Heather Gardens
ASSOCIATION

LONG RANGE PLANNING COMMITTEE AGENDA
April 22, 2020 at 10 AM
ZOOM MEETING

1. Determine a Quorum
2. Welcome Guests
3. Approval of Last Meeting Report
4. Chair's Comments
5. General Manager's Comments
6. Opportunity for Guests to Address Committee on Agenda Items
7. Unfinished Business
    a. Parking Structure Report from Walker Consultants
    b. Update on FPE Panel Testing
    c. Review of PM LRP-1
8. New Business
    a. Committee Representative on Capital Reserve Committee
9. Adjournment

Don O'Gorman

To:
Allen Lindeman
Cc:
Calvin Eddy-White; Jon Rea; Jon Howell

Tuesday, April 14, 2020 12:42 PM

You replied on 4/14/2020 1:47 PM.

Hi Al,

Below is a Cost Breakdown, showing Replacement and Testing Cost for (2) CP Units (2800A and 13727B) FPE Panels and the Commercial FPE Panel at Building 217. This pricing includes engineering, parts, labor and estimated plan review and permitting cost. CP's 2800A and 13727B have been replaced. We are waiting on B217's replacement before sending the breakers for testing. The estimated timeline for B217's Panel Replacement is below as well.

FPE Electrical Replacement/ Testing Cost Breakdown		
Location	**Cost**	**Completed Yes/N0**
2800A	$2,750	Y
13727B	$2,900	Y
B217	$7,875 +/-	N
Testing	$8,000	N
Total	**$21,525 +/-**	B217's Plan Review/ Permit Fees could fluctuate total cost.

Estimated Timeline for B217's FPE Panel Replacement.

4/10 - City of Aurora Received the Engineered One-line Drawings for Plan Review.

4/10 – 4/20 – City of Aurora Conducts Plan Review.

4/21 – The contractor should receive the reviewed drawings from the City of Aurora. If approved the contractor will deliver the drawings to the Electric Panel Manufacturer. Panel Manufacturing will take 7-10 business days.

5/5 - If everything goes to plan the panels should be finished being manufactured by the 5th of May. We can hopefully schedule install the 1st or 2nd week of May. Install will take 1-2 days. Once the panel at B217 is replaced we will submit (40) Electrical Breakers from the (3) locations for testing. Testing results take (4) weeks once the testing agency receives the breakers.

The Cap. Reserve form is 90% complete, we are waiting on the final cost for B217's plan review and permit fees. Please let me know if you have questions.

Have a Great Day!

Don O'Gorman
Assistant Contracts Manager
Heather Gardens
720-974-6906

WALKER CONSULTANTS

10375 Park Meadows Drive, Suite 4250
Lone Tree, CO 80124

303.694.6622
walkerconsultants.com

April 15, 2020

Mr. Allen Lindeman
Heather Gardens
2888 S. Heather Gardens Way
Aurora, CO 80014

Via email:allen.lindeman@heathergardens.org

Re: Heather Gardens Parking Structures 1, 2, 3, & 4 Interim Condition Assessment
Aurora, Colorado

Dear Mr. Lindeman:

Walker Consultants is pleased to submit for your review this forensic restoration report for the Heather Gardens Parking Structures 1 – 4 located in Aurora, Colorado.

PROJECT BACKGROUND AND DESCRIPTION

The objectives of the evaluation were as follows:

- Perform an assessment of the structures to determine an opinion of the current conditions.
- Develop recommendations/options for repair and maintenance of the structures.
- Provide an opinion of probable cost (Rough Order of Magnitude – ROM) for repair options.

To assist in the development of this report, the following documents were reviewed:

- Partial original construction documents – Fishkin/Brin Architects circa 1973-74
- BC&E LLC – Parking Structures No. 1, 2, and 3 Post-Tensioned System and Concrete Repairs – Dated 7/19/2019
- BC&E LLC – Parking Structure No. 4 Post-Tensioned System Repairs – Dated 12/27/2017

Walker performed a condition assessment of the above referenced parking structures during our site visit of January 14, 2020. We performed a visual assessment of the structures to evaluate the condition of the supported concrete slabs, columns, ramps, stair towers, metal building enclosures, façade, and vehicle barrier systems.

