS
75 BROKEN
29 CORRODED
104 GOOD
208 TENDONS TESTED

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CHURCH AND CHESTNUT STREET
PARKING STRUCTURE P-T ASSESSMENT
ROCKFORD, ILLINOIS

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DRAWN BY: JSM
CHECKED BY: DEM
SHEET TITLE:

THIRD LEVEL PLAN

R-103

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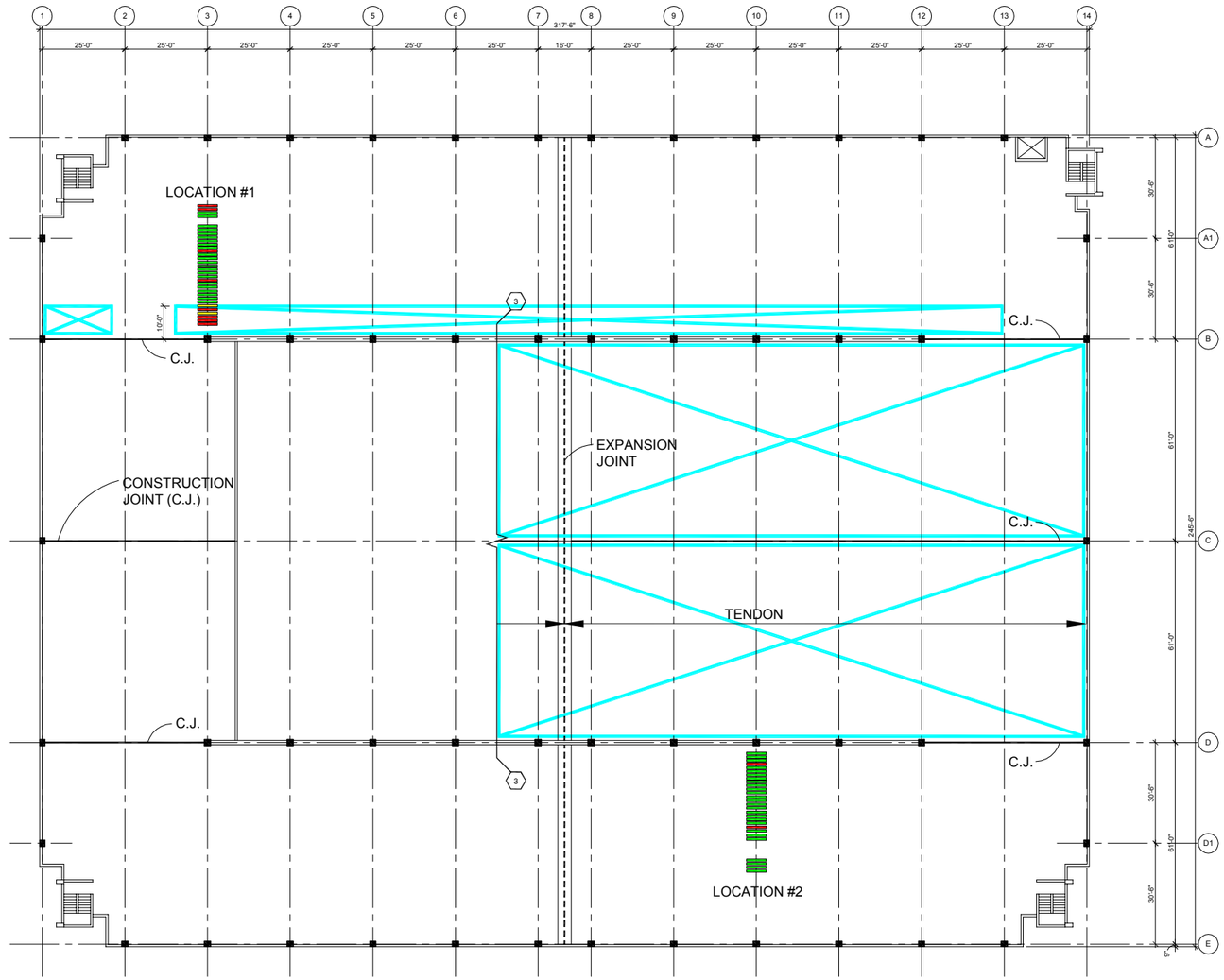

