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August 27, 2010

Thomas Surprenant, Associate Project Manager
Connecticut Department of Public Works
165 Capital Avenue, Room 460
Hartford, CT 06106

Re: *Condition Appraisal Report*
25 Sigourney Street Parking Garage
Hartford, Connecticut

Dear Tom:

In accordance with our proposal dated August 19, 2010, Walker has visited site and performed a visual inspection of the subject parking structure for the purpose of forming opinions as to its physical condition and the required repairs. The following is a summary of our findings and observations for the subject structure.

FACILITY DESCRIPTION

The property at 25 Sigourney Street is a multi-story office tower owned and occupied by the State of Connecticut. Parking at the facility is provided by a six level free standing parking structure extended off the west side of the office tower with additional structured parking provided within the tower foot print. The total area of the parking facility is approximately 270,000 square feet and we understand the facility accommodates approximately 850 vehicles. Vehicles enter the facility through a circular plaza off of Sigourney Street onto Level P-4 within the tower footprint. Drivers can then circulate up or down in the garage via the free standing portion of the facility. The construction documents made available to Walker indicate the facility was constructed around 1985.

The free-standing or west side of the facility consists of cast-in-pace mildly reinforced and post-tensioned concrete construction. The supported floors are one-way, post-tensioned slabs supported by mildly reinforced concrete beams and columns. At the north and south perimeter the beams cantilever approximately 10 feet to the exterior. The exterior of the structure consists of mildly reinforced concrete spandrel panels. The vehicular circulation pattern is considered a single threaded helix.

The portion of the structure under the building or the east side, consists of a cast-in-place, two-way reinforced (mild steel) flat slab system supported by cast-in-place concrete columns. The exterior

of the structure consists of mildly reinforced concrete spandrel panels, similar to the west side of the facility.

Pedestrian circulation is via a stair tower at the southwest corner of the west side and a stair/elevator core within the section beneath the building.

EXECUTIVE SUMMARY

Walker visited and reviewed the subject parking structure for the purposes of determining its overall physical condition, what repairs are necessary and what the range of costs may be to restore the structure. The on-site review of the facility was performed on August 23, 2010. The on-site effort consisted of visual surveys of the interior and exterior of the garage facility as well as a limited sounding survey of select elements in an effort to identify areas of deterioration not yet visible to the naked eye. In addition, to support our effort Walker interviewed DPW and property management personnel to gain a better understanding of past repair and maintenance history, and reviewed a prior engineering study to gain additional background knowledge on the facility.

Based on our visual observations and review of available documentation, Walker considers the general condition of the structure to vary between fair and good with select elements observed to be in poor condition. In most instances the elements in poor condition occur at select locations, such as the expansion joints between the east and west side, and areas of the supported floors where deterioration has reached a point where failure of post-tensioning strands has occurred.

A brief summary of our major findings follows:

- Corrosion induced deterioration of the floor slabs (spalling) exposing the post-tensioning cables;
- Failure of individual post-tensioning cables at select locations;
- Full depth cracking of the floor slabs allowing moisture to penetrate to the level of the mild steel reinforcing and the post-tensioning cables;
- Corrosion induced deterioration (spalling & delaminations) on the topside and underside of the east side floor slabs;
- Damage/deterioration to the expansion joint seals;
- Extensive corrosion of the sprinkler system.

Deterioration in the structure can be categorized as the lack of replacement maintenance on components that have a finite life (Expansion seals, Sprinkler system), and corrosion induced deterioration to the structural system resulting from service related exposure to moisture and chlorides (top and underside spalling concrete, broken p/t cables, etc). Of primary concern is the condition of the post-tensioning system. Failed cables were noted at several locations on the topside and underside of the west side floors. In addition we noted a number of spalls in the floor slabs where the sheathed P/T cables have been exposed. Visual observations indicate the protective sheathing is being damaged and worn away by vehicular traffic and probably snow

plowing. The loss of the protective sheath exposes the strands of the cable making them highly susceptible to further deterioration and failure.