Additionally, we engaged a contractor, Restruction Corporation, to provide excavations into the supported slab at select locations on Structures 2 & 3 to observe the condition of the embedded PT (Post-Tensioned) elements as well as observing the conditions of the concrete, embedded PT, and reinforcing steel (rebar) at areas that were currently under repair based on the BC&E documents for Structures 1, 2, & 3.

The following summarizes information obtained from our review of the original design documents and our on-site findings.

BACKGROUND AND DESCRIPTION

The parking structures are located along Heather Gardens Way in Aurora, Colorado and provides parking for the residences and patrons of Heather Gardens Community. The parking structures each consist of two levels, one asphalt surface on-grade level and one elevated two-way PT slab. The PT system is a button-headed wax paper wrapped wire strand system. The parking structures have steel and wood framed metal panel clad garage structures on the elevated level of each structure. The elevated parking on Structure 1 is accessed from an adjacent surface lot that is level with the elevated surface. Structures 2 & 4 are accessed from interior ramps along the edges of the structures, and Structure 3 is accessed from an exterior ramp at the north end.

The approximate overall dimensions and parking capacity of the structures are as follows:

- Structure 1 – 215'x125', 160 spaces
- Structure 2 – 263'x180', 296 spaces
- Structure 3 – 215'x125', 167 spaces
- Structure 4 – 365'x125', 288 spaces

It is our understanding that there have been previous repair programs completed on the parking structures over the past several years. In addition, a current repair project is underway for Structures 1, 2, & 3 based on the aforementioned BC&E documents.

RECOMMENDATIONS AND CONCLUSION

Based on our review of the visual observations, observation of the concrete and embedded PT and rebar elements at the investigative and repair openings, review of the project information made available, and knowledge and history of similar structures constructed in the early 70's with button-head wax paper wrapped PT systems we found that the structures were in overall fair condition but are considered in poor condition due to the high likelihood of continued issues associated with the PT system.

The condition rating was assigned as the structures present condition, with a PT system that has experienced multiple failures and is highly likely to continue to experience failures of the PT system, could contribute to the structures no longer performing their original function. The structures are performing adequately at this time but exhibit evidence of previous repairs, deferred maintenance, and are approaching the end of their useful life. Repair or replacement is necessary to prevent further deterioration and to extend their useful life.

The concrete columns and supported slab are in fair condition with select areas requiring repairs. The barrier railing at the perimeter of the structures does not provide adequate protection nor do they meet current code for vehicle barriers or as a pedestrian guard. Replacement of the barrier railing with a code compliant vehicle barrier system is required to provide protection from a vehicle going through the railing and falling to grade level.

While the existing structural slab system is considered to be in poor condition, we feel a repair program can be implemented that would extend the service life of the structure. We recommend the implementation of a

structural repair program to abandon the existing PT system in place. The repair would include the removal of the metal building enclosures and interior overlays on the elevated slabs, repair of damaged surface concrete, installation of a bonded, mildly-reinforced structural overlay, installation of supplemental reinforcing as needed at the soffit column lines, supplementing foundations and columns as needed to carry the additional dead load, and repairs to the vehicle barrier system repairs to the stairs & railings, and architectural repairs to address deficiencies noted to extend the useful service life of the structure.

IMMEDIATE REPAIR RECOMMENDATIONS

We recommend the current repair program be continued through to completion to address the immediate repairs required to the PT systems to allow the continued use of the structures while long term repairs are designed and implemented.

The structures should be monitored to ensure that they remain functional until long-term repairs can be performed.

BASE REPAIR RECOMMENDATIONS

Based on our findings, we recommend that the following items be repaired in a structured repair program to correct the existing deficiencies and extend the life of the structures:

RISK MANAGEMENT

- Install a new vehicle barrier system to replace the existing damaged railing. *
- Replace rails at the stairs with current code compliant handrails and guards. *

*NOTE: The installation of a vehicle barrier system and the stair railing replacement are included in the R.O.M. for the proposed repair.