1 ROOF LEVEL PLAN

LOCATION #1
8 BROKEN
2 CORRODED
22 GOOD

LOCATION #2
2 BROKEN
0 CORRODED
26 GOOD

LEGEND:

- TENDON OBSERVED BROKEN
- TENDON OBSERVED WITH SIGNIFICANT CORROSION
- TENDON OBSERVED WITH MINOR OR NO CORROSION
- RECOMMEND CLOSING AREA IMMEDIATELY DUE TO SIGNIFICANT NUMBER OF BROKEN TENDONS AND/OR SIGNIFICANT SLAB CRACKING

TOTALS
75 BROKEN
29 CORRODED
104 GOOD
208 TENDONS TESTED

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ROCKFORD, ILLINOIS

NO.	DATE	DESCRIPTION

PROJECT NO: 31-7439.00
DRAWN BY: JSM
CHECKED BY: DEM
SHEET TITLE:

ROOF LEVEL PLAN

R-104

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APPENDIX D
P-T EXCAVATIONS SUMMARY

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P-T EXCAVATIONS SUMMARY

Table 1 - Location #1 Roof						
Grid A to B, Along Grid 3						
Tendon No.	**Distance***	**Pry Bar Test**	**Screwdriver Test**	**Cover**	**Condition**	**Tension**
1A	5'-4"	B	B	1-1/4"	Severe corrosion	B
1B	5'-4"	B	B	1-1/4"		B
2A	7'-4"	B	B	1-1/4"	Severe corrosion	B
2B	7'-4"	PT	PT	1-1/4"	Severe corrosion	B
3A	9'-9"	B	B	1-1/4"	Dry, good	B
3B	9'-9"	T	T	1-1/4"	Minor corrosion	T
4A	12'-0"	T	T	1-1/4"	Good	T
4B	12'-0"	T	T	1-1/4"	Good	T
5A	14'-2"	T	T	1-1/2"	Dry, good	T
5B	14'-2"	T	T	1-1/2"	Dry, good	T
6A	16'-6"	T	T	1-1/4"	Dry, good	T
6B	16'-6"	T	T	1-1/4"	Dry, good	T
7A	18'-5"	B	B	3/4"-1-1/4"	Dry, good	B
7B	18'-5"	PT	T	3/4"-1-1/4"	Dry, good	PT
8A	20'-7"	T	T	1/2"	Good	T
8B	20'-7"	T	T	1/2"	Good	T
9A	22'-8"	T	T	3/4"-1-1/4"	Dry, good	T
9B	22'-8"	T	T	3/4"-1-1/4"	Dry, good	T
10A	25'-0"	T	T	1-1/4"	Excellent	T
10B	25'-0"	T	T	1-1/4"	Excellent	T
11A	27'-8"	B	B	1-1/2"	Dry, good	B
11B	27'-8"	T	T	1-1/2"	Good	T
12A	29'-2"	T	T	1-3/8"	Good	T
12B	29'-2"	T	T	1-3/8"	Good	T
13A	31'-0"	T	T	1-1/2"	Dry, good	T
13B	31'-0"	T	T	1-1/2"	Good	T
14A	33'-4"	T	T	1-1/2"	Dry, good	T
14B	33'-4"	T	T	1-1/2"	Good	T
15A	35'-4"	T	T	1-3/4"	Dry, good	T
15B	35'-4"	T	T	1-3/4"	Dry, good	T
16A	37'-8"	T	T	1-1/2"	Dry, good	T
16B	37'-8"	T	T	1-1/2"	Dry, good	T
17A	39'-8"	B	B	1-1/4"	Severe corrosion	B
17B	39'-8"	B	B	1-1/4"	Light corrosion	B
* Distance from face of Column B/3 T = Tension B = Broken PT = Partial Tension						

