Feasibility Study

MILLENNIUM LIBRARY PARKADE | 201 DONALD STREET

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Feasibility Study

Millennium Library Parkade

201 Donald Street

April 22, 2024

Prepared for:

City of Winnipeg
Winnipeg Parking Authority

Prepared by:
Stantec Consulting Ltd.

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1	Draft Report	December 23, 2022	Various	BF/MH/MB/LK	Russell Lavitt	RL
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Sign-off Sheet

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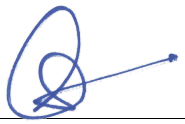
Prepared by 
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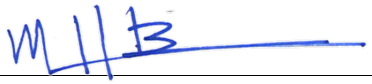
Prepared by 
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EXECUTIVE SUMMARY

The Millennium Library Parkade was built in 1974 and is an underground heated parking facility with 480 parking stalls centrally located in downtown Winnipeg. The parkade is connected to the Millennium Library and the downtown skywalk system. The parkade supports services and businesses in the downtown by providing parking to people visiting the library, working in the downtown, attending special events at the Canada Life Centre and visiting restaurants and shops in the area. A large public park sits above a portion of the parkade.

In 2021, a previous condition assessment conducted on the parkade estimated that $55 million of capital repairs (Class 5) would be required to keep the parkade operational. Due to the high cost of the repair estimate, the City commissioned a report from Stantec to undertake a feasibility study to determine the best long-term plan for the parkade and to refine the 2021 cost estimates.

The Millennium Library Parkade was studied by Stantec in two parts namely; high priority repairs and a feasibility study with four options. For the high priority repairs, it was determined that the repairs could be carried out over a three year construction period for a cost of $14,463,000. The drawings and specifications were advanced to a Class 3 costing level. This works includes high priority items that should be addressed within the next four years.

The feasibiliy study included four options as follows:

Option	Description
1. Repair the Parkade	This option explored repairing the parkade
2. Build a New Parkade	This option explored demolishing the existing parkade and building a new above ground 480 stall parkade with two small parks
3. Demolish the Parkade	This option explored demolition of the existing parkade and rebuilding the existing park
4. Sell the Parkade	This option explored decoupling the electrical and mechanical sytems for the parkae and library to make them standalone assets, and then potentially selling the parkade.

When considering capital and operating costs, service level impacts and alignments to City masterplans and policies, the feasibility study concluded that repairing the parkade offers the greatest benefit to the City over other all other options explored.

The feasibility study assessed the cost/benefit of each option from a Net Present Value standpoint as well as a lifecycle costing review over a 20 year timeframe.

Option	**Lifecycle Cost (in thousands)**		
	Capital	**Operating**	**Total**
1. Repairing the Parkade	$ 28,804	$ 17,297	$ 46,101
2. Building a New Parkade	$ 48,857	$ 26,244	$ 75,101
3. Demolish the Parkade	$ 14,875	$ 35,857	$ 50,732
4. Selling the Parkade	$ 10,313	$ 25,357	$ 35,670

Note: Capital costs are Class 4 estimates, with exception of the costs included in the repair parkade options for years 2024-2027, which are Class 3 estimates. Capital costs in the table above do not include internal City administrative charges.

From a purely financial standpoint, selling the parkade is the least costly option over a 20 year timeframe, however as demonstrated in the NPV analysis, the detrimental service level impacts that would occur from selling the parkade, ranks selling the parkade as the least favorable option for the City.

The Net Present Value analysis ranks the order of each option, the option with the best cost/benefit ranking (see cost/benefit rank 1.00 in table below) is the best option for the City.

PROJECT ANALYSIS SUMMARY							
Status Quo Analysis							
Baseline NPV Opex ($k)		$ (12,482)					
**Status quo is defined as maintaining the current operations and maintenance behaviour. This is typically the O&M recommendations defined by the manufacturer or designer. Status quo provides the realistic operating cost baseline to be used to compare the project options against.*							
NPV and Benefit Options Summary Table							
Option Number	**Option Description**	**NPV Capex ($k)**	**NPV Opex ($k)**	**NPV ($k)**	**Benefit Score (in points)**	**Cost/Benefit**	**Cost/Benefit Rank**
Option 1	Repair Existing Parkade	$ 23,152	$ 11,189	$ 34,341	2,712	12.6620	1.00
Option 2	Build New Parkade	$ 41,413	$ 17,606	$ 59,019	2,041	28.9227	2.00
Option 3	Demolish Parkade & Build New Park	$ 12,595	$ 20,406	$ 33,000	696	47.4080	3.00
Option 4	Sell Parkade	$ 8,943	$ 12,186	$ 21,129	46	463.9806	4.00
**Note: The Benefit/NPV ratio takes into account the number of projects included in a program*							

Table obtained from Net Present Value spreadsheet

The Net Present Value analysis concluded that repairing the parkade the option ranked as the best option for the City to pursue.

Repairing the parkade provides the following service level benefits:

- Provides secure parking to people working downtown and attending special events at the Canada Life Centre as the parkade is connected to the downtown skywalk. This supports access to the Sports, Hospitality and Entertainment District (SHED) in the downtown.
- Provides parking to people visiting or attending programming at the Millennium Library.
- Ensures that persons with disabilities are able to access a barrier-free accessible route from the parkade to the library as well as other downtown destinations via the weather protected skywalk.
- Supports economic development and residential growth plans for the area, including Centre Plan 2050 and the future redesign of Graham Avenue, which is intended to strengthen this district as an entertainment and destination district directly adjacent to the parkade.
- Allows for continued use of the park above the parkade which is important as there is currently not enough greenspace in the downtown.

This option also aligns with approved Council plans and policies, including OurWinnipeg 2024, The Winnipeg Parks Strategy, and the City's Strategic Priorities Action Plan.

The table below presents the capital cost that would need to be included in the upcoming budget cycle for the option to Repair the Parkade:

Timeframe	Description of Work	Capital Cost
2024 - 2027	Undertake high priortity concrete slab repairs on P1 level; replace obsolete lighting system controls; replace air handling unit	$ 14,463,000 (Class 3 estimate)
2028	Undertake additional structural, electrical, and mechanical repairs and add up to 40 electrical electric charging statios	$ 3,895,000 (Class 4 estimate)
2030	Undertake additional structural, electrical, and mechanical repairs	$ 11,627,000 (Class 4 estimate)
Total		$ 29,985,000

*Note: These costs are slightly higher than the lifecycle costing analysis from the feasibility study as they include internal City charges.

Stantec recommends moving forward with Option 1 to Repair the Parkade and to include enhanced testing to be undertaken during detailed design in order to refine the structural remediation design.

1.0 INTRODUCTION

1.1 SCOPE OF REPORT

The purpose of this report is to advance the work completed by others in the previous Parkade Condition Assessment report dated April 8, 2021, and to undertake a feasibility study of several planning options envisioned by the City of Winnipeg. The study will consider the options, feasibility, logistics, and costing, as well as discussing possible future requirements to implement the options. The work can be described as follows in the following two deliverables:

Part 1: High Priority Short Term Repairs

- Generate drawings and specification.
- Generate a Class 3 cost estimate for previous high priority short term repairs to be undertaken over the next four years.

Part 2: Feasibility Study Options

- Complete a feasibility study to develop and assess viable options that offer cost-effective solutions:
- Undertake a cost-benefit analysis based on four options:
    1. Repair the Parkade
    2. Build a New Parkade
    3. Demolish the Parakde
    4. Sell the Parkade
- Consultation with various Civic departments and stakeholders to identify service level impacts of all options and alignments to existing Council approved policies and master plans.
- Generate an outline specification and generate a Class 4 cost estimate for the four options above.

The findings of this report will help inform the City in considering the future use of the Parkade.

This review is to document the recent findings and report on the general conditons encountered at the Millennium Library Parkade.

1.2 GENERAL DESCRIPTION

The facilty can generally be described as a below grade, two level parking garage with a library above on the northern portion of the parking garage and park above the southern portion. The garage was developed as part of the original Centennial (now Millennium) Library, constructed in 1974.

Various repairs and upgrades have been undertaken on the structure since the original construction including the more notable modifications:

2003 – Landscaping to upgrade a strip of the park beside the library (north extent).

2008 – Landscaping upgrades to the park.

2012 – Landscaping upgrades to the south portion of the park (along St. Mary’s Avenue).

2012 – 2013 – Repairs to the lowest level parking slab and various concrete repairs. Stairwell replacement and slab repairs to P1. New traffic membrane installed.

2018 – Additional repairs to ramps for heating loops. Warranty repairs on traffic membrane.

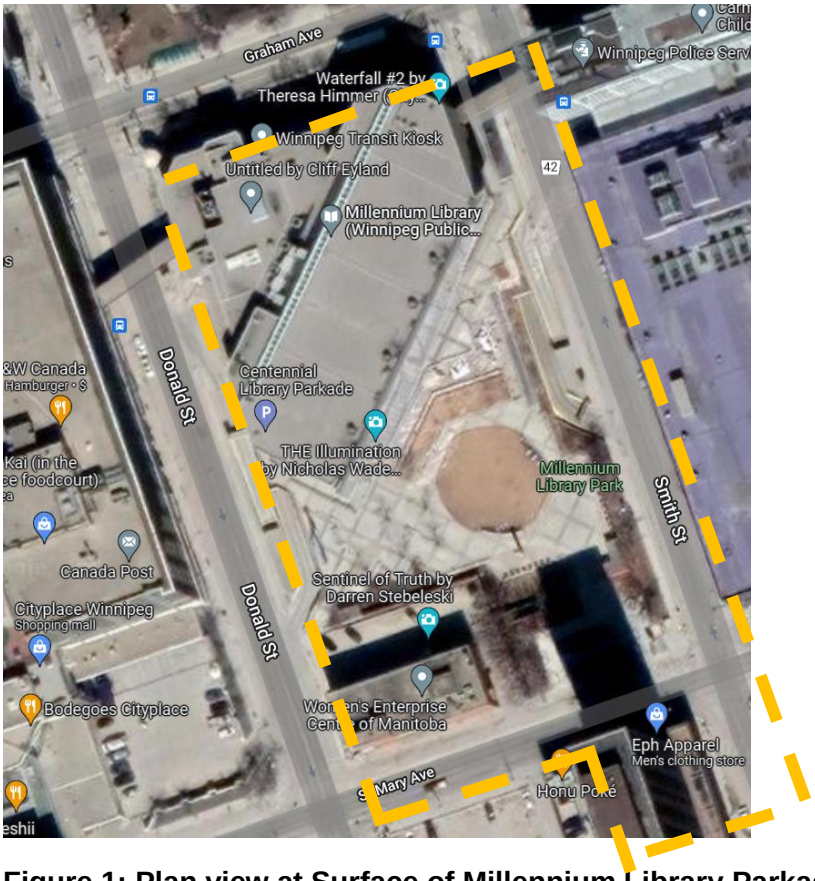


Figure 1: Plan view at Surface of Millennium Library Parkade

2.0 PART 1: HIGH PRIORITY SHORT TERM REPAIRS

2.1 INTRODUCTION

High priority short term repairs to the Millennium Library Parkade encompass various structural, mechanical, and electrical elements with the intention to extend the life of the Parkade. Structural recommendations are intended to address underlying causes of deterioration. Mechanical recommendations include air handling unit replacement, obsolete lighting replacement, additional parking booth ventilation for office spaces. Electrical recommendations consist of improved labelling for electrical equipment, generating single line diagram, emergency generator battery

replacement, as well as an alarm system replacement for the parking booth only. Costing for this deliverable are to be at a Cost level 3 Estimate.

2.2 GENERAL DESCRIPTION

The Millennium Library Parkade can generally be described as a below ground, two-level parking garage constructed from conventional reinforced concrete. The highest level, P1, is a 9” thick reinforced concrete two-way slab with drop panels and is supported on columns in a 30ft-by-30ft grid while the lowest level, P2, is a slab-on-earth arrangement. The roof slab above P1 is 12” thick reinforced concrete slab complete with drop panels and supports the park above. The perimeter walls are built of reinforced concrete. There are vehicle ramps located on the Smith Street (east) and Donald Street (west) walls of the Parkade. The P2 level slab was replaced in 2012 as part of a refurbishment contract to repair the garage. Stairwells were replaced in 2012 – 2013. A new traffic membrane was installed on level P1 and warranty repairs on the traffic membrane were installed in 2018.

Figure 2: Plan view of structural floor (P1).

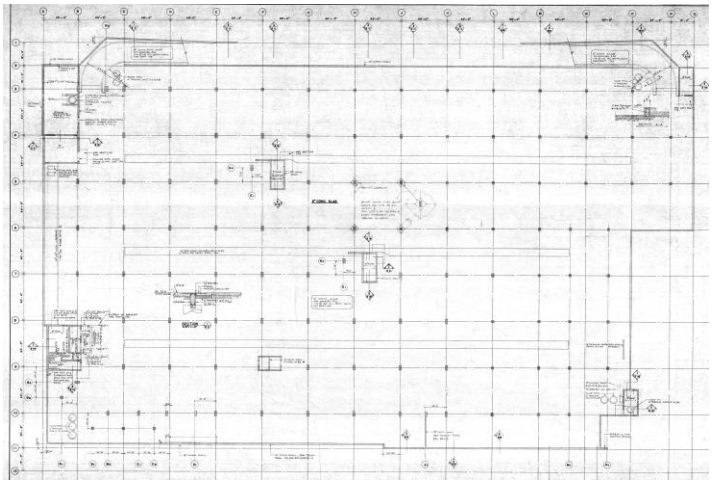


Figure 3: Plan view of structural floor lowest level framing (P2)

2.3 STRUCTURAL REVIEW

2.3.1 Structural Visual Observations

In mid-July 2022, Stantec structural group (Blair Fraser P. Eng and Linda Duch EIT) undertook a non-destructive, visual assessment of the Parkade. The assessment of the Parkade included a non-destructive review of the garage and noted deficiencies throughout the Parkade. The original construction drawings provided by the City of Winnipeg and the previous consultant report provided were helpful in the review as they outlined the design and some of the previous assessment work completed on the Parkade. This information provided a starting point for the current re-assessment and this report will build upon the previous 2021 assessment.

The parking garage has been well maintained over the years, and concrete patching and concrete surface painting has assisted in preserving the Parkade. Our team found numerous small issues such as concrete cracking and some concrete spalls. Some signs of moisture ingress were visible during our reviews.

2.3.2 Upper Level P1

The membrane on P1 has had numerous repair patches. The P1 concrete top surface was sounded (chain tested) to determine the amount of delaminated concrete in the Parkade. It was previously determined by others that 10% of the slab was debonded while the sketch provided in the older report (noted as S1.1) appears to imply a larger amount. Debonding occurs when a separation forms within the concrete slab creating a hollow which during a chain test (a metal chain dragged across the concrete surface) results in a “drummy” sound (rather than a metallic chain sound in that location) which can be an indicator of damage to the concrete.

The roof slab above P1 appeared to be in good condition as viewed from the underside as the top of the slab is covered with ponds, paving stones, grass, concrete over top of insulation and a membrane. We found very few

problematic items in the soffit of the roof slab during the review. The majority of the underside of the roof was painted, and we found the majority of the paint was in good condition.

Figures 4 and 5 below are a summary of the findings and were used as the basis for the costing for the Class 3 costing estimate.

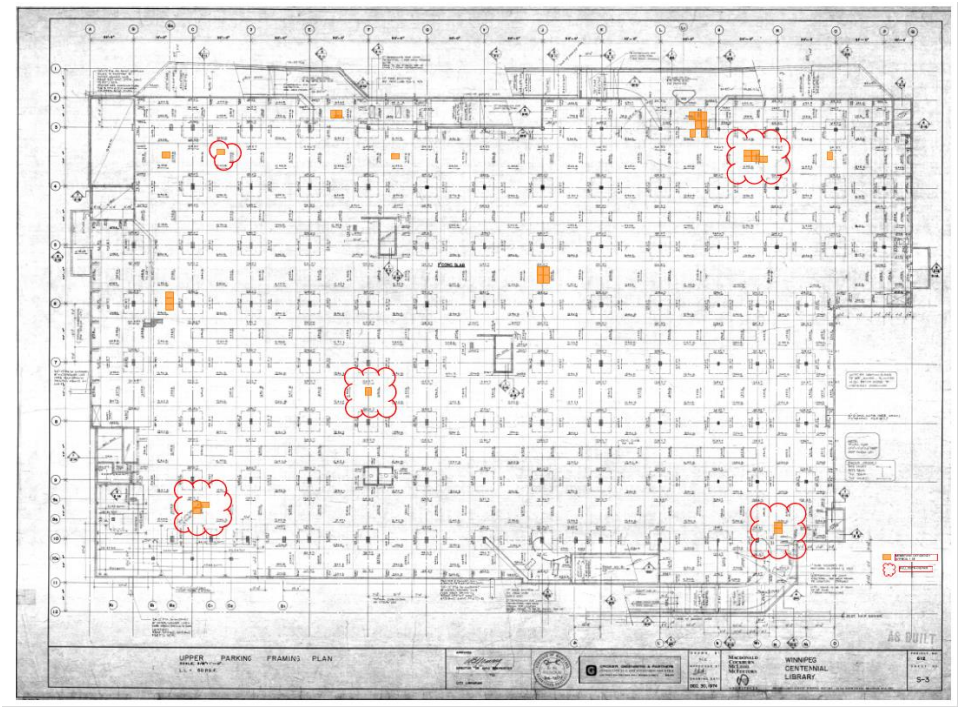


Figure 4: Topside P1 Slab Repair Zones

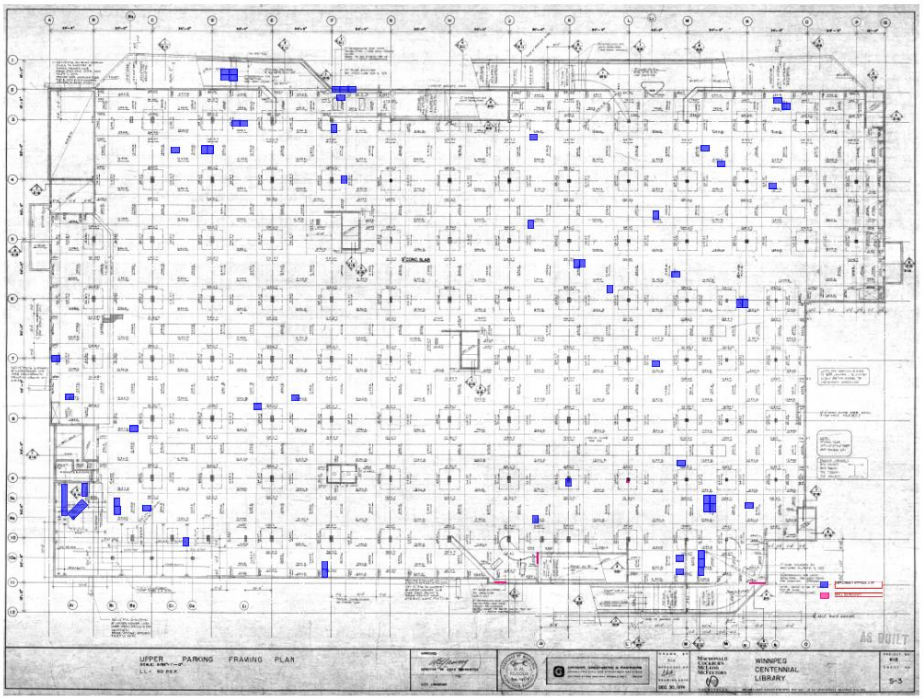


Figure 5: Underside P1 Slab Repair Zones

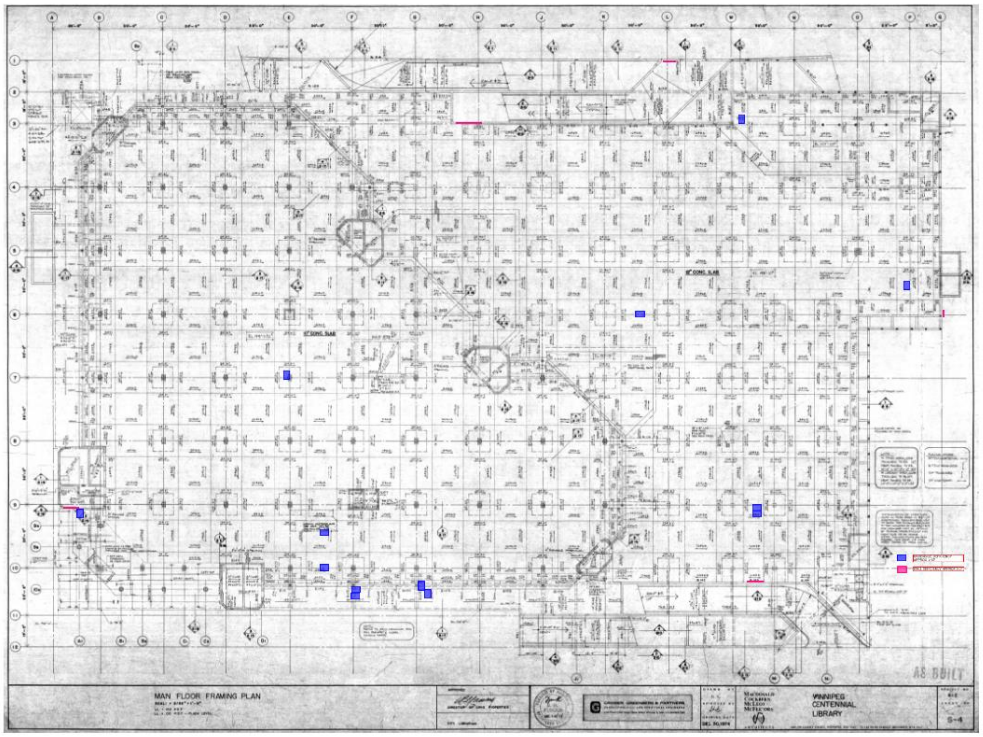


Figure 6: Underside Roof Slab Repair Zones

2.3.3 Lower Level P2

The lower level P2 slab was in good condition as it was recently replaced. Very few items were found during the review. The owner noted that the P2 slab was constructed with fiber reinforcement and thus membrane was not installed. Based on field observations, the lower level appeared to have significantly less traffic and does not require a traffic membrane on the parking stalls or drive aisles. However, the City should consider installing a traffic membrane on the lower P2 level in order to protect the slab against deterioration and weathering.

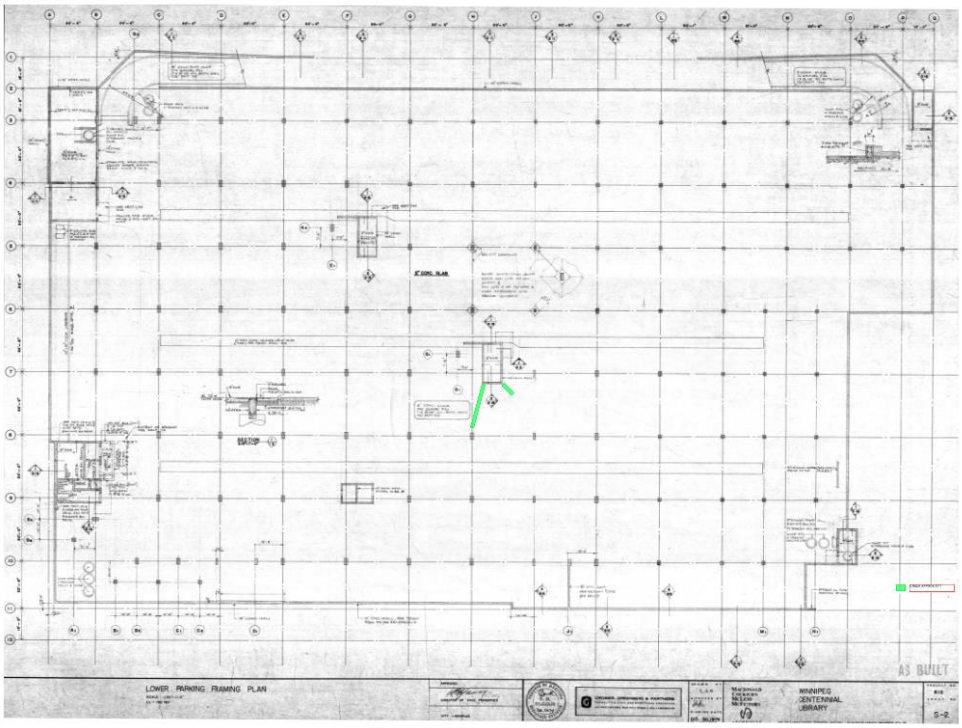


Figure 7: Top of P2 Slab Repair Zones

The walls of the parking garage appear to have some cracking and signs of water ingress, but minimal overall. The walls were primarily painted where the paint was in good condition.

Our team undertook a crack survey of the walls where it was found that, in general, there are limited cracks in the facility. The following figure summarizes the findings. As many of the cracks in the concrete are larger than 0.1mm, they could be prone to leaking and should be repaired to limit water ingress into the parking garage. The common approach to repair is to utilize crack injection.

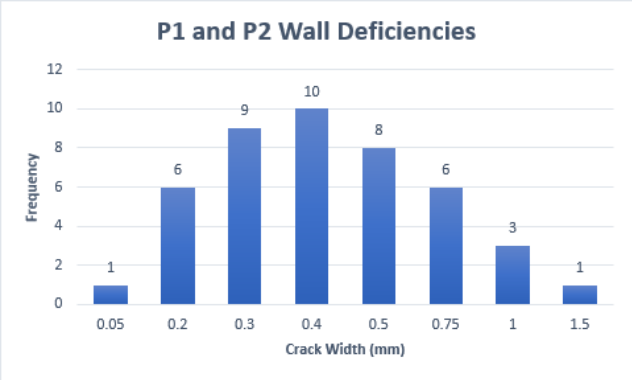


Figure 8: Wall crack Widths

2.3.4 Mechanical Rooms

The P2 level mechanical room exhibited signs of water ingress through cracks in the wall leading from the Millennium Park area. Water was ponding at the base of the stairs. Leaks appeared to be generally slow but enough to cause a pond.

2.3.5 Stairwells

The stairwells had been replaced in previous projects and as such this review found limited issues with the stairwells. The items that should be addressed include the step cracks on the CMU partition wall in the southeast vestibule and one missing anchor bolt in the stair handrail. The step cracks should be hand packed with grout and re-painted to prevent water ingress and the missing bolt should be installed.

2.3.6 Structural Review of Core Sampling and Testing

Our team reviewed the findings from the previous report(s) and understood that there is very limited data used for the assessment from the past report. Several cores were extracted from the slabs and sent for compression testing, chloride testing and carbonation tests to obtain the in-situ conditions. The following sections discuss the previous findings.

2.3.6.1 Compressive Strength

The previous report provided a statistical comparison of the concrete obtained from three (3) samples and used this limited information to generate a very conservative assessment of the concrete. The previous report used a strength of 11.5 MPa (1,700 psi) which was found to be very low when compared to the drawings which indicate a value closer to 20.7 MPa (3,000 psi). The previous assessment concluded the strength was acceptable when the demand-capacity ratio approach is used to validate the concrete service conditions. If further testing was undertaken, it is believed the value would increase due to the statistical approach of the assessment which would only improve the “in-situ” strength. This had been noted in the previous report, and additional coring would validate this assumption.

2.3.6.2 Chloride Ions

Upon reviewing the chloride testing provided in previous reports, which tested the P1 slab from the top, it was found that the previous testing indicted shallow depth has larger concentration of chlorides and deeper into the P1 concrete the chlorides were low. We would expect this finding as the concentration would diminish with depth into the concrete. The applied traffic membrane on P1 would limit the additional chlorides into the top of the parking slab. The concentrations in the slab were highest in the drive isle at 2.20% while 0.67% in the parking stalls. Both of these values are above recommended limits and as such validate the need for a well-maintained membrane. This indicator is the greatest reason to consider removal and replacement of the top few inches of the concrete slab and to provide a new surface membrane. Some of our concrete experts suggested a physical review of the reinforcing in select zones would provide a better assessment of the actual in-situ conditions before continuing with the full repair.

2.3.6.3 Carbonation and Visual Review of the Reinforcing

Our team consulted with our concrete materials engineer with respect to the concrete testing provided. We undertook a review of the carbonation results previously reported and stated that the carbonation has resulted in reduction the pH of the concrete from 12 to a range of approximately 9 to 7, but this may not be deterministic of corrosion of the Parkade reinforcing steel. As such, a physical review of select zones would provide a better assessment on select samples. Carbonation occurs when atmospheric carbon dioxide diffuses with the atmospheric moisture and collects on surfaces reacting with the concrete. The loss of the passive nature of the concrete only means that conditions in the concrete allow for additional moisture to start corrosion of the reinforcing steel. Corrosion of reinforcing steel is normally a slow process and signs such as concrete spalls or cracking begin as an indicator that corrosion is occurring in select locations.

The use of barriers such as paint (which in the case of this Parkade is existing) would aid in being a partial barrier; however, a silane sealer/barrier would be more effective than simple paint. In some cases, the paint might not have any barrier abilities. The use of a barrier would help preserve the asset and reduce further carbonation while limiting moisture ingress into the concrete. Additionally, the traffic membrane above the concrete surface would aid in carbonation protection and limit moisture into the concrete. A properly designed ventilation system would help reduce the humidity in the air and would improve conditions. It was envisioned that during certain times of the year the ventilation system might have reduced air exchanges resulting in higher humidity and carbon dioxide concentrations inside the Parkade. This is likely the result in operational changes made early in the operation of the Parkade due to massively increased energy costs in the 1970s. Building operators looked to reduce energy consumption, and in this case year-round ventilation of the Parkade, to reduce operating costs. It is therefore suggested to improve ventilation.

2.3.7 Membrane Condition Survey

The previous investigation undertook bond testing on the existing membrane and found the bond to be 2.29 MPa, which is well above recommended minimum of 1.4 MPa. The report noted that the thickness was slightly less than membrane thicknesses but could be attributed to field measurements and location of testing. Overall, it appears the membrane is behaving as expected for its age and use.

2.3.7.1 P1 Traffic Membrane

The membrane is estimated to be approximately 10 years old and as such would be beyond its warranty period but appears to have some life remaining. The City should consider a new traffic membrane such as Sikalastic -3900 Traffic System for medium/heavy traffic applications. The City could ask for a longer warranty period and compare costs based upon lifespan.

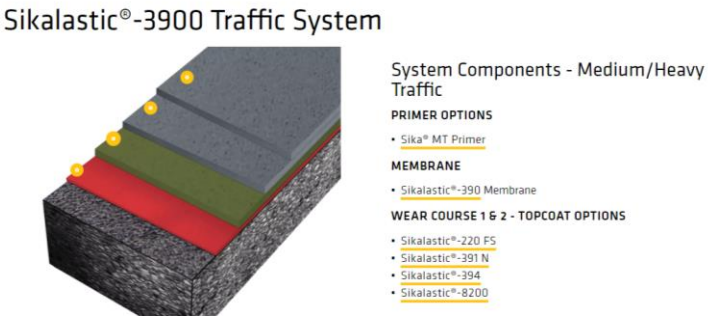


Figure 9: Suggested Traffic Coating System

Our team recently undertook an extensive survey of traffic membrane suppliers and found that the majority only have a 5-year warranty period on their systems unless an enhanced system is considered. For example, the manufacturer Sika has an enhanced system which provides a 10-year warranty period, but is more costly, and as such the interruption of service to the Parkade due to a membrane replacement is less, partially offsetting the higher cost of the enhanced membrane. Sika's enhanced membrane system has been used throughout Europe and is relatively new to the North American market but could be considered a viable option for this site. The warranties for these enhanced systems are based on a 5-year warranty then after the initial 5-year warranty period, the Supplier and Installer undertake a review and require the Owner to make the repairs extending the warranty period another 5 years to make up the 10-year warranty. This type of contractual arrangement binds the supplier and installation contractor during the 10-year warranty period. It is common at the end of the initial 5-year warranty period, there is a recoating (top-coat) which is required and estimated to be around $100,000.

The higher-grade membrane system offered by Sika is called Pronto RB 5700 Puma, and the Neogard system is provided under the Auto-Gard family of products. We have included some literature from Neogard and Sika for reference.

The Sika Pronto RB-5700 Puma coating system, which is an enhanced membrane system, does have a very strong odor during application and the Parkade would need to be well ventilated during installation. Sika notes the odor subsides once the product is fully cured but could not provide a timeline. An enhanced ventilation system during installation would need to be further investigated and included in the costs if this system is further considered. The issue is that the strong odor during the installation could result in odor issues in the library.

The Puma system has the advantage of quicker curing times compared to the Sikalastic-3900 system. When comparing the costs for the Sikalastic-3900 traffic system and when compared to the Puma system, installers have indicated the cost of the Puma system would be 4 to 5 times the cost of the Sikalastic-3900 system.