To restore the structure a program of repairs and replacement is required to address the deterioration noted above. In addition to the base repair/replacement work, a comprehensive waterproofing program must be implemented to provide long term protection to the supported floor slabs. Walker's opinion of cost for the identified work is estimated to range from $3.9 to $4.6 Million including a 10% contingency, but not including the restoration of the entry plaza. This equates to approximately $4,600 to $5,400 per vehicle space. Our opinion of cost to replace the structure with a precast-prestressed concrete structure of equivalent capacity to the west garage (+/-580 spaces), including demolition, is in the range of $23,000 to $27,000 per space, or approximately $13.5 to $15.5 Million. For the purposes of this study we've assumed the east garage under the tower would be restored in conjunction with building the new garage. The cost to restore the east garage is approximately $1.5 Million.

FINDINGS & REPAIR REQUIREMENTS

Walker's findings and repair requirements for remedial action to address observed conditions will be divided into three component areas; structure, waterproofing and miscellaneous. The miscellaneous component area includes items that were observed ancillary to our structural and waterproofing review, including fire protection, electrical and similar components.

The following is a description and discussion of observed conditions.

STRUCTURE

The overall condition of the structure is fair to good with localized areas of the supported floor slabs in poor condition. There were limited areas of prior repair noted by our visual review of the structure. The repairs noted include routing and sealing of cracks in the floor slabs, replacement of a few expansion joints and temporary patches in floor spalls. With that said there were issues and areas of deterioration encountered during our review that require repair. They are as follows:

- Supported Floor Slabs

  On the post-tensioned west side garage, corrosion induced spalls and delaminations occur in the supported floors primarily over the tops of the concrete beams. At these locations mild steel reinforcing is installed in the slab to supplement the post-tensioning system. Based on visual observations the concrete cover over this steel reinforcing is minimal (<1"), which limits the natural protection concrete gives the reinforcing and makes the steel more susceptible to corrosion from the penetration of moisture and chlorides. This mild steel has corroded resulting in spalls and delaminations. On the west side garage the majority of slab deterioration occurs on the Roof Level and Level P-2.

A consequence to the spalling is the cavities expose the post-tensioning cables. The majority of floor spalls have exposed P/T cables. By design the cables are covered with a protective layer of grease and a plastic or PVC sheath. The exposure of the cables has made the sheathing susceptible to damage from vehicles and in many locations the sheathing has been perforated or torn away. Several cables with damaged or missing sheathing were noted to be corroding. In addition, at approximately five spall locations we noted broken and/or released P/T cables.

A pattern of leaking cracks was observed on the underside of the slabs running transversely to the direction of the beams and appearing generally in the vicinity of the exterior columns and cantilevered section on both the north and south sides. The cracks exhibited leaching, rust stains and in some locations grease staining (most likely emanating from the encapsulated P/T cable). The cracks were more pronounced on the underside of the roof level, which is likely the result of the drainage profile directing run-off over these cracks. On Level P-3 a P/T cable has broken and burst through the bottom of the slab at a crack that is repeated on most of the supported floors. This may be an indication that additional hidden P/T damage is present in these cracked areas of the supported floor slabs.

The two-way mildly reinforced floor slabs of the east side of the garage exhibit corrosion induced spalling and delaminations on both the topside and underside of the slab. On the topside of the slab the deterioration occurs primarily around the columns where the slab has a heavy concentration of reinforcing steel. On the underside of the slab the deterioration occurs primarily at construction joints where moisture has penetrated through the slab reaching the bottom layer of steel.

Repair Requirements:

- ✓ Conduct full and partial depth patching to the supported concrete floors – east and west garage;
- ✓ Inject or gravity feed full depth cracks in the supported concrete floors;
- ✓ Repair broken P/T cables and repair damaged cable sheathing (Further investigation of the P/T system must be carried out prior to undertaking a restoration program)
- ✓ Conduct partial depth overhead patching to the underside of the east garage concrete floors.

Prior to undertaking repairs to the west garage further engineering analysis is required to evaluate the P/T system and to determine the possible causes of the slab cracking in the cantilevered areas of the decks.

- Columns and Beams

Concrete beams and columns were found to be in good condition overall. Some corrosion induced deterioration was observed at the base of the columns as a result of moisture "wicking" into the concrete and affecting the reinforcing steel at the perimeter of the columns. Reinforced concrete beams were in good condition

overall with the exception of several beam locations at the expansion joint between the east and west side of the garage. At these locations the long term leakage through the failed expansion seal has saturated the beam, corroding the embedded steel and subsequently causing the observed spalls.