Table 2 - Location #2 Roof						
Grid D to E, Along Grid 10						
Tendon No.	**Distance***	**Pry Bar Test**	**Screwdriver Test**	**Cover**	**Condition**	**Tension**
1A	3'-2"	T	T	2"	Dry, good	T
1B	3'-2"	T	T	2"	Dry, good	T
2A	4'-11"	T	T	1-1/2"	Dry, good	T
2B	4'-11"	B	B	1-1/2"	Dry, good	B
3A	7'-6"	T	T	1-1/4"	Dry, good	T
3B	7'-6"	T	T	1-1/4"	Dry, good	T
4A	9'-4"	T	T	1-1/4"	Dry, good	T
4B	9'-4"	T	T	1-1/4"	Dry, good	T
5A	11'-3"	T	T	1-1/4"	Good	T
5B	11'-3"	T	T	1-1/4"	Good	T
6A	13'-6"	T	T	1-1/4"	Dry, good	T
6B	13'-6"	T	T	1-1/4"	Dry, good	T
7A	16'-6"	T	T	1-1/4"	Good	T
7B	16'-6"	T	T	1-1/4"	Good	T
8A	17'-7"	T	T	1-1/4"	Good	T
8B	17'-7"	T	T	1-1/4"	Good	T
9A	20'-2"	T	T	1-1/4"	Good	T
9B	20'-2"	T	T	1-1/4"	Good	T
10A	22'-2"	T	T	1-1/2"	Good	T
10B	22'-2"	T	T	1-1/2"	Good	T
11A	24'-6"	B	B	1-1/2"	Severe corrosion	B
11B	24'-6"	T	T	1-1/2"	Good	T
12A	27'-0"	T	T	2"	Good	T
12B	27'-0"	T	T	2"	Good	T
13A	35'-2"	T	T	1-5/8"	Good	T
13B	35'-2"	T	T	1-5/8"	Good	T
14A	37'-4"	T	T	3/4-1-1/2"	Dry, good	T
14B	37'-4"	T	T	3/4-1-1/2"	Dry, good	T
* Distance from face of Column D/10 T = Tension B = Broken PT = Partial Tension						

Table 3 - Location #3						
Grid B to C, Along Grid 6 Third Floor						
Tendon No.	**Distance***	**Pry Bar Test**	**Screwdriver Test**	**Cover**	**Condition**	**Tension**
1A	7'-2"	B	B	1-1/2"	Minor corrosion	B
1B	7'-2"	B	B	1-1/2"	Dry, good	B
2A	9'-0"	B	B	1-1/4"	Dry, good	B
2B	9'-0"	T	T	1-1/4"	Dry, good	T
3A	11'-4"	T	T	1-1/4"	Dry, good	T
3B	11'-4"	T	T	1-1/4"	Dry, good	T
4A	13'-6"	T	T	3/4"	Dry, good	T
4B	13'-6"	T	T	3/4"	Dry, good	T
5A	15'-8"	T	T	3/4"	Dry, good	T
5B	15'-8"	B	B	3/4"	Minor corrosion	B
6A	17'-10"	PT	T	3/4"	Severe corrosion	T
6B	17'-10"	B	B	3/4"	Severe corrosion	B
7A	20'-0"	B	B	1-1/4"	Dry, good	B
7B	20'-0"	B	B	1-1/4"	Dry, good	B
8A	22'-0"	T	T	1-1/2"	Dry, good	T
8B	22'-0"	T	T	1-1/2"	Dry, good	T
9A	24'-4"	T	T	1-1/8"	Minor corrosion	T
9B	24'-4"	PT	B	1-1/4"	Dry, good	B
10A	26'-4"	T	T	1"	Dry, good	T
10B	26'-4"	T	T	1-1/2"	Minor corrosion	T
11A	28'-6"	B	B	1-1/2"	Minor corrosion	B
11B	28'-6"	B	B	1-1/2"	Minor corrosion	B
12A	30'-8"	B	B	1-1/2"	Minor corrosion	B
12B	30'-8"	B	B	1-1/2"	Minor corrosion	B
13A	33'-0"	B	B	1-1/2"	Minor corrosion	B
13B	33'-0"	B	B	1-1/2"	Minor corrosion	B
14A	35'-2"	B	B	3/4"	Minor corrosion	B
14B	35'-2"	B	B	3/4"	Severe corrosion	B
15A	37'-4"	B	B	1-1/2"	Minor corrosion	B
15B	37'-4"	B	B	1-1/2"	Dry, good	B
* Distance from face of Column B/6 T = Tension B = Broken PT = Partial Tension						