Stantec feels that the use of the Puma system could still be considered viable for this project, even at higher costs, as the Parkade extends below the Library and forms and integral part of the entire structure.

The costing reports are based on a traditional membrane system and as such the cost estimates would need to be increased and ventilation costs would need to be added. The membrane additional cost is anticipated to be about $15 per square foot and based on 100,000 square feet would add about $1,500,000 to the membrane cost.

Figure 10: Traffic Coating System

Because the off gassing of the Puma system (or equivalent) could be a large possible impact to Library users we feel the preferred approach to minimize disruptions should be to use the lower cost membranes (Sikalastic-3900) and consider using a thicker coat or secondary coat in the drive isles.

2.3.8 Structural High Priority Short Term Repair Description

High priority short term repairs would include:

- Hydro demolition to replace delaminated concrete
- Crack repair
- Concrete slab resurfacing
- Installing swales at columns

Delaminated concrete was mainly found on the underside of the P1 slab where several areas exhibited exposed reinforcement. Repairing delaminated concrete on the underside of the P1 slab consists of removing all loose concrete and chipping any additional concrete until sound concrete is reached and existing reinforcing is exposed. The exposed reinforcement must be wire brushed or pressure washed and primed for mortar using an anti-corrosion

coating. The surface is then prepared and saturated (SSD – surface saturated dry) and the repair mortar installed using below or preferred top side pressure grouting as per manufacturer's specifications.

The P2 level mechanical room exhibited signs of water ingress through cracks in the wall leading from the Millennium Park area. Crack injection may be used to repair the cracks to limit or restrict water from leaking into the mechanical room. All damaged, loose concrete surrounding the cracks are removed and the surface is roughened and cleaned to create a suitable substrate.

To replace sections of delaminated concrete on the top surface of the P1 slab, 3" of concrete would be hydro demolished to expose existing reinforcement which will be assessed to determine any deteriorated or corroded reinforcement requiring replacement. Additional concrete is chipped away to fully expose the reinforcement and may be required, which is then cleaned with either a wire brush or pressure washed to be prepped with anti-corrosion coatings. After the demolished concrete is removed and the surface prepared, new concrete is then set in place. After curing has completed and the relative humidity is in the correct range for the traffic membrane, the new traffic membrane can be installed as per manufacturers recommendations.

2.3.9 Sequencing of Construction

To stage the construction of the rehabilitation of the parking slab, our team has generated a concept of how the parking slab repair could be staged in a manner where the repairs are staged over a series of years, rather than undertaking all the work at the same time. We have provided a sketch in the report for a two-stage repair scheme; however, the slab repair could be further staged if additional stages are needed based on available funding. The stages would consist of undertaking repairs in strips (north-south) while trying to maintain half a drive isle in width. When undertaking work on the ramps, the City will only want work to proceed on one set of ramps while maintaining operations on the other set of ramps. Parkade operations are intended to continue through construction where approximately a quarter of the parkade is closed at any one time to limit negative impacts to customers while still generating revenue.

After a review of the work, our team found that by breaking the work into stages, the City would incur costs related to remobilization and hording costs depending on the final arrangement of the work, but the slab costs would be reduced accordingly based on the final staging selection. At this time, it is our suggestion that the City proceed with a full slab repair. We have estimated this work could be completed over the course of a three-year time frame but would need to be validated by the successful contractor.

2.3.10 Potentially Deferring the Repair Work

We have reviewed the previous CKP report and have determined that there is an opportunity to extend the timelines for the repairs and potentially deferring the work. The concrete has slowly been undergoing chemical/physical changes as previously noted, but we have not seen the visual deterioration manifest in the way of large spawls or corrosion related deterioration. While it's proactive to replace the concrete before this deterioration occurs, some additional testing and spot repairs with a new membrane could be a viable option.

While we understand the conditions within the concrete have begun to change which creates an environment whereby corrosion of the reinforcing could begin, further testing could be undertaken to validate the amount of corrosion. If the reinforcing is found to have limited deterioration, then there is a real possibility the timelines can be extended, and repair work deferred. This would also serve to find times where the Parkade is used less frequently, and the work could be phased to reduce loss of use (e.g., repair could be scheduled in manner whereby the work is completed over several summers when usage is reduced).

We commonly see structural slab repairs once we see more physical issues such as spalls or rust staining, when typically, a repair program is initiated to cut-out and patch concrete as necessary before a major rehabilitation occurs. (The City has reported some smaller spawls are occurring and has undertaken some light maintenance when they occur.) The result could be in align with the initial assessment, but this approach would allow for more scheduled maintenance rather than undertaking the work in a single or multi phased work approach. This would also give the City more time to understand the impacts of usage by the City Departments as well as parking customers, including monthly permits and special events.

We understand the previous work was based on a capital plan to generate costs based on a 1 year, 5 year and 10-year timeline. Many concrete deterioration mechanisms can take up to 20 years to materialize and this would not fit neatly into these timelines and as such the previous work was limited into these discretized time limits. By forcing the work into these defined time brackets, it may have created a sense of urgency, when we feel this might be too stringent. Being proactive with repairs is important when trying to preserve assets but should be balanced with available budget and occurrence of issues such as spawls. This approach of reviewing the structure is commonly undertaken by private companies or groups such as bridge engineers where structures are reviewed more intensely to off-set the capital cost which permits the owner to reduce or phase work more effectively.

The City could consider a more rigorous testing approach to help validate the effort for the rehabilitation and this would consist of:

- Petrographic testing
- Half-cell scan of the slab
- Physical visualization of the rebar at select locations
- Additional coring
- Regular yearly reviews and comparison to past results

In addition, the use of better moisture and humidity control would help slow down the deterioration mechanisms and examples of such could include:

- Use of better traffic and barrier membranes
- Improved air handling systems to control moisture
- Enhanced cleaning

2.3.11 Structural Recommendations

While our team provided an option to the City to conduct additional slab testing and stagger work on the P1 stab structure over a longer timeframe, the City requested that the structural deficiencies be approached in a proactive manner to avoid any potential for concrete falling causing injury and to avoid, avoid potential safety issues with the structural slab, and proactively remove contamination that could further deterioration the concrete. As such, the structural work is planned and budgeted for in accordance with the original condition assessment in 2021 to conduct hydro-demolition of the P1 slab and ensure removal of chloride contamination. However, additional testing for the state of the concrete will be done during detailed design work to validate whether the full hydro-demolition is warranted on the full P1 slab.

Based on our team's visual field findings, the Parkade appears to be in good condition for its age with exception of the internal chemistry changes of the concrete. Stantec has noted items found during our field review and have included the spot deterioration locations in the costing documents. These repair spots should be completed within the next maintenance budget at a minimum. The City should budget for spot repairs over the next several years unless the City moves forward with Hydro demolition and full membrane replacement.

The upper several inches of the concrete on parking slab P1 has a higher chloride concentration and as such replacement of the upper 3" of the concrete is recommended. If this work is undertaken, this would mean the removal of concrete utilizing a method such as hydro demolition whereby the concrete is removed by high pressure water blasting. Once the concrete is removed, damaged bars are replaced, and new concrete is poured where the existing concrete was removed. The use of a bonding agent should be considered to improve bond between the overlay and the existing concrete. After the new concrete is poured, the traffic membrane would be replaced. As an additional measure to prolong the life of the structure, the City could consider the use of zinc cathodic protection pucks which would help reduce the corrosion time in addition to a good membrane and proper ventilation.

As for the walls we found limited zones of deterioration and some limited cracking which should be repaired, and zones are noted in our sketches.

2.4 MECHANICAL REVIEW

The following items were noted through site reviews undertaken in July of 2022 and previous work Russell Lavitt, P.Eng, has undertaken in former reviews on this structure.

2.4.1 HVAC System Observations

Generally, the Millennium Library Parkade is served on both levels by a single large capacity natural gas fired makeup air unit not equipped with cooling. This unit was likely sized at the time of design based on the ASHRAE 62-1973 Standard, but it is known that these standards were not enforced by the City until the early 1990s. It is therefore likely that the ventilation equipment was sized using an industry standard norm of

1 cubic foot per hour of fresh air per square foot of floor space, continually operating, resulting in very high electrical and natural gas costs as these utility costs rose through the late 1970s and 1980s. Nonetheless, this equipment has been beyond its service life for nearly 15 years now and requires replacement in the short term. A new ventilation system, selected based on National Building and Energy Codes would be implemented with carbon dioxide, carbon monoxide and nitrogen oxide ambient level operational overrides to address concrete carbonization issue noted in the structural discussions of this report. The City has confirmed that cooling systems are not required for a Parkade application.

2.4.2 HVAC Controls Observations

HVAC controls are a mix of legacy pneumatic, legacy electronic, and legacy direct digital controls. All are beyond their current service life and are partially inoperable. Replacement with current direct digital control equipment compatible with the Millennium Library system is recommended.

2.4.3 Parking Booth Ventilation Addition for Office Spaces

Currently and historically, the Parkade attendant booth and the Winnipeg Parking Authority field personnel equipment room are not ventilated according to National Building code requirements. A new energy recovery ventilator with a small electrically heated and cooled air handling unit is required with fresh air ducted from the exterior, preheated with ventilation exhaust from these spaces, and ducted to each space. The City has noted that the Parking Authority field personnel do not occupy the space for extended periods of time and its use case is primarily a drop in space.

2.4.4 Mechanical Recommendations

Generally, the HVAC equipment is at or beyond its service life and requires replacement in the short term. A new design and implementation should comply to current codes for parking garage ventilation and respect the air flow requirements noted in the structural portion of this report.

The fire protection system appears to be in good operating condition but may require eventual upgrades to sprinkler heads due to age.

Some plumbing and drainage systems may require replacement or upgrade due to wear and tear and material failure.

2.5 ELECTRICAL REVIEW

The following items were noted through site reviews by Mark Hockin undertaken in July of 2022.

2.5.2 Condition Observations

The Millennium Parkade, Park, and Library share a main electrical room and Hydro Service which is located in the P2 level electrical vault. There is an existing high voltage switch gear cell with Kirk Key interlocks to the main electrical distribution. The main electrical distribution is an older Westinghouse 3,000-Amp system that has undergone several building upgrades over its service life and appears to be in excess of 45 years of age. The electrical distribution is fed from a main disconnect switch in the same room that is Kirk Key coordinated. There are 3 disconnected cells in the vault and a single operating cell that feeds the buildings. The main electrical distribution feeds three different sections of the building; the Millennium Library, the Millennium Parkade, and Millennium Park. In order to properly isolate these buildings, it would be beneficial to provide each building section with its own service equipment and metering at the time of equipment replacement. It is recommended that a replacement plan for the existing distribution equipment be developed as much of the equipment has exceeded its recommended service life, to improve reliability of power supply to the facilities, meet current requirements for overcurrent protection for life safety systems, and ease maintenance and procurement struggles that come with older and obsolete equipment. Such replacement would be the proper time to separate the three building electrical systems and provide three separate service lineups and require preliminary coordination with Manitoba Hydro who would need to provide input into the availability of additional Transformer capacity to service separate electrical systems.

The remaining building spaces are fed from sub panels and disconnects that are of various ages, with many of these additionally past the end of their recommended service life. In some cases, there are panelboards that are from obsolete manufacturers with breakers that are no longer available in the marketplace. In order to prevent prolonged unplanned outages or failure of the systems serviced by these panelboards, immediate replacement with currently manufactured panelboards is recommended.

The building's electrical equipment has been extensively modified, added to, or replaced over the years and the labelling on all the equipment is lacking in accuracy and detail. Many components are not labelled or labelled incorrectly. It is recommended that all the equipment be re-labelled with Lamacoid labels including detailed equipment information and descriptions of its service equipment both upstream and downstream where applicable. It is estimated that there are approximately 300 pieces of electrical equipment including distribution, sub-distribution, panelboards, disconnects and equipment items that would be updated with this revised labelling. This will provide better personnel and operational safety by ensuring equipment shut-off is properly performed, and ease electrical equipment maintenance.

2.5.3 General Lighting

Lighting throughout the Parkade has been upgraded to fluorescent T8 LED lamps and drivers through almost all the areas. It is recommended that any remaining fluorescent and incandescent fixtures in equipment and storage rooms be replaced with new LED fixtures or retrofitted with LED lamps and drivers to match the Parkade fixtures which have been upgraded. The Parkade lighting is controlled by a Douglas Lighting Control system. Lighting control panels are

in some of the building electrical rooms. The system is in good condition, and lighting control is provided through programmed schedules and manual control at the control workstation. The lighting control system is by Douglas Lighting who have just recently gone out of business and whose equipment is no longer supported in an existing installation. In order to change, or modify the systems, especially when the need to separate the parkade lighting systems from the library lighting systems becomes necessary, a replacement system will be required. A system called Next Light integrates with the existing Douglas system requiring only the panel control relays and main electrical server to be replaced and allowing the remaining wiring and control panels to remain as is. It is recommended that an assessment of the lighting control system be fully performed and an estimate for the replacement to the Next Light System be created.

Lighting in Millennium Park is provided primarily by bollard style fixtures mounted along the pathway and by building exterior mounted wall pack fixtures. All the fixtures were observed to be operating and, except for graffiti painted onto the bollard fixtures and discoloration of the fixture lenses on many fixtures, the lighting is in fair condition overall and providing satisfactory illumination to the parks pathways. Lighting in the Millennium Park is included as part of providing context to the space only and is not included in the scope of work pertaining to the High Priority Short Term Repair work, however, the City should be aware of this information with consideration to park planning.

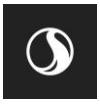
2.5.4 Exit Signs and Emergency Lighting

The exit lighting has been fully upgraded to green pictogram (running man) style devices throughout the Parkade. All the Parkade devices are in excellent condition and were all operating during the time of review. The Parkade is serviced by a generator for backup power and the exit lighting is fed from panelboards supplied by the generator. In the mechanical rooms, equipment areas and stairwells, many of the exit signs have not been replaced and are not currently operating. It is recommended that these all be replaced with green running man style to match the Parkade fixtures as soon as possible and any non-functioning units need to be replaced immediately.

2.5.5 Fire Alarm and Gas Detection

The Fire Alarm Panel is a Simplex 4100U model and the main FACP is in the mezzanine Parkade electrical room. This series of panels was manufactured starting in 2001 and is at the end of its life cycle. The panel has undergone several renovations and updates. There are numerous fire alarm modules in the main electrical room above the fire alarm control panel (FACP) that have no covers or labels and it is recommended that these be installed to clearly identify the purposes each one serves in the event of an emergency. The system also has a second network panel connected to the Millennium Library at the north end near the entrance. The fire alarm is verified annually by Vipond, and the next scheduled testing is July 7, 2022, and was overdue at the time of this report.

There are Honeywell gas detection units throughout the Parkade and monitoring them is done via the fire alarm system. All the units are in good condition and have recently been inspected. As automotive trends change to more electrified vehicles and reduced emission methods of transportation, the gasses, and emissions in the Parkade will be reduced, therefore the need for increased gas detection is unlikely.



2.5.6 Electrical Recommendations

The Electrical Systems in the Parkade overall are well maintained, and despite their age, are in good condition. Some of the recommended items pertaining to the repairs and updates to extend the efficiency and operational reliability of the Parkade and park will be outlined further in the recommendations for the various scenarios provided for the future of the Parkade, and the park. The short-term items such as the obsolete panelboard replacement beginning in stages to control costs and power interruptions. By beginning to replace the panelboards which are past the end of their recommended service life with newly manufactured panelboards and breakers the facility can increase their overall electrical reliability and decrease the potential for a failure or electrical incident resulting in unplanned power interruptions of any critical building or parking systems.

There are numerous damaged conduits, junction boxes and devices at the parkade entrances and where exposed to vehicle damage and damage from weather. These conduits and their wiring need to be replaced with new conduit and wiring as required and any damaged devices should be replaced as a short-term repair.

Another item noted during the site assessment was the security booth and its systems identified as requiring some updating in lighting and security systems. This will create a more suitable environment for the personnel utilizing the booth and improve the reliability of the security monitoring from that location.

Replacement of non-functioning exit signs is critical to life safety and egress of the spaces in an emergency or power failure. This is a critical item that required immediate rectification in the areas where the exit signs were noted as non-functioning.

The labelling of the Electrical equipment throughout the building is done in such a manner that the supply services for each piece of equipment is difficult to ascertain and locate. Re-labelling the equipment from the main electrical service to the sub-distribution equipment will improve safety by helping to avoid accidental disconnection of incorrect breakers and make it easier to identify areas serviced by electrical equipment.

Regarding the City Council desire to convert natural gas heating in the Library to electricity (known as electrification), further study is required to determine whether Manitoba Hydro is capable of providing additional electrical capacity to the location. It is currently understood that there is insufficient capacity and that new infrastructure would be required, potentially in a form as significant as a new high voltage feed main to a new downtown sub-station, where a new high-voltage transformer would feed new transformers, switchgear and controls serving the added electrical heating for the building. Infrastructure costs related to this approach are known to be excessively costly and would have to be determined in conjunction with Manitoba Hydro as part of a separate study not part of the scope of work of this report. This costing for this query from Council therefore has not been included in the present discussion.

2.6 COST ESTIMATE

2.6.1 High Priority Short Term Repair Cost Estimate

The Class 3 cost estimate based on the findings is $14,463,000 to be undertaken over a multi-year time frame. Refer to costing report attached cost estimate.

High Priority Short Term Repair	Cost Estimate (Class 3)
Structural Repairs	$ 4,570,000
Traffic Membrane	$ 568,000
Mechanical Repairs	$ 4,429,000
Electrical Repairs	$ 174,000
Design, Admin, Contingencies	$ 705,000
	$ 210,000
	$ 3,237,000
	$ 570,000
Total	$ 14,463,000

Prior to commencing high priority structural repair work, approximately $100k of structural slab testing is required to be undertaken in order to refine the slab repair design. This cost is intended for the City to manage through the design contingency.

3.0 PART 2: FEASIBILITY STUDY OPTIONS

The feasibility study portion of the report includes four feasibility options including:

- Repair the Parkade
- Build a New Parkade
- Demolish the Parkade
- Sell the Parkade

Each of these options are discussed and the impacts of each are summarized in the following sections.
The recommended option is based upon various factors which include cost, benefits through service level impacts, alignment with Council approved polices and plans, and the City of Winnipeg's goal towards OurWinnipeg 2045.

3.2 REPAIR THE PARKADE

3.2.1 Description

This option endeavors to prolong the life of the Parkade by undertaking all short-term, medium, and long-term repairs outlined in the previous Condition Assessment Report. The following sections discuss the items included in this option.

3.2.2 Structural Investigation

Structural repairs include full depth concrete slab repair for P1, repair of the roof slab underside, P1 slab topside, P1 slab underside, P1 wall repairs, column swale construction, crack injection in the mechanical room and concrete repair in the stairwell. Additional structural repair descriptions are available in section 2.3.8.

3.2.3 Park Membrane

The previous report noted a $5,000,000 cost associated with exterior waterproofing on the roof of the Millennium Parkade which sits below the Millennium Park. The area is noted as approximately 10,000 SF of area, whereas the total area of park is approximately 40,000 SF so based on areas this would have included for water proofing on approximately one quarter of the park area. The 2008 repair drawings indicated that the entire roof was to have a new high build, cold applied, liquid waterproofing membrane when the park was partially replaced, and the requirements are as specified in specification section 07545 and the product was noted a HLM 5000 by BASF Building Systems.

Literature on membrane varies but generally lifespan of these products:

- Basic waterproofing membranes: 10 years
- Common lifespan: 25-40 years.

These values can be significantly impacted by installation and installation details.

As the membrane was partially replaced in 2008/09 and if a 10 year basic warranty period is added to this date, it would mean the end of the warranty period (for the replaced portions of the membrane) in 2018-2019 for which the membrane is now beyond its warranty period but below the expected overall lifespan. We did not find significant leakage so the membrane still appears to be performing but patching could become more of maintenance issue. As it is unclear if the entire membrane was replaced, as some areas appear to be much older, we would expect leakage to be possible. The City should begin to provide allowances for membrane replacement as it directly affects the parkade structure and to consult with Parks/Community Services. If the park is to be renewed in the upcoming years, then the membrane should be replaced.

3.2.4 Electrical Investigation

Electrical investigation into the recommendations to prolong the Parkade have taken into consideration many short-, medium- and long-term repair and replacement items. These items include but are not limited to:

High Priority short term electrical repair/improvement items include:

- Replacement of non-functioning building exit signs to match existing.
- Creation of proper building single line diagram and equipment lamacoid labels represent existing system configuration and facilitate future design changes and upgrades.
- Upgrade of existing security booth security system and booth lighting.
- Update of newly obsolete Lighting Control system
- Upgrade of Information systems for control and monitoring of future vehicle charging systems.
- Evaluation of obsolete Electrical Panelboards and disconnects and replacement planning.
- Development of plan to convert to council mandated electrification of building heating and air movement systems.
- Repair/Replacement of exterior conduit and wiring for parking garage entrances/signs and lighting.
- Evaluation of electrical upgrades to support the addition of up to 40 level 2 Electric Vehicle Charging Stations.

Medium term electrical replacement Items

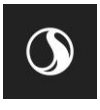
- Fire alarm replacement and separation planning from Library.
- Exterior Lighting Replacement to LED and Lighting Replacement on Interior and Lighting Control Upgrades due to obsolescence.
- Addition of Level 2 Car Charging Stations (City Owned, or Third-Party Options) for up to 40 spaces within the parkade.

Long term electrical repairs include:

- Electrical service replacement and upgrading including separation from Library Distribution
- Sub-distribution and transformer replacement
- Building lighting and control system replacement
- Exit sign replacement.
- CCTV Replacement
- Parking Equipment and Door Control and Upgrades
- Generator replacement

3.2.4.1 Electrical Distribution Upgrades

The electrical distribution for these facilities is more than 50 years of age and many of the components have been replaced or modified to suit projects and building changes over time. Some of the downstream panels have exceeded the recommended service life of 35 years and are from obsolete manufacturers with no breakers or service components available in the marketplace. One such panel is adjacent to the security booth in the Parkade, and it is recommended that this panelboard be replaced with a newly manufactured panelboard in the immediate future.
In order to fully restore the Parkade and its electrical system to full life expectancy, a complete replacement of the main electrical distribution should be taken into consideration. Replacement would include the main distribution in the P2 Electrical Vault and any remaining panelboards that are also older than the recommended service life. Replacing a distribution of this size and complexity would cause a great deal of downtime and retrofitting the existing distribution with newly manufactured equipment into the existing distribution frame would be a desirable method of replacement. Review of the Parkade also noted that there are multiple older fusible disconnects and magnetic starters that are in excess of 15 years of age and these are also recommended for replacement to ensure complete reliability of the systems they serve. The costs for this replacement are provided in the cost summary for the Repairing the Parkade option.



The overall electrical capacity of the distribution is expected to have the capacity for adding some vehicle charging stations in locations withing the parkade where there is sufficient structural support for the increased weight of the EV vehicles to be in position simultaneously. There is currently one larger such station in the Parkade and to maintain this facility, and meet future requirements, an additional transformer and sub distribution panel should be installed to service these additional loads. With the suggested updates to LED lighting in the future, the existing distribution should be sufficient to service a reasonable number of individual charging stations spread through the Parkade at various locations.

The potential for upgrading of the building air handling systems and heating systems through electrical means rather than utilizing natural gas will require significant upgrades to the building electrical distribution including a significant increase in the facility loading requirements for Manitoba Hydro. Preliminary discussions indicated that Manitoba Hydro would require a full calculation of future anticipated building loading and would need considerable time to study whether the increase could be accommodated at that location. A further engineering study is recommended to provide further clarification on the possibility of this option and a budget for the proposed costs for installation and monthly operation have not been included in the costing provided with this report.

Figure 11: Indicate Essential Panelboard no longer used and obsolete Security Booth Panel

Figure 12: Indicate Essential Panelboard no longer used and obsolete Security Booth Panel

Figure 13: The Main 3000 Amp Westinghouse Shared Electrical Distribution

3.2.4.2 Lighting Systems

As detailed in the electrical findings in the earlier section of this report, the fluorescent lighting in the Parkade was updated to include LED lamps and replacement of any non-functioning ballasts. These fixtures will eventually require replacement and it is recommended that the original fluorescent fixtures be replaced with complete LED fixtures throughout the Parkade. This replacement will provide reliable and efficient lighting for years to come and the energy savings can provide options for additional electrical additions that the facility may require.

The building lighting control system is a product from Douglas lighting control. Douglas Lighting has recently gone out of business and their systems and components are no longer serviced in the industry. A newly developed system from Next Light is compatible with existing Douglas Lighting Control systems, however the main lighting controller and server and software require upgrading to provide any changes or upgrades and additions to an existing system. To separate the library and parking lot lighting control systems for future expansion or individual control purposes a new system controller, server and programming would have to be installed. Further investigation into the system update should be conducted with Integra Lighting Agency who represent Next Light. A provisional budget for this conversion has been provided in the costing report.

3.2.4.3 Existing Signs and Emergency Lighting

The exit lighting has been fully upgraded to green pictogram (running man) style devices throughout the Parkade. All the Parkade devices are in excellent condition and were all operating during the time of review. The Parkade is serviced by a generator for backup power and the exit lighting is fed from panelboards supplied by the generator. In the mechanical rooms, equipment areas and stairwells, many of the exit signs have not been replaced and are not currently operating. It is recommended that these all be replaced with green running man style to match the Parkade fixtures as soon as possible and any non-functioning units need to be replaced immediately.

Figure 14: Exit Signs in Stairwells not functioning and improper style

As the building is powered by an emergency diesel generator the exit and emergency lighting is primarily provided through this power source in the event of a power outage. The replacement of the non-functioning exit signs and any non-pictogram signs is recommended immediately and will be included in the costs cost summary for this section.

3.2.4.4 Emergency Power Generation

The building is serviced by a Caterpillar 350-kilowatt, 600-volt diesel generator serving standby and emergency loads. The generator is a newer unit installed in 2004, appears to be in good condition, and was recently serviced by Toromont. It has been indicated that the generator is due for a battery replacement in the previous report, but it is unclear if this work had been completed. Emergency power generators are generally considered to have an expected service life of 40 years so planning for replacement at the end of this service period should be considered to maintain building reliability in the event of power failure. Continued preventative maintenance and regular testing until the replacement of the generator, the costs for which are recommended in the long-term planning strategy.

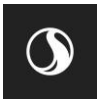
3.2.4.5 Security and CCTV

There is an extensive CCTV system in place throughout the Parkade. The cameras are newer style in weatherproof and tamper proof housings, and the conduit and connections appear to be in good condition throughout the building. There are many cameras on the building's exterior near most entrances/exits and all appear to be in good condition. No issues with the cameras were communicated during the assessment, and the quantity appears sufficient for the coverage required.

There are several conduit penetrations through walls that have not been caulked with silicon or fire stopping. It is recommended that all these penetrations be addressed with suitable sealants.

There is a newer card access system installed on all doors to the Parkade on multiple entrances. The system has one door on the exterior entrance at the park on the southwest side that is non-functioning and needs repair. Other than the one noted door device, the system is newer and in good general condition.

The Parkade security booth has a security alarm panel and keypad that are older, and the City has identified their intention to replace these. This would be recommended also as the booth is crowded with electrical and other control components and it would be beneficial to replace the system with new current equipment and provide secured conduit and wiring in a neat and easily identifiable fashion. Re-configuration of some of the existing wiring and devices would need to be coordinated to make an overall more efficient and professional workspace.



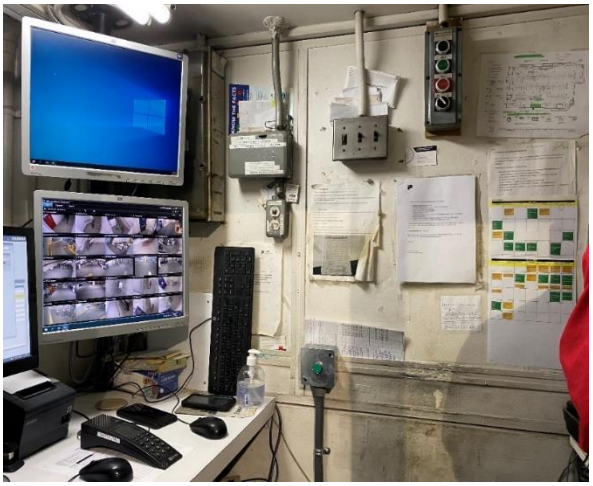


Figure 15: Security Cubicle

3.2.4.6 Parking Systems

The Parkade utilizes a system of manufactured parking equipment, remote signaling lights, and rapid roll-up insulated doors to control parking entrance and egress in the Parkade. The systems overall are in very good condition and newer in appearance. The Rytec doors are an expensive maintenance and replacement item, and the doors should have several years of service before requiring replacement. The parking lot equipment also appears to be very new and in very good condition, as are the interior signaling lights and conduit. On the building's exterior, there are some conduits feeding the parking systems that have some damage and show early signs of corrosion. It is recommended that any damaged conduit be replaced, and the wiring inspected and replaced as required for continued reliability of operation. The parking equipment appears to also have a ground loop for vehicle identification and any work on the ramp areas would require replacement of this conduit and wiring system.

As parking equipment technology advances the future replacement systems may wish to incorporate more modern methods of customer detection and payment methods through software and smart phone smart recognition and pay systems. Future parking systems utilize embedded steel and conductive materials to help maneuver vehicles and indicate lot statuses. The addition of CCTV cameras to determine parking space availability is also increasingly common. As the building systems age and it begins to become necessary to review replacement options, these types of systems may become more attractive and further studies particular to a desired system are recommended to determine the suitability for the existing parkade and the budgets and coordination required to implement such system.

3.2.5 Mechanical Investigation

The following items were noted through site reviews undertaken in July of 2022 and previous work Russell Lavitt, P.Eng, has undertaken in former employment roles as a subconsultant to CKP.

3.2.5.1 Fire Protection System Observations

The existing fire protection systems comprising of automatic sprinklers, hose valves and hose cabinets are in good operating condition and are annually inspected by a licensed fire protection systems contractor. It is recommended that funds be provisioned or eventual replacement of the sprinkler heads as they are approaching the end of their recommended service life. Representational samples can be provided to a certified testing agency to verify proper ongoing operation beyond the lifespans recommended in the relevant standards. This verification could extend the available lifetime of the current sprinklers but would require a cost-benefit analysis for this specific issue.

3.2.5.2 Plumbing System Observations

Generally, the plumbing systems serving the Parkade proper (not the Library above) are in good general condition as visually observed. It is, however noted, that the piping system are at or approaching 50 years of age and will likely require more direct attention and regular maintenance as fittings, couplings. Valves, and connections aged. It is the opinion of this author that these can be dealt with through annual maintenance budgets than through capital planning. While not directly observed, there may be galvanized steel piping in the facility given its age (due to the shortage of copper during the Vietnam War era in the early 1970s) and this is known to fail prematurely due to erosion of the sacrificial galvanization eventually exposing the steel to corrosion and failure.

3.2.5.3 Mechanical Summary and Recommendations

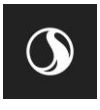
Generally, the HVAC equipment is at or beyond its service life and requires replacement in the short term. A new design and implementation should comply to current codes for parking garage ventilation and respect the air flow requirements noted in the structural portion of this report.

The fire protection system appears to be in good operating condition but may require eventual upgrades to sprinkler heads due to age.

Some plumbing and drainage systems may require replacement or upgrade due to wear and tear and material failure.

Long term mechanical repairs include:

- Fuel oil vent fan install
- Natural gas line paint
- Fuel oil tanks seal tappings
- NO_2 detection in all spacing



3.2.6 Service Level Impacts

During consultation with civic department stakeholders, the option to repair the parkade was found to have the highest benefits of positive service level impacts which include:

- Supporting access to Sports, Hospitality, and Entertainment District in Downtown Winnipeg by providing safe and convenient parking to people attending special events, visiting downtown core businesses, or commuting to work.
- Provides parking to people visiting or attending programming at the Millennium Library, providing direct access to the library through the parkade.
- Supports economic development and growth plans in the area, including CentrePlan 2050 and the future redesign of Graham Avenue
- Allows for continued use of the Millennium Library Park, thus supporting greenspace use in Downtown Winnipeg.

No negative service level impacts were identified with this option. However, it was noted that consideration should be given to conducting an accessibility review in the parkade to identify if there are any improvements that can be made to better support persons with disabilities, including any potential upgrades to the elevators.