Repair Requirements:

- ✓ Conduct partial depth patching to spalls and delaminations on columns and beams;

- Exterior Spandrels

  Review of the perimeter spandrel beams was limited by the number of parked vehicles in the garage, but visual observations noted some minor concrete spalling at the base of the panel.

  Repair Requirements:

  - ✓ Conduct partial depth patching to spalls and delaminations at the base of the spandrels;

WATERPROOFING

The waterproofing systems for this structure consist primarily of joint sealant at the construction joints, crack sealant and expansion seals between the free standing west garage and the office tower, or east side of the garage. There is no surface applied waterproofing membrane on the supported floors of either the west or east side of the garage. Typically given the age of the structures both the east and west garage should have received a comprehensive waterproofing treatment at some point over their service life to stop the ingress of moisture and chlorides and help minimize corrosion induced deterioration. It is not known whether a penetrating sealer has been applied to the horizontal concrete surfaces during its service life.

The observed waterproofing systems (sealants and expansion seals) in the garage appear to be at or beyond their useful service life and in need of replacement.

Repair Requirements:

- ✓ Replace all deteriorated expansion joints between the east and west garage;
- ✓ Install a traffic bearing waterproofing membrane on all supported floors.

MISCELLANEOUS COMPONENT AREAS

The items in this section address deterioration to mechanical and electrical systems and other miscellaneous components. It should be noted that some of these items such as the condition of the sprinkler system are important to the safety of the patrons using the facility.

- Fire Protection (Sprinkler)

  Fire protection in both garages is provided by a dry sprinkler system. The piping used for the system is black carbon steel. Visual observations indicate the piping serving the system is corroding and has reached the end of its useful service life. In addition, we were advised by building management that the corrosion of the system has resulted in perforation of the piping, which has activated the system. To aid us in our review Walker was provided a 2006 MEP Building Evaluation Report by VanZelm Heywood & Shadford. This report recognized the significant corrosion of the system, but also noted that current NFPA code requires dry sprinkler/standpipe systems exposed to the atmosphere to be constructed of galvanized steel.

  Repair Requirements:

  ✓ Replace sprinkler system;

- Lighting

  Based on discussion with building management the lighting in the garage was replaced at some point over the last five years. The current fluorescent fixtures are connected through the existing conduit that is embedded in the floor slabs. The embedded conduit is most likely a lightweight metal and given the high chloride levels in the concrete (as determined by a previous engineering study), the conduit is, in all likelihood, corroding and will be compromised by the penetration of moisture. A number of fixtures at the perimeter of the garage were not operating at the time of our visit; however, it is not known whether these fixtures are controlled by photocell or time clock.

  Repair Requirements:

  ✓ Replace the existing lighting system, including new surface mounted conduit;

- Drainage

  The garage drainage system was noted to be in good condition overall and the profile of the floor slabs appear to promote positive drainage. In a few locations of the east garage we noted some ponding water on the supported floors. Prior engineering studies indicate the garage is in need of an oil/sand separator and the roof level needs repiping to a different outlet to meet current Connecticut code.

  Repair Requirements:

  ✓ Replace deteriorated piping and drain bodies as required;
  ✓ Install oil/sand separator and repipe floors as required to meet current code.

- Railings and Guards

  In the west garage there is a combined pedestrian guard/vehicle barrier along interior Column Line 5 that blocks the drop-off between the ramped and flat floors.

REPAIR VS. REPLACEMENT

It has been our experience that the cost of restoring an existing parking garage is generally not the governing factor when evaluating the decision to repair or replace the structure. Typically other combined factors such as the need for more parking, poor functional design, re-use of the site, or the structure has reached a point where it is no longer salvageable, have a greater influence on the decision to replace.

Based on our limited appraisal of the 25 Sigourney Street parking garage, we are of the opinion that the structure can be satisfactorily restored to extend the service life. We have determined that the initial cost of restoration will range from $4,600.00 to $5,400.00 per vehicle space (Assuming 850 vehicles). A new parking garage of similar size to the west garage (580 spaces), constructed of precast-prestressed concrete will likely cost in the range of $23,000.00 to $27,000.00 per vehicle space, including demolition of the existing structure, plus the cost of restoring the tower garage estimated at $1.5 Million.