STRUCTURAL/CONCRETE

- Remove the existing metal building enclosures and railings.
- Repair damaged concrete at the surface of the supported slab.
- Investigate the load carrying capacity of the existing foundations and subgrade and supplement as required.
- Repair deteriorated concrete at the columns, soffits, and stairs.
- Install a bonded mildly reinforced structural topping slab over the existing supported level.
- Install as required supplemental reinforcement at the underside column lines.
- Install a new vehicle barrier system at the garage perimeters.
- Install new transitions at access points to accommodate the increased elevation of the bonded overlay.
- Repair cracks in the soffit of the existing supported level.

WATERPROOFING

- Install joint sealants at construction joints in the topping slab.
- Repair random cracks in the topping slab.
- Repair damaged waterproofing membrane at the stairs.

ARCHITECTURAL/MISCELLANEOUS

- Clean and paint the underside of the structures.
- Replace damaged decorative CMU at the perimeter and provide expansion joints to minimize future damage.
- Paint traffic markings.
- Repair miscellaneous façade deficiencies.

OPINION OF PROBABLE REPAIR COSTS (R.O.M.)

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

TABLE 1 - OPINION OF R.O.M. PROBABLE REPAIR COST (2020 DOLLARS) **

REPAIR ITEMS	COSTS
Parking Structure 1	$ 850,000
Parking Structure 2	$ 1,500,000
Parking Structure 3	$ 900,000
Parking Structure 4	$ 1,500,000
TOTAL	**$ 4,750,000**

**NOTE: The R.O.M. does not include Consulting and Engineering costs. Typical design costs would be in the range of 7-10% of construction costs.

DISCUSSION

The parking structures require extensive repairs to the supported concrete slabs to extend the service life of the structures. The following outlines discussions of observations.

CONCRETE/STRUCTURAL

The concrete slabs on the supported levels are in fair condition. The supported floor slab was surveyed by a chain-drag device which assists in identifying most shallow depth concrete delamination's, and by observations of ongoing repairs.

The concrete is experiencing varying degrees of delamination and spalling. The delamination and spalling of the supported slab appears to be due to corrosion of the post-tensioned (PT) wires and embedded steel reinforcement in the slab. Contributing factors to the corrosion of the PT system and embedded reinforcement are the migration of chlorides from de-icing salts and other chemicals that reach the embedded ferrous metal elements creating a condition where the steel will corrode. This corrosion of the embedded steel creates an increase in the volume of the steel which in turn creates tensile stresses in the concrete. When the tensile stresses exceed the tensile capacity of the concrete the concrete delaminates. These areas of delamination will eventually result in spalling.

The button-head post-tensioned reinforcement system consists of individual wires, typically ¼" diameter, that are bundled together and wrapped in a wax paper and terminated at anchors called button-heads. These bundles of wires are referred to as "PT tendons" in this report. The wires of the button-head PT tendons are under large forces. As the PT wires of the button-head PT tendons corrode and lose cross-sectional area the load carrying capacity is reduced. When the cross-sectional area of the wires is reduced below the amount required to carry the stresses in the tendons, a failure occurs of the affected wire. The loads that were carried in the failed wire are then transferred to the remaining wires. This increased load on the remaining wires eventually exceeding the capacity of the remaining wires and a complete failure occurs.

Exploratory openings in the supported slabs on structures 2 & 3 were performed to evaluate the condition of the embedded PT wires. Representative areas on each structure were chosen that did not exhibit existing delamination or spalling. The intent was to open areas not currently exhibiting deterioration to determine the condition of a representative sample of PT tendons that were not part of the current repair program. Openings were made at two locations on each parking structure with openings that captured both orientations of PT tendons. Five adjacent tendons were exposed at each location and the condition of the embedded PT tendons were noted. The condition of the exposed tendons ranged from no visible corrosion to severe corrosion of PT wires. The most notable corrosion occurred where the PT tendons had the least amount of concrete cover. This condition coincides with the current PT repairs that were being completed where the majority of the failed PT tendons occurred at areas with less concrete cover most notably over the tops of the columns and at the high points in the tendons between the columns.

The PT tendon anchor locations along the perimeter of the parking structures are susceptible to moisture infiltration and failed tendons due to corrosion at the anchor locations which were found as part of the current repair program. Cracks in the concrete at the perimeter, failed joint sealants, and failed traffic topping at the anchor locations allow moisture to enter into the concrete. Moisture that reaches the PT wires and anchors creates the potential for corrosion and failure of the system.