Alignments to Council approved policies and plans include:

- Strategic Priorities Action Plan (SPAP) action item 1.4 supports access to downtown libraries and greenspace, which would be accomplished with this option as access to the library and park are maintained. In this option the glass wall of the library is not obstructed which would not change the current user experience in the library.
- OurWinnipeg Complete Communities 2.0 action item 3.4 that encourages the location of major offices uses in the Downtown is supported in this option. Most people parking the parkade are doing so as they work in the downtown.
- OurWinnipeg Complete Communities 2.0 supports attractions in the Sports, Hospitality and Entertainment District and residential/office areas in the downtown which is made possible with this option.
- The Winnipeg Parks Strategy describes the downtown as underserviced in parks space compared to the rest of the City and this option supports maintaining park space in the downtown as the park above the parkade remains unchanged. Additionally, OurWinnipeg Community Communities 2.0 supports parks and public spaces in the downtown (action items 9.10 and 9.11).

3.2.7 Cost Estimate

The feasibility study assessed the capital and operating cost of each option. The cost estimates presented below are capital cost that were prepared by Stantec Consulting Ltd. Winnipeg office and a cost consultant. See the cost/benefit analysis section that for costing on both the capital and operating costs of each option with reference to attached costing report and net present value spreadsheet.

The cost estimate to Repair the Parkade is $28,804,000 as per the Net Present Value spreadsheet. This class estimate is a blend of a Class 3 estimate (years 2024-2027) and a Class 4 estimate (years 2028 – 2030).

The capital costs for the high priority short-, medium- and long-term items as per the net present value spreadsheet not including inflation are identified are as follows:

High Priority Repairs 2024 – 2027 (Class 3 Estimate)	
Structural + Membrane Costs	$ 4,782,000
Mechanical Costs	$ 4,040,000
Electrical Costs	$ 164,000
Design, Admin, Contingency Costs	$ 3,879,000
Total Capital Cost	$ 12,865,000
Repairs in 2028 (Class 4 Estimate)	
Structural + Membrane Costs	$ 185,000
Mechanical Costs	$ 343,000
Electrical Costs	$ 1,410,000
Design, Admin, Contingency Costs	$ 1,269,000
Total Capital Cost	$ 3,207,000
Repairs in 2030 (Class 4 Estimate)	
Structural + Membrane Costs	$ 85,000
Electrical Costs	$ 5,723,000
Design, Admin, Contingency Costs	$ 3,318,000
Total Capital Cost	$ 9,126,000

Option	Lifecycle Cost (in thousands)		
	Capital	Operating	Total
Repairing the Parkade	$28,804	$17,297	$46,101

3.3 BUILD A NEW PARKADE

3.3.1 Description

This option would include demolishing the current Parkade and construction of a new Parkade on the park. The current Parkade in situated below the park and below the library. As the Parkade is below the existing library, it would not be practical to demolish the slab or structure below the library as it could impact the library structure and it would be abandoned. In addition, the services below the Parkade would need to be accessed from time to time and so it should be left in place. As the portion below the park would need to be demolished, a new wall and piling to close off the southern portion of the property would need to be constructed. The park could then be demolished as well as the slabs/columns demolished and the hole infilled. The exterior walls would remain in place to shore the existing soil and granular would be placed to shore up the walls during demolition. As the lower portions under the library could be used for random storage, the opportunity exists to leave some of the ramps in place for vehicle access or for maintenance of the services.

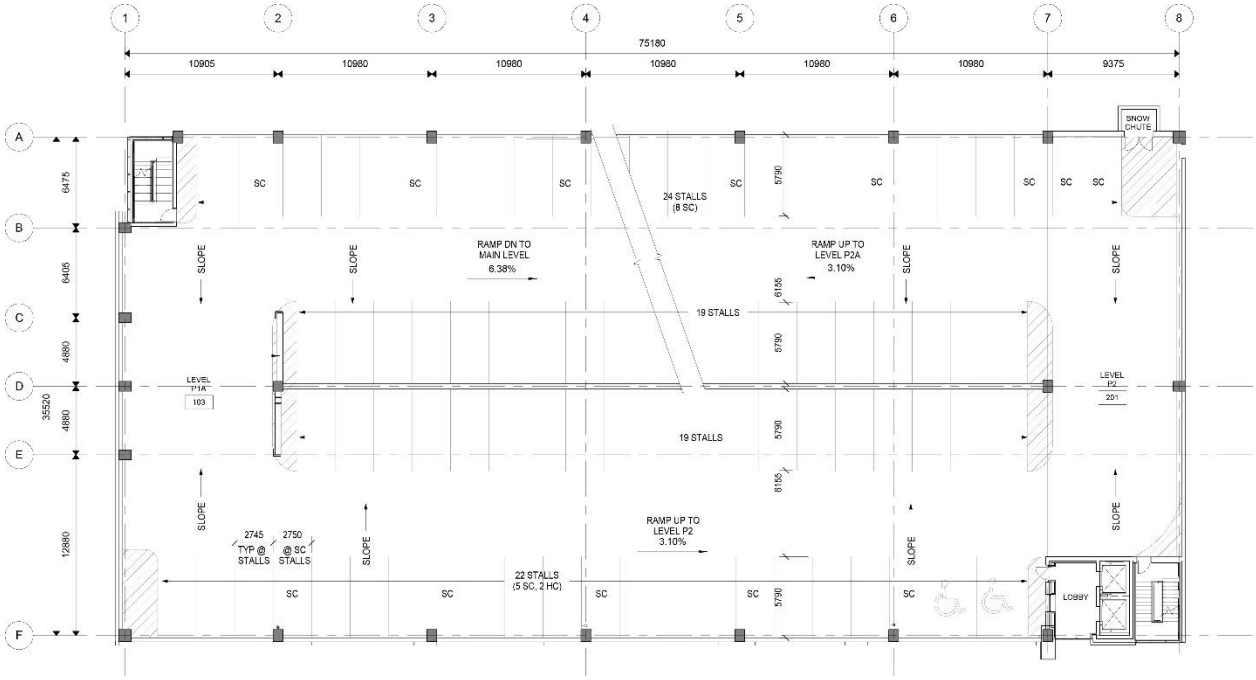


Figure 16: Plan view of Parkade Concept

Nearly 20 years ago, in 2005, the Winnipeg Centennial Library Renovation and Addition was completed including a new multi-storey glass wall complete with reading terraces, facing south to receive the prairie light and warmth during long cold winter climes, connecting a largely disconnected interior and public amenity to the city including a fully renovated public park.

While the remainder of Winnipeg's Centennial Library continues to be largely uninviting and disconnected from the City along Graham Avenue, Donald and Smith Streets, with small vertical slot windows with dark tinted reflective glass, the south facing reading terrace with it highly transparent glass wall and public park are the principal features of the existing library. The glass wall connects people to the city and the city to the library, while the park is one of the very few green spaces in downtown Winnipeg. The park also hosts notable public art and public programs for locals and the community at large, while also offering downtown workers a bucolic respite from the everyday hustle.

Figure 30: Millennium Library Park

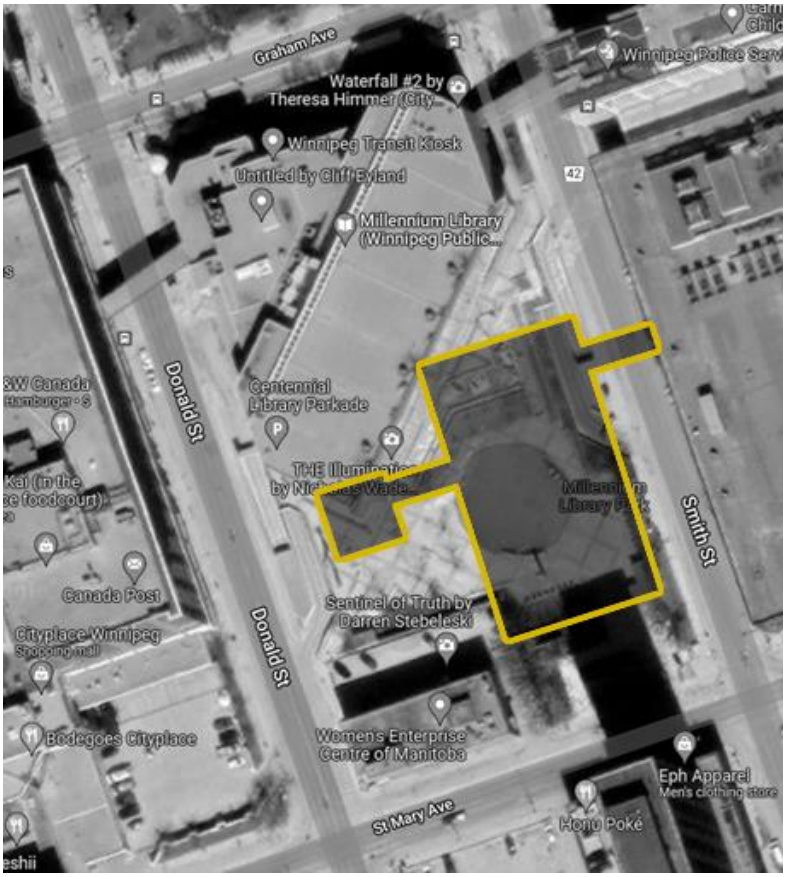


Figure 17: Plan view at Surface with New Parkade

Figure 18: Concept of New Parkade

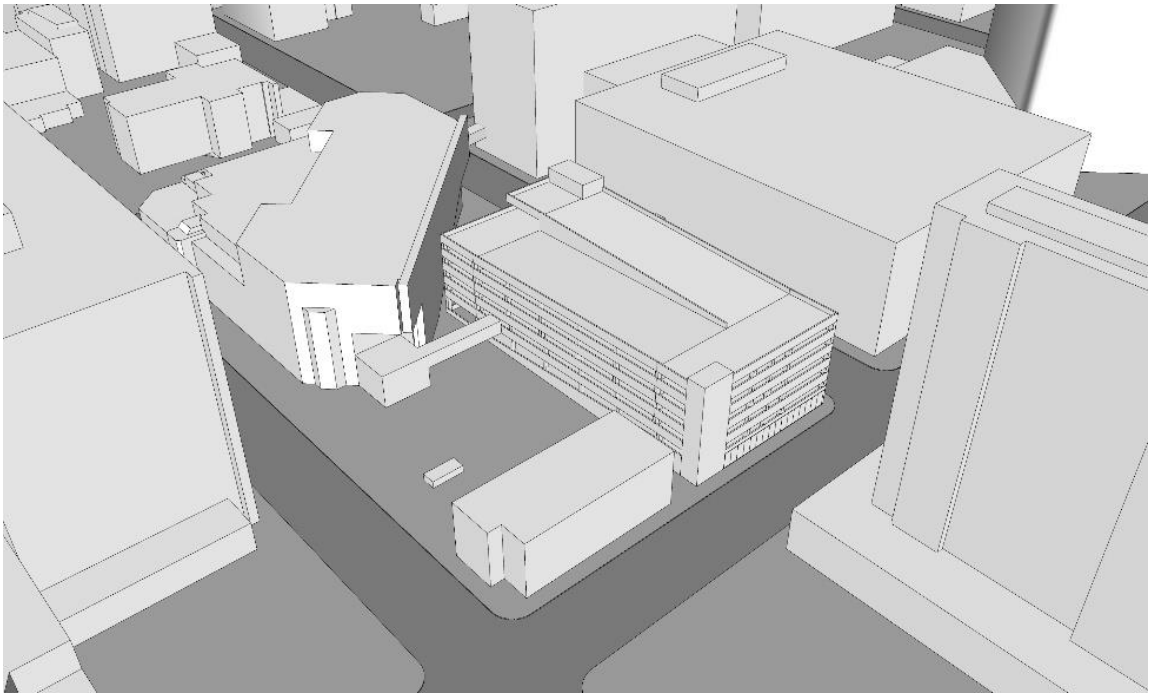


Figure 19: Concept of New Parkade

3.3.2 Future Park Rehabilitation

Doing the most with what remains. Develop a pocket park in the interstitial spaces.

The footprint of a new above-ground Parkade would occupy much of the area previously dedicated to public open space. Being located next to a public library, this space was a critical amenity for downtown residents and visitors, patrons of the library and several other user groups. Many of these user groups could be considered under-represented in our city and so this park space is important for not only recreation, but also for social equity. The Millennium Library Park serves as an important space for meeting and gathering. On hot days, its trees and water features provide cooling and comfort. And with one of downtown Winnipeg's only significant patches of lawn, the park provides an inviting space for rest and relaxation.
The interstitial exterior spaces left behind in Building a New Parkade are recommended to be restored or redeveloped as a high functioning social space. As much as possible, the park's current amenities should be reintroduced into the new greenspace. With a short consultation and observational study to determine what these key functions are, our landscape architects can help target the most effective ways to ensure what may be lost is minimized, and what can be gained likewise, is maximized. While the park's footprint will be much smaller and it will effectively lose its connection to Smith Street, what remains must be an impactful, small urban park.

There is a substantial amount of precedent for these pocket parks, to provide an exceptional level of amenity in a small space, even with simple and subdued designs. A reintroduction of nature is essential and will provide shade and comfort. Water features provide acoustic comfort and tranquility in a busy downtown core. Seating options that

are movable and adaptable have been demonstrated time after time, to be a huge comfort for users who can reconfigure their seating to find the sunny or shady spots, assemble with their friends or sit alone in a quiet spot. Accessibility is a key element in the park layout to ensure that no barriers are present for those enjoying its use. Finally, this exterior space will present an opportunity for The City of Winnipeg to express its ongoing commitment to Truth and Reconciliation. It is our recommendation that local representatives of the First Nations and Metis Peoples are engaged to ensure this future space is addressing the most relevant needs and issues.

Winter issues may be more pronounced in heavily programmed small spaces. Mindful attention in the design phase should be paid to facilitating snow clearing and simplifying the winterization of the space. Options to increase winter-oriented activities could include warming stations and attractive lighting displays.

If a new park is to be reconstructed to about the same quality level as the current park but with updated characteristics, then this would be in the range of $2,000,000.

Figure 20: Pocket Park Precedent - Paley Park, Manhattan, NY

Figure 21: Pocket Park Precedent - Gallery Garden Park, Marshalltown, IA

3.3.3 Service Level Impacts

During consultation with civic department stakeholders, the option to build a new parkade was found to have the second highest benefits of service level impacts which include:

- Supporting access to Sports, Hospitality, and Entertainment District in Downtown Winnipeg by providing safe and convenient parking to people attending special events, visiting downtown core businesses, or commuting to work.
- Provides parking to people visiting or attending programming at the Millennium Library, providing direct access to the library through the parakde.
- Supports economic development and growth plans in the area, including CentrePlan 2050 and the future redesign of Graham Avenue

Negative service level impacts include:

- An above ground parkade obstructs the architecturally significant glass wall of the Millennium Library, which is a key feature of the library
- The reconstructed park would become two smaller, disjointed parks which would not function as successfully as one unified park. Furthermore, the disjointed parks could pose as a potential safety risk due to decreased sightlines.

Alignment with Council approved policies and plans include:

- OurWinnipeg Complete Communities 2.0 action item 3.4 that encourages the location of major offices uses in the Downtown is supported in this option. Most people parking the parkade are doing so as they work in the downtown.
- OurWinnipeg Complete Communities 2.0 supports attractions in the Sports, Hospitality and Entertainment District and residential/office areas in the downtown which is made possible with this option.
- Strategic Priorities Action Plan (SPAP) action item 1.4 that emphasizes the importance of expanding access to libraries and community spaces especially in the downtown is not supported in this option. In this option there would be less interest for the public to attend the library when the architectural feature of the glass wall is obscured by an above ground parkade. This option also makes the community park space less functional.
- The Winnipeg Parks Strategy is not supported in this option as the existing park is reduced in size and has less functionality as a greenspace. The Parks Strategy does not allow for disposition of parklands unless specific criteria are met, which would not be met in this option.

3.3.4 Cost Estimate

The Class 4 cost estimate based on the findings is $48,857,000. Refer to attached costing report and net present value spreadsheet.

Option	Lifecycle Cost (in thousands)		
	Capital	Operating	Total
Building a New Parkade	$48,857	$26,244	$75,101

3.4 DEMOLISH THE PARKADE

3.4.1 Description

If the Parkade was to be closed and demolished, the City would have to consider leaving a portion of the Parkade below the library and construct a new wall and piling to close off the southern portion of the property. This is similar to the previous option. The park would be demolished, and the slabs/columns demolished and the hole infilled.

The wall on Donald Street has been positioned to allow for the use of the ramp to the basement area under the Library and connection to the stairwell located in the southwest corner of the Parkade. The City might decide to sell this portion of the property depending on the request from developers.

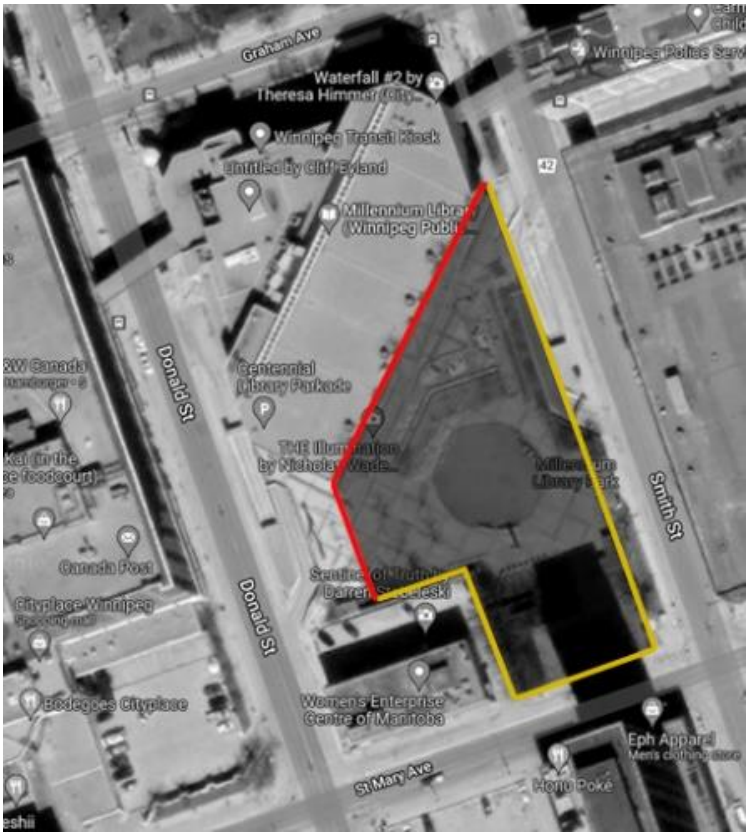


Figure 22: Plan view Indicating new potential for future development

The City may decide to demolish the elevated parking slab and the entry ramps as an expanded scope but the columns would need to be checked as the slab braces the existing columns under the library. By demolishing the slab, the lower level under the library would become a two storey volume which could impact the library columns and a careful review of the column loads should be undertaken if this option is advanced. The slab below the Parkade would need to remain in place if demolishing the slab would impact the columns. If the ramps are demolished, then additional parks could be reclaimed along Donald Street.

3.4.2 Future Park Rehabilitation

Expanding the streetscape and creating a neighborhood park or plaza

This option proposes the demolition of the existing underground Parkade. Currently, most of the Millennium Library Park sits atop this structure as a roof garden, so the demolition of the Parkade would mean the demolition of the park. This, however, is not a complete loss as some of the current park's major constraints are related to its placement on a roof and its raised elevation which requires ramps and limits accessibility. Additionally, a large amount of area occupied by the vehicle ramps, on both Donald and Smith Streets could be returned to greenspace effectively increasing the area of the park. In addition to this, reconstructing the park at street level will enhance the accessibility

of the park and connect it more with the streetscape. This completely changes the focus of the park and unleashes the design opportunities.

The added area will allow the park to sprawl more, be more inviting to the street and allow for a wider range of uses. This higher capacity is something that can be taken advantage of. Without limits on entry and exit, it can be expected that cut-through traffic will increase to higher volumes, an advantage for safety and perceived safety. Downtown Winnipeg has a lack of outdoor venues, and a reinvented Millennium Park is one of the few spaces that can fill that void Whether it's neighborhood feasts or cultural celebrations, this park can support a thriving community. Opportunities to enhance traffic volumes in the park could be to provide stations for market stalls or for food trucks to park, plug in and serve the community. Providing this here can help generate some revenue but more importantly can create a space that buzzes during peak hours and during evening events in the SHED district.

As the park is no longer being situated on a rooftop, this will remove any limits on planting strategies allowing for denser more natural planting opportunities. Tree species that grow large such as elms can be planted as legacy trees, allowing broad canopies to stretch out. The patch of grass that currently exists can be expanded with ease and cared for with less ongoing maintenance. With increasing attention on downtown residential development, Millennium Park has the capacity to be a much needed neighbourhood hub. As with any landscape option, this exterior space will present an opportunity for The City of Winnipeg to express its ongoing commitment to Truth and Reconciliation. It is our recommendation that local representatives of the First Nations and Metis Peoples are engaged to ensure this future space is addressing the most relevant needs and issues.

Addressing winter issues in a street level park should be made simpler for snow clearing and by dedicating space for temporary snow stockpiles. Options to increase winter-oriented activities could include hard surfaces that convert to a skating rink, or warming stations that include purpose-built burning barrels. Good, even lighting is critical for dark winter evenings to add an inviting atmosphere.

Figure 23: Urban Park precedents – White Arkitekter, Stockholm, Sweden

Figure 24: Urban Park precedents – Cosmic Coffee, Austin TX, USA

3.4.3 Service Level Impacts

During consultation with civic department stakeholders, the option to demolish the parkade was found to have the third highest benefits of service level impacts which include:

- Continued use of the park above the parkade.
- Opportunity to promote and advance alternative modes of transportation through reducing available parking space in the downtown.

Negative service level impacts include:

- Parking becomes significantly more inconvenient for people visiting the Millennium Library or attending programming, causing a major detriment to library users and staff.
- Parking becomes significantly more inconvenient for people working downtown, thus negatively impacting customers as well as the Winnipeg Police Service.
- Reduced parking availability for people attending special events in the down town.
- Does not support the future redevelopment of Graham avenue as the parkade is in an ideal location to support the upcoming destination area.

Alignment with Council approved policies and plans include:

- This option aligns with the SPAP action item 1.4 to maintain access to downtown greenspace and the Winnipeg Parks Strategy.
- This option does not support the SPAP action item 1.4 to support access to the downtown library.
- This option does not support OurWinnipeg 2045 Complete Communities 2.0 as it does not support access to the SHED.

3.4.4 Cost Estimate

The class 4 cost estimate based on the findings is $14,875,000. Refer to attached costing report cost estimate and net present value spreadsheet.

This option includes constructing a park with roughly the same quality level as the current park but with modern characteristics, which has a cost of approximately $6,000,000 (Postma).

Option	Lifecycle Cost (in thousands)		
	Capital	Operating	Total
Demolish the Parkade	$14,875	$35,857	$50,732

3.5 SELL THE PARKADE

3.5.1 Description

If the City were to sell the Parkade, the operations and asset would be turned over to an independent for-profit owner. This poses a significant risk as the City of Winnipeg loses the ability to control what the new owner may build in its place. This would introduce a number of issues that would need to be further studied and understood in more depth:

- Lost parking revenue
- Private ownership of Parkade
- Connected elevators between Parkade and library
- New additional annual expense for Park Maintenance

If the Parkade is sold, the City would lose the revenue generated by the Parkade. The City would also reduce their Parkade and Park maintenance costs. Loss of control over the Park could result in park neglect and become an unsightly issue in the City for which the City would have to deal with public complaints.

Electrical and mechanical related costs/impacts.

Electrical related costs and impacts are a result of the following items:

- Separation of Electrical Distribution for Library and Parkade. Construction of new Parkade Electrical Distribution
- Separation of Fire Alarm Systems and Independent Fire Alarm Control Panel and Monitoring for Parkade.
- Separation of Card Access and CCTV systems and monitoring independently for the Parkade
- Separation of Lighting Control System and independent Server and Controls for Parkade

Mechanical related costs and impacts are a result of the following items:

- Install new sprinkler tree and domestic water service
- Replace HVAC equipment
- Replace applicable ductwork
- Install fuel oil vent fan
- Paint natural gas lines

3.5.2 Service Level Impacts

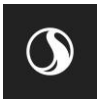
During consultation with civic department stakeholders, the option to sell the parkade was found to have the lowest benefit score of service level impacts.

Positive service level impacts include:

- Parking may still be offered in this location.
- Opportunity for positive mixed used development.

Negative service level impacts include:

- Lack of control regarding future land use. For example, future developers may opt to build a structure which could impact the Millennium Library glass feature wall, all the related negative service level impacts could occur.
- Loss of downtown greenspace
- Reduced available parking for people visiting the library, attending programming at the library, attending special events, or commuting to work.



- Does not support the future redevelopment of Graham avenue as the parkade is in an ideal location to support the upcoming destination area.

This option does not align with the following Council approved policies and plans, which include:

- This option may not align with the SPAP action item 1.4 to maintain access to downtown greenspace and the Winnipeg Parks Strategy.
- This option may not support the SPAP action item 1.4 to support access to the downtown library.
- This option may not support OurWinnipeg 2045 Complete Communities 2.0 as it does not support access to the SHED.

3.5.3 Cost Estimate

The class 4 cost estimate based on the findings is $10,313,000. Refer to attached costing report and net present value spreadsheet.

Option	Lifecycle Cost (in thousands)		
	Capital	Operating	Total
Selling the Parkade	$10,313	$25,357	$35,670

3.6 ELECTRIC VEHICLES

The Parkade currently has an electric vehicle charging station from Rio Tinto, part of the FLO charging network.

This type of charging station quickly charges up to two vehicles, at a rapid rate.

As electric vehicles become more and more common, the new Parkade should incorporate more electrical infrastructure for up to 40 Level II EV charging. The type and quantity of chargers will need to be determined at the time of design as the electric vehicle industry is still evolving. It will likely include a mix of proprietary chargers for specific vehicle brands, such as Tesla, and generic chargers capable of serving multiple brands of vehicles. It should also include conventional receptacles for plug-in hybrid and other vehicles not serviced by typical Level II chargers.

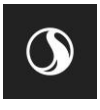
The power service and distribution design should provide the necessary capacity to support all this equipment, as well as flexibility to accommodate future evolution of the EV charging market as much as can be predicted at this time. All parking stalls should also be equipped with communication infrastructure to facilitate tracking of usage, scheduling, and demand control for the charging systems.

Coordination of the placement of the chargers will need to take into consideration the additional weight of the current electric vehicle battery loading. The costs for repair of the parkade do not take into consideration requirements for additional structural re-enforcement that may be necessary.

3.7 AUTONOMOUS VEHICLES

Provisions could also be made for future autonomous vehicle parking, although such technology is currently still in the early stages of development and differs from vehicle manufacturer to manufacturer. Provisions for autonomous vehicle parking could include reference beacons and vehicle sensors assisting vehicles in finding available space and maneuvering themselves into parked position. Automated parking/racking systems may also be considered in the longer-term future.

We have found that the use of autonomous vehicles does not reduce the amount of parking but changes the way drivers use vehicles. The common approach is to believe the vehicles will drop off their users and travel home and return later in the day thus reducing parking needs. The current thought is that autonomous vehicles will aid drivers, but the vehicle will remain in a Parkade. The parking layouts might change inside the Parkades but it does not eliminate the need for downtown parking.



3.8 ALIGNMENT TO OURWINNIPEG 2045

Imperative to the success of a 'Central Library' beyond the physical experience and amenities, programming, etc. is public access. Winnipeg's flagship library is currently well located for access to public transport, active transportation, and with its underground Parkade—secure transportation. The City is faced with the challenge of assessing the best path forward for its underground Parkade with consideration to the investment required to maintain and operate it. It is important for the City to understand who uses it and how it contributes to the City's mission and vision, specifically in terms of generating revenue and whether there is a business case for it, what alternatives there are to investing in the underground Parkade, as well as what is best for the City, its citizens, the central library, and the downtown.

In analyzing the options and opportunities, it is important to reference the City's development plan OurWinnipeg 2045, Complete Communities 2.0 An OurWinnipeg Direction Strategy, and Downtown Winnipeg – Urban Design Guidelines, starting with the City's **vision**:

To be a vibrant and healthy city which places its highest priority in quality of life for all its citizens,

and **mission**:

Working together to achieve affordable, responsive and innovative public service.

OurWinnipeg 2045 establishes the following six goals for the successful development of the City:

OurWinnipeg 2045 Goal	Description
Leadership and Good Governance	• Peace, justice and strong institutions • Partnership for the goals
Environmental Resilience	• Clean water and sanitation • Affordable clean energy • Responsible consumption and production • Climate action • Life below water • Life on land
Economic Prosperity	• No poverty • Quality education • Decent work and economic growth
Good Health and Well-Being	• Zero hunger • Good health and well-being
Social Equity	• Gender equality • Reduced inequalities

City Building	• Industry, innovation and infrastructure • Sustainable cities and communities

Complete Communities 2.0 An OurWinnipeg Direction Strategy identifies the following seven areas of focus:

Complete Communities 2.0 Direction Strategy	**Description**
Growth and Servicing	• General Growth • Financing Growth • Servicing
Transformative Areas	• Downtown • Corridors • Rapid Transit Corridors • Commercial Areas and Mixed Use Centres • Major Redevelopment Sites • New Communities
Established Neighbourhoods	• Established Neighbourhoods • Mature Communities • Recent Communities • Emerging Communities • Reinvestment Areas
Additional Areas	• Employment Lands • Rural and Agricultural
Special Districts	• Airport Area • Urban Reserves • Capital Region
Urban Structure Supports	• Mobility • Strategic Infrastructure and Resources Heritage • Parks and Recreation • Major Open Space • Housing • Urban Design • Heritage Conservation

The City's decision to Repair the Parkade, Build a New Parkade, Demolish the Parkade, or Sell the Parkade directly affects five of the City's seven focus areas identified in Complete Communities 2.0, An OurWinnipeg Direction Strategy and include: Growth and Servicing, Transformative Areas, Established Neighbourhoods, Urban Structure Supports, and Implementation.

Downtown Winnipeg – urban design guidelines establishes two areas of focus to enhance the livability of Winnipeg's urban environment and create high quality and innovative design leading to a vibrant downtown:

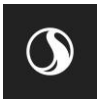
Downtown Winnipeg Urban Design Guidlines	**Description**
Urban Design & the Public Realm	• Enhance pedestrian comfort, safety and accessibility • Create identifiable places where appropriate to the context of the urban fabric • Respect the urban tradition of streets and blocks • Celebrate and build on the best features of the surrounding context • Contribute to important vistas and linkages • Animate the interface between interior and exterior space
Architectural Design	• Strive for quality and character • Integrate public art • Practice heritage conservation • Design for refinement and integration • Practice sustainable design

Ultimately, the city's decision to: Repair the Parkade, Build a New Parkade, Demolish the Parkade, or Sell the Parkade, directly affects five of the City's six goals established in OurWinnipeg 2045:

- Environmental Resilience (Reasonable consumption and production, Climate Action, Life on Land)
- Economic Prosperity (Quality Education)
- Good Health and Well-Being
- Social Equity (Reduced inequalities)
- City Building (Industry, innovation, and infrastructure, Sustainable cities and communities).

Similarly, the city's decision to Repair the Parkade, Build a New Parkade, Demolish the Parkade, or Sell the Parkade directly affect both of the City's two focus areas established in Downtown Winnipeg – Urban Design Guidelines:

- Urban Design & the Public Realm



- Architectural design

With these considerations, the role and purpose of Winnipeg's flagship library is to contribute to the social, economic, cultural, and sustainable success of cities for their citizens. A renewed recognition of the importance behind libraries across Canada was made evident in the investment made in Winnipeg's flagship library nearly 20 years ago and can be seen through the cultural importance of the multi-story glass wall, reading terraces, and public park. These culturally significant focal points are made possible through the initiatives carried out by City's development plans, OurWinnipeg 2045, Complete Communities 2.0 An OurWinnipeg Direction Strategy, and Downtown Winnipeg – Urban Design Guidelines, the right option becomes clearer.

Demolishing the existing below ground Parkade and building a new above ground Parkade, results in:

- a significant loss to the public realm—the demolition of the park, a significant public urban amenity and asset to residents, businesses, and tourists.
- a significant increase in greenhouse gas emissions, the embodied carbon embedded in the underground structure refused to landfill, new embodied carbon to mine materials, transport, fabricate components, transport components, and build a new above ground Parkade, and the ongoing additional operational carbon to maintain and operate an above it.
- a loss of carbon capturing flora and a loss of habitat for fauna.

3.8.1 Repair the Parkade

Repair the Parkade results in achieving the benefits of each option, while eliminating the concerns of each option. The City maintains the park, a significant public urban amenity and asset for residents, businesses, and tourists, continuing to provide carbon capturing flora and habitat for fauna; maintains ownership and control of the park, maintains the revenue generated from the Parkade, eliminates additional expense for parking city vehicles in a private Parkade; while limiting greenhouse gas emissions.