Whether restoring the existing or building new, future maintenance must be planned and budgeted for.

After completing the required repairs and carrying out a comprehensive waterproofing program, corrosion induced deterioration will continue to some degree, albeit at a slower rate, due to high chlorides and latent moisture in the concrete. Maintaining the waterproofing membrane is key to preventing another significant program of concrete restoration. Typically waterproofing systems come with a five year warranty; therefore, annual inspections by facility maintenance staff can identify failures in the system, which can be addressed quickly under warranty. In addition to performing routine maintenance tasks preventive maintenance and repairs must be planned and budgeted for. Waterproofing membranes have a typical useful service life estimated conservatively at 5 to 7 years depending on exposure. This does not mean the system will need to be replaced at this interval. At this time interval we expect that some repairs and recoating of the membrane will be required at specific high wear areas on the floors, as well as at locations where corrosion induced deterioration (spalling) has occurred in the floor, breaching the membrane. In addition to the waterproofing membrane, the expansion joints will require repair or replacement at the same time interval. The major preventive maintenance costs after restoration are outlined below

Table 2: Opinion of Probable Maintenance Costs – Restored Structure

Repair Maintenance	Cost Range at 5 to 7 year intervals
1. Repair Concrete Floors	$40,000 - $60,000
2. Repair Concrete Beams, Columns and Walls	$10,000 - $15,000
3. Replace Expansion Joints	$35,000 - $50,000
4. Repair/Recoat Waterproofing Membrane	$125,000 - $150,000

A new precast-prestressed concrete parking structure, the system most common in New England, will also require future repair and maintenance at similar time intervals. With precast-prestressed construction the concrete is very durable, which limits the amount of corrosion induced

deterioration. However, the typical double tee beam system used in garage construction results in a significant amount of joint sealant to maintain. This joint sealant will have a 7 to 10 year service life at which point it will need to be replaced. In addition, assuming a new garage was built in the footprint of the existing, expansion joints would be needed between the new garage and the tower. The major preventive maintenance costs for a new precast-prestressed concrete structure are outlined below:

Table 3: Opinion of Probable Maintenance Costs – New Precast Structure

Repair Maintenance	Cost Range at 7 to 10 year intervals
1. Repair Concrete Floors	$3,000 - $5,000
2. Replace Sealant in Double Tee System	$150,000 - $175,000
3. Replace Expansion Joints	$35,000 - $50,000

CLOSING

The 25 Sigourney Street Parking Garage is considered to be in fair to good condition overall, with select areas of poor conditions existing in the floor slab. Of primary concern is the condition of the post-tensioning system in the floor slabs. Several broken cables were noted during our survey and there is evidence that additional cables are potentially in an advanced state of deterioration. While the State considers its options for the 25 Sigourney Street site, an incremental program of restoration should be started to address the deteriorated floor slabs and reduce the potential for further P/T system deterioration.

Walker trusts the above information helps the Department of Public Works with the necessary decisions on the facility. Please contact our office if you have further questions.

Yours very truly,

WALKER RESTORATION CONSULTANTS

David W. Johnston
Restoration Department Head

Arthur G. Stadig, P.E.
Vice President

Photo 1 Typical slab deterioration on the Roof Level

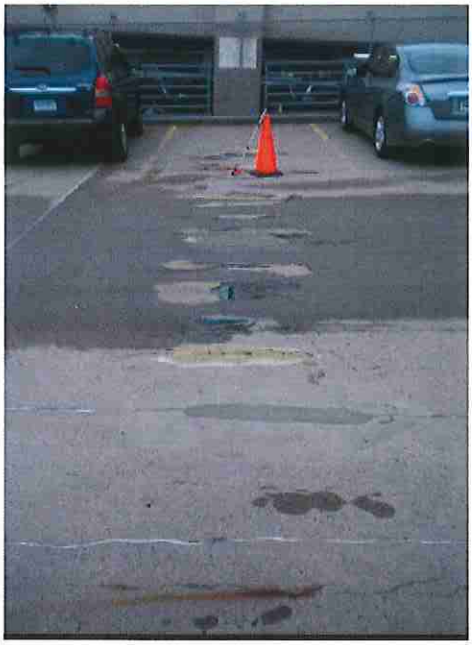

Photo 2 Typical slab deterioration over concrete beams.