We believe it is highly probable that additional failures of the PT system will occur in the structure as it is currently configured due to the chlorides that have migrated into the supported slab and the presence of moisture in the concrete slab. Minimizing moisture migrating into the concrete would reduce but not fully stop the corrosion of the embedded elements.

An application of a film forming waterproofing on the surface of the supported concrete slab would likely eliminate the majority of the moisture migrating from the surface. However, as the structures are open to the environment there will always be the potential of moisture in the concrete that contributes to the ongoing corrosion. Additionally, these types of waterproofing coatings require continued maintenance to maintain their continuity as damage from snow plowing, tire abrasion, etc. damage the coatings reducing their effectiveness.

Considering the age of the structure, the past usage of snow melt/deicing chemicals, the deterioration of the PT system in current repair areas, the conditions noted in the exploratory openings and the well-known history and performance of these early 1970's paper-wrapped button-head PT systems, it is highly likely that the structures will continue to see failures of the PT system that will require ongoing repair.

Several options were considered for addressing the exiting conditions that contribute to the failure of the PT system including monitoring and repair of failed tendons and concrete surfaces as they occur, installation of traffic coatings to minimize moisture infiltration in to the supported concrete slabs, replacement of the button-head system with an encapsulated shielded PT system, adding additional structural systems to replace the structural load carrying capability of the existing PT system, and replacement of the parking structures with new construction.

Walker's opinion is that abandoning the existing PT system in place by the installation of a bonded reinforced structural topping slab, and if required, installation of supplemental reinforcement at the underside of the supported slab along the column lines would provide the most cost-effective, long-term solution. Consideration of the increased dead loads on the columns and subgrade will be addressed as part of the proposed repair. With a new bonded structural topping with proper maintenance the service life of the structures can be extended 20+ years.

Spalling and delamination at the columns, foundation walls, and stair structures was also noted that is also the result of corrosion of embedded reinforcing steel. To support the elevated slabs, these elements also require repair.

VEHICLE BARRIER

The existing guardrail around the perimeter of the structure is in poor condition and does provide protection from a vehicle driving off of the structure. The existing railing has been damaged from impact, shows areas of previous repair, exhibits corrosion, and does not have the load carrying capacity as required by current regulations to resist a vehicle impact. The guard rails should be removed and a new vehicle barrier system designed and installed. This can be completed as part of the installation of a bonded structural topping slab.

STAIRS/HANDRAILS/GUARDRAILS

The existing handrails/guard do not meet the regulations of the current building code. The existing configuration does not provide a handrail and a guard, the openings in the rails exceed that allowed by code, and the rails exhibit excessive deflection when a 50lb load is applied. The railings should be replaced with code compliant handrails and guards as part of the repair project.

METAL BUILDING ENCLOSURES

The existing metal building that are constructed on the supported slabs are in poor condition and require repair. Corrosion of the metal siding, damage from impact, corrosion at the steel post bases, and rotting of the wood framing was observed.

Generally, the supported structural slabs were constructed so moisture would sheet drain across the structures. The construction of the metal enclosures interrupted this sheet flow resulting in corrosion of the metal elements, deterioration of the wood framing and increased deterioration of the concrete where moisture ponded.

Additionally, several of the metal enclosures had a concrete topping installed over the structural slab at the interiors that sloped form the middle of the buildings to the outer walls. This was likely done to try and address the flow and ponding of water inside the metal enclosures. However, the topping slab interrupts sheet flow of water across the structural slab, and extensive sections of the overlays were de-bonded which allows moisture to migrate between the topping and the concrete slab creating areas where high concentrations of chemicals and moisture are present. These conditions create areas where the embedded reinforcing and PT tendons are highly susceptible to corrosion.

WATERPROOFING

Control and construction joint sealants in the topping slab which prevent moisture from entering the concrete slab through cracks and joints are failed throughout the structures. Moisture that infiltrates these cracks and joints will contribute to the corrosion of the embedded steel elements in the slab.

EXTERIOR FAÇADE

The exterior façade of the parking structure was in good condition. Open decorative CMU units were used at numerous locations along the perimeter to provide limited access into the structure while providing natural lighting. Select areas were noted where the CMU units had been damaged do movement and binding of the exterior partitions. Providing adequate expansion joints at areas of likely movement will help in eliminating damage to these elements in the future. The damaged CMU units should be replaced and an expansion joints provided to isolate the CMU from structural elements.