3.8.2 Build a New Parkade

Additional considerations inherent in the challenge of developing an above ground parkade include the desire to provide a better pedestrian experience by incorporating an at grade commercial space. This creates significant additional cost which drive higher lease rates for a less desirable location, and thus less leasable commercial space. Furthermore, the need to provide secure parking for City vehicles significantly increases the capital cost of construction to enclose an above ground parkade, including the building enclosure, heating, ventilation, air conditioning, and sprinklers, and to cost to maintain and operate it.

3.8.3 Demolish the Parkade

Demolishing the existing parkade and rebuilding the park results in a temporary loss of the public space, whereas maintaining this significant public urban amenity results in a significant increase in greenhouse gas emissions. The embodied carbon within the underground structure would be relegated to landfill, new embodied carbon introduced as a result of mined materials, transportation, and component fabrication. However, a new park would continue to provide carbon capturing flora and habitat for fauna.

3.8.4 Sell the Parkade

Selling the Parkade while maintaining the air rights to maintain and operate the park results in both a loss of private vehicle parking revenues for the City, as well as an additional expense to park City vehicles including any additional upgrades required by the City to secure their vehicles at this time. This complicates the City's ownership and control of a significant public urban amenity and asset for residents, businesses, and tourists, all while limiting greenhouse gas emissions and continuing to provide carbon capturing flora and habitat for fauna.

3.9 COST/BENEFIT ANALYSIS

The City of Winnipeg has provided the Lifecycle costing spreadsheets for which we have populated to determine the net present value (NPV) for the various options. Loss calculations for Net Present Value were determined based on a twenty-year horizon. The costs were included based on the anticipated timelines and the loss in review has been updated accordingly. The factors used to assess the different options within the project included cost, NPV, and benefits of service level impacts and alignments to council master plans and policies.

With respect to capital costs, service level impacts, alignment to Council approved policies and plans, the feasibility study has determined that the option that had the best business case evaluation was option 1 to Repair the Parkade. The second highest ranked business case is Build a New Parkade, however functional and major aesthetic considerations to the Library property made this option unviable. The Demolition of the Parkade option would result in a major loss of services and accesibility to the Library and adjacent businesses and community and was not considered a desirable outcome. Finally, given the cost of segregation of the Parkade from the Library property involved many physical mechanical, electrical, structural, and architectural system complications and capital costs to implement such would offset the business case benefits, as a result, the option to Sell the Parkade was also not considered viable, and had the lowest NPV.

The option to Repair the Parkade provides the following positive service level impacts:

- Secure parking to people supporting attending events at the Canada Life Centre, attending programming at the Millennium Library, and commuting to work. This supports accessibility to Sports, Hospitality, and Entertainemnt District (SHED) in the downtown.
- Parking to people visiting or attending programming at the Millennium Library

- Supports economic development and growth plans, including CentrePlan 2050 and the future redesign of Graham Avenue

- Continued use of the Millennium Library park, supporting greenspace use in the downtown.

Repairing the Parkade is intended to be undertaken over the course of several years, where high priority occur in the first three year period, 2024 – 2027, in order to reduce the possibility of unplanned closures in the parkade. Remaining structural, mechanical, and electrical repairs are to occur between 2028 – 2030 period. The existing mechanical and electrical systems servicing the Millennium Library Parkade have exceeded their useful lifetime and must be replaced. The parkade repairs are expected to extend the life of the asset by approximately 25 years.

The City of Winnipeg's Business case evaluation has been completed using the costing and updating Net Present Value assessment. The following table provides a summary of the findings:

PROJECT ANALYSIS SUMMARY							
Status Quo Analysis							
Baseline NPV Opex (Sk)		$ (12,482)					
**Status quo is defined as maintaining the current operations and maintenance behaviour. This is typically the O&M recommendations defined by the manufacturer or designer. Status quo provides the realistic operating cost baseline to be used to compare the project options against.*							
NPV and Benefit Options Summary Table							
Option Number	**Option Description**	**NPV Capex ($k)**	**NPV Opex ($k)**	**NPV ($k)**	**Benefit Score (in points)**	**Cost/Benefit**	**Cost/Benefit Rank**
Option 1	Repair Existing Parkade	$ 23,152	$ 11,189	$ 34,341	2,712	12.6620	1.00
Option 2	Build New Parkade	$ 41,413	$ 17,606	$ 59,019	2,041	28.9227	2.00
Option 3	Demolish Parkade & Build New Park	$ 12,595	$ 20,406	$ 33,000	696	47.4080	3.00
Option 4	Sell Parkade	$ 8,943	$ 12,186	$ 21,129	46	463.9806	4.00

Table obtained from Net Present Value spreadsheet

Lifecycle Cost Summary Table				
Option Number	**Description**	**Total Lifecycle Capital Cost ($k)**	**Total Lifecycle Operating Cost ($k)**	**Total Lifecycle Cost ($k)**
Option 1	Repair Existing Parkade	$ 28,804	$ 17,297	$ 46,101
Option 2	Build New Parkade	$ 48,857	$ 26,244	$ 75,101
Option 3	Demolish Parkade & Build New Park	$ 14,875	$ 35,857	$ 50,732
Option 4	Sell Parkade	$ 10,313	$ 25,357	$ 35,670

Table obtained from Net Present Value spreadsheet

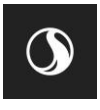
Our assessment found the following key points from the cost to benefit assessment:

- It appears that the best value for the City based on the criteria in the analysis evaluation table would be to Repair the Existing Parkade as it generates the best ranking.
- The second-best option would be to Build a New Parkade. This option has the largest net present value.

- The option to Demolish The Parkade and Build a New Parkade is third ranked with the second highest net present value as it does not benefit from the selection criteria and does not benefit the City due to the permanent loss of revenue.
- The option to sell the Parkade is the lowest ranked and should not be pursued further.

The City should consider the below items is subsequent studies:

- Role & purpose of Millennium Library Park with regard to OurWinnipeg 2045: Environmental Resilience (Reasonable consumption and production, Climate Action, Life on Land), Good Health and Well-Being), Social Equity (Reduced inequalities), and City Building (Industry, innovation, and infrastructure, Sustainable cities and communities).
- Role & purpose of Millennium Library Park with regard to Complete Communities 2.0 An OurWinnipeg Direction Strategy: Growth and Servicing (General Growth, Financing Growth, Servicing), Transformative Areas (Downtown, Corridors, Commercial Areas and Mixed Use Centres, Major Redevelopment Sites), Established Neighbourhoods (Established Neighbourhoods, Reinvestment Areas), Urban Structure Supports (Mobility, Strategic Infrastructure and Resources Heritage, Parks and Recreation, Major Open Space, Housing, Urban Design), and Implementation.
- Role & purpose of Millennium Library Park with regard to Downtown Winnipeg – Urban Design Guidelines: Urban Design & the Public Realm (Enhance pedestrian comfort, safety and accessibility, Create identifiable places where appropriate to the context of the urban fabric, Respect the urban tradition of streets and blocks, Celebrate and build on the best features of the surrounding context, Contribute to important vistas and linkages, Animate the interface between interior and exterior space), and Architectural Design (Strive for quality and character, Integrate public art, Design for refinement and integration, Practice sustainable design).
- Greenhouse Gas Emissions: the embodied carbon embedded in the underground structure and if demolished, refused to landfill, new embodied carbon to mine materials, transport, fabricate components, transport components, and build a new above ground Parkade, the ongoing additional operational carbon to maintain and operate an above ground Parkade; as well as a loss of carbon capturing flora and a loss of habitat for fauna should the City proceed with a new above ground Parkade.
- Additional Costs of developing an above ground Parkade including the desire to provide a better pedestrian experience incorporating commercial space at grade adds significant additional cost driving higher lease rates for a less desirable, therefore leasable, space, as well as the need to provide secure parking for city vehicles, significantly increasing the capital cost of construction to enclose an above ground Parkade, add the requisite building enclosure, heating, ventilation, air conditioning, and sprinklers, and to maintain and operate it.
- Revenue Generation: private vehicle parking revenues for the city will be eliminated if below ground Parkade sold.
- New additional expense: parking city vehicles in a privately held Parkade, including any additional upgrades required by the City to secure their vehicles at this time.



- Ownership: should the below ground Parkade be sold, the City's ownership and control of the site will become more complicated.
- Potential for redevelopment of the park.
- Acquiring the building located at 207 St Mary Avenue to increase the public park, presence, amenity, and asset. Note, costs associated with this purchase are not included.
- Use of the Parkade by City Departments such as WPS needs to be further investigated.
- Potential for increasing parking rates would benefit the asset.

3.10 RECOMMENDED OPTION

Based on the results of the feasibility study, repairing the parkade offers the greatest value to the City and is the recommended option. Stantec to include enhanced testing to be undertaken during detailed design in order to refine the structural remediation design. The recommended option offers the greatest benefit through positive service level impacts including but not limited to supporting access to SHED in Downtown Winnipeg, convenient parking to special events in the downtown, as well as supporting economic development and growth plans in the area. Furthermore, this option supports Council approved policies and plans including but not limited to Strategic Priorities Plans, The Winnipeg Parks Strategy, and OurWinnipeg Complete Communities.

For budgeting purposes, the capital costs the Winnipeg Parking Authority would need to include in the upcoming budget cycle are noted below. The costs are slightly higher than what was included in the feasibility study analysis as they include internal City charge backs. The following costs are based on the costing report by Postma and the basis of estimate spreadsheet.

High Priority Repairs 2024 – 2027 (Class 3 Estimate)	
Structural + Membrane Costs	$ 5,138,000
Mechanical Costs	$ 4,429,000
Electrical Costs	$ 174,000
Design, Admin, Contingency Costs	$ 4,722,000
Total Capital Cost	$ 14,463,000
Repairs in 2028 (Class 4 Estimate)	
Structural + Membrane Costs	$ 215,000
Mechanical Costs	$ 398,000
Electrical Costs	$ 1,635,000
Design, Admin, Contingency Costs	$ 1,647,000
Total Capital Cost	$ 3,895,000
Repairs in 2030 (Class 4 Estimate)	
Structural + Membrane Costs	$ 105,000
Electrical Costs	$ 7,039,000
Design, Admin, Contingency Costs	$ 4,483,000
Total Capital Cost	$ 11,627,000

4.0 CONCLUDING COMMENTS

The Millennium Parkade is completely interconnected to operations within the City when considering the Park, the library, and the users of the Parkade. The decision to proceed with any of these four options should not be based singly on any parameter but must consider a variety of competing aspects of the Parkade. The largest items that impact the Parkade are:

1) Users of the Parkade for library access.
2) Users of the Parkade for downtown events.
3) Operation and public opinion of the park.
4) Maintenance and repair costs.

Owning green space in the core of any downtown is rare and in this case the City is the owner of the park, and as such, should weight these competing items in their decision as to the future of this park and Parkade.
Based on our findings during the feasibility study, our recommendation is to Repair the Parkade and to include enhanced testing in order to refine the structural remediation design.

Stantec thanks the City of Winnipeg in providing insight into operations and past documents which assisted in the development of this report.

5.0 REFERENCES

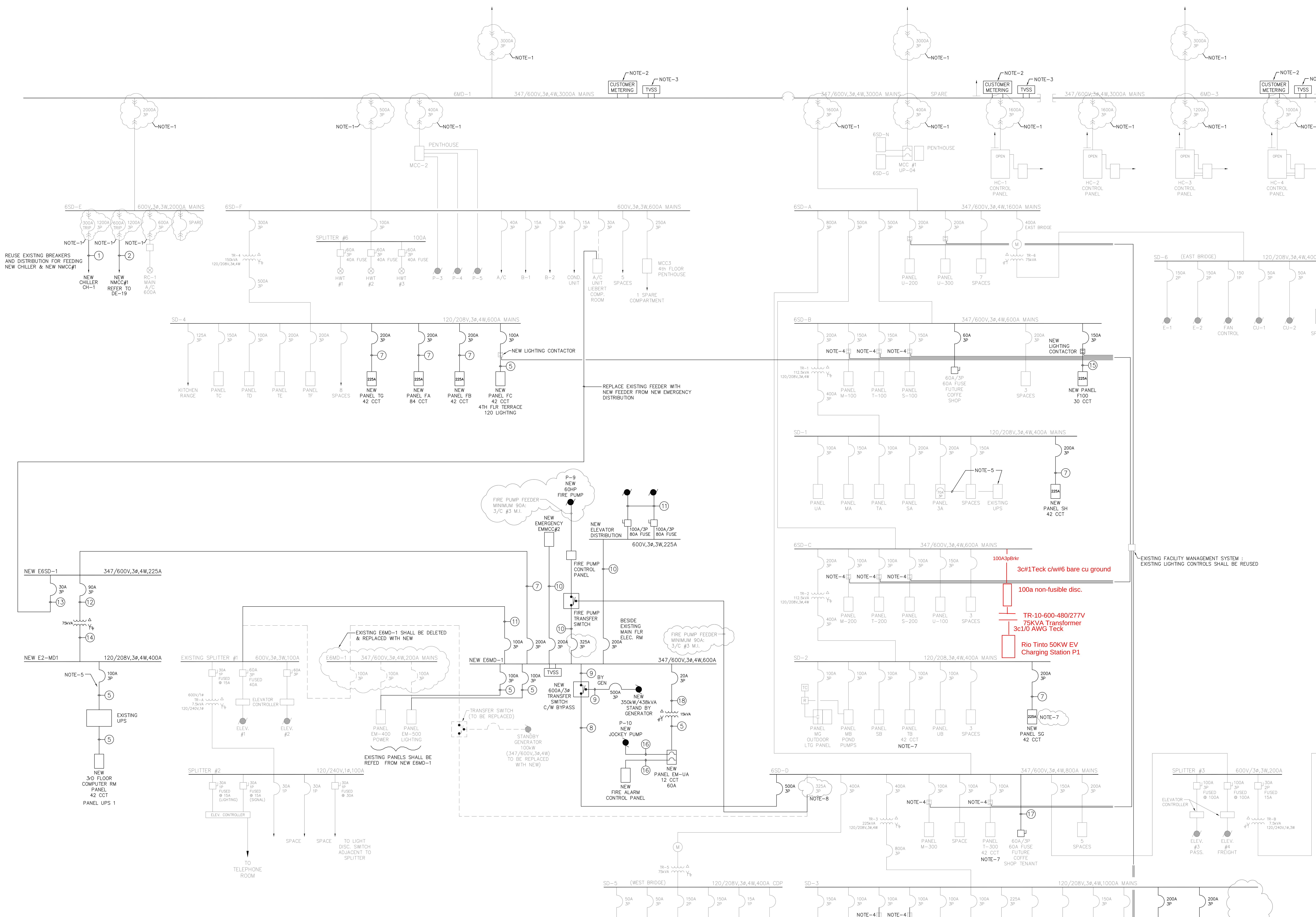
The following documents were referenced for this report.

- Millennium Parkade Condition Assessment Report, April 8, 2021, Crosier Kilgour and Partners.
- Partial set of Winnipeg Central Library Construction Documents, 1974.
- HTFC Landscape Architecture drawings, 2003/2004.
- City of Winnipeg Bid Opportunity, No. 655-2008.
- Image 1 : Seattle Central Library / OMA + LMN https://www.archdaily.com/11651/seattle-central-library-oma-lmn
- Image 2: Seattle Central Library / OMA + LMN https://www.archdaily.com/11651/seattle-central-library-oma-lmn
- Image 3: Seattle Central Library / OMA + LMN https://www.archdaily.com/11651/seattle-central-library-oma-lmn
- Image 4: Seattle Central Library / OMA + LMN https://www.archdaily.com/11651/seattle-central-library-oma-lmn
- Image 5: Seattle Central Library / OMA + LMN https://www.archdaily.com/11651/seattle-central-library-oma-lmn
- Image 6: Calgary Central Library / Snøhetta https://www.archdaily.com/905263/calgary-central-library-snohetta
- Image 7: Calgary Central Library / Snøhetta https://www.archdaily.com/905263/calgary-central-library-snohetta
- Image 8: Calgary Central Library / Snøhetta https://www.archdaily.com/905263/calgary-central-library-snohetta
- Image 9: New Halifax Central Library / schmidt hammer lassen architects + Fowler Bauld & Mitchell https://www.archdaily.com/577039/new-halifax-central-library-schmidt-hammer-lassen
- Image 10: New Halifax Central Library / schmidt hammer lassen architects + Fowler Bauld & Mitchell https://www.archdaily.com/577039/new-halifax-central-library-schmidt-hammer-lassen
- Image 11: Ottawa Public Library and Archives / Diamond Schmitt https://www.archdaily.com/932869/diamond-schmitt-reveals-design-for-ottawa-public-library-and-archives-joint-facility
- Image 12: Saskatoon Public Library / Designed by Formline Architecture, Chevalier Morales, and Architecture 49 https://saskatooncentrallibrary.ca/design/final-design/
- Image 13: Millennium Library Park / HTFC Planning & Design: https://htfc.ca/projects/millennium-library-park/

APPENDIX A – SINGLE LINE DIAGRAM

FEEDER SCHEDULE:

TYPE	DESCRIPTION	AMPACITY
1	3 #500 MCM R90 IN 78mmC.	395 (3W)
2	2X (3 #3/0)	420
5	4 #3 R90 IN 35mmC.	105
7	4 #3/0 R90 IN 53mmC.	210
8	4 #750 MCM R90 IN 103mmC.	500
9	4 #350 M.I. FREE AIR MINERAL INSULATED	500
10	3 #1 M.I. FREE AIR MINERAL INSULATED	200 (3W)
11	3 #6 M.I. FREE AIR MINERAL INSULATED	100 (3W)
12	3 #3 R90 IN 35mmC.	105 (3W)
13	4 #8 IN 27mmC.	45
14	4 #250 IN 78mmC.	265
15	4 #2/0 IN 53mmC.	185
16	2 #12 R90 IN 16 mmC.	15
17	3 #6 1 #2 GROUND IN 35mmC.	65
18	3 #10 R90 IN 21mmC.	30



GENERAL NOTES:

1. ALL NEW SWITCH GEAR AND DISTRIBUTION SHALL MATCH EXISTING WESTINGHOUSE EQUIPMENT. ALL EXISTING EQUIPMENT SHALL REMAIN UNLESS NOTED OTHERWISE.
2. ALL DISTRIBUTION TO BE CLEANED TO MANUFACTURER'S RECOMMENDED CLEANING METHODS. ALL BUSS SYSTEMS TO BE RETORQUED TO MANUFACTURER'S RECOMMENDATION.
3. PROVIDE SPRINKLER PROOFING FOR ALL EQUIPMENT & ALL EXISTING BUSS SYSTEMS. COORDINATE WITH MANUFACTURER.

NOTES:

1. PROVIDE NEW MICROPROCESSOR TRIP UNITS AS SPECIFIED FOR EACH EXISTING AIR CIRCUIT BREAKER.
2. PROVIDE NEW DIGITAL CUSTOMER METERING AS SPECIFIED FOR EACH DISTRIBUTION SECTION.
3. PROVIDE NEW TVSS AS SHOWN.
4. EXISTING LIGHTING CONTACTORS SHALL BE MAINTAINED, CLEANED, TESTED & MADE LIKE NEW & TIED INTO EXISTING FACILTY MANAGEMENT SYSTEM. PROVIDE NEW FEEDERS AS INDICATED.
5. REMOVE EXISTING UPS FEEDER AND RE-FEED AS INDICATED. PROVIDE NEW PANEL AS INDICATED.
6. REMOVE EXISTING ESCALATOR BREAKER, FEEDER, SPLITTER AND ASSOCIATED EQUIPMENT.
7. REPLACE EXISTING PANEL WITH NEW PANEL C/W NEW BREAKERS. PROVIDE 32 BREAKERS FOR PANEL T-300 AND TB TO REPLACE EXISTING & TIE INTO EXISTING CIRCUITING.
8. UTILIZE EXISTING BREAKER LOCATION AND PROVIDE NEW BREAKER TO FEED FIRE PUMP TRANSFER SWITCH.
9. EXISTING CONTROL PANELS HC-1, HC-2, HC-3 & HC-4 AND ASSOCIATED BUS DUCTS ARE OBSOLETE AND SHALL BE TOTALLY DEMOLISHED.
10. SPRINKLERPROOFING SHALL MEET THE APPROVAL OF THE LOCAL INSPECTOR, BUT AS A A MINIMUM SHALL INCLUDE CAULKING AND WATERPROOFING ALL TOP CONDUIT ENTRIES TO ALL DISTRIBUTIONS, TRANSFORMER, CDP'S, PANELBOARDS, ETC. ALSO SHIELDS SHALL BE PROVIDED SUCH THAT SPRAY OF WATER DOES NOT MAKE DIRECT CONTACT ONTO LIVE BUSSING, TRANSFORMER WINDINGS OR CIRCUIT BREAKERS OF ANY KIND.

No.	Date	Description	By
4	OCT. 21, 2005	RECORD DRAWING	
3	JAN. 16, 2004	ISSUED FOR PERMIT	
2	OCT. 30, 2003	ISSUED FOR TENDER	
1	OCT. 22, 2003	ISSUED FOR REVIEW	

ISSUE / REVISION

DRAWN BY: GA
PRINTING DATE:

RECORD DOCUMENT
OCTOBER 21, 2005

THIS DRAWING HAS BEEN UPDATED WITH CHANGES DOCUMENTED BY CHANGE ORDERS AND ASBUILT INFORMATION PROVIDED BY THE CONTRACTOR. THE INFORMATION ON THIS DRAWING MAY NOT REFLECT ACTUAL SITE CONDITIONS. THE USER OF THIS DRAWING IS ADVISED TO RELY ONLY ON INFORMATION THAT HAS BEEN CONFIRMED ON SITE.

The contractor is to verify dimensions and data noted herein with conditions on the site and is held responsible for reporting any discrepancy to the architects for adjustment.

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Consulting Professional Engineers
210-1821 Wellington Avenue
Winnipeg, Manitoba R3H 0G4
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E-Mail: mcw_wpg@mcw-ers.com
4221

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PLANNING PROPERTY AND DEVELOPMENT DEPARTMENT
3rd Floor — 65 Garry Street, Winnipeg, MB R3C 4K4

CENTENNIAL LIBRARY MILLENNIUM PROJECT

251 Donald Street Winnipeg
CITY OF WINNIPEG PROJECT NO. 2001-233

SINGLE LINE DISTRIBUTION SCHEMATIC DIAGRAM

COMM. NO.: ---- SHEET: **AE-12**
PLOTTED ON: October 30, 2003

APPENDIX B – POSTMA COST ESTIMATES

POSTMA CONSULTING

400-93 Lombard Ave
Winnipeg, MB R3B 3B1
Phone: (204) 415-3700
Email: info@postmaqs.ca
www.postmaconsulting.ca

Stantec Architecture
500-311 Portage Ave
Winnipeg MB
R3B 2B9

Attention: Blair Fraser, PM, Cert. P. Eng
Structural Team Lead
Senior Associate, Project Manager
Buildings and Industrial Facilities

Re: **Millennium Library Parkade**
Feasibility Study
Winnipeg, MB
Class C & D Estimates

We are pleased to attach our class 3 & 4 estimates for the above noted project and do hereby certify the values as noted below which includes a 20% design & pricing contingency and 8% for escalation for the Class 4 estimates and a 15% design & pricing contingency and 8% for escalation for the Class 3 estimate (Option 1)

Description	Base Estimate	Escalation	Design & Pricing Contingency	Total
Option 1 – slab repair Class 3	$5,010,724	$400,858	$811,737	$6,233,320
Option 2A – Demolish parkade and construct new parkade Class 4	$25,411,055	$2,032,884	$5,488,788	$32,932,727
Option 2B – Close and demolish parkade Class 4	$4,419,068	$353,525	$954,519	$5,727,111
Option 2C – Sell parkade including related repairs to sell – Class 4	$5,411,481	$432,918	$1,168,880	$7,013,279
Option 2D – Repairs excluding option 1 work – Class 4	$10,481,197	$838,496	$2,263,939	$13,583,631

Estimate Exclusions:

- GST
- COVID impact costs
- Fixtures & equipment
- Consulting fees
- Soft costs

- Construction contingency
- Hazardous material abatement
- Water use
- High end features & landscaping at area between new parkade and existing library
- Mechanical & electrical repairs as noted in April 8, 2021 CKP report except as noted (immediate and short term repairs included)

The pricing reflects probable construction costs obtainable in the location of the project as of the date of this estimate and is a determination of fair market value for the construction of this project and should not be taken as a prediction of low bid.

This pricing assumes competitive bidding for every portion of the construction work including all sub-contractors as well as the general contractor and assumes a minimum of four (4) general bidders. If fewer bids are received, the bid results can be expected to be higher.

It is recognized, however, that Postma Consulting does not have control over the cost of labour, material or equipment, over a contractor's methods of determining bid prices, or over competitive bidding, market or negotiation conditions.

Accordingly, Postma Consulting cannot and does not warrant or represent that bids or negotiated prices will not vary from this or any subsequent estimate of construction cost or evaluation prepared or agreed to by Postma Consulting. It is generally acknowledged that a Class 3 estimate is within the range of plus thirty (30%) or minus twenty (20%) percent and a Class 4 estimate is within the range of plus sixty (60%) or minus thirty (30%) percent.

We hope this meets to your satisfaction. If you have any questions, please do not hesitate to call.

POSTMA CONSULTING LTD.

Wes Postma, CET, GSC, PQS
Senior Advisor

Milleneum Library Parkade

Class 3 estimate Option 1 - Slab repairs

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
1	**Division 00 - Cash Allowances**				
2	Testing	item	1	$75,000.00	$75,000
3				Subtotal	$75,000
4	**Division 01 - General Requirements**				
5	Site Supervision & Administration	months	24	$27,000.00	$648,000
6	Indirect Site Costs (trailers, temp elec, temp lighting etc.)	months	24	$24,000.00	$576,000
7	Contractor fee	%	10.00	$4,555,200	$455,520
8	Street Rental & shutdown	months	12	$2,500.00	$30,000
9	Temporary heating and hoarding	months	0	$50,000.00	existing
10	Jersey barriers, traffic management	months	24	$5,000.00	$120,000
11	Hoarding for phases - assume 5 phases	m2	2,875	$20.00	$57,500
12	Bonds & Insurance	thous.	5,011	$26.00	$130,286
13	Permits	thous.	5,011	$12.00	$60,132
14				Subtotal	$2,077,438
15	**Division 02 - Existing Conditions**				
16	Hydro demolition suspended slab 75 mm	m2	8,525	$102.25	$871,681
17	Water treatment and control	item	1	$45,000.00	$45,000
18	Movable hoardings for water spray control	item	1	$75,000.00	$75,000
19	Shoring slab with reshore posts - minor	m2	8,525	$11.00	$93,775
20	Chip out around columns	no	60	$400.00	$24,000
21	Chip out along walls	m	420	$90.00	$37,800
22				Subtotal	$1,147,256
23	**Division 03 - Concrete**				
24	Clean, incl rebar shadow & saturate existing concrete	m2	8,525	$10.00	$85,250
25	Replace damaged rebar - say 10,000 kg	allow	1	$50,000.00	$50,000
26	Apply anticorrision protection to rebar	m2	8,525	$24.00	$204,600
27	Concrete topping 75mm	m2	8,525	$87.00	$741,675
28				Subtotal	$1,081,525
29	**Division 04 - Masonry**				
30	No work noted		0	$0.00	$0
31				Subtotal	$0
32	**Division 05 - Metals**				
33	No work noted		0	$0.00	$0
34				Subtotal	$0
35	**Division 06 - Wood, Plastics and Composites**				

Milleneum Library Parkade

Class 3 estimate Option 1 - Slab repairs

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
36	No work noted		0	$0.00	$0
37				Subtotal	$0
38	**Division 07 - Thermal and Moisture Protection**				
39	New traffic membrane at new topping	m2	8,525	$60.00	$511,500
40	Ramp temp signalling/traffic control	item	1	$20,000.00	$20,000
41	Traffic membrane at ramp, clean existing, prep	m2	1,153	$85.00	$98,005
42				Subtotal	$629,505
43	**Division 08 - Openings**				
44	No work noted		0	$0.00	$0
45				Subtotal	$0
46	**Division 09 - Finishes**				
47	No work noted		0	$0.00	$0
48				Subtotal	$0
49	**Division 10 - Specialties**				
50	No work noted		0	$0.00	$0
51				Subtotal	$0
52	**Division 11 - Equipment**				
53	No work noted		0	$0.00	$0
54				Subtotal	$0
55	**Division 12 - Furnishing**				
56	No work noted		0	$0.00	$0
57				Subtotal	$0
58	**Division 13 - Special Construction**				
59	No work noted				$0
60				Subtotal	$0
61	**Division 14 - Conveying Equipment**				
62	No work noted		0	$0.00	$0
63				Subtotal	$0
64	**Division 21-25 - Mechanical**				
65	No work noted		0	$0	$0
66	RST	%	7	$0.00	$0
67				Subtotal	$0
68	**Division 26-28 - Electrical**				
69	No work noted		0	$0.00	$0
70	RST	%	7	$0.00	$0

Milleneum Library Parkade

Class 3 estimate Option 1 - Slab repairs

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
71				Subtotal	$0
72	**Division 31 - Earthwork**				
73	No work noted		0	$0.00	$0
74				Subtotal	$0
75	**Division 32 - Exterior Improvements**				
76	No work noted		0	$0.00	$0
77				Subtotal	$0
78	**Division 33 - Utilities**				
79	No work noted		0	$0.00	$0
80				Subtotal	$0
81	**Subtotal**				$5,010,724
82	Escalation			8.00%	$400,858
83	**SUBTOTAL**				$5,411,582
84	Design & Pricing Contingency			15.00%	$811,737
85	**TOTAL**				**$6,223,320**

Milleneum Library Parkade

Class 4 estimate - Option 2A - Demolish parkade and construct new parkade

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
1	**Division 00 - Cash Allowances**				
2	Testing	item	1	$0.00	not required
3				Subtotal	$0
4	**Division 01 - General Requirements**				
5	Site Supervision & Administration	months	16	$27,000.00	$432,000
6	Indirect Site Costs (trailers, temp elec, temp lighting etc.)	months	16	$24,000.00	$384,000
7	Contractor fee	%	5.00	$24,201,000	$1,210,050
8	Street Rental & shutdown	months	16	$2,500.00	$40,000
9	Temporary heating and hoarding	months	6	$50,000.00	$300,000
10	Jersey barriers, traffic management	months	16	$5,000.00	$80,000
11	Hoarding for separation	m2	720	$30.00	$21,600
12	Bonds & Insurance	thous.	25,411	$20.00	$508,220
13	Permits	thous.	25,411	$12.00	$304,932
14				Subtotal	$3,280,802
15	**Division 02 - Demolition & Misc work**				
16	Demo suspended slab - 225 & 300 thick with drop heads	m2	8,000	$86.00	$688,000
17	Demo slab on grade	m2	4,000	$33.00	$132,000
18	Demo columns	no	94	$350.00	$32,900
19	Demo ramp	m2	350	$75.00	$26,250
20	Demo int walls masonry/concrete	m2	189	$80.00	$15,120
21	Demo surface works, landscaping	m2	4,000	$100.00	$400,000
22	Misc demo, stairs, doors etc	item	1	$50,000.00	$50,000
23	Shore exterior wall - 3 metre OC	m	165	$1,000.00	$165,000
24	Tie into Police station	item	1	$25,000.00	$25,000
25	Tie into Library	item	1	$25,000.00	$25,000
26				Subtotal	$1,559,270
27	**Division 03 - Concrete**				
28	Concrete wall 300 thick x 6 metre high	m3	216	$1,625.00	$351,000
29	Pile caps 1.2 x .90 x length of wall	m3	130	$1,000.00	$130,000
30	Rebar for wall and caps - 100 kg/m3	kg	30,800	$3.00	$92,400
31	Elevator pit and wall	item	1	$4,000.00	$4,000
32	Grade beams link	m3	4	$2,500.00	$10,000
33	Slab on void at link	m2	29	$200.00	$5,800
34	Concrete work for new parkade	m2	5,584	$410.00	$2,289,440
35	Precast work for new parkade	m2	13,962	$460.00	$6,422,520
36	Hammer head and column, cap at link	no	5	$20,000.00	$100,000