Table 4 - Location #4 Third Floor						
Grid A to B, Along Grid 8						
Tendon No.	**Distance***	**Pry Bar Test**	**Screwdriver Test**	**Cover**	**Condition**	**Tension**
D1A	7'-2"	B	B	1"	Severe corrosion	B
1B	7'-2"	?	T	1-3/8"	Severe corrosion	T
2A	9'-6"	PT	T	1"	Severe corrosion	T
2B	9'-6"	PT	T	1"	Severe corrosion	T
3A	11'-9"	T	T	3/4"	Good**	T
3B	11'-9"	B	B	3/4"	Severe corrosion	B
4A	13'-8"	PT	B	3/4"	Severe corrosion	B
4B	13'-8"	B	B	3/4"	Severe corrosion	B
5A	16'-0"	T	T	1-1/4"	Severe corrosion	T
5B	16'-0"	B	B	1-1/4"	Severe corrosion	B
6A	18'-0"	T	T	1"	Dry, good	T
6B	18'-0"	T	T	1"	Severe corrosion	T
7A	20'-2"	PT	T	1"	Severe corrosion	B
7B	20'-2"	T	T	1"	Dry, good	T
8A	22'-4"	B	B	1"	Severe corrosion	B
8B	22'-4"	B	B	1"	Severe corrosion	B
9A	24'-6"	T	T	1"	Dry, good	T
9B	24'-6"	T	T	3/4"	Good**	T
10A	26'-8"	T	PT	1"	Severe corrosion	PT
10B	26'-8"	B	B	1"	Severe corrosion	B
11A	28'-11"	T	T	1"	Dry, good	T
11B	28'-11"	T	T	1"	Dry, good	T
12A	31'-2"	T	T	1-1/8"	Dry, good	T
12B	31'-2"	PT	T	1-1/8"	Dry, good	T
13A	33'-4"	Can't test	T	1-1/4"	Severe corrosion	T
13B	33'-4"	PT?	B	1-1/4"	Minor corrosion	B
14A	35'-6"	B	B	1"	Severe corrosion	B
14B	35'-6"	B	B	1"	Minor corrosion	B
15A	37'-6"	B	B	3/4"	Severe corrosion	B
15B	37'-6"	B	B	3/4"	Severe corrosion	B

* Distance from face of Column B/8
**Tendon replaced (new tendon)
T = Tension B = Broken PT = Partial Tension

Table 5 - Location #5 Second Floor

Grid A to B, Along Grid 5

Tendon No.	Distance*	Pry Bar Test	Screwdriver Test	Cover	Condition	Tension
1A	5'-4"	B	B	—	Cut at Patch	B
1B	5'-5"	B	B	—	Cut at Patch	B
2A	7'-4"	T	T	1/2"	Minor corrosion	T
2B	7'-5"	B	B	5/8"	Minor corrosion	B
3A	9'-7"	PT	T	5/8"	Severe corrosion	T
3B	9'-8"	T	T	3/4"	Severe corrosion	T
4A	11'-9"	B	B	—	Cut at Patch	B
4B	11'-10"	B	B	—	Cut at Patch	B
5A	13'-9"	T	T	1"	Good	T
5B	13'-10"	B	B	0"	Good	B
6A	16'-1"	B	B	7/8"	Minor corrosion	B
6B	16'-2"	B	B	7/8"	Minor corrosion	B
7A	18'-4"	T	T	1-1/8"	Minor corrosion	T
7B	18'-5"	T	T	1-1/8"	Good	T
8A	20'-7"	T	T	3/4"	Minor corrosion	T
8B	20'-8"	T	T	3/4"	Minor corrosion	T
9A	22'-7"	T	T	1"	Minor corrosion	T
9B	22'-8"	T	T	1"	Minor corrosion	T
10A	24'-8"	T	T	3/4"	Minor corrosion	T
10B	24'-9"	T	T	7/8"	Minor corrosion	T