TRAFFIC MARKING

Traffic markings and way finding signage in the structures were faded and worn and require repainting to improve visibility.

REPAIR SCENARIOS & OPINON OF ROM

The following repair scenarios were considered for the parking structures;

1. Maintain structures in current condition - R.O.M. Opinion $100K-$500K/YR and increasing as structures age with minimal to no extension of service life.
    a. Pros:
        i. Least short-term disruption.
        ii. Lowest short-term cost.
    b. Cons:
        i. Continued corrosion and failure of PT tendons.
        ii. Maintenance costs continue to increase as structure continues to age.
        iii. Shortest service life for the structures.

2. Perform concrete repairs and install waterproofing traffic coating – R.O.M Opinion $900k-$1,100k with a 5 to 10-year service life of the coating and continuing need for concrete and PT repairs.
    a. Pros:
        i. Protection of concrete from water infiltration will reduce the current rate of corrosion
    b. Cons:
        i. Installation cost.
        ii. Addresses only water intrusion into slab to reduce corrosion rate.
        iii. High maintenance costs.
        iv. Continued failures requiring repair of PT tendons.

3. Abandon the existing PT structural system with the installation of a reinforced, bonded structural topping – R.O.M. Opinion $4.7-$5 mil with a 20-year service life and routine maintenance costs.
    a. Pros:
        i. New concrete surface will provide long term durability.
        ii. Damage & corrosion of existing PT system relegated.
        iii. Maintains existing overhead clearance at grade level parking.
        iv. Extends service life of existing structures.
        v. Installation of topping slab will require that the metal enclosures are addressed.
    b. Cons:
        i. Requires change in surface elevation at transitions.
        ii. Garage would not be available for parking during construction.
        iii. Requires removal of metal enclosures and inconvenience to customers.

4. Replace existing parking structures with new parking facilities – R.O.M. Opinion $23-$28 mil with a 40-year service life and routine maintenance costs.
    a. Pros:
        i. New construction provides long term solution.
        ii. Change in parking capacity and functionality easily accomplished.
    b. Cons:
        i. Highest initial cost and life cycle cost.
        ii. Parking facilities out of service for extended time.
        iii. Long construction durations.

OBSERVATIONS AND FINDINGS

This evaluation included a visual survey of the topside and underside of the supported levels, concrete slab, sealants, columns, beams, facade, drainage systems, stair towers and other miscellaneous items. Conditions observed include:

CONCRETE/STRUCTURAL

1. Delaminated and spalled concrete at the supported slabs.
    a. Asphalt patching material placed in spalled concrete surface.
2. Failed PT tendons at select locations.
3. Cracks along the inside second row of columns in the soffit of supported slabs.
4. Deterioration of the concrete at the edges of the structure at various locations.
5. Cracks and leakage in exterior foundation walls.

METAL BUILDING ENCLOSURES

1. Corroded steel columns at the metal enclosures.
2. Damaged and corroded metal siding.
3. Damaged overhead doors.
4. Damaged interior separation wall in metal enclosures.
5. Deteriorated wood framing.
6. Failed (cracked and de-bonded) overlay at select garages.

WATERPROOFING

1. Failed control joint sealants
2. Failed traffic coating at the perimeter.
3. Cracks in the mild reinforced edges that were not sealed.

VEHICLE BARRIER/STAIR TOWERS/HANDRAILS/GUARDS

1. Perimeter railing damaged and bent.
2. Previous repairs of perimeter railing.
3. Corrosion at perimeter railing.
4. Perimeter railings/vehicular guards constructed of light gauge metal elements.
5. Spalls and delamination of concrete at the stairs.
6. Handrails/guards with openings exceeding current code.
7. Excessive deflection of rails under load.
8. New traffic coating installed at stairs.

Walker Consultants appreciates the opportunity to be of service to you. If there are any questions regarding the findings, recommendations, or opinion of probable R.O.M. costs provided in this report, please do not hesitate to call us.