Milleneum Library Parkade

Class 4 estimate - Option 2A - Demolish parkade and construct new parkade

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
37	Concrete toppings for links	m2	200	$75.00	$15,000
38				Subtotal	$9,420,160
39	**Division 04 - Masonry**				
40	Masonry for new parkade	m2	1	$90,000.00	$90,000
41	Shaft and stair walls	m2	200	$290.00	$58,000
42				Subtotal	$148,000
43	**Division 05 - Metals**				
44	Misc steel work for new parkade	item	1	$75,000.00	$75,000
45	Steel stairs at link	risers	32	$1,000.00	$32,000
46	Landing at link	m2	7	$1,500.00	$10,500
47	Steel deck links roof and floor	m2	448	$52.00	$23,296
48	Structural steel for links	kg	21,000	$8.00	$168,000
49				Subtotal	$308,796
50	**Division 06 - Wood, Plastics and Composites**				
51	Misc work for parkade new	m2	16,754	$4.50	$75,393
52				Subtotal	$75,393
53	**Division 07 - Thermal and Moisture Protection**				
54	Roofing at link	m2	224	$300.00	$67,200
55	Soffit at link	m2	188	$485.00	$91,180
56	Waterproofing at new concrete wall, insulate	m2	720	$95.00	$68,400
57	Roofing, traffic coating at new parkade	m2	8,525	$54.00	$460,350
58				Subtotal	$687,130
59	**Division 08 - Openings**				
60	Curtainwall at links -	m2	570	$1,300.00	$741,000
61	Curtainwall at stairs parkade	m2	310	$1,300.00	$403,000
62	Doors at links	no	11	$4,000.00	$44,000
63	Doors, windows at new parkade	m2	16,754	$6.00	$100,524
64				Subtotal	$1,288,524
65	**Division 09 - Finishes**				
66	Painting, flooring at new parkade	m2	16,754	$12.00	$201,048
67	Architectural finish exterior parkade	m2	16,754	$25.00	$418,850
68	Painting, flooring at link	m2	260	$50.00	$13,000
69				Subtotal	$632,898
70	**Division 10 - Specialties**				
71	Misc items new parkade	m2	16,754	$2.00	$33,508
72				Subtotal	$33,508

Milleneum Library Parkade

Class 4 estimate - Option 2A - Demolish parkade and construct new parkade

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
73	**Division 11 - Equipment**				
74	Parking equipment	m2	16,754	$7.00	$117,278
75				Subtotal	$117,278
76	**Division 12 - Furnishing**				
77	No work noted		0	$0.00	$0
78				Subtotal	$0
79	**Division 13 - Special Construction**				
80	No work noted				$0
81				Subtotal	$0
82	**Division 14 - Conveying Equipment**				
83	Elevator new parkade and link	item	1	$600,000.00	$600,000
84				Subtotal	$600,000
85	**Division 21-25 - Mechanical**				
86	Mechanical allowance parkade & links	m2	17,014	$65.00	$1,105,910
87	Demo gas and disconnect	item	1	$5,000	$5,000
88	Demo mechanical	item	1	$90,000	$90,000
89	RST	%	7	$1,200,910.00	$84,064
90				Subtotal	$1,284,974
91	**Division 26-28 - Electrical**				
92	Electrical allowance parkade & links	m2	17,014	$140.00	$2,381,960
93	Reprogram fire alarm panel	item	1	$2,500.00	$2,500
94	Delete cables for fire alarm	item	1	$5,000.00	$5,000
95	Reverify fire alarm	item	1	$5,000.00	$5,000
96	Disconnect and remove CCTV	item	1	$5,000.00	$5,000
97	Remove cables CCTV	item	1	$7,500.00	$7,500
98	Reprogram light controls	item	1	$7,500.00	$7,500
99	Remove interconnections	item	1	$5,000.00	$5,000
100	Reprogram card access	item	1	$5,000.00	$5,000
101	Demo electrical	item	1	$80,000.00	$80,000
102	RST	%	7	$2,504,460.00	$175,312
103				Subtotal	$2,679,772
104	**Division 31 - Earthwork & Piling**				
105	Backfill parkade with gravel	m3	33,400	$38.00	$1,269,200
106	Excavation and backfill for new parkade	m2	2,793	$250.00	$698,250
107	750 dia x 8 Metre pile wall	no	40	$3,000.00	$120,000
108	Foundation for stair and elevator	no	12	$2,750.00	$33,000

Milleneum Library Parkade

Class 4 estimate - Option 2A - Demolish parkade and construct new parkade

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
109	900 dia x 9 metre pile link	no	4	$4,400.00	$17,600
110	Foundation for new parkade	m2	2,793	$250.00	$698,250
111				Subtotal	$2,836,300
112	**Division 32 - Exterior Improvements**				
113	Landscaping and hard scaping for new parkade	item	1	$200,000.00	$200,000
114	Restore landscaping - high end features	m2	1,200	$0.00	NIC
115	Restore paving, etc at links	item	1	$30,000.00	$30,000
116	New perimeter fence (50% - remainder new parkade)	m	113	$250.00	$28,250
117				Subtotal	$258,250
118	**Division 33 - Utilities**				
119	Site servicing - new parkade - allowance	item	1	$200,000.00	$200,000
120				Subtotal	$200,000
121	**Subtotal**				$25,411,055
122	Escalation			8.00%	$2,032,884
123	**SUBTOTAL**				$27,443,939
124	Design & Pricing Contingency			20.00%	$5,488,788
125	**TOTAL**				**$32,932,727**

Milleneum Library Parkade

Class 4 estimate - Option 2B - close and demolish parkade

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
1	**Division 00 - Cash Allowances**				
2	Testing	item	1	$0.00	not required
3				Subtotal	$0
4	**Division 01 - General Requirements**				
5	Site Supervision & Administration	months	6	$27,000.00	$162,000
6	Indirect Site Costs (trailers, temp elec, temp lighting etc.)	months	6	$24,000.00	$144,000
7	Contractor fee	%	5.00	$4,209,000	$210,450
8	Street Rental & shutdown	months	6	$2,500.00	$15,000
9	Temporary heating and hoarding	months	1	$50,000.00	$50,000
10	Jersey barriers, traffic management	months	6	$5,000.00	$30,000
11	Hoarding for separation	m2	720	$30.00	$21,600
12	Bonds & Insurance	thous.	4,419	$15.50	$68,495
13	Permits	thous.	4,419	$12.00	$53,028
14				Subtotal	$754,573
15	**Division 02 - Demolition & Misc work**				
16	Demo suspended slab as per 2A	m2	8,000	$86.00	$688,000
17	Demo slab on grade	m2	4,000	$33.00	$132,000
18	Demo columns	no	94	$350.00	$32,900
19	Demo ramp	m2	350	$75.00	$26,250
20	Demo int walls masonry/concrete	m2	189	$80.00	$15,120
21	Demo surface works, landscaping	m2	4,000	$100.00	$400,000
22	Misc demo, stairs, doors etc	item	1	$50,000.00	$50,000
23				Subtotal	$1,344,270
24	**Division 03 - Concrete**				
25	Concrete wall 300 thick x 6 metre high	m3	216	$1,625.00	$351,000
26	Pile caps 1.2 x .90 x length of wall	m3	130	$1,000.00	$130,000
27	Rebar for wall and caps	kg	30,800	$3.00	$92,400
28				Subtotal	$573,400
29	**Division 04 - Masonry**				
30	No work noted		0	$0.00	$0
31				Subtotal	$0
32	**Division 05 - Metals**				
33	No work noted		0	$0.00	$0
34				Subtotal	$0
35	**Division 06 - Wood, Plastics and Composites**				

Milleneum Library Parkade

Class 4 estimate - Option 2B - close and demolish parkade

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
36	No work noted		0	$0.00	$0
37				Subtotal	$0
38	**Division 07 - Thermal and Moisture Protection**				
39	Waterproofing at new concrete wall, insulate	m2	720	$95.00	$68,400
40				Subtotal	$68,400
41	**Division 08 - Openings**				
42	No work noted		0	$0.00	$0
43				Subtotal	$0
44	**Division 09 - Finishes**				
45	No work noted		0	$0.00	$0
46				Subtotal	$0
47	**Division 10 - Specialties**				
48	No work noted		0	$0.00	$0
49				Subtotal	$0
50	**Division 11 - Equipment**				
51	No work noted		0	$0.00	$0
52				Subtotal	$0
53	**Division 12 - Furnishing**				
54	No work noted		0	$0.00	$0
55				Subtotal	$0
56	**Division 13 - Special Construction**				
57	No work noted				$0
58				Subtotal	$0
59	**Division 14 - Conveying Equipment**				
60	No work noted		0	$0.00	$0
61				Subtotal	$0
62	**Division 21-25 - Mechanical**				
63	Demo gas and disconnect	item	1	$5,000	$5,000
64	Demo mechanical	item	1	$90,000	$90,000
65	RST	%	7	$95,000.00	$6,650
66				Subtotal	$101,650
67	**Division 26-28 - Electrical**				
68	Reprogram fire alarm panel	item	1	$2,500.00	$2,500
69	Delete cables for fire alarm	item	1	$5,000.00	$5,000
70	Reverify fire alarm	item	1	$5,000.00	$5,000

Milleneum Library Parkade

Class 4 estimate - Option 2B - close and demolish parkade

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
71	Disconnect and remove CCTV	item	1	$5,000.00	$5,000
72	Remove cables CCTV	item	1	$7,500.00	$7,500
73	Reprogram light controls	item	1	$7,500.00	$7,500
74	Remove interconnections	item	1	$5,000.00	$5,000
75	Reprogram card access	item	1	$5,000.00	$5,000
76	Demo electrical	item	1	$80,000.00	$80,000
77	RST	%	7	$122,500.00	$8,575
78				Subtotal	$131,075
79	**Division 31 - Earthwork & Piling**				
80	Backfill parkade with gravel	m3	33,400	$38.00	$1,269,200
81	750 dia x 8 Metre pile wall	no	40	$3,000.00	$120,000
82				Subtotal	$1,389,200
83	**Division 32 - Exterior Improvements**				
84	New perimeter fence	m	226	$250.00	$56,500
85				Subtotal	$56,500
86	**Division 33 - Utilities**				
87	No work noted		0	$0.00	$0
88				Subtotal	$0
89	**Subtotal**				$4,419,068
90	Escalation			8.00%	$353,525
91	**SUBTOTAL**				$4,772,593
92	Design & Pricing Contingency			20.00%	$954,519
93	**TOTAL**				**$5,727,111**

Milleneum Library Parkade

Class 4 estimate - Option 2C - Sell parkade

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
1	**Division 00 - Cash Allowances**				
2	Testing	item	1	$0.00	not required
3				Subtotal	$0
4	**Division 01 - General Requirements**				
5	Site Supervision & Administration	months	3	$27,000.00	$81,000
6	Indirect Site Costs (trailers, temp elec, temp lighting etc.)	months	3	$24,000.00	$72,000
7	Contractor fee	%	7.00	$5,058,000	$354,060
8	Street Rental & shutdown	months	0	$2,500.00	not required
9	Temporary heating and hoarding	months	0	$50,000.00	not required
10	Jersey barriers, traffic management	months	0	$5,000.00	not required
11	Bonds & Insurance	thous.	5,412	$15.50	$83,886
12	Permits	thous.	5,412	$12.00	$64,944
13				Subtotal	$655,890
14	**Division 02 - Demolition & Misc work**				
15	Misc cut and patching	item	1	$15,000.00	$15,000
16				Subtotal	$15,000
17	**Division 03 - Concrete**				
18	No work noted		0	$0.00	$0
19				Subtotal	$0
20	**Division 04 - Masonry**				
21	No work noted		0	$0.00	$0
22				Subtotal	$0
23	**Division 05 - Metals**				
24	No work noted		0	$0.00	$0
25				Subtotal	$0
26	**Division 06 - Wood, Plastics and Composites**				
27	No work noted		0	$0.00	$0
28				Subtotal	$0
29	**Division 07 - Thermal and Moisture Protection**				
30	No work noted		0	$0.00	$0
31				Subtotal	$0
32	**Division 08 - Openings**				
33	Telecom room and electrical room doors	no	3	$2,250.00	$6,750
34				Subtotal	$6,750

Milleneum Library Parkade

Class 4 estimate - Option 2C - Sell parkade

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
35	**Division 09 - Finishes**				
36	Telecom room and electrical room walls	item	1	$9,000.00	$9,000
37				Subtotal	$9,000
38	**Division 10 - Specialties**				
39	No work noted		0	$0.00	$0
40				Subtotal	$0
41	**Division 11 - Equipment**				
42	No work noted		0	$0.00	$0
43				Subtotal	$0
44	**Division 12 - Furnishing**				
45	No work noted		0	$0.00	$0
46				Subtotal	$0
47	**Division 13 - Special Construction**				
48	No work noted				$0
49				Subtotal	$0
50	**Division 14 - Conveying Equipment**				
51	No work noted		0	$0.00	$0
52				Subtotal	$0
53	**Division 21-25 - Mechanical**				
54	Repairs as per CKP list dated April 1, 2022 - no list in outline spec		0	$0	$0
55	Add new sprinkler tree and domestic water service	item	1	$100,000	$100,000
56	Replace HVAC equipment	stall	480	$3,271	$1,570,080
57	Replace ductwork if required	stall	480	$2,804	$1,345,920
58	Fuel oil vent fan install	item	1	$80,000	$80,000
59	Natural gas line paint	item	1	$10,000	$10,000
60	Fuel oil tanks seal tappings	item	1	$3,000	$3,000
61	Parking booth ventilation add	item	1	$40,000	$40,000
62	No2 detection 50%	item	1	$90,000	$90,000
63	RST	%	7	$3,239,000.00	$226,730
64				Subtotal	$3,465,730
65	**Division 26-28 - Electrical**				
66	Electrical as per attached worksheets - servicing	item	1	$618,615.00	$618,615
67	Electrical as per attached worksheets - repairs	item	1	$277,750.00	$277,750
68	RST	%	7	$896,365.00	$62,746
69				Subtotal	$959,111
70	**Division 31 - Earthwork & Piling**				

Milleneum Library Parkade

Class 4 estimate - Option 2C - Sell parkade

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
71	No work noted		0	$0.00	$0
72				Subtotal	$0

Milleneum Library Parkade

Class 4 estimate - Option 2C - Sell parkade

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
73	**Division 32 - Exterior Improvements**				
74	No work noted		0	$0.00	$0
75				Subtotal	$0
76	**Division 33 - Utilities**				
77	Site servicing allowance - new service for sell portion		1	$200,000.00	$200,000
78	Electrical site contribution allowance - Man Hydro		1	$100,000.00	$100,000
79				Subtotal	$300,000
80	**Subtotal**				$5,411,481
81	Escalation			8.00%	$432,918
82	**SUBTOTAL**				$5,844,399
83	Design & Pricing Contingency			20.00%	$1,168,880
84	**TOTAL**				**$7,013,279**

Milleneum Library Parkade

Class 4 estimate Option 2D - Repairs

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
1	**Division 00 - Cash Allowances**				
2	Testing	item	1	$0.00	not required
3				Subtotal	$0
4	**Division 01 - General Requirements**				
5	Site Supervision & Administration	months	18	$27,000.00	$486,000
6	Indirect Site Costs (trailers, temp elec, temp lighting etc.)	months	18	$24,000.00	$432,000
7	Contractor fee	%	6.00	$9,888,000	$593,280
8	Street Rental & shutdown	months	0	$2,500.00	not needed
9	Temporary heating and hoarding	months	0	$50,000.00	included
10	Jersey barriers, traffic management	months	0	$5,000.00	$0
11	Hoarding for phases - assume 5 phases	m2	2,875	$20.00	$57,500
12	Bonds & Insurance	thous.	10,482	$15.50	$162,471
13	Permits	thous.	10,482	$12.00	$125,784
14				Subtotal	$1,857,035
15	**Division 02 - Existing Conditions**				
16	Remove traffic topping	m2	8,525	$25.00	$213,125
17				Subtotal	$213,125
18	**Division 03 - Concrete**				
19	Repair underside of roof slab	m2	3	$1,250.00	$3,750
20	Repair topside P1 slab	m2	125	$380.00	$47,500
21	P1 wall repairs	m	43	$90.00	$3,870
22	Underside P1 slab repair	m2	25	$1,250.00	$31,250
23	Column swale	no	5	$2,000.00	$10,000
24	Crack inject mechanical room	item	1	$2,000.00	$2,000
25	Concrete repair stairwells	item	1	$10,000.00	$10,000
26	Full depth repair	m2	16	$650.00	$10,400
27	Repair contingency 40%	item	1	$48,000.00	$48,000
28				Subtotal	$166,770
29	**Division 04 - Masonry**				
30	No work noted		0	$0.00	$0
31				Subtotal	$0
32	**Division 05 - Metals**				
33	No work noted		0	$0.00	$0
34				Subtotal	$0
35	**Division 06 - Wood, Plastics and Composites**				
36	No work noted		0	$0.00	$0
37				Subtotal	$0

Milleneum Library Parkade

Class 4 estimate Option 2D - Repairs

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
38	**Division 07 - Thermal and Moisture Protection**				
39	New traffic membrane at parking	m2	8,525	$60.00	$511,500
40	Ramp temp signalling/traffic control	item	1	$20,000.00	$20,000
41	Traffic membrane at ramp, clean existing, prep	m2	1,153	$85.00	$98,005
42				Subtotal	$629,505
43	**Division 08 - Openings**				
44	No work noted		0	$0.00	$0
45				Subtotal	$0
46	**Division 09 - Finishes**				
47	No work noted		0	$0.00	$0
48				Subtotal	$0
49	**Division 10 - Specialties**				
50	No work noted		0	$0.00	$0
51				Subtotal	$0
52	**Division 11 - Equipment**				
53	No work noted		0	$0.00	$0
54				Subtotal	$0
55	**Division 12 - Furnishing**				
56	No work noted		0	$0.00	$0
57				Subtotal	$0
58	**Division 13 - Special Construction**				
59	No work noted				$0
60				Subtotal	$0
61	**Division 14 - Conveying Equipment**				
62	No work noted		0	$0.00	$0
63				Subtotal	$0
64	**Division 21-25 - Mechanical**				
65	Repairs as per CKP list dated April 1, 2022	item	0	$0	$0
66	Fuel oil vent fan install	item	1	$80,000	$80,000
67	Natural gas line paint	item	1	$10,000	$10,000
68	Fuel oil tanks seal tappings	item	1	$3,000	$3,000
69	Parking booth ventilation add	item	1	$40,000	$40,000
70	Vent office space upgrade	item	1	$45,000	$45,000
71	No2 detection all spaces	item	1	$180,000	$180,000
72	RST	%	7	$358,000.00	$25,060
73				Subtotal	$383,060
74	**Division 26-28 - Electrical**				

Milleneum Library Parkade

Class 4 estimate Option 2D - Repairs

Postma Consulting Ltd.

	Description of Work	Unit	Quantity	Unit Price	Total
75	*Short Term Repairs - 1-5 years*				
76	Replace exit signs (only what in non functioning)	item	1	$11,600.00	$11,600
77	Electrical labeling	item	1	$15,000.00	$15,000
78	Replace generator battery	item	1	$10,000.00	$10,000
79	Replace security booth alarm system	item	1	$9,500.00	$9,500
80	Replace obsolete disconnects and starters	item	1	$45,000.00	$45,000
81	Single line diagram	item	1	$7,500.00	$7,500
82	*Medium Term Repairs - 5-10 years*				
83	Replace obsolete disconnects and starters	item	1	$60,000.00	$60,000
84	Electrical car charging stations add	item	1	$350,000.00	$350,000
85	Fire alarm replacement	item	1	$1,000,000.00	$1,000,000
86	*Long Term Repairs*				
87	Electrical service replacement	item	1	$1,200,000.00	$1,200,000
88	Sub-distribution and transformer replacement	item	1	$850,000.00	$850,000
89	Building lighting and control system replacement	item	1	$900,000.00	$900,000
90	Car parking equipment/doors - replace, technology upgrades	item	1	$500,000.00	$500,000
91	Exit Sign Replacement	item	1	$50,000.00	$50,000
92	CCTV Replacement	item	1	$200,000.00	$200,000
93	Branch conduit and wiring replacement	item	1	$1,300,000.00	$1,300,000
94	Generator replacement	item	1	$250,000.00	$250,000
95	RST	%	7	$6,758,600.00	$473,102
96				Subtotal	$7,231,702
97	**Division 31 - Earthwork**				
98	No work noted		0	$0.00	$0
99				Subtotal	$0
#	**Division 32 - Exterior Improvements**				
#	No work noted		0	$0.00	$0
#				Subtotal	$0
#	**Division 33 - Utilities**				
#	No work noted		0	$0.00	$0
#				Subtotal	$0
#	**Subtotal**				$10,481,197
#	Escalation			8.00%	$838,496
#	**SUBTOTAL**				$11,319,693
#	Design & Pricing Contingency			20.00%	$2,263,939
#	**TOTAL**				**$13,583,631**

APPENDIX C – MEMBRANE INFORMATION

Sikalastic®
SIKA SOLUTIONS FOR PARKING DECKS AND BALCONIES

ECONOMIC AND DURABLE WATERPROOFING PROTECTION

BUILDING TRUST
CONSTRUIRE LA CONFIANCE

ONE-COMPONENT: Balcony and Parking Coating Systems

Fully bonded and seamless elastomeric waterproofing polyurethane system. Easily applied, repaired and renewed, for exterior and interior top coats on structural slabs to provide improved wear and UV resistance.

FEATURES	BENEFITS
Single component system	Ease of application with unlimited pot life restrictions
Seamless and fully bonded	Eliminates lateral water migration undermining durability
Elastomeric across temperature range	Excellent crack bridging properties even at low temperatures
Abrasion and chemical resistant	Resist to light vehicle traffic, vehicle fluids spills and as well to deicing salts exposure
Different variations of surface textures may be achieved*	Increased mechanical properties and slip resistance
Liquid applied membrane, easily maintained	Low cost to install and maintain
Acceptable for exterior applications	Enhanced wear and UV resistance, with broader choice of colours

** Surface texture will be determined by quantity and gradation of sand broadcasted into wear course*

Wear Course Colours* Custom colours available on request

Grey | Charcoal | Tan | Limestone

**Disclaimer: All colours shown are as accurate as printing methods and display screens permit. Results may differ due to variances in application technique and gloss levels may vary depending upon product used. Final colour selections should be made based upon actual samples. Please consult a Sika Canada for detailed advices.*

SYSTEM COMPONENTS

Sikalastic®-700 Series	Product Name	Product Description
Membrane	Sikalastic®-710 NP Membrane	1-component elastomeric polyurethane waterproofing membrane
Wear Course Topcoat	Sikalastic®-735 AL	Aliphatic 1-component , UV resistant poyureathane wear course

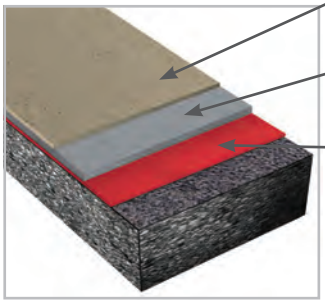
TYPICAL BALCONY, PEDESTRIAN AND PARKING DECK SYSTEMS

Zone	Sika® MT Primer or Sikalastic®-120 FS Primer (Optional)	Sikalastic®-710 NP Membrane	Wear Course I Sikalastic®-735 AL	Wear Course II Sikalastic®-735 AL
Light (balconies and pedestrian areas)	6 - 10 mils (w.f.t./d.f.t)	32 mils (w.f.t.) 23 mils (d.f.t.)	20 mils (w.f.t.) 15 mils (d.f.t.)	-
Light (parking stalls)	6 - 10 mils (w.f.t./d.f.t)	32 mils (w.f.t.) 23 mils (d.f.t.)	25 mils (w.f.t.) 19 mils (d.f.t.)	-
Medium (drive lanes)	6 - 10 mils (w.f.t./d.f.t)	32 mils (w.f.t.) 23 mils (d.f.t.)	20 mils (w.f.t.) 15 mils (d.f.t.)	20 mils (w.f.t.) 15 mils (d.f.t.)
Heavy (traffic areas such as turn lanes, entrances and ramps)	6 - 10 mils (w.f.t./d.f.t)	32 mils (w.f.t.) 23 mils (d.f.t.)	25 mils (w.f.t.) 19 mils (d.f.t.)	20 mils (w.f.t.) 15 mils (d.f.t.)

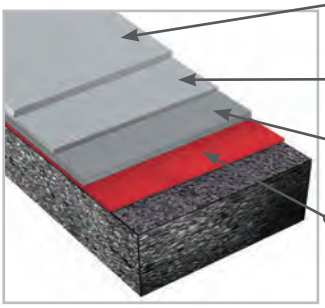
- *Zone descriptions and thicknesses above are recommended for guideline purposes. If thickness variations are required outside of these parameters, contact Sika Canada.*
- *Surface profile and/or porosity will influence consumption required to achieve the minimum film thicknesses recommended.*
- *For surface textures (broadcast aggregates) and all other technical, application information and product limitations, refer to the Product Data Sheet of the related product.*
- *For slabs on grade, use **Sika Ferrogard®-908**, **Sikagard® SN-40 Lo-VOC** or **Sikagard® SN-100** protective penetrating silane sealers.*

SYSTEM BUILD-UP

Light Duty Zones



Medium to Heavy Duty Zones

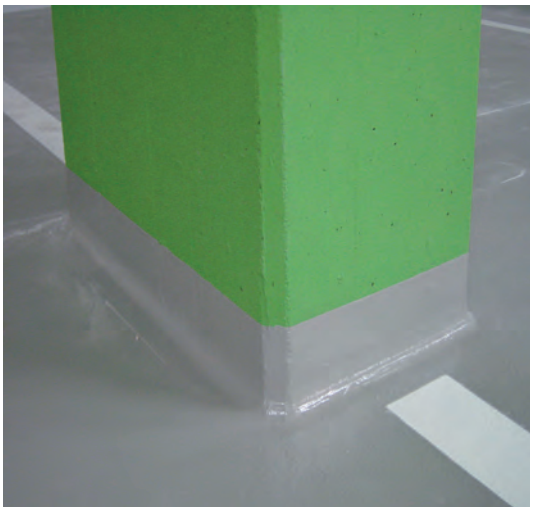


TWO-COMPONENT: Sikalastic®-3900 Traffic System

This system utilizes polyurethane and epoxy technologies to protect steel-reinforced, concrete traffic and pedestrian decks from the damaging effects of chlorides and water ingress. Manufactured in Canada, specifically for Canadian conditions.

FEATURES	BENEFITS
Conforms to standard CSA S413-14	Conforms to most recent Canadian standards for parking garages
Low temperature crack bridging	Continued protection across ~1.5 mm (1/16 in) wide crack at -26 °C (15 °F)
Medium to low viscosity systems	Easy to install / increased productivity
Resistance to chemicals and solutions	Barrier to deicing salts and automotive fluids
Different variations of surface textures may be achieved*	Increased mechanical properties and slip resistance
Seamless waterproofing and protection	Prolonged service life of structures
Two-component, hybrid wearing courses	Excellent abrasion and wear resistance

** Surface texture will be determined by quantity and gradation of sand broadcasted into wear course*



Wear Course Colours* Custom colours available on request

RAL 7015
Slate Grey

RAL 9017
Traffic Black

RAL 7046
Telegrey 2

RAL 7012
Basalt Grey

**Disclaimer: All colours shown are as accurate as printing methods and display screens permit. Results may differ due to variances in application techniques and gloss levels may vary depending upon product used. Final colour selections should be made based upon actual samples. Please consult Sika Canada for detailed advices.*

SYSTEM COMPONENTS

Sikalastic®-3900 Traffic System	Product Name	Product Description
Primer Options	Sika® MT Primer	Moisture-tolerant and adhesion promoting primer for dry or damp substrates
	Sikalastic®-120 FS Primer	Adhesion -promoting fast-setting primer
Membrane	Sikalastic®-390 Membrane	2-component elastomeric polyurethane waterproofing membrane
Wear Course Topcoat Options	Sikalastic®-391 N	Standard 2-component polyurethane-based wear course
	Sikalastic®-394	2-component aliphatic, UV resistant polyurethane wear course

TYPICAL PARKING DECK SYSTEMS

Unless indicated otherwise, mils thicknesses equate to both w.f.t. and d.f.t., being 100 % solids materials.

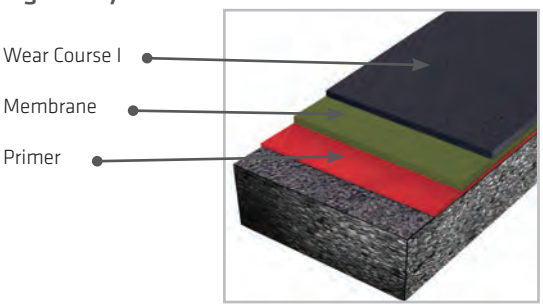
Zone	Sika® MT Primer or Sikalastic®-120 FS Primer	Sikalastic®-390 Membrane	Wear Course I Sikalastic®-391 N / -394*	Wear Course II Sikalastic®-391 N / -394*
Light (parking stalls and pedestrian)	6 - 10 mils	25 - 30 mils	18 -20 mils	-
Medium (drive lanes)	6 - 10 mils	25 - 30 mils	18 - 20 mils	15 - 20 mils
Heavy (turn lanes, ramps, entry/exit, ticket booth)	6 - 10 mils	25 - 30 mils	25 - 30 mils	15 - 25 mils

Use **Sikalastic®-394 as final wear course for UV resistance to sunlight exposure.*

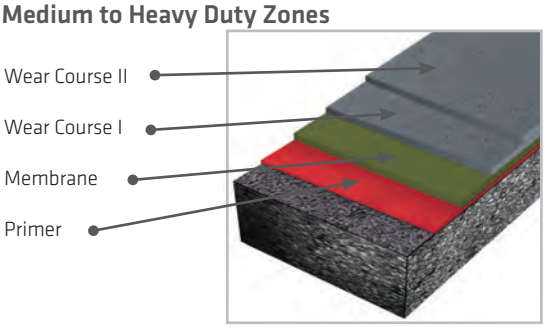
- *Additional wear course options, such as **Sikalastic®-220 FS** and **Sikalastic®-8200**, are also available. Contact your Sika Canada technical representative for features, advantages and recommendations.*
- *Zone descriptions and thicknesses above are recommended for guideline purposes. If thickness variations are required outside of these parameters, contact Sika Canada.*
- *Surface profile and/or porosity will influence consumption required to achieve the minimum film thicknesses recommended.*
- *For surface textures (broadcast aggregates) and all other technical, application information and product limitations, refer to the Product Data Sheet of the related product.*
- *For slabs on grade, use **Sika Ferrogard®-908**, **Sikagard® SN-40 Lo-VOC** or **Sikagard® SN-100** protective penetrating silane sealers.*

SYSTEM BUILD-UP

Light Duty Zones



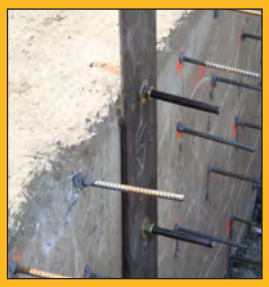
Medium to Heavy Duty Zones



SIKA CAR PARK SOLUTIONS

When it comes to construction, maintenance and refurbishment of parking structures, Sika can help you at virtually every stage of the process with a fully integrated and warranteed range of systems. These include: concrete admixtures, corrosion inhibitors, galvanic anodes and other forms of corrosion management; full-depth, patch or shallow repair mortars; anchoring adhesives and injection resins; joint sealants; penetrating sealers and protective/decorative coatings; right through to line marking materials for the deck membranes themselves. **Sika has your car park covered!**

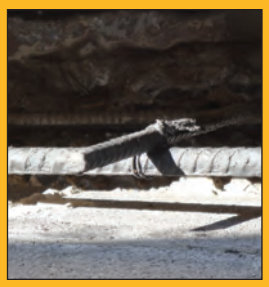
WATERPROOFING
SikaProof®
Sika® Greenstreak®
Sikalastic®
SikaSwell®
Sikagard®



ANCHORING
Sika AnchorFix®
Sikadur®
SikaGrout®

STRUCTURAL STRENGTHENING
Sika® CarboDur®
Sika® CarboShear
SikaWrap®

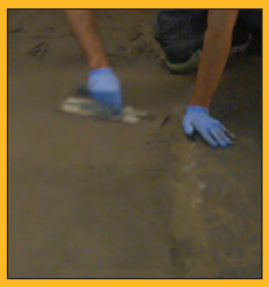
CORROSION MITIGATION
Sika® Galvashield®
Sika Ferrogard®
Sika® Ebonex®



STEEL PRIMERS AND BONDING AGENTS
SikaTop® Armatec
Sikadur®
Sikagard®

PROTECTIVE SEALERS
Sikagard®
Sikafloor®
Sika® Florseal
Sikalastic® Duocel

CONCRETE AND FULL DEPTH REPAIRS
Sikacrete®
Sika® Viscocrete®

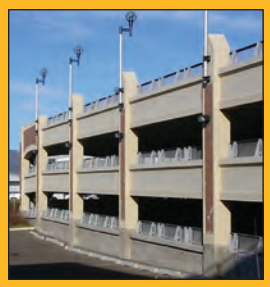


SURFACE REPAIR AND LEVELLING MORTARS
SikaTop®
Sika MonoTop®
SikaQuick®
Sikafloor®
Sika® Pronto®
Sikafloor® Level

CRACK INJECTION RESINS
Sikadur®
SikaFix®

MOISTURE MITIGATION SYSTEMS
Sikagard® EpoCem®CA
Sikafloor® EpoCem®CA
Sika® Primer

EXPANSION AND CONTROL JOINTS
Sikaflex®
Sikasil®
Sika® Duoflex®
Sikadur® Combiflex®



PROTECTIVE AND DECORATIVE COATINGS
Sikagard®
Sikagard® Duroplast

SIKA CANADA INC.
Head Office
601, avenue Delmar
Pointe-Claire, Quebec
H9R 4A9

Other locations
Toronto
Edmonton
Vancouver

1-800-933-SIKA
www.sika.ca

Certified ISO 9001 (CERT-0102780)
Certified ISO 14001 (CERT-0102791)

BUILDING TRUST
CONSTRUIRE LA CONFIANCE

Entrance / Exit

Fast Installation

Sikalastic® Pronto PUMA

Can return-to-service 1 hour after installation

RAPID CURING, WATERPROOFING SYSTEMS

SINGLE DAY RAPID INSTALLATION

- Full system install and return-to-service - within 5 hours
- Minimize contractor days on site
- Reduce parking revenue losses and user disruption

ROBUST HIGH PERFORMANCE SYSTEM BUILD

- Reactive acrylic resin (PUMA) basecoat membrane
- Heavy-duty wear layer balances PUMA flexibility with aggregates
- UV-stable coloured topcoat seals, protects and provides aesthetics

WIDE TEMPERATURE INSTALLATION RANGE

- Adjustable curing component to suit varied temperature conditions
- Affords more seasonal versatility compared to polyurethane and epoxy systems

ADDITIONAL RAL COLOURS AVAILABLE UPON REQUEST

RAL 7015 Slate Grey

RAL 9017 Traffic Black

RAL 7046 Telegrey 2

RAL 7012 Basalt Grey

Note: All colours shown are as accurate as printing methods and display screens permit. Final colour selections should be made based upon actual samples. Please consult Sika Canada for detailed advice.