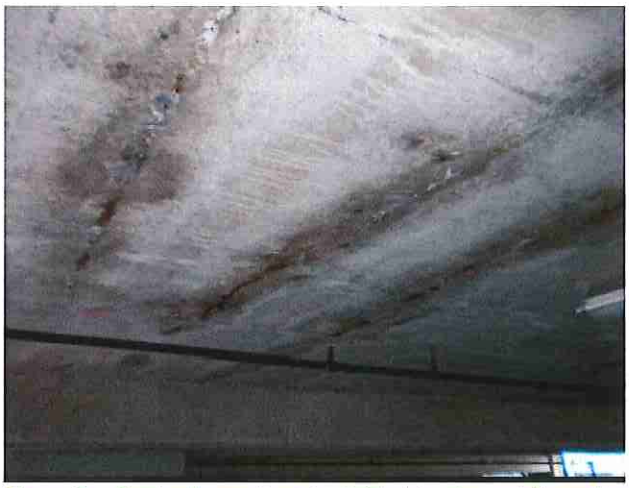

Photo 3 Typical cracking in P/T slab viewed from the underside.

Photo 4 Typical cracking in P/T slab near cantilevered end of beam.

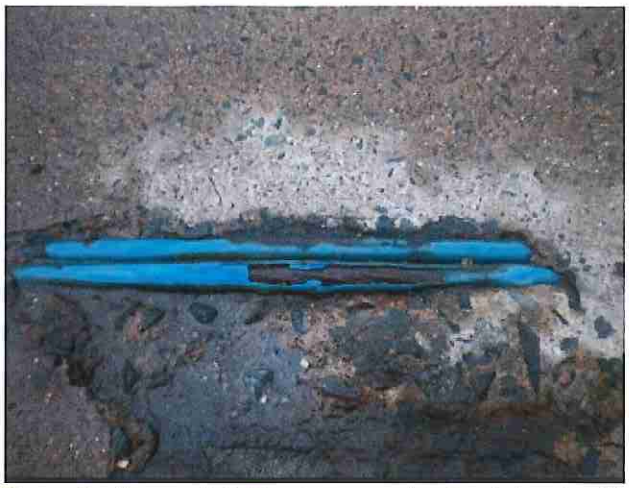

Photo 5 Exposed P/T cables on the Roof Level with damaged sheathing.

Photo 6 Broken P/T Cable at floor spall.

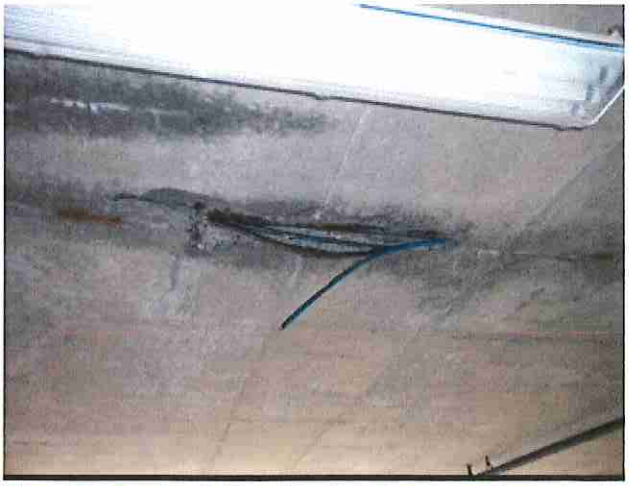

Photo 7 Broken P/T cable that has burst through the bottom of Level P-3 Slab.

Photo 8 Exposed P/T cable with apparent separation of strands, indicative of a possible break.

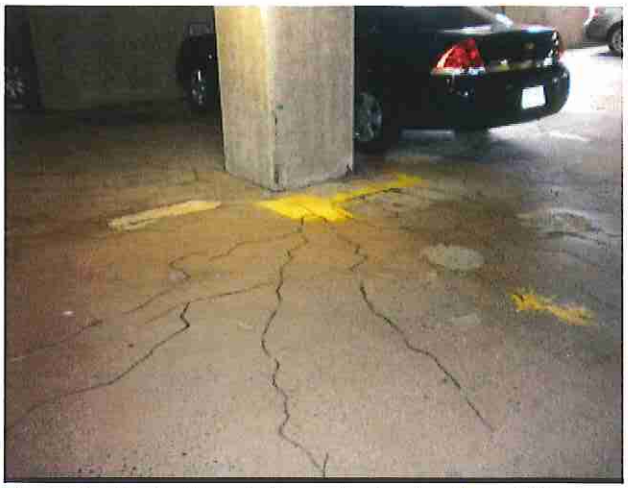

Photo 9 Typical sealed cracks in the East Side floor slabs.