Sincerely,
WALKER CONSULTANTS

Loren M Reimer, P.E.
Consultant

Enclosures: Limitations
Appendix A – Photographs

LIMITATIONS

This report contains the professional opinions of Walker Consultants based on the conditions observed as of the date of our site visit and documents made available to us by Heather Gardens Association (Client). 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 assessment 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 appraisal and the recommendations therein are to be used by Client 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 agreed scope of services, the assessment 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. More detailed and invasive testing may be provided by Walker Consultants as an additional service upon written request from Client.

The recommended repair concepts outlined represents current generally accepted technology. This report does not provide any kind of guarantee or warranty on our findings and recommendations. Our assessment was based on and limited to the agreed scope of work. We do not intend to suggest or imply that our observation has discovered or disclosed latent conditions or has considered all possible improvement or repair concepts.

A review of the facility for Building Code compliance and 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 Client and may not be assigned without written consent from Walker Consultants. Use of this report by others is at their own risk. Failure to make repairs recommended in this report in a timely manner using appropriate measures for safety of workers and persons using the facility could increase the risks to users of the facility. Client assumes all liability for personal injury and property damage caused by current conditions in the facility or by construction, means, methods and safety measures implemented during facility repairs. Client shall indemnify or hold Walker Consultants harmless from liability and expense including reasonable attorney's fees, incurred by Walker Consultants as a result of Client's failure to implement repairs or to conduct repairs in a safe and prudent manner.

Photo 1 – View of Structure #2 viewed from the west. Typical single supported level construction.

Photo 2 – Perimeter railing at Structure #2. Typical of perimeter railings at all structures.

Photo 3 – Traffic coating at the perimeter and asphalt patch material at slab spalling..

Photo 4 – Perimeter railing with welded post repair and deflection from impact.

Photo 5 – Typical stair layout and railings.

Photo 6 – Damaged CMU light units at top of wall at perimeter foundation wall.

Photo 7 – Severely deteriorated concrete at the west edge of Structure #2.

Photo 8 – Typical concrete spall at column.

Photo 9 – Crack at parking structure soffit. Note peeled paint and staining indicating moisture migrating through the crack.

Photo 10 – Spalled concrete at supported slab with corroded rebar and failed PT tendon.

Photo 11 – Stains at perimeter foundation wall indicating leakage through the wall.

Photo 12 – Failed joint sealant on supported slab.

Photo 13 – Failed joint sealant at overlay inside a metal building enclosure.

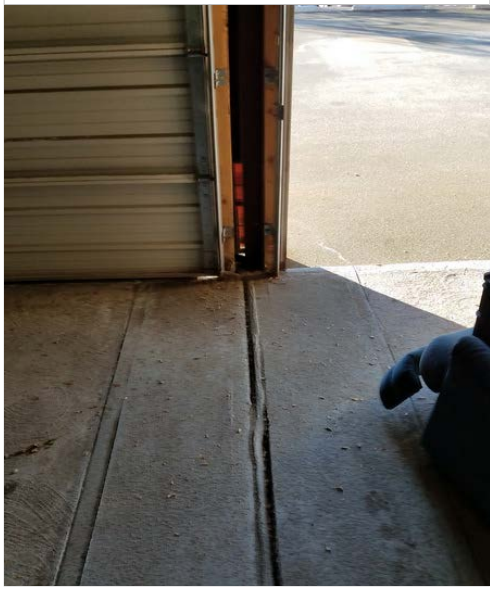

Photo 14 – Cracked and delaminated overlay inside metal building enclosure.

Photo 15 – Damaged siding at meal buildings.

Photo 16 – Damaged façade cladding and corroded structural steel.

Photo 17 – Corroded structural post and door railings and deteriorating wood framing.

Photo 1 – South end of Structure 2 at typical exploratory openings at PT tendons.

Photo 2 – PT tendon penetration test. (Used to determine is tendon is stressed)

Photo 3 – Failed PT tendons at the anchors due to corrosion.

Photo 4 – Typical PT tendon bundle.

Photo 1 – Exploratory openings of tendons running in the east-west direction.

Photo 2 – Exploratory openings of tendons running in the north-south direction.

Photo 3 – PT tendon bundles with corrosion present on wires.

Photo 4 – Corroded PT tendon.

Photo 5 – Severely corroded PT tendon.