LEARN MORE

Our most current General Sales Conditions shall apply.
Please consult the most current local Product Data Sheet prior to any use.

SIKA CANADA INC.
Head Office
601 Delmar Avenue
Pointe-Claire, Quebec
H9R 4A9

Other locations
Boisbriand (QC)
Brantford; Cambridge; Sudbury; Toronto (ON)
Edmonton (AB); Surrey (BC)

1-800-933-7452
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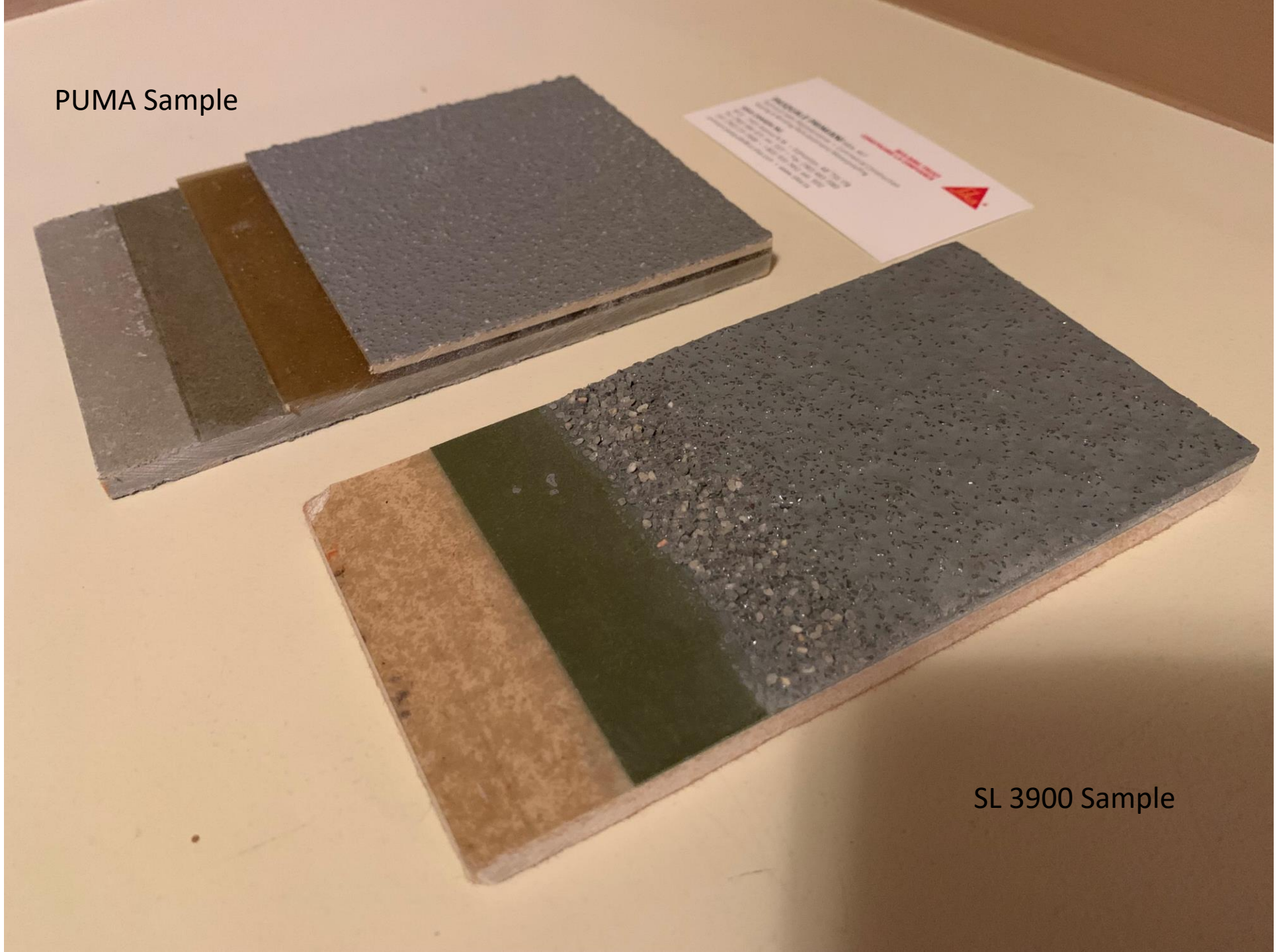
PUMA Sample
SL 3900 Sample


Sikalastic® Pronto RB-5700 PUMA
Sikalastic®-511 Pronto Primer / Apprêt
Sikalastic®-532 Pronto Basecoat / Couche de base
Sikalastic®-532 Pronto Wear Layer with Quartz Sand Broadcast / Couche d'usure avec sable de quartz répandu
Sikalastic®-518 Pronto Topcoat / Couche de finition – RAL 7046 Telegrey 2 / Telegris 2
Sample represents approximate colour, surface texture and dimensional tolerance. It is not an exact representation of an installed product, as finished surfaces are subject to application variances. Substrate does not represent actual surface profile requirements. / Cet échantillon offre une représentation approximative de la couleur, texture de surface et tolérance dimensionnelle. Ceci n'est pas une représentation exacte du produit installé dans la mesure où les surfaces finies sont sujettes à des variations dans l'application. Substrat ne représente pas les exigences de profil de surface requis.
Sika Canada Inc.
1-800-933-7452
www.sika.ca
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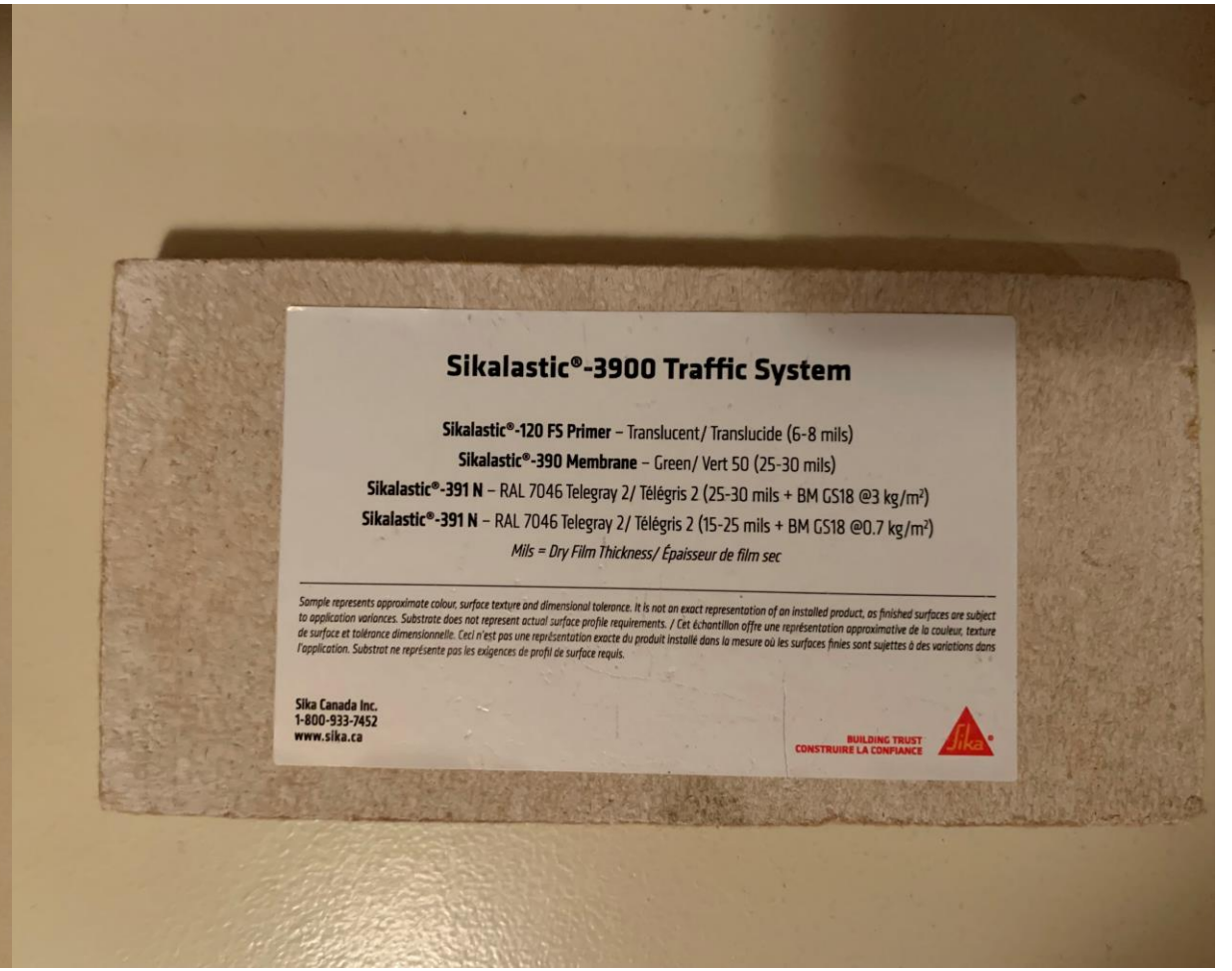
Sikalastic®-3900 Traffic System
Sikalastic®-120 FS Primer – Translucent/ Translucide (6-8 mils)
Sikalastic®-390 Membrane – Green/ Vert 50 (25-30 mils)
Sikalastic®-391 N – RAL 7046 Telegray 2/ Télégris 2 (25-30 mils + BM GS18 @3 kg/m²)
Sikalastic®-391 N – RAL 7046 Telegray 2/ Télégris 2 (15-25 mils + BM GS18 @0.7 kg/m²)
Mils = Dry Film Thickness/ Épaisseur de film sec
Sample represents approximate colour, surface texture and dimensional tolerance. It is not an exact representation of an installed product, as finished surfaces are subject to application variances. Substrate does not represent actual surface profile requirements. / Cet échantillon offre une représentation approximative de la couleur, texture de surface et tolérance dimensionnelle. Ceci n'est pas une représentation exacte du produit installé dans la mesure où les surfaces finies sont sujettes à des variations dans l'application. Substrat ne représente pas les exigences de profil de surface requis.
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Sika
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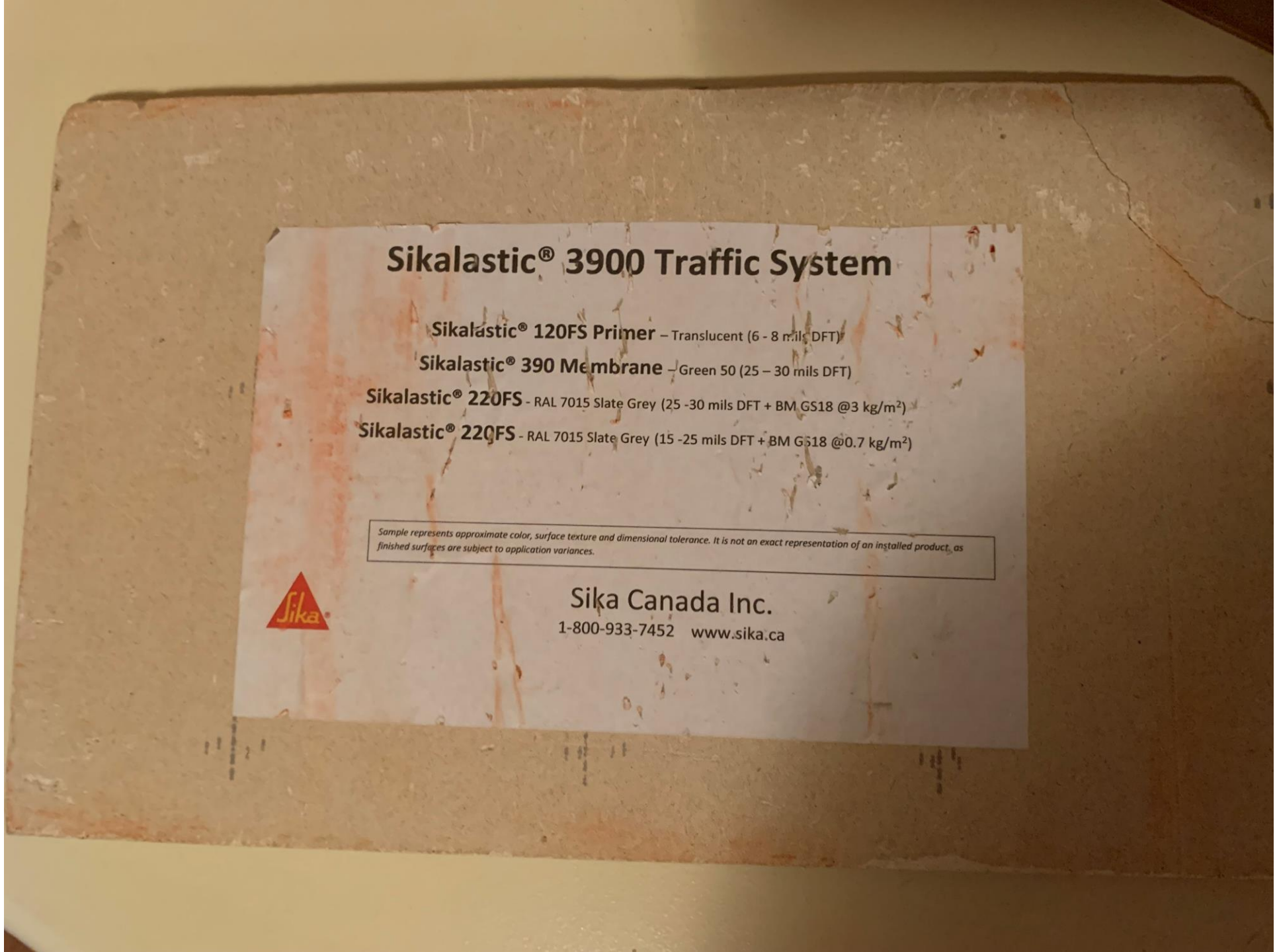
Technical Sales Representative • Commercial Construction
Sealing & Bonding/Refurbishment/Waterproofing
SIKA CANADA INC.
18131 - 114th Avenue N.W. • Edmonton, AB T5S 1T8
Tel: (780) 486-6111, ext. 5517 • Fax: (780) 483-1580
Cell: (780) 231-7888 • 1-800-933-7452, ext. 5512
pmiani.pasquale@ca.sika.com • www.sika.ca

SL 220 FS Sample


Sikalastic® 3900 Traffic System
Sikalastic® 120FS Primer – Translucent (6 - 8 mils DFT)
Sikalastic® 390 Membrane – Green 50 (25 – 30 mils DFT)
Sikalastic® 220FS - RAL 7015 Slate Grey (25 -30 mils DFT + BM GS18 @3 kg/m²)
Sikalastic® 220FS - RAL 7015 Slate Grey (15 -25 mils DFT + BM GS18 @0.7 kg/m²)
Sample represents approximate color, surface texture and dimensional tolerance. It is not an exact representation of an installed product, as finished surfaces are subject to application variances.
Sika
Sika Canada Inc.
1-800-933-7452 www.sika.ca

AutoGard E

Table of Contents

Product Data Sheet

70991 (47XJB)
Polyurethane Sealant

Description: 70991 (Hempel 47XJB) is a one-component, contractor/construction grade, smooth polyurethane sealant.

Recommended use: 70991 is used for sealing the following: expansion and control joints in pre-cast concrete panels; various roofing and siding applications; perimeters of doors, windows, and other wall penetrations.

Features: May be used with most building materials, including stone, masonry, ceramic, marble, wood, steel, aluminum, fiber cement board and many other synthetic materials.
Easy gunning; reduces installer's fatigue.
Bonds well to most common building materials.
Quicker skin and cure time; reduces jobsite dirt pickup.

Service temperatures: -40°F–150°F (-40°C–66°C)

Certificates/approvals: Type S, Grade NS, Class 25, Use NT, A and M. US Federal Specification TT-S 00230C (COMB-NBS) for one-component sealants as Class A, non-sag.
Canadian Specification CAN/CGSB 19.13-M87.
CARB and SCAQMD Compliant. Meets VOC requirements for OTC Regulation.

Availability: Available in North America. Not included in Group Assortment; other regions must confirm.

Colors and packaging:

70991-4 (47XJB1L030)	Gray	10.1-oz cartridge

Physical constants:

Hardness (Shore A)	42	ASTM D2240
Modulus at 100% Elongation	65 psi	ASTM D412
Modulus at 25% Elongation	45 psi	ASTM D412
Tensile Strength at Break	133 psi	ASTM D412
Elongation at Break	685%	ASTM D412
UV Resistance	Pass	ASTM C793
VOC	43 g/L (2.8%)	Calculated
Adhesion Peel	> 5 piw	TT-S-00230C/ASTM C794
Joint Movement Capability	+25%	TT-S-00230C/ASTM C719

Tool/Work Time	60 minutes
Skin Time	4 hours
Curing Time at 77°F/25°C	2–7 days, 1/16" per day
Flow, Sag or Slump	0.1 inch

The above tested results are typical values. Individual lots may vary up to 10% from the typical value. Further technical information can be found at www.neogard.com.

Application details:

Application method: Caulking gun
Cleaning: Clean tools with an aromatic solvent. Dry-wipe excess uncured sealant from surfaces, then follow with a solvent wipe. Cured sealant is difficult to remove without damaging the substrate.

Safety: Handle with care. Before and during use, observe all safety labels on packaging and paint containers, consult Neogard Safety Data Sheets and follow all local or national safety regulations.

Surface preparation: Surface must be clean, sound, and dry. Do not apply over damp, contaminated, loose surfaces, old sealants, or other foreign substances that may impair adhesion. Pre-test substrates with a sample of 70991 before full application.

Product Data Sheet

70991 (47XJB)
Polyurethane Sealant

Application conditions:

Do not install when the dew point of the substrate is close to ambient temperature, or if moisture-vapor transmission (MVT) is present. Damp substrates with high moisture content will cause bubbling and foaming. Lower relative humidity and temperature will significantly extend curing time. Confined areas, deep joints, and moisture barrier substrates may also affect the full cure time and extend it by many days. High temperature/humidity can cause bubbles to develop during the curing process.

Subsequent coat:

According to Neogard system Guide Specifications. Test paints or coatings for adhesion before general application.

Remarks:

Do not apply to copper substrates. Will cause staining of porous substrates such as marble, limestone, and granite. Not for sealing narrow joints, fillet joints, and face nail holes.
Not recommended for smearing and feathering over joints, or by itself joints where abrasion resistance is required (walkways, driveways, runways, etc.). Not for continuous immersion in water or any other fluid, or exterior or interior sealing below the waterline. Not for glazing applications. Bond line strength can be affected by UV rays through the clear material (glass, acrylic glass, polycarbonate). When fully cured, avoid exposure to fuels, or chlorinated, acid, or alkaline solutions. Contact with asphalts and other filler compounds impregnated with oil, asphalt, tar, etc., may deteriorate the cohesive strength of the substrate and ultimately compromise the seal. Lower relative humidity and temperature will significantly extend curing time. Confined areas, deep joints, and moisture barrier substrates may also affect the full cure time and extend it by many days. Exposure to UV/sunlight will alter original color or gloss. Effect is limited to the surface layer and will not compromise the sealing properties if joint dimensions are proper and the sealant is properly applied. Check shelf life prior to use. Do not use past shelf life. Shelf life of polyurethane sealants may be significantly reduced by high temperature and high relative humidity.

Application coverage rates (linear feet per 10.1 fl oz cartridge):

		Width							
		1/8”	**1/4”**	**3/8”**	**1/2”**	**5/8”**	**3/4”**	**7/8”**	**1”**
Depth	**1/8”**	99	49	33	24	20	16	14	12
	1/4”	NA	24	20	12	10	8	7	6
	3/8”	NA	NA	11	8	6	5	5	4
	1/2”	NA	NA	NA	6	5	4	3	3

Note: **70991 is for professional use only.**

Issued by: Hempel (USA) – 47XJB

This Product Data Sheet (“**PDS**”) relates to the supplied product (“**Product**”) and is subject to update from time-to-time. Accordingly, the buyer/applicator should refer to the PDS current as of the time of delivery. In addition to the PDS, the buyer/applicator may receive some or all of the specifications, statements and/or guidelines listed below or available at www.neogard.com (the “**Additional Documents**”):

No.	**Document Description**
1	PDS
2	Guide Specification
3	Application Manual
4	Other Technical Support Information (i.e. summary application tables, troubleshooting guides, maintenance manuals, chemical resistance charts and other technical information)

In the event of a conflict between this PDS and the Additional Documents, the conflict shall be resolved in accordance with the order of priority set forth above. In addition, the buyer/applicator should refer to the relevant Safety Data Sheet current as of the time of delivery and available at www.neogard.com. Buyer/applicator is responsible for determining the suitability of the intended use of the Product, and Neogard disclaims all responsibility for any use, handling and storage of the Product that is not in accordance with the requirements set forth in the relevant PDS and the Additional Documents. The terms and provisions hereof apply to this PDS, the Additional Documents and any other documents supplied by Neogard in respect of the Product. The Product is supplied and all technical assistance is given subject to the General Conditions of Sale of Hempel Products and/or Services available at www.hempel.com. NEOGARD MAKES NO OTHER WARRANTY THAT EXTENDS BEYOND THE WARRANTY REFERENCED THEREIN INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NEOGARD WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OR CONDITION, OR THAT IN ANY WAY ARISE IN RELATION TO THE PRODUCT. 70991-PDS ksk 04122021.docx

Neogard®, a part of Hempel
2728 Empire Central - Dallas, Texas 75235 - Phone (214) 353-1600 - Fax (214) 357-7532 - www.neogard.com

Product Data Sheet

70714/70715 (45060) – 2K Epoxy
Base 70714 (45069) : Curing Agent 70715 (95073)

Description: 70714/70715 (Hempel 45060) is a two-component, 100% solids epoxy resin.

Recommended use: Applications include: High-gloss, high-build protective coating; binder for self-smoothing pigmented and color quartz flooring; low-viscosity binder for trowel-applied mortar flooring systems; high-quality primer for chemical resistant urethane top coats, and/or Neogard waterproofing and flooring systems; low-viscosity binder for trowel applied mortar and/or patching material; low viscosity binder for crack injection.

Features: Formulated for use on damp or dry concrete. Near water-clear. Exhibits no amine blush when used in humid environments. Very low viscosity for deep penetration into concrete. Uniform wetting of filler aggregates. Excellent chemical and water resistance.
Meets U.S.D.A. requirements for incidental food contact.
Meets South Coast Air Quality Management District (SCAQMD) VOC requirements.

Certificates/approvals: LEED: MRc5, IEQc4.2, BDc4, IDc4
MPI: MPI #212

Availability: Available in North America. Not included in Group Assortment; other regions must confirm.

Colors and packaging:

70714 (4506900000)	Clear and Tintable	15- and 3-gallon kits
70714-01 (4506916640)	White	15- and 3-gallon kits
70714-02 (4506916650)	Gray	15- and 3-gallon kits
70714-03 (4506923820)	Tan	15- and 3-gallon kits
70714-04 (4506916670)	Dark Gray	15- and 3-gallon kits
70714-05 (4506957930)	Tile Red	15- and 3-gallon kits
70714-11 (4506916660)	Light Gray	15- and 3-gallon kits
70714-16 (4506919990)	Black	15- and 3-gallon kits
70714-06 (4506949890)	Green	3-gallon kits
70715 (9507300000)	NA	Curing agent, included in kits

Some standard colors and/or packaging may have extended lead times and/or minimum quantities. Contact Neogard for additional colors.

Physical constants:

Tensile strength	3,700 psi	ASTM D638
Elongation	25%	ASTM D638
Compressive strength	25,300 psi	ASTM D695
Flexural strength	3,180 psi	ASTM D790
Flexural modulus	57,700 psi	ASTM D790
Water resistance	0.21%	ASTM D570
MVT at 10 mils	0.16	ASTM E96
Taber abrasion	25 mg/1,000 CS-17	ASTM D4060
Shore d	78	ASTM D2240
Adhesion	350 psi	ASTM D4541
Flammability	Pass	ASTM D635
Weight/gallon (mixed)	8.8 lbs/gal	ASTM D1475
Weight solids (mixed)	100%	ASTM D4209
Volume solids (mixed)	100%	Calculated
VOC (mixed)	<10 g/L	EPA Method 24
Flash point	>200°F/93°C	ASTM D3278
Shelf life	1 year	
Thin film cure at 75°F/23°C	8–9 hours	
Full cure at 75°F/23°C	7 days	
Full chemical resistance	7 days	

The above tested results are typical values. Individual lots may vary up to 10% from the typical value. Further technical information can be found at www.neogard.com.

Product Data Sheet

70714/70715 (45060) – 2K Epoxy
Base 70714 (45069) : Curing Agent 70715 (95073)

Application details:

Version, mixed product	**70714/70715 (45060)**
Mixing ratio:	Base 70714 (45069) : Curing Agent 70715 (95073) 2 : 1 by volume
Mixing instructions:	Pre-mix base for 3–5 minutes before adding curing agent. Mix for a minimum of 5 minutes before applying. Jiffy Mixer paddle recommended.
Application method:	Roller or squeegee
Thinner (max.vol.):	7055 Odorless Reducer (086JB) or Hempel's Thinner 08080 (xylene) (10%)
Pot life:	30 minutes at 70°F/21°C
Cleaning of tools:	7055 Odorless Reducer (086JB) or Hempel's Thinner 08080 (xylene)
Safety:	Handle with care. Use with adequate ventilation. Before and during use, observe all safety labels on packaging and paint containers, consult Neogard Safety Data Sheets and follow all local or national safety regulations.
Surface preparation:	According to Neogard Guide Specifications.
Application conditions:	Ambient temperature must be between 40°F/4°C and 100°F/37°C, and a minimum of 5°F/3°C above dew point.
Preceding coat:	According to Neogard Guide Specifications.
Subsequent coat:	Must be recoated within 24 hours at 70°F/21°C for subsequent coat to properly bond. If the 24-hour recoat window is missed, sand to dull finish before applying subsequent coat(s).
Storage temperature:	Store in a cool area to ensure full shelf life. Recommended temperature: 70°F/21°C.

Note: **70714/70715 is for professional use only.**

Issued by: Hempel (USA) – 45060

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Product Data Sheet

70714/70715-09 — 2K General Purpose Epoxy
45062: Base 45069 : Curing Agent 95075

Description: 70714/70715-09 (Hempel 45062) is a two-component, general purpose, 100% solids epoxy resin.

Recommended use: Applications over concrete include: High strength overlayment; high-strength dustproofer; high-gloss, high-build protective coating; binder for self-smoothing pigmented and color quartz flooring; low-viscosity binder for trowel-applied mortar flooring systems; high-quality primer for chemical resistant urethane top coats, and/or Neogard waterproofing and flooring systems; low-viscosity binder for trowel-applied mortar and/or patching material; low viscosity binder for crack injection.

Features: Meets South Coast Air Quality Management District (SCAQMD) VOC requirements.

Certificates/approvals: LEED: MRc5, IEQc4.2

Availability: Available in North America. Not included in Group Assortment; other regions must confirm.

Colors and packaging:

70714 (4506900000)	Clear	15- and 3-gallon kits
70714-01 (4506916640)	White	15- and 3-gallon kits
70714-02 (4506916650)	Gray	15- and 3-gallon kits
70714-03 (4506923820)	Tan	15- and 3-gallon kits
70714-04 (4506916670)	Dark Gray	15- and 3-gallon kits
70714-05 (4506957930)	Tile Red	15- and 3-gallon kits
70714-11 (4506916660)	Light Gray	15- and 3-gallon kits
70714-16 (4506919990)	Black	15- and 3-gallon kits
70714-06 (4506949890)	Green	3-gallon kits
70715-09 (9507500000)	NA	Curing agent, included in kits

Some standard colors and/or packaging may have extended lead times and/or minimum quantities. Contact Neogard for additional colors.

Physical constants:

Tensile strength	2,000 psi	ASTM D638
Elongation	40%	ASTM D638
Compressive strength	15,000 psi	ASTM D695
Flexural strength	1,900 psi	ASTM D790
Flexural modulus	62,000 psi	ASTM D790
Water resistance	0.17%	ASTM D570
MVT at 10 mils	0.18 Perm	ASTM E96
Shore D	77	ASTM D2240
Adhesion	400 psi	ASTM D4541
Impact flexibility	Pass at 120 in/lb	ASTM D6905-03
Flammability	Pass	ASTM D635
Taber abrasion	61 mg/1,000 CS-17	ASTM D4060
Weight/gal (mixed)	8.81 lbs/gal	ASTM D1475
Weight solids (mixed)	100%	ASTM D4209
Volume solids (mixed)	100%	Calculated
Viscosity (mixed)	1,250 cps	ASTM D2196
VOC (mixed)	< 5 g/L	EPA Method 24
Flash point	>200°F/93°C	ASTM D3278
Shelf life	1 year	
Thin film cure at 75°F/23°C	8–9 hours	
Full cure at 75°F/23°C	7 days	
Full chemical resistance	7 days	

The above tested results are typical values. Individual lots may vary up to 10% from the typical value. Further technical information can be found at www.neogard.com.

Product Data Sheet

70714/70715-09 — 2K General Purpose Epoxy
45062: Base 45069 : Curing Agent 95075

Application details:

Version, mixed product	**45062**
Mixing ratio:	Base 45069 : Curing Agent 95079 2 : 1 by volume
Mixing instructions:	Pre-mix base for 3–5 minutes before adding curing agent. Mix for a minimum of 5 minutes before applying. Jiffy Mixer paddle recommended.
Application method:	Roller or squeegee
Thinner (max.vol.):	7055 Odorless Reducer (086JB) or Hempel's Thinner 08080 (xylene) (10%)
Pot life:	25 minutes at 70°F/21°C
Cleaning of tools:	7055 Odorless Reducer (086JB) or Hempel's Thinner 08080 (xylene)
Safety:	Handle with care. Use with adequate ventilation. Before and during use, observe all safety labels on packaging and paint containers, consult Neogard Safety Data Sheets and follow all local or national safety regulations.
Surface preparation:	According to Neogard Guide Specifications.
Application conditions:	Ambient temperature must be between 50°F/10°C and 85°F/29°C, and a minimum of 5°F/3°C above dew point.
Preceding coat:	According to Neogard Guide Specifications.
Subsequent coat:	Must be recoated within 24 hours at 70°F/21°C for subsequent coat to properly bond. If the 24-hour recoat window is missed, sand to dull finish before applying subsequent coat(s).
Storage temperature:	Store in a cool area to ensure full shelf life. Recommended temperature: 70°F/21°C.