* Distance from face of Column A/5
T = Tension B = Broken PT = Partial Tension

Table 6 - Location #6 Second Floor						
Grid A to B, Along Grid 8						
Tendon No.	**Distance***	**Pry Bar Test**	**Screwdriver Test**	**Cover**	**Condition**	**Tension**
1A	20'-1"	B	B	1"	Minor corrosion	B
1B	19'-10"	B	B	1"	Severe corrosion	B
2A	18'-10"	T	T	1-1/8"	Good	T
2B	18'-9"	T	T	1"	Good	T
3A	17'-6"	B	B	3/4"	Severe corrosion	B
3B	17'-5"	B	B	3/4"	Severe corrosion	B
4A	13'-4"	B	B	1/2"	Severe corrosion	B
4B	13'-3"	T	T	1"	Good**	T
5A	11'-8"	T	T	3/4"	Severe corrosion	T
5B	11'-7"	PT	T	3/4"	Severe corrosion	T
6A	9'-0"	T	T	1"	Good**	T
6B	8'-11"	T	T	1"	Good**	T
7A	6'-9"	B	B	3/4"	Severe corrosion	B
7B	6'-8"	T	T	1"	Good**	T
8A	4'-6"	B	B	1/2"	Severe corrosion	B
8B	4'-5"	B	B	0"	Severe corrosion	B
9A	2'-6"	B	B	0"	Severe corrosion	B
9B	2'-5"	T	B	1/2"	Severe corrosion	T
* Distance from face of Column B/8 **Tendon replaced (new tendon) T = Tension B = Broken PT = Partial Tension						

Table 7 - Location #7 Second Floor
Grid D to E, Along Grid 12

Tendon No.	Distance*	Pry Bar Test	Screwdriver Test	Cover	Condition	Tension
1A	54'-7"	T	T	5/8"	Good	T
1B	54'-6"	B	B	5/8"	Severe corrosion	B
2A	52'-7"	B	B	7/8"	Good	B
2B	52'-6"	B	B	1"	Severe corrosion	B
3A	50'-4"	T	T	1"	Good	T
3B	50'-3"	T	T	1"	Severe corrosion	T
4A	48'-2"	T	T	3/4"	Good	T
4B	48'-1"	PT	T	1"	Severe corrosion	T
5A	45'-11"	T	T	1"	Good	T
5B	45'-10"	T	T	1-1/8"	Good	T
6A	43'-10"	T	T	1"	Good	T
6B	43'-9"	T	T	1"	Good	T
7A	41'-8"	T	T	7/8"	Severe corrosion	T
7B	41'-7"	T	T	1-1/8"	Good	T
8A	39'-5"	T	T	1-3/8"	Good	T
8B	39'-4"	T	T	1-1/2"	Good	T
9A	37'-5"	T	T	1-1/4"	Minor corrosion	T
9B	37'-4"	T	T	1-1/4"	Good	T
10A	35'-2"	B	B	1-1/2"	Minor corrosion	B
10B	35'-1"	B	B	1-3/4"	Good	B
11A	33'-1"	T	T	1-1/2"	Good	T
11B	33'-0"	T	T	1-1/2"	Good	T
12A	30'-11"	T	T	1-5/8"	Minor corrosion	T
12B	30'-10"	T	T	1-3/4"	Good	T
13A	28'-8"	T	T	1-1/4"	Minor corrosion	T
13B	28'-7"	B	B	1-1/8"	Minor corrosion	B
14A	26'-6"	B	B	1-1/4"	Good	B
14B	26'-5"	B	B	1-1/2"	Minor corrosion	B
15A	24'-4"	T	T	1-1/2"	Good	T
15B	24'-3"	T	T	1-1/2"	Minor corrosion	T
16A	22'-2"	B	B	1-1/2"	Severe corrosion	B
16B	22'-1"	B	B	1-1/2"	Minor corrosion	B
17A	19'-11"	T	T	1"	Minor corrosion	T
17B	19'-10"	T	T	1"	Severe corrosion	T
18A	17'-10"	T	T	1-1/2"	Severe corrosion	T
18B	17'-9"	T	T	1-1/4"	Minor corrosion**	T
19A	15'-8"	T	B	3/4"	Severe corrosion	B
19B	15'-7"	T	T	1"	Minor corrosion**	T
20A	13'-6"	PT	T	7/8"	Severe corrosion	T
20B	13'-5"	PT	T	3/4"	Severe corrosion	T
21A	11'-4"	B	B	1/2"	Severe corrosion	B
21B	11'-3"	B	B	3/4"	Severe corrosion	B
22A	9'-1"	T	T	1"	Severe corrosion	T
22B	9'-0"	T	T	1"	Severe corrosion	T
23A	7'-0"	B	B	7/8"	Severe corrosion	B
23B	6'-11"	B	B	1"	Severe corrosion	B
24A	4'-10"	B	B	1-1/4"	Severe corrosion	B
24B	4'-9"	B	B	1-3/8"	Severe corrosion	B
25A	2'-8"	T	T	1-7/8"	Severe corrosion	T
25B	2'-7"	T	T	1-3/4"	Severe corrosion	T