Photo 10 Spalling on the underside of the East Side Slab.

Photo 11 Spalling on the slab beneath the garage exit.

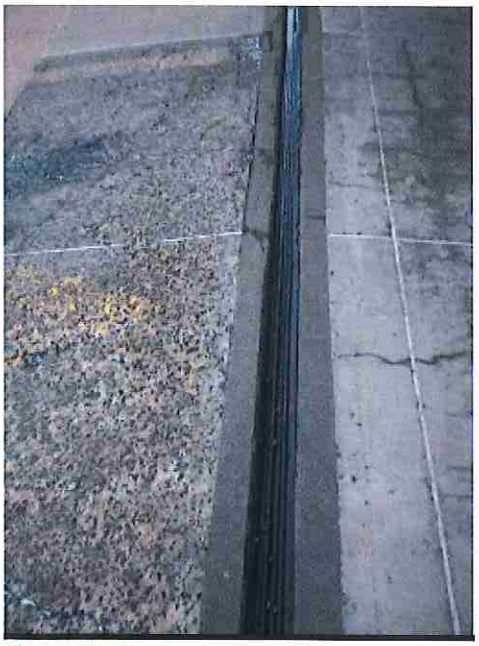

Photo 12 Roof Level expansion joint. Note scaling of concrete wash.

Photo 13 Typical condition of expansion joint between the East and West side. Note steel cover plate.

Photo 14 Leakage on beam below the expansion joint.

Photo 15 Spalling of concrete beam below expansion joint.

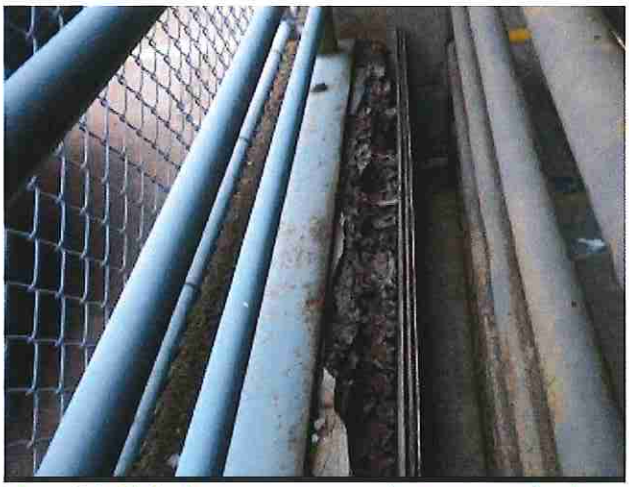

Photo 16 Slab deterioration at pedestrian guardrail.

Photo 17 Curb deterioration at pedestrian guardrail.

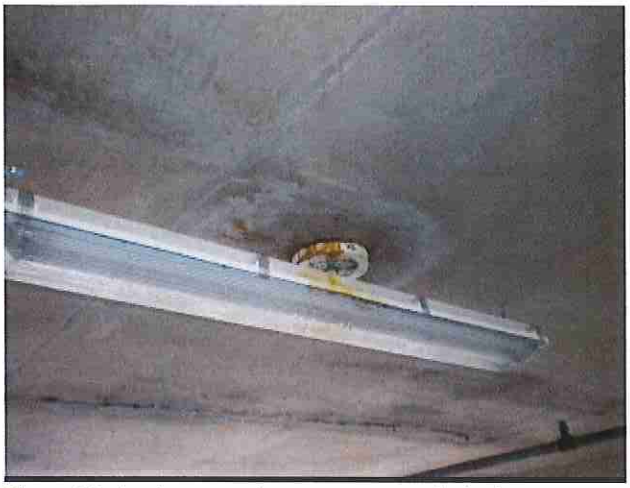

Photo 18 Leakage and rust staining at light fixture.