Note: **70714/70715-09 is for professional use only.**

Issued by: Hempel (USA) – 45062

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Product Data Sheet

7992-U (66EJB)
Silica Quartz Sand Aggregate, 12-20 Mesh

Description: 7992-U silica quartz sand (Hempel 66EJB) is a uniformly graded hard aggregate (12-20 mesh).

Recommended use: 7992-U aggregate is used for skid resistance in Neogard fluid-applied coating systems.

Features: Hardness of 7 or greater on Moh's Hardness Scale.

Availability: Available in North America. Not included in Group Assortment; other regions must confirm.

Colors and packaging:

7992-U (66EJB99980)	White/Tan	50-lb bags

Physical constants:

Grain Shape	Round
Moisture Content	<0.1%
Specific Gravity	2.65 g/cm^3
Bulk Density, Loose	92–95 lbs/ft^3
Bulk Density, Compacted	98–100 lb/ft^3
Packaging	50 lb bags

The above tested results are typical values. Individual lots may vary up to 10% from the typical value. Further technical information can be found at www.neogard.com.

Sieve #	Percent retained
12	0.7
16	69.6
20	28.6
30	1.0
Pan	0.1

Application details:

Application method: Broadcast, rate according to Neogard system Guide Specifications.

Safety: Handle with care. Before and during use, observe all safety labels on packaging and paint containers, consult Neogard Safety Data Sheets and follow all local or national safety regulations.

Storage: Store in a dry area.

Note: **7992-U is for professional use only.**

Issued by: Hempel (USA) – 66EJB

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2	Guide Specification
3	Application Manual
4	Other Technical Support Information (i.e. summary application tables, troubleshooting guides, maintenance manuals, chemical resistance charts and other technical information)

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Product Data Sheet

7797/7798 — Urethane Primer
254JB: Base 254J9 : Curing Agent 946JB

Description: 7797/7798 (Hempel 254JB) is a two-component, high solids, low odor urethane primer.

Recommended use: 7797/7798 is applied to surfaces to promote adhesion of standard and fast-cure elastomeric coatings. It may also be applied over existing coatings.

Certificates/approvals: LEED: BDc4, IDc4
Factory Mutual: Class A

Availability: Available in North America. Not included in Group Assortment; other regions must confirm.

Colors and packaging:

7797 (254J900000)	Amber	3-gallon kit
7798 (946JB00000)	Neutral	

Physical constants:

Weight/Gal (mixed)	8.99 lbs/gal	ASTM D1475
Weight Solids (mixed)	91%	ASTM D5201
Volume Solids (mixed)	91%	ASTM D5201
Viscosity (mixed)	160 cps	ASTM D562
VOC (mixed)	0.01 g/L	ASTM D5201
Adhesion to Concrete	500 psi	ASTM D4541
Adhesion to 70613, 70630	Meets requirements	ASTM D903
Adhesion to 7430, FC7510/FC7961, FC7520/FC7962, FC7530/FC7963, FC7540/FC7964	≥400 psi	ASTM D7234

The above tested results are typical values. Individual lots may vary up to 10% from the typical value. Further technical information can be found at www.neogard.com.

Application details:

Version, mixed product	**254JB**
Mixing ratio:	Base 254J9 : Curing Agent 946JB 2 : 1 by volume
Mixing instructions:	Pre-mix base for 3–5 minutes before adding curing agent. Mix for a minimum of 5 minutes before applying. Jiffy Mixer paddle recommended.
Application method:	Roller, brush, or spray (contact Neogard for spray equipment information)
Recommended application rate:	300–500 sq ft/gallon
Thinner (max.vol.):	Do not thin
Pot life:	30 minutes at 77°F/25°C
Cleaning of tools:	Hempel's Thinner 08080 (xylene)

Safety: Handle with care. Before and during use, observe all safety labels on packaging and paint containers, consult Neogard Safety Data Sheets and follow all local or national safety regulations. Use with adequate ventilation.

Surface preparation: According to Neogard Guide Specifications.

Application conditions: Substrate temperature must be ≥40°F/4°C and <110°F/32°C.

Subsequent coat: According to Neogard Guide Specifications.

Storage temperature: 75°F/23°C

Remarks: Apply coating within 24 hours of primer application. Not recommended for constant immersion. Not compatible with asphaltic compounds. For on-grade applications, substrates constructed over unvented metal decks or between-slab applications, contact the Neogard Technical Service Department.

Note: **7797/7798 is for professional use only.**

Issued by: Hempel (USA) – 245JB

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Product Data Sheet

FC7500/FC7960 — Fast-Cure Polyurethane Base Coat
45063: Base 45067 : Curing Agent 95077

NEOGARD
A part of HEMPEL

Description: FC7500/FC7960 (Hempel 45067/95077) is a two-component, fast-cure polyurethane base coat.

Recommended use: As a waterproofing membrane for pedestrian and vehicular traffic bearing surfaces, where fast turnaround time and/or solvent free materials are required. Suitable areas include parking garages, stadiums, balconies, plaza decks, walkways, rooftop recreation areas, and mechanical rooms.

Features: Meets South Coast Air Quality Management District (SCAQMD) VOC requirements.

Certificates/approvals: LEED: MRc5, IEQc4.2, BDc4, IDc4
UL: TGFU.R6034
Miami-Dade: NOA No.: 14-0902.10
City of Los Angeles: RR# 25702

Availability: Available in North America. Not included in Group Assortment; other regions must confirm.

Colors and packaging:

FC7500 (4506716650)	Gray	5- and 1- gallon
FC7960 (9507700000)	NA	1-pint, 1-gallon

Physical constants:

Tensile strength	1,500 psi	ASTM D412
Elongation	500%	ASTM D412
Permanent set	<20%	ASTM D412
Tear resistance	150 pli	ASTM D1004
Water resistance	1% at 7 days	ASTM D471
MVT at 20 mils	5 English Perm	ASTM E96
Shore A	74–79	ASTM D2240
Adhesion to: 70714/70715 7760/7761 7780/7781 Inter-Coat	400 psi	ASTM D4541
Weight/gallon (mixed)	9.7 lbs/gal	ASTM D1475
Weight solids (mixed)	99%	ASTM C1250
Volume solids (mixed)	99%	Calculated
VOC (mixed)	<5 g/L	EPA Method 24
Viscosity (mixed)	2,000 cps	ASTM D2196
Flash point	>250°F/>121°C	ASTM D3278
Shelf life	1 year	
Fire resistance (spread of flame)	Class A (as part of a system)	ASTM E108/UL 790

The above tested results are typical values. Individual lots may vary up to 10% from the typical value. Further technical information can be found at www.neogard.com.

Application details:

Version, mixed product	**45063**
Mixing ratio:	Base 45067 : Curing Agent 95077 9 : 1 by volume
Mixing instructions:	Pre-mix base for 3–5 minutes before adding curing agent. Mix for a minimum of 5 minutes before applying. Jiffy Mixer paddle recommended.
Application method:	Roller or squeegee
Thinner (max.vol.):	7055 Odorless Reducer (086JB1L001) (10%)
Pot life:	20–30 minutes at 75°F/23°C
Cleaning of tools:	Hempel's Thinner 08080 (xylene)

Product Data Sheet

FC7500/FC7960 — Fast-Cure Polyurethane Base Coat
45063: Base 45067 : Curing Agent 95077

Safety:	Handle with care. Use with adequate ventilation. Before and during use, observe all safety labels on packaging and paint containers, consult Neogard Safety Data Sheets and follow all local or national safety regulations.
Application conditions:	Substrate temperature must be between 40°F/4°C and 110°F/32°C.
Preceding coat:	According to Neogard Guide Specifications.
Subsequent coat:	According to Neogard Guide Specifications.
Storage temperature:	Store in a cool area to ensure full shelf life. Recommended temperature: 75°F/23°C.
Remarks:	Not intended for use as a topcoat. Maximum time for UV exposure: 5 days. Not recommended for constant immersion. Do not apply over asphaltic compounds. For on-grade applications, substrates constructed over unvented metal decks or between-slab applications, contact Neogard Technical Service.

Note: **FC7500/FC7960 is for professional use only.**

Issued by: Hempel (USA) – 45063

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Product Data Sheet

7780/7781 — Water-Borne Epoxy Primer
280JB: Base 280J9 : Curing Agent 98060

Description: 7780/7781 (Hempel 280JB) primer is a two-component, water-borne epoxy primer.

Recommended use: 7780/7781 is applied to wood and concrete substrates prior to the application of high performance surface-applied coating systems.

Certificates/approvals: LEED: BDc4, IDc4
Factory Mutual: Class A

Availability: Available in North America. Not included in Group Assortment; other regions must confirm.

Colors and packaging:

7780 (280J95L071)	Red	5-gallon kit
7781 (9806000000)	Neutral	

Physical constants:

MVT at 7 mils	0.42 Perms	ASTM E96
Adhesion to concrete	400 psi	ASTM D4541
Adhesion to 7430, 70410, 70420, FC7500/FC7960, FC7510/FC7961, FC7520/FC7962, FC7530/FC7963	>400 psi	ASTM D7234
Weight/gal (density, mixed)	8.9 lbs/gal	ASTM D1475
Weight solids (mixed)	32.4%	ASTM D4209
Volume solids (mixed)	28%	Calculated
Viscosity (mixed)	36 sec, Z1 cup, 77°F/25°C	ASTM D4212
VOC (mixed)	85 g/L	EPA Method 24
Flash point, 7780 & 7781	>230°F/110°C	ASTM D3278

The above tested results are typical values. Individual lots may vary up to 10% from the typical value. Further technical information can be found at www.neogard.com.

Application details:

Version, mixed product	**280JB**
Mixing ratio:	Base 280J9 : Curing Agent 98060 4 : 1 by volume
Mixing instructions:	Pre-mix base for 3–5 minutes before adding curing agent. Mix for a minimum of 5 minutes before applying. Jiffy Mixer paddle recommended.
Application method:	Roller or spray (contact Neogard for spray equipment information)
Thinner (max.vol.):	Do not thin
Pot life:	2 hours at 75°F/23°C
Cleaning of tools:	Water

Safety: Handle with care. Before and during use, observe all safety labels on packaging and paint containers, consult Neogard Safety Data Sheets and follow all local or national safety regulations.

Surface preparation: According to Neogard Guide Specifications.

Application conditions: Recommended air temperature: ≥50°F/10°C. Recommended relative humidity: 45–75%. Temperature of concrete must be at least 5°F/3°C above the air dew point during coating application and cure time. Avoid application on a damp surface. Do not apply in the late afternoon if moisture condensation can appear during the night.

Subsequent coat: According to Neogard Guide Specifications.

Storage temperature:	Store above freezing (32°F/0°C). Freezing will cause 7780/7781 to become unusable. Do not ship or store unless protection from freezing is available. Do not apply if conditions will not permit complete cure before rain, dew or freezing temperatures occur.
Remarks:	Avoid applying a thick film. Thick film increases cure time, especially at low temperature and high relative humidity, and may blister and crack on a hot concrete surface.

Note: **7780/7781 is for professional use only.**

Issued by: Hempel (USA) – 280JB

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Product Data Sheet

86220 (63BJB)
Tietex T272 Roofing Fabric

Description: 86220 (Hempel 63BJB) Tietex T272 Roofing Fabric is a stitchbonded, 100% polyester reinforcing material.

Recommended use: 86220 is embedded in Neogard fluid-applied materials to reinforce roofing and deck coating systems.

Features:
High strength and elongation
Accommodates thermal stress
Conforms to irregular surfaces

Availability: Available in North America. Not included in Group Assortment; other regions must confirm.

Colors and packaging:

86220 (63BJB99980)	White	Case, 4 rolls, 6” x 300’ (1,200 linear ft/case)

Physical constants:

Tensile strength (1" Jaws)	WARP 74 lbs, WEFT 45 lbs	ASTM D5034
Elongation at break	WARP 21.3%, WEFT 51.3%	ASTM D5034
Elongation	61 - 63%	ASTM D1682
Ball burst	111 lbs	ASTM D3787
Mullen burst	176.8 lbs	ASTM D3786
Trapezoid (tear strength)	WARP 13.5 lbs, WEFT 24.2 lbs	ASTM D1117
Trapezoid	16.1 lbs	ASTM D1117
Thickness	.018	ASTM D1777
Gauge	18	
CPI	18	
Finished weight	3.41 oz/square yard	

The above tested results are typical values. Individual lots may vary up to 10% from the typical value. Further technical information can be found at www.neogard.com.

Application details:

Application method: Embed 86220 into Neogard fluid-applied coatings, without stretching, and roll or brush to eliminate wrinkles and/or air pockets. Roll or brush another layer of coating over the fabric. Feather edges to completely cover the fabric and provide a smooth transition to of the coating to the surface.

Safety: Handle with care. Before and during use, observe all safety labels on packaging, consult Neogard Safety Data Sheets, and follow all local or national safety regulations.

Remarks: For more information on Tietex T272 Roofing Fabric, contact Tietex International, Ltd.:
3010 North Blackstock Road
Spartanburg, SC 29301, USA
Phone: 864-574-0500
Fax: 864-574-9490
tietex.com

Note: **86220 is for professional use only.**

Issued by: Hempel (USA) – 63BJB

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Product Data Sheet

86218 (62ZJB)
Eternabond WebSeal Tape

Description:	86218 EternaBond WebSeal Tape (Hempel 62ZJB) is a sealant tape, primarily used in roofing applications.
Recommended use:	Sealing joints, seams, copings, gutters, skylights, and other areas which require a complete seal.
Features:	Bonds permanently to a wide range of roofing surfaces, including: EPDM, TPO, CSPE/Hypalon, most PVC, CPE , SBS, APP modifies, asphalt BURs, coal tar BURs, tiles, shingle, and all metal roofs. Also bonds to gypsum board, wood, polyethylene, propylene, polystyrene, fiberglass, brick, concrete, masonry, OSB, and others. Composed of a 100% solids formulation of synthetic resins, thermoplastics, non-curing rubber (non-butyl), and a built in primer, bonded to a woven polyester backing. Extremely flexible, with no memory; conforms to almost any shape without return. Self-sealing; can be cut and folded around objects. Silicone release liner protects the tape roll from contamination.
Service temperatures:	-70°F– >200°F/-56°C – >93°C
Availability:	Available in North America. Not included in Group Assortment; other regions must confirm.

Colors and packaging:

86218 (62ZJB99980)	Gray	Case, 4 rolls, 6” x 50’ (200 linear ft/case)

Contact Neogard for additional widths.

Physical constants:

Adhesion	19 lbs/in width	
Water vapor test	.005 grms/100" sq./24hrs/100°F	
Permanence	.001 perms maximum	ASTM E96B
Low temperature flexibility	1/2” radius at -30°F (-34°C)	
Elongation	>500%	
Pliability	No cracks in membrane	
Total thickness	30 mils (1 mm)	
Shelf life	Up to 5 years	

The above tested results are typical values. Individual lots may vary up to 10% from the typical value. Further technical information can be found at www.neogard.com.

Application details:

Application method:	Removing silicone release liner gradually to prevent contamination of the adhesive prior to application. Rub or roll with pressure using your hand or steel roller to activate bonding process. Apply a topcoat of roofing material for UV protection.
Safety:	Handle with care. Before and during use, observe all safety labels on packaging, consult Neogard Safety Data Sheets, and follow all local or national safety regulations.
Surface preparation:	Surface must be clean and dry; free of loose rust and scale, dust, talc, and dirt. Oil, grease, and other contaminants should be removed with a suitable solvent/cleaner. For older plastic roofs, score surface with sand cloth and wipe away dust.
Application conditions:	Temperature: -20°F–150°F/-28°C–65°C ambient.
Remarks:	For more information on EternaBond WebSeal, please contact EternaBond, Inc.: Phone: 888-336-2663 Fax: 847-837-9449 Web: www.eternabond.com

Note: **86218 is for professional use only.**

Issued by: Hempel (USA) – 62ZJB

This Product Data Sheet ("**PDS**") relates to the supplied product ("**Product**") and is subject to update from time-to-time. Accordingly, the buyer/applicator should refer to the PDS current as of the time of delivery. In addition to the PDS, the buyer/applicator may receive some or all of the specifications, statements and/or guidelines listed below or available at www.neogard.com (the "**Additional Documents**"):

No.	Document Description
1	PDS
2	Guide Specification
3	Application Manual
4	Other Technical Support Information (i.e. summary application tables, troubleshooting guides, maintenance manuals, chemical resistance charts and other technical information)

In the event of a conflict between this PDS and the Additional Documents, the conflict shall be resolved in accordance with the order of priority set forth above. In addition, the buyer/applicator should refer to the relevant Safety Data Sheet current as of the time of delivery and available at www.neogard.com. Buyer/applicator is responsible for determining the suitability of the intended use of the Product, and Neogard disclaims all responsibility for any use, handling and storage of the Product that is not in accordance with the requirements set forth in the relevant PDS and the Additional Documents. The terms and provisions hereof apply to this PDS, the Additional Documents and any other documents supplied by Neogard in respect of the Product.The Product is supplied and all technical assistance is given subject to the General Conditions of Sale of Hempel Products and/or Services available at www.hempel.com. NEOGARD MAKES NO OTHER WARRANTY THAT EXTENDS BEYOND THE WARRANTY REFERENCED THEREIN INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NEOGARD WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OR CONDITION, OR THAT IN ANY WAY ARISE IN RELATION TO THE PRODUCT. 86218-PDS ksk 04122021.docx

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Product Data Sheet

7760/7761 — Epoxy Primer
25100: Base 25109 : Curing Agent 95054

Description: 7760/7761 (Hempel 25100) is a is a two-component epoxy polyamide primer.

Recommended use: 7760/7761 is applied on wood, concrete, and metal surfaces prior to application of surface-applied waterproofing systems.

Availability: Available in North America. Not included in Group Assortment; other regions must confirm.

Colors and packaging:

7760 (2510957930)	Red	5- and 1-gallon
7761 (9505400000)	Neutral	

Physical constants:

Weight/Gal (mixed)	8.5 lbs/gal	ASTM D1475
Weight Solids (mixed)	66%	ASTM D4209
Volume Solids (mixed)	59%	Calculated
Viscosity (mixed)	60 KU	ASTM D562
VOC (mixed)	336 g/L	EPA Method 24
Flash Point - 7760	58°F/15°C	ASTM D3278
Flash Point - 7761	45°F/8°C	ASTM D3278
Adhesion (mixed)	300 psi	ASTM D4541

The above tested results are typical values. Individual lots may vary up to 10% from the typical value. Further technical information can be found at www.neogard.com.

Application details:

Version, mixed product	**25100**
Mixing ratio:	Base 25109 : Curing Agent 95054 1 : 1 by volume
Mixing instructions:	Pre-mix base for 3–5 minutes before adding curing agent. Mix for a minimum of 5 minutes before applying. Jiffy Mixer paddle recommended.
Application method:	Roller or spray (contact Neogard for spray equipment information)
Thinner (max.vol.):	Hempel's Thinner 08080 (xylene) (10%)
Pot life:	3–4 hours at 75°F/23°C
Recoat time:	90 minutes at 75°F/23°C, 50% relative humidity
Cleaning of tools:	Hempel's Thinner 08080 (xylene)

Safety: Handle with care. Before and during use, observe all safety labels on packaging and paint containers, consult Neogard Safety Data Sheets and follow all local or national safety regulations.

Surface preparation: According to Neogard Guide Specifications.

Application conditions: According to Neogard Guide Specifications.

Subsequent coat: According to Neogard Guide Specifications.

Note: **7760/7761 is for professional use only.**

Issued by: Hempel (USA) – 25100

This Product Data Sheet ("**PDS**") relates to the supplied product ("**Product**") and is subject to update from time-to-time. Accordingly, the buyer/applicator should refer to the PDS current as of the time of delivery. In addition to the PDS, the buyer/applicator may receive some or all of the specifications, statements and/or guidelines listed below or available at www.neogard.com (the "**Additional Documents**"):

No.	Document Description
1	PDS
2	Guide Specification
3	Application Manual
4	Other Technical Support Information (i.e. summary application tables, troubleshooting guides, maintenance manuals, chemical resistance charts and other technical information)

In the event of a conflict between this PDS and the Additional Documents, the conflict shall be resolved in accordance with the order of priority set forth above. In addition, the buyer/applicator should refer to the relevant Safety Data Sheet current as of the time of delivery and available at www.neogard.com. Buyer/applicator is responsible for determining the suitability of the intended use of the Product, and Neogard disclaims all responsibility for any use, handling and storage of the Product that is not in accordance with the requirements set forth in the relevant PDS and the Additional Documents. The terms and provisions hereof apply to this PDS, the Additional Documents and any other documents supplied by Neogard in respect of the Product. The Product is supplied and all technical assistance is given subject to the General Conditions of Sale of Hempel Products and/or Services available at www.hempel.com. NEOGARD MAKES NO OTHER WARRANTY THAT EXTENDS BEYOND THE WARRANTY REFERENCED THEREIN INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NEOGARD WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OR CONDITION, OR THAT IN ANY WAY ARISE IN RELATION TO THE PRODUCT. 7760-7761-PDS ksk 10062021.docx

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Product Data Sheet

70750/70751 — Low-Modulus Epoxy
472JB: Base 472J9 : Curing Agent 95YJB

Description: 70750/70751 (Hempel 472JB) is a two-component, 100% solids, moisture tolerant, flexible, low-modulus epoxy.

Recommended use: As a binder for epoxy overlay systems and for use as a wearing course with aggregate for Neogard traffic bearing coating systems.
Note: Not for use as a topcoat (see Remarks on Page 2).

Features: Moisture tolerant.
Excellent viscosity for leveling.

Availability: Available in North America. Not included in Group Assortment; other regions must confirm.

Colors and packaging:

70750 (472J900000)	Clear	15-gallon kit
70751 (95YJB00000)	Clear	

Physical constants:

Tensile strength	1,362 psi ± 100	ASTM D638
Elongation	81% ± 10	ASTM D638
Flexural strength	1,100 psi	ASTM D790
Taber abrasion	60 mg/1,000 CS-17	ASTM D4060
Shore D	65	ASTM D2240
Modulus of elasticity	42,000 psi	ASTM D790
Adhesion to concrete	960 psi	ASTM D4541
Water resistance	1.3% at 24 hours	ASTM D570
Viscosity	3,800–4,500 cps	ASTM D2196
Weight/gallon (mixed)	8.77 lbs/gal	ASTM D1475
Weight solids (mixed)	100%	ASTM D2369
Volume solids (mixed)	100%	ASTM D3960
VOC (mixed)	9.66 g/L (0.08 lbs/gal)	EPA Method 24
Flash point	271°F/133°C	ASTM D3278
Shelf life	1 year	
Tack-free time at 73°F/22°C	4 hours	ASTM D5894

The above tested results are typical values. Individual lots may vary up to 10% from the typical value. Further technical information can be found at www.neogard.com.

Application details:

Version, mixed product	**472JB**
Mixing ratio:	Base 472J9 : Curing Agent 95YJB 2 : 1 by volume; mix for 3–5 minutes before applying
Application method:	Roller/Rake/Squeegee/Notched squeegee
Pot life:	30 minutes at 75°F/23°C
Cleaning of tools:	7055 Odorless Reducer (086JB) or Hempel's Thinner 08080 (xylene)

Safety: Handle with care. Use with adequate ventilation. Before and during use, observe all safety labels on packaging and paint containers, consult Neogard Safety Data Sheets and follow all local or national safety regulations.

Surface preparation: According to Neogard Guide Specifications.

Application conditions: Ambient temperature must be between 40°F/4°C and 100°F/37°C, and a minimum of 5°F/3°C above dew point.

Preceding coat: According to Neogard Guide Specifications.

Subsequent coat:	According to Neogard Guide Specifications.
Storage temperature:	Store in a cool area to ensure full shelf life. Recommended temperature: 75°F/23°C.
Remarks:	Not for use as a topcoat; product is too soft and will be damaged. Do not sand or roughen; product is too soft and will be damaged.

Note: **70750/70751 is for professional use only.**

Issued by: Hempel (USA) – 472JB

This Product Data Sheet ("**PDS**") relates to the supplied product ("**Product**") and is subject to update from time-to-time. Accordingly, the buyer/applicator should refer to the PDS current as of the time of delivery. In addition to the PDS, the buyer/applicator may receive some or all of the specifications, statements and/or guidelines listed below or available at www.neogard.com (the "**Additional Documents**"):

No.	Document Description
1	PDS
2	Guide Specification
3	Application Manual
4	Other Technical Support Information (i.e. summary application tables, troubleshooting guides, maintenance manuals, chemical resistance charts and other technical information)

In the event of a conflict between this PDS and the Additional Documents, the conflict shall be resolved in accordance with the order of priority set forth above. In addition, the buyer/applicator should refer to the relevant Safety Data Sheet current as of the time of delivery and available at www.neogard.com. Buyer/applicator is responsible for determining the suitability of the intended use of the Product, and Neogard disclaims all responsibility for any use, handling and storage of the Product that is not in accordance with the requirements set forth in the relevant PDS and the Additional Documents. The terms and provisions hereof apply to this PDS, the Additional Documents and any other documents supplied by Neogard in respect of the Product. The Product is supplied and all technical assistance is given subject to the General Conditions of Sale of Hempel Products and/or Services available at www.hempel.com. NEOGARD MAKES NO OTHER WARRANTY THAT EXTENDS BEYOND THE WARRANTY REFERENCED THEREIN INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NEOGARD WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OR CONDITION, OR THAT IN ANY WAY ARISE IN RELATION TO THE PRODUCT. 70750-70751-PDS ksk 02212022.docx

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Product Data Sheet

FC7540/FC7964 — Fast-Cure Aliphatic Urethane Topcoat
47QJB: Base 47QJ9 : Curing Agent 949JB

NEOGARD
A part of HEMPEL

Description: FC7540/FC7964 (Hempel 47QJB) is a two-component, aliphatic, high solids, fast-cure polyurethane topcoat.

Recommended use: As a waterproofing membrane for pedestrian and vehicular traffic bearing surfaces, where fast turnaround time and/or solvent free-materials are required. Suitable areas include parking garages, stadiums, balconies, plaza decks, walkways, rooftop recreation areas, and mechanical rooms.

Features: Available in a tint base; custom colors can be produced in small amounts.
Meets South Coast Air Quality Management District (SCAQMD) VOC requirements.

Certificates/approvals: LEED: MRc5, IEQc4.2, SSc7.1, BDc4, IDc4
Miami-Dade: NOA No.: 14-0902.10, NOA No. 15-0616.03

Availability: Available in North America. Not included in Group Assortment; other regions must confirm.

Colors and packaging:

FC7540 (47QJ916650)	Gray	4- and 2-gallon
FC7540-03 (47QJ923820)	Tan	2-gallon
FC7540-11 (47QJ916660)	Light Gray	4- and 2-gallon
FC7540-041 (47QJ916680)	Charcoal	4- and 2-gallon
FC7540-058 (47QJ961300)	Dark Maple	2-gallon
FC7540-00 (47QJ900050)	(Tint Base, special order only)	
FC7964 (949JB00000)	Clear	2- and 1-gallon

Some standard colors and/or packaging may have extended lead times and/or minimum quantities. Contact Neogard for additional colors.

Physical constants:

Tensile strength	2,000 psi	ASTM D412
Elongation	130%	ASTM D412
Permanent set	<10%	ASTM D412
Tear resistance	155 pli	ASTM D1004
Water resistance	<2% at 7 days	ASTM D471
MVT at 20 mils	1.0 English Perm	ASTM E96
Taber abrasion	95 mg/1,000 CS-17	ASTM D4060
Shore A	80–90	ASTM D2240
Adhesion to: 70714/70715 7780/7781 FC7510/FC7961 FC7500/FC7960 FC7540/FC7964 70410 7430	400 psi	ASTM D4541
Weight/gallon (mixed)	11.1 lbs/gal	ASTM D1475
Weight solids (mixed)	91% at 12 hours	ASTM C1250
Volume solids (mixed)	89%	Calculated
VOC (mixed)	<99.5 g/L	EPA Method 24
Viscosity (mixed)	1,200 cps	ASTM D2196
Flash point, FC7540	275°F/135°C	ASTM D3278
Flash point, FC7964	135°F/57°C	ASTM D3278
Cure to recoat at 75°F/23°C, 50% relative humidity	3–4 hours	

The above tested results are typical values. Individual lots may vary up to 10% from the typical value. Further technical information can be found at www.neogard.com.

Product Data Sheet

FC7540/FC7964 — Fast-Cure Aliphatic Urethane Topcoat
47QJB: Base 47QJ9 : Curing Agent 949JB

Application details:

Version, mixed product	**47QJB**
Mixing ratio:	Base 47QJ9 : Curing Agent 949JB 2 : 1 by volume
Mixing instructions:	Pre-mix base for 3–5 minutes before adding curing agent. Mix for a minimum of 5 minutes before applying. Jiffy Mixer paddle recommended.
Application method:	Roller or squeegee
Thinner (max.vol.):	7055 Odorless Reducer (086JB1L001) (10%)
Pot life:	120 minutes at 75°F/23°C
Cleaning of tools:	Hempel's Thinner 08080 (xylene)
Safety:	Handle with care. Use with adequate ventilation. Before and during use, observe all safety labels on packaging and paint containers, consult Neogard Safety Data Sheets and follow all local or national safety regulations.
Application conditions:	Substrate temperature must be between 40°F/4°C and 110°F/43°C.
Preceding coat:	According to Neogard Guide Specifications.
Storage temperature:	Store in a cool area to ensure full shelf life. Recommended temperature: 75°F/23°C.
Remarks:	Not recommended for constant immersion. Do not apply over asphaltic compounds. For on-grade applications, substrates constructed over unvented metal decks or between-slab applications, contact Neogard Technical Service.

Note: **FC7540/FC7964 is for professional use only.**

Issued by: Hempel (USA) – 47QJB

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Chemical Resistance Chart

FC7540/FC7964 (47QJB)
Aliphatic Urethane

Rating Key: 0 = No Effect; 1 = Stains/Dulls Film; 2 = Blisters Film; 3 = Lifts Film
Ratings are based on 7-day spot test.

Chemical	Rating	Chemical	Rating
Ammonia (28%)	0	Oleic Acid	1
Bleach	1	Phosphoric Acid (10%)	1
Brake Fluid	2	Propylene Glycol	0
Calcium Chloride (10%)	0	Sodium Hydroxide (20%)	1
Ethylene Glycol	0	Sodium Hydroxide (50%)	1
Gasoline	0	Sodium Hypochlorite (10%)	1
Hydrochloric Acid (5%)	1	Soya Oil	1
Hydrochloric Acid (15%)	1	Sulfuric Acid (5%)	1
Isopropyl Alcohol	1	Sulfuric Acid (10%)	1
Jet Fuel	0	Sulfuric Acid (20%)	1
Mineral Spirits	0	Tall Oil Fatty Acid	2
Motor Oil	0	Transmission Oil	1
Nitric Acid (5%)	1		

Issued by: Hempel (USA) – FC7540/FC7964 CRC

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Product Data Sheet

70714/70715-01 — 2K Fast-Cure Epoxy
45061: Base 45069 : Curing Agent 95074

Description: 70714/70715-01 (Hempel 45061) is a two-component, 100% solids epoxy resin.

Recommended use: Applications include: High-gloss, high-build protective coating; binder for self-smoothing pigmented and color quartz flooring; low-viscosity binder for trowel-applied mortar flooring systems; high-quality primer for chemical resistant urethane top coats, and/or Neogard waterproofing and flooring systems; low-viscosity binder for trowel applied mortar and/or patching material; low viscosity binder for crack injection.

Features: Formulated for use on damp or dry concrete. Near water-clear. Exhibits no amine blush when used in humid environments. Very low viscosity for deep penetration into concrete. Uniform wetting of filler aggregates. Excellent chemical and water resistance.
Meets South Coast Air Quality Management District (SCAQMD) VOC requirements.

Certificates/approvals: LEED: MRc5, IEQc4.2

Availability: Available in North America. Not included in Group Assortment; other regions must confirm.

Colors and packaging:

70714 (4506900000)	Clear	15- and 3-gallon kits
70714-01 (4506916640)	White	15- and 3-gallon kits
70714-02 (4506916650)	Gray	15- and 3-gallon kits
70714-03 (4506923820)	Tan	15- and 3-gallon kits
70714-04 (4506916670)	Dark Gray	15- and 3-gallon kits
70714-05 (4506957930)	Tile Red	15- and 3-gallon kits
70714-11 (4506916660)	Light Gray	15- and 3-gallon kits
70714-16 (4506919990)	Black	15- and 3-gallon kits
70714-06 (4506949890)	Green	3-gallon kits
70715-01 (9507400000)	NA	Curing agent, included in kits

Some standard colors and/or packaging may have extended lead times and/or minimum quantities. Contact Neogard for additional colors.