* Distance from face of Column D/12
**Tendon replaced (new tendon)
T = Tension B = Broken PT = Partial Tension

APPENDIX E
SCOPE OF SERVICES

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SCOPE OF SERVICES

TASK 1 – CONDITION APPRAISAL

The work will specifically include the following:

1. Review existing drawings, specifications, and any previous reports made available to us. We intend to use the existing drawings as our background drawings for our field survey.

2. Perform a visual review of readily accessible areas of the structure to document noticeable distress such as cracks, leaks, spalls, scaling, joint deterioration, and other similarly adverse conditions. In addition to documenting the nature of noticeably adverse conditions, this review will be utilized to quantify the conditions for cost estimating.

3. Representative sounding of structural elements will be performed to identify concrete delaminations and possible corrosion of the embedded steel reinforcement. We will perform sounding of the following elements:

    a. Floor surfaces. A chain drag survey will be performed on readily accessible elevated floor surfaces.

    b. Columns, beams, walls, ceilings, and other structural elements will be sounded at areas with visible distress. Additionally, random sounding will be performed at these elements.

    c. If additional testing is necessary, we will recommend this to you in writing along with the associated costs.

TASK 2 – P/T SYSTEM ASSESSMENT

This task will specifically include the following:

1. Review existing drawings, specifications, shop drawings, and previous repair documents to familiarize ourselves with the construction and existing conditions.

2. Conduct on-site visual observations of the parking structure to document visible conditions related to potential slab PT distress. Additionally, we will make observations required to select excavation locations based on observed deterioration.

3. Engage an experienced restoration contractor to perform excavations within the PT slab at selected representative locations (the contractor will repair the concrete at these locations at the end of our investigation). The excavations will generally be over existing beams and approximately 24 inches by 6 inches in size. A few openings will be made at the stressing anchors. The openings will be performed over a two day period, which will typically allow for approximately 90 openings, occurring across three separate beam lines. We believe that this is the minimum number of excavations required for a reasonably accurate picture of the condition of the PT tendons given the

deterioration your structure currently exhibits.

4. Visually observe the condition of the embedded slab post-tensioning system, including the tendons and anchorages (if possible) at slab excavations. The observed conditions will be documented with notes and photographs.

5. Non-destructively test the tension force of the embedded slab post-tensioning system at slab excavations using a penetration test and other methods to identify de-tensioned tendons.

6. Perform limited analyses, as required, to evaluate the magnitude of the loss of strength in the post-tensioning due to observed deterioration at investigation opening locations.

7. We will notify you immediately if our observations identify locations that shoring or repairs to the slab post-tensioning system are required for the continued use of the parking structure. If shoring design would be required, we will work with you to select the least disruptive and most cost-effective shoring solution. Engineering services in connection with shoring design, if required, would be performed on a time and expense basis.

TASK 3 – REPORTING

1. Compile and analyze field examination and materials testing data to generate repair alternatives, recommendations, and our opinion of probable cost for the recommended repairs.

2. Have a conference call with you to present our preliminary observations and to answer any questions that you may have. We will also request your input on your repair goals.

3. Provide a report to summarize our observations, findings, and repair recommendations for the structure. The report will be issued electronically for review and distribution. Our report will:

   a. Identify immediate repairs to structural elements to maintain serviceability.

   b. Recommend solutions for the identified problems and provide an opinion of probable cost and repair priority. Where necessary, selection of the most cost-effective repair recommendations will be based on cost/benefit basis.

   c. Identify the need for other structural evaluation, field investigations, and/or study that may be required to develop or implement the restoration program.

4. Conduct a conference call with you to review our report, recommendations, alternatives, and estimate of probable construction costs, if requested.

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