Physical constants:

Tensile strength	3,700 psi	ASTM D638
Elongation	25%	ASTM D638
Compressive strength	25,300 psi	ASTM D695
Flexural strength	3,069 psi	ASTM D790
Flexural modulus	54,000 psi	ASTM D790
Water resistance	0.21%	ASTM D570
MVT at 10 mils	0.16	ASTM E96
Flammability	Passes	ASTM D635
Taber abrasion	78 mg/1,000 CS-17	ASTM D4060
Shore D	77	ASTM D2240
Adhesion	350 psi	ASTM D4541
Flammability	Pass	ASTM D635
Weight/gal (mixed)	8.79 lbs/gal	ASTM D1475
Weight solids (mixed)	100%	ASTM D4209
Volume solids (mixed)	100%	Calculated
Viscosity (mixed)	400 cps	ASTM D2196
VOC (mixed)	<5 g/L	EPA Method 24
Flash point	>200°F/93°C	ASTM D3278
Shelf life	1 year	
Thin film cure at 75°F/23°C	2–3 hours	
Full cure at 75°F/23°C	7 days	
Full chemical resistance	7 days	

The above tested results are typical values. Individual lots may vary up to 10% from the typical value. Further technical information can be found at www.neogard.com.

Product Data Sheet

70714/70715-01 — 2K Fast-Cure Epoxy
45061: Base 45069 : Curing Agent 95074

Application details:

Version, mixed product	**45061**
Mixing ratio:	Base 45069 : Curing Agent 95074 2 : 1 by volume
Mixing instructions:	Pre-mix base for 3–5 minutes before adding curing agent. Mix for a minimum of 5 minutes before applying. Jiffy Mixer paddle recommended.
Application method:	Roller or squeegee
Thinner (max.vol.):	7055 Odorless Reducer (086JB) or Hempel's Thinner 08080 (xylene) (10%)
Pot life:	15 minutes at 70°F/21°C
Cleaning of tools:	7055 Odorless Reducer (086JB) or Hempel's Thinner 08080 (xylene)
Safety:	Handle with care. Use with adequate ventilation. Before and during use, observe all safety labels on packaging and paint containers, consult Neogard Safety Data Sheets and follow all local or national safety regulations.
Surface preparation:	According to Neogard Guide Specifications.
Application conditions:	Ambient temperature must be between 50°F/10°C and 85°F/29°C, and a minimum of 5°F/3°C above dew point.
Preceding coat:	According to Neogard Guide Specifications.
Subsequent coat:	Must be recoated within 24 hours at 70°F/21°C for subsequent coat to properly bond. If the 24-hour recoat window is missed, sand to dull finish before applying subsequent coat(s).
Storage temperature:	Store in a cool area to ensure full shelf life. Recommended temperature: 70°F/21°C.

Note: **70714/70715-01 is for professional use only.**

Issued by: Hempel (USA) – 45061

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WATERPROOFING - JOINT & SEVERAL WARRANTY

Project Name: _____

Project Address: _____

Neogard System: _____ **Substrate:** _____

Applicator: _____

Substantial Completion Date: _____ **Area in Square Feet:** _____

Owner: _____

Warranty No: (Neogard Use Only) _____

Our Promise - Neogard® warrants to the Owner that, for _____ after the Substantial Completion Date, the NEOGARD products that comprise the Neogard System will not leak and will not adhesively/cohesively fail due to defects in material. This warranty is void unless Neogard products are installed in an institutional, commercial, industrial, or high-rise/multi-family residential building.

Our Obligations – If Neogard, upon inspection, determines that a leak or failure as defined above has occurred due to defects in material or the failure of Applicator to install the Neogard System in a good and workmanlike manner, Neogard and Applicator will repair the leak or failure inclusive of labor (the liability of Neogard and Applicator not exceed the originally invoiced purchase price of the Neogard System). THE OBLIGATIONS OF NEOGARD AND APPLICATOR DESCRIBED IN THE PREVIOUS SENTENCE ARE JOINT AND SEVERAL, AND ARE THE SOLE AND EXCLUSIVE REMEDIES OF THE OWNER FOR BREACH OF THIS WARRANTY OR OTHER WISE IN CONNECTION WITH THE PERFORMANCE OF THE NEOGARD SYSTEM.

Exclusions and Limitations - This Warranty does not cover:

1. Work performed by the Applicator, other than the installation of the Neogard System.
2. Removal or reinstallation of obstructions that interfere with the repair of the Neogard System.
3. Lift or other equipment necessary to gain access to the Neogard System.
4. Changes in the appearance of the Neogard System resulting from weathering or atmospheric conditions.
5. Cleanliness or discoloration of the Neogard System resulting from environmental conditions.
6. Damage to the Neogard products caused by:
    a. improper maintenance;
    b. substrate construction or movement of greater than 1/16";
    c. exposure to fatty acids, oils, greases, and other contaminants;
    d. mechanical contact such as snow or ice removal, from falling objects, and contact with plant or animal life;
    e. vapor drive, infiltration or condensation of moisture in, through or around walls, copings, the building structure or underlying or surrounding materials.
7. Products not supplied by Neogard.

Owner's Obligations - This Warranty is void unless:

1. Neogard and Applicator receive full payment for the Neogard System.
2. Owner provides access to the Neogard System upon request during the regular business hours.
3. Owner submits all warranty claims in writing within 30 days of discovery or any leak or failure, but in any case, within the warranty period.
4. Owner uses reasonable care in maintaining the Neogard System.
5. Owner only repairs the Neogard System with materials approved by Neogard.

Warranty Transfer – The unexpired portion of this Warranty may be transferred to a subsequent owner for a $500 fee if: (1) Neogard is notified within 30 days after the effective date of the change of ownership. (2) Neogard and Applicator are given an opportunity to inspect the Neogard System and (3) all repairs required by Neogard and Applicator are completed.

NEOGARD MAKES NO OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, THAT EXTEND BEYOND THE WARRANTIES SET FORTH HEREIN, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NEOGARD and APPLICATOR SHALL NOT BE LIABLE OR OBLIGATED FOR ANY LOSS OR CONSEQUENTIAL OR OTHER DAMAGE INCURRED DIRECTLY OR INDIRECTLY BY OWNER OR ANY OTHER PERSON OR ENTITY THAT ARISES IN ANY WAY IN RELATION TO NEOGARD PRODUCTS AND/OR THE NEOGARD SYSTEM OR THE USE OR FAILURE THEREOF, WHETHER BASED ON BREACH OF WARRANTY OR NEGLIGENCE, EXCEPT AS PROVIDED HEREIN.

Neogard, a part of Hempel (USA), Inc.

2728 Empire Central, Dallas, TX 75235

APPLICATOR

By: _____ **Firm:** _____

Title: _____ **By:** _____
Signature w/Printed Name

Date: _____ **Title:** _____

Issue Number: _____

Product Information Available at www.neogard.com

Warranty is null and void if a valid copy, executed by all parties, is not on file at NEOGARD's Warranty Department, Dallas, TX.

Revision March 2021

WATERPROOFING -MATERIAL WARRANTY

Project Name: _____

Project Address: _____

Neogard System: _____ **Substrate:** _____

Applicator: _____

Substantial Completion Date: _____ **Area in Square Feet:** _____

Batch/Lot Number: _____

Owner: _____

Warranty No: (Neogard Use Only) _____

Our Promise - Neogard® warrants to the Owner that, for _____ after the Substantial Completion Date, the NEOGARD products that comprise the Neogard System that will not leak, adhesively/cohesively fail due to defects in material and will conform to the Neogard Guide Specifications in effect at the time of manufacture. This warranty is void unless Neogard products are installed in an institutional, commercial, industrial, or high-rise/multi-family residential building.

Our Obligations – If, upon inspection, Neogard determines that a leak or failure as defined above has occurred due to defects in material, Neogard repair the leak or failure inclusive of labor (Neogard's liability not to exceed the originally invoiced purchase price for the nonconforming product). THE OBLIGATIONS OF NEOGARD DESCRIBED IN THE PREVIOUS SENTENCE ARE THE SOLE AND EXCLUSIVE REMEDIES OF THE OWNER FOR BREACH OF THIS WARRANTY OR OTHERWISE IN CONNECTION WITH THE PERFORMANCE OF THE NEOGARD PRODUCTS.

Exclusions and Limitations – This Warranty does not cover:

1. Handling or installation of the Neogard products, or the workmanship of the applicator.
2. Any portion of Neogard products that are not applied in accordance with the applicable Neogard Guide Specification or other written requirements provided by Neogard.
3. Labor or equipment costs associated with repairing or accessing the Neogard products.
4. Changes in the appearance of the Neogard products resulting from weathering or atmospheric conditions.
5. Cleanliness or discoloration of the Neogard products resulting from environmental conditions.
6. Damage to the Neogard products caused by:
    a. improper maintenance;
    b. substrate construction or movement of greater than 1/16";
    c. exposure to fatty acids, oils, greases, and other contaminants;
    d. mechanical contact such as snow or ice removal, from falling objects, and contact with plant or animal life;
    e. vapor drive, infiltration or condensation of moisture in, through or around walls, copings, the building structure or underlying or surrounding materials.
7. Products not supplied by Neogard.

Owner's Obligations – This Warranty is void unless:

1. Owner submits all warranty claims in writing within 30 days of discovery of any failure, but in any case, within the warranty period.
2. Neogard is paid in full for the Neogard products.
3. Owner uses reasonable care in maintaining the Neogard products.
4. Owner only repairs the Neogard products with materials approved by Neogard.

Warranty Transfer – The unexpired portion of this Material Warranty may be transferred to a subsequent owner for a $500 fee if: (1) Neogard is notified within 30 days after the effective date of the change of ownership. (2) Neogard is given an opportunity to inspect the Neogard products an (3) all repairs required by Neogard are completed.

NEOGARD MAKES NO OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, THAT EXTEND BEYOND THE WARRANTIES SET FORTH HEREIN, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NEOGARD SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY OR OTHERWISE IN CONNECTION WITH THE NEOGARD PRODUCTS.

Neogard, a part of Hempel (USA), Inc.

2728 Empire Central, Dallas, TX 75235

☒ **APPLICATOR CERTIFICATION: Applicator hereby represents and warrants that all the information provided by Applicator is accurate and complete, and that the NEOGARD products have been applied and maintained in accordance with the applicable NEOGARD Guide Specification and NEOGARD written requirements.**

BY:_____ **TITLE:** _____ **DATE:** _____

WATERPROOFING -MATERIAL & LABOR WARRANTY-NEW

Project Name: _____

Project Address: _____

Neogard System: _____ **Substrate:** _____

Applicator: _____

Substantial Completion Date: _____ **Area in Square Feet:** _____

Owner: _____

Warranty No: (Neogard Use Only) _____

Our Promise - Neogard® warrants to the Owner that, for _____ years after the Substantial Completion Date, the Neogard products will not leak and will not adhesively/cohesively fail due to defects in material and will conform to the Neogard specifications in effect at the time of manufacture. This warranty only applies to NEOGARD products used on institutional, commercial, industrial, and high-rise/multi-family residential buildings.

Our Obligations - If, upon inspection, Neogard determines that a leak or failure as defined above has occurred due to defects in material, Neogard will repair the leak or failure inclusive of labor (not to exceed originally invoiced purchase price). THE OBLIGATIONS OF Neogard DESCRIBED IN THE PREVIOUS SENTENCE ARE THE SOLE AND EXCLUSIVE REMEDIES OF THE OWNER FOR BREACH OF THIS WARRANTY.

Exclusions and Limitations

This Warranty does not cover:

1. Removal or reinstallation of obstructions that interfere with the repair of the Neogard System.
2. Lift equipment necessary to gain access to the NEOGARD System.
3. Cracks due to abnormal exposure, expansion or contraction on a poorly prepared substrate or movement/cracking of the underlying substrate of greater than 1/16".
4. Colorfastness changes in appearance of the Neogard System as the result of normal weathering or atmospheric conditions.
5. Vapor drive, infiltration or condensation of moisture in, through or around walls, copings, building structure or underlying materials.
6. Products not supplied by Neogard.

Owner's Obligations

This Warranty is void unless:

1. Neogard receives full payment for the Neogard System.
2. Owner regularly provides access to the Neogard System during regular business hours.
3. Owner provides a written description of any coating failure within 30 days after it is discovered.
4. Owner uses reasonable care in maintaining the Neogard System.
5. Owner only repairs the Neogard System with materials approved by Neogard.

Applicator's Obligations

If Neogard determines that a coating leak or failure is the result of faulty handling or installation of the Neogard Products, the APPLICATOR will repair the leak or failure at the Applicator's expense.

Transfer of Warranty

The unexpired portion of this warranty may be transferred to a subsequent owner for a $500 fee if: (1) NEOGARD is notified in writing within 30 days of the transfer (2) NEOGARD and APPLICATOR are given an opportunity to inspect the project and (3) all required repairs are completed.

THE ABOVE WARRANTY IS IN LIEU OF ANY OTHER WARRANTIES OR LEGAL REMEDIES, AND NEOGARD AND APPLICATOR MAKE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY, IN RESPECT OF NEOGARD PRODUCTS AND/OR THE NEOGARD SYSTEM, EXCEPT AS PROVIDED HEREIN. NEOGARD AND APPLICATOR SHALL NOT BE LIABLE OR OBLIGATED FOR ANY LOSS OR CONSEQUENTIAL OR OTHER DAMAGE INCURRED DIRECTLY OR INDIRECTLY BY OWNER OR ANY OTHER PERSON OR ENTITY THAT ARISES IN ANY WAY IN RELATION TO NEOGARD PRODUCTS AND/OR THE NEOGARD SYSTEM OR THE USE OR FAILURE THEREOF, WHETHER BASED ON BREACH OF WARRANTY OR NEGLIGENCE, EXCEPT AS PROVIDED HEREIN.

Neogard, a part of Hempel (USA), Inc.

2728 Empire Central, Dallas, TX 75235

APPLICATOR

By: _____ **Firm:** _____

Title: Waterproofing Segment Manager **By:** _____
Signature w/Printed Name

Date: _____ **Title:** _____

Issue Number: _____

Product Information Available at www.neogard.com

Warranty is null and void if a valid copy, executed by all parties, is not on file at NEOGARD's Warranty Department, Dallas, TX.

NEOGARD®
CONSTRUCTION COATINGS
A part of the Hempel Group

WARRANTY EXTENSION RIDER

Warranty Number: _____

Project Name: _____

Address: _____

At the end of the initial warranty period, the Owner shall have the option to renew the warranty for up to an additional **(X)** years, under the following conditions:

Upon the expiration of this Warranty **(X)**, and at the Owner's request, NEOGARD and Applicator will inspect the coating installation. This inspection is free of charge and without obligation.

If the Owner elects to exercise his option to renew Warranty **(X)**, the Owner shall have the maintenance work described in the inspection report plus the application of a new wear/topcoat performed at his expense by the Applicator. All work required must be started no later than ninety (90) days after expiration date of Warranty **(X)** unless specific written permission is given by the NEOGARD Technical Department Manager.

Upon completion of the above mentioned work and payment for same has been made, Warranty **(X)** will be extended for an additional **(X)** years and will be issued by the Applicator and NEOGARD to the Owner.

NEOGARD, a Division of Hempel (USA), Inc.
2728 Empire Central, Dallas, TX 75235

By: Signature Required to be Valid Ismael Vazquez

Title: Technical Department

Date: _____

APPLICATOR

Firm: _____

By: _____
Signature w/Printed Name

Title: _____

APPENDIX D – PRELIMINARY BOOK SPECIFICATION AND DRAWINGS FOR SHORT TERM REPAIRS

00 00 00 PROCUREMENT AND CONTRACTING REQUIREMENTS

00 21 13 Instructions to Bidders

.1 Tender acceptance period TBD

.2 Bonding Requirements

- .1 Bid Bond – 10 % of Bid Price
- .2 Performance Bond – 50% of Contract Price
- .3 Labour and Materials Payment Bond – [50%] of Contract Price.

02 24 13 Scope of Bid

.1 Bidding method:

- .1 Public tender
- .2 Prequalified Bidders
- .3 Invited Bidders

00 31 00 Available Project Information

.1 None

00 41 13 Bid Form - Stipulated Price

00 72 00 Agreement and General Conditions

- .1 [CCDC 2 - Stipulated Price Contract, 2008]
- .2 [CCDC 5A - Construction Management Contracts - for Services, 2010].
- .3 [CCDC 5B - Construction Management Contracts - for Services and Construction, 2010].
- .4 [Document 14 - 2000 Design-Build Stipulated Price Contract (CCA, CSC, RAIC).]

00 73 00 Supplementary General Conditions

01 00 00 GENERAL REQUIREMENTS

01 11 00 Summary of Work

.1 **Option B: Demolish the Parkade**

- 1.1 Demolish existing park
- 1.2 Demolish slab P1 and Main floor
- 1.3 Construct new wall supported on piling.
- 1.4 Infill demolished portion with granular
- 1.5 Compacted granular to grade
- 1.6 Make good for potential future park

.2 **Construction of New Parkade-.**

2.1 Demolish existing park

2.2 Demolish slab P1 and Main floor

2.3 Construct new wall supported on piling.

2.4 Infill demolished portion with granular

2.5 Compacted granular to grade

2.6 Construct new pre-cast concrete parking garage

2.7 Construct new overhead walkway from new parking garage to Police headquarters, overhead walkway to be steel framed truss system complete with glass walls.

2.8 Construct new walkway to lobby on Donald, overhead walkway to be steel framed truss system complete with glass walls.

.3 **Repairs**

3.1 Repairs as shown on drawings.

.4 **Sell Parkade-.**

4.1 Delineate mech and electrical equipment

.5 Construction Schedule

.1 Project milestones:

.1 Work to be undertaken 2023-2027

.6 Work Sequence:

.1 Work shall proceed in sequential phases to accommodate Owner's use of premises during construction.

.2 Each phase must be complete before work on the next phase can commence.

01 21 00 Allowances

.1 Contractor is to carry all cash allowances.

01 31 00 Project Management and Coordination

.1 Project Meetings

.1 Project meetings chaired by Contractor who shall record and distibute meeting minutes.

.2 Start up meeting prior to start of Work.

.3 Progress meetings to be held monthly.

.4 Meetings shall be held in Contractor’s site office.

01 32 00 Construction Progress Documentation

.1 Construction Progress Schedule: schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT) showing as minimum milestone and activity types. Revised monthly.

01 33 00 Submittal Procedures

.1

01 50 00 Temporary Facilities and Controls

.1 Temporary Utilities

01 70 00 Execution And Closeout Requirements

.1 Examination and Preparation:

.1 Surveying: building layed out by legal land surveyor.

01 74 00 Cleaning and Waste Management

.1 Construction/Demolition Waste Management and Disposal

01 80 00 Performance Requirements

.1 Facility Performance Requirements

.2 Sustainable Design Requirements

.3 Indoor Air Quality Requirements

.4 Commissioning

02 00 00 EXISTING CONDITIONS

02 30 00 Subsurface Investigation

02 40 00 Demolition and Structure Moving

.1 Selective Site Demolition

.2 Structure Demolition

.3 Selective Building Demolition

.4 Removal and Salvage of Construction Materials

.5 Deconstruction of Structures

.6 Structure Moving

02 50 00 Site Remediation

.1 Physical Decontamination

.2 Chemical Decontamination

.3 Thermal Decontamination

.4 Biological Decontamination

.5 Remediation Soil Stabilization

02 60 00 Contaminated Site Material Removal

.1 Removal and Disposal of Contaminated Soils

.2 Hazardous Waste Recovery Processes

.3 Underground Storage Tank Removal

03 00 00 CONCRETE

03 10 00 Concrete Forming and Accessories

.1 Refer to Structural sketches.

03 20 00 Concrete Reinforcing

.1 Refer to Structural sketches

03 30 00 Cast-In-Place Concrete

.1 Refer to Structural sketches

04 00 00 MASONRY

04 01 00 Maintenance of Masonry

.1 Masonry Restoration : [_____].

.2 Masonry Cleaning: [_____].

04 05 00 Common Work Results for Masonry

.1 Masonry Mortar and Grout:

- .1 Mortar [and grout]: CAN/CSA-A179.
- .2 Colour: ground coloured natural aggregates or metallic oxide pigments. Colour [_____] [selected by Consultant]. Northern Pigment Extra Strong Mortar Colour, Interstar.
- .3 Mortar Types
  - .1 Loadbearing: Type [N] [S] [M] based on [Property] [Proportion] specifications.
  - .2 Non-loadbearing: Type [N] [S] based on [Property] [Proportion] specifications.
  - .3 Mortar for stonework: Type [N] based on [Property] [Proportion] specifications.
- .4 Schedule:
  - .1 White mortar: [glass block] [_____].
  - .2 Coloured mortar: [exterior masonry veneer] [_____].
  - .3 Non-staining mortar: [limestone] [_____].
  - .4 Waterproof mortar: [glazed masonry units].

.2 Masonry Anchorage and Reinforcing

- .1 Masonry Anchors:
  - .1 Exterior masonry veneer on concrete block backup: [galvanized] [stainless] steel, Fero Block Shear Connector Assembly.
  - .2 Exterior masonry veneer on steel stud backup: [galvanized] [stainless] steel, Fero Stud Shear Connector Assembly.
  - .3 Exterior masonry veneer on [wood] stud backup: [galvanized] [stainless] steel,Fero Rap-Tie System.
  - .4 Exterior masonry veneer on cast-in-place concrete backup: [galvanized] [stainless] steel, Fero Rap-Tie System.
- .2 Masonry Reinforcing Bars
- .3 Stone Anchors: [stainless steel].

.3 Masonry Accessories

.4 Exterior wall sheathing paper: to CAN/CGSB-51.32 [single ply] [laminated] [spunbound olefin] type [coated] [impregnated].
.1 Acceptable material: [Tyvek Commercial Wrap] [Typar] [R-Wrap]

.5 Control joint fillers and sealants: as specified in Section [07 92 00 - Joint Sealing].

.6 Mortar net: fabricated of recycled polyester or high-density polyethylene, 90 percent open mesh weave. Complete with bottom strip. Provide in thickness to fit masonry cavity.
.1 Acceptable material: Mortar Net.

.7 Weep hole vents: purpose-made of flexible injection moulded PVC, offset 'T' shape with slotted head for inserting in head joint.
.1 Acceptable material: Williams-Goodco Brick Vent, available from Williams Products Inc, 1-800-521-9594.

.8 Masonry flashing: self-adhesive sheet membrane consisting of rubberized asphalt bonded to high-density polyethylene film, nominal [1.0 mm] [40 mils] overall thickness. Use primers and mastic sealants of type recommended by membrane manufacturer.
.1 Acceptable material: Grace Perm-A-Barrier Wall Flashing; Bakor Blueskin TWF; Soprema Sopraseal Stick 1100 T.

.9 Metal drip edge: fabricated of [galvanized] [prefinished] steel sheet as specified in Section [07 62 00 - Metal Flashing and Trim]. Base metal thickness minimum [0.6 mm (24 MSG)] [24 MSG]. Brake formed to profile, with [6 - 9 mm] [1/4" - 3/8"] formed drip at front edge, and extending minimum [100 mm] [4"] under masonry base course.

04 20 00 Unit Masonry

.1 Brick Masonry:
.1 Face brick: [_____].

.2 Concrete Masonry Units (Concrete Block)
.1 Standard concrete masonry units: to CAN/CSA-A165 Series (A165.1),
.1 Exposed corners for [walls and partitions]: [square] [bullnosed].
.2 Exposed corners at [door,] [window,] and [wall] openings: [square] [bullnosed].
.2 Special fire resistant concrete masonry units: to CAN/CSA-A165 Series (A165.1) for fire resistant rated walls and partitions.

05 00 00 METALS

05 10 00 Structural Metal Framing

.1 Structural Steel for Buildings: Refer to sketches

05 20 00 Metal Joists

.1 Steel Joist Framing: Refer to sketches

05 30 00 Metal Decking

.1 Steel Decking: Refer to sketches

07 00 00 THERMAL AND MOISTURE PROTECTION

07 01 50.81 Roof Replacement

.1 Section Includes.

.1 Re-roofing existing roof.

.2 Materials.

07 11 13 Bituminous Dampproofing

.1 Summary

.1 Bituminous dampproofing to perimter [foundation walls] [and] [grade beams].

.2 Materials:

.1 Bituminous damproofing:

.1 For application and curing at temperatures above 5°C: [Bakor] [700-01] [710-07] [710-11] or equivalent.

.2 For application and curing temperatures above 0°C but below 5°C: [Bakor] [710-

.2 Protection board: insulating fibreboard thickness [9 mm] [3/8"] [12 mm] [1/2"] [indicated].

.3 Drainage board composite: [_____].

.3 Execution:

.1 Applied full coverage on [grade beams] [foundation walls] to a point not less than [200 mm] [8"] [above] [below] finished graded.

.2 [Protection] [drainage] board installed over dampprofing as protection from fill materials.

07 13 26 Self-Adhering Sheet Waterproofing

.1 General.

.1 Section includes: self-adhesive bituminous sheet membrane waterproofing for

.2 Products

.1 Self-adhesive sheet waterproofing: modified bitumen prefabricated sheet, non-woven polyester reinforcing, thickness [1.5 mm] [60 mils] (minimum), top surface polyethylene film, bottom surface polyethylene release sheet.

.1 Acceptable material: WR Grace Bituthene 3000, Soprema Colphene 3000, W.R. Meadows Mel-Rol, IKO Aquabarrier FP, Bakor Blueskin WP 200.

.2 Primer: type recommended by manufacturer, applicable for substrate, [water based]. [Solvent based primer is acceptable only when ambient and surface temperatures fall below manufacturer's recommended limits for water based primers.]

.3 Protection board: insulating fibreboard: to CAN/ULC-S706, Type I, thickness [indicated].

.3 Execution.

.1 Prepare and prime surfaces, and install membranes in accordance with manufacturer’s instructions.

.2 On vertical surfaces install sheets vertically with minimum number of end joints.

.3 On foundation walls apply membrane full height of wall extending down to bottom edge of beam [and carry out over to edge of footing].

.4 Grade beams: apply membrane full height of beam extending down to bottom edge of beam [and carry out over to edge of footing].

.5 Install protection board against all waterproofing membranes that are not covered by board insulation.

07 26 00 Vapour Retarders – Polyethylene Sheet

.1 General.

.1 References

.1 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

.2 Canadian Construction Materials Centre (CCMC)

.2 Products:

.1 Sheet vapour retarder: polyethylene film to CAN/CGSB 51.34, [0.15 mm (6 mil)] [6 mil] thick, CCMC listed, [EcoLogo certified] [containing minimum [50 %] [recycled content], [VOC content] [___].

.2 Joint sealing tape: air resistant pressure sensitive adhesive tape, [cloth fabric duct tape] [type recommended by vapour retarder manufacturer], [50 mm] [2"] wide for lap joints and perimeter seals, [25 mm] [1"] wide elsewhere.

.3 Sealant: acoustical sealant.

.3 Execution.

.1 Install sheet vapour retarder on warm side of exterior [wall,] [ceiling] [and] [floor] assemblies prior to installation of gypsum board or paneling to form continuous retarder.

07 27 13 Air Barriers: Modified Bituminous Sheet

.1 General

.1 Quality Assurance

.1 NABA Quality Assurance Program: Conform to requirements of the Air Barrier Quality Assurance Program used by NABA.

.2 Installers shall be NABA Certified.

.2 Products.

.1 Self-adhesive air barrier membrane: modified bitumen on high-density polyethylene film, with silicone release paper on adhesive side, nominal thickness [1.0 mm (40 mils)].

.1 Acceptable material: Soprema Sopraseal Stick 1100; Bakor Blueskin SA; Grace Perm-A-Barrier; IKO Aquabarrier AVB, W.R. Meadows Air-Shield; Carlisle Coatings and Waterproofing CCW-705 Air & Vapor Barrier.

.3 Execution.

.1 Prepare and prime substates and install membrane air barrier in accordnce with manufacturer’s instructions.

.2 Apply with good construction practice to maintain continuity of air barrier membrane over building elements.

.3 Field Quality Control.

.1 Air barrier installation shall be inspected by an independent inspection agency appointed by the [Consultant].

.2 The building, when complete, shall be subject to air leakage testing by an independent testing agency appointed by the Consultant.

.3 Cost for inspection [and] [testing] shall be paid by [Owner] [cash allowance].

Fire Stopping

.1 Products:

.1 Fire stopping and smoke seal systems: in accordance with ULC S115. Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ULC-S115 and not to exceed opening sizes for which they are intended. Certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19 (series) under Label Service of ULC.

.2 Execution

.1 Fire stopping and smoke seal materials and components installed in accordance with ULC certification and manufacturer's instructions.

Joint Sealers

.1 Products:

.1 Sealants (caulking):

.1 Urethane One Part, Non-Sag: exterior vertical joints.
.2 Urethane, One Part, Self-Leveling: exterior horizontal joints (paving).
.3 Urethanes, Two Part, Non-Sag: exterior vertical joints.
.4 Urethanes, Two Part, Self-Leveling: exterior horizontal joints (paving).
.5 Acrylic, One Part: interior caulking..
.6 Silicone, One Part, Mildew Resistant. Bathroom fixtures, wet areas, countertops.

.2 Expanding foam sealants

.1 Vertical joints below grade in foundation walls and grade beams: Emseal 20H System.
.2 Vertical joints above grade in exterior walls: secondary seal requiring primary seal of wet caulking. Emseal Greyflex.
.3 Vertical joints above grade in exterior walls: Emseal Colorseal.

Gypsum Board

.1 Materials

.1 Gypsum board

.1 Standard board: to ASTM C1398 regular and fire rated.
.2 Water resistant board: to ASTM C1396, regular and fire rated.
.3 Water resistant tile backer board: to ASTM C1178, regular and fire-rated. GP Gypsum Dens-Shield.
.4 Glass mat gypsum board sheathing: to ASTM C1177, regular and fire-rated, GP Gypsum DensGlass Gold; BPB GlasRoc.
.5 Abuse resistant gypsum board: to ASTM C1278, fiber-reinforced gypsum panels, standard and fire rated, CGC Fiberock [AR] [VHI] [Diamond Veneer Plaster] finish.

.2 Reinforced cement board: aggregated Portland cement board with vinyl-coated, woven glass-fibre mesh embedded in front and back surfaces,

.1 Interior applications: Wonderboard, Durock, Latapanel, HardiBacker 500.
.2 Exterior applications: Wonderboard; Duracrete, Latapanel.

.3 Metal furring, runners, hangers, tie wires, inserts, anchors: to ASTM C1280, galvanized

.4 Screws: to ASTM C1002, corrosion resistant for [water resistant board] [tile backer board] [exterior sheathing]. Nails not permitted.

.5 Casing beads, corner beads fill type: to ASTM C1047, [zinc coated sheet steel] [plastic].

.6 Acoustic insulation: mineral fibre batt and blanket insulation to CAN/ULC-S702, Type 1.

.2 Installation:

.1 Metal furring, suspended ceilings: to ASTM C840.

.2 Gypsum board: to ASTM C840.

.3 Gypsum sheathing board: to ASTM C1280.

.4 Fire rated assemblies: Type X (fire rated) gypsum board to obtain fire ratings indicated.

.5 Gypsum board finishing:

.1 Taping and filling to ASTM C840.

.2 Gypsum Board Finish Levels:

.1 Finish levels as defined in Gypsum Association GA-214, Recommended Levels for Gypsum Board Finish.

.2 Where a fire resistance rating is required for the gypsum board assembly, details of construction and finishing shall be in accordance with reports of fire tests of assemblies that have met the fire-rating requirement, regardless of the finish level specified below.

Level	Location
0	temporary construction; and behind solid paneling where fire or smoke seal is not required.
1	above finished ceilings, pleneum areas, attics, building service corridors and other areas not normally open to public view
2	backer board for ceramic tile; and in unfinished spaces (excluding service spaces)
3	behind medium to heavy duty texture finish and semi-rigid wall coverings
4	where gypsum board is to be painted with flat, eggshell or satin paint; and gypsum board behind light-duty wall coverings and texture finishes.
5	Where gypsum board finish is painted with semi-gloss or gloss paint; and in [(locations)].

.3 Remedial work: existing gypsum board, metal furring patched and repaired for alteration and renovation work with match materials.

10 00 00 SPECIALTIES

Pedestrian Control Devices

.1 Portable posts and railings:

.2 Turnstiles

.3 Rotary gates:

11 00 00 EQUIPMENT

Parking Control Equipment

.1 Automated Key and Card Control Units

.2 Parking Gates

.3 Coin Machine Units

.4 Ticket Dispensers

21 00 00 FIRE SUPPRESSION

.1 Refer to [Mechanical Outline Specification].

22 00 00 PLUMBING

.1 Refer to [Mechanical Outline Specification].

23 00 00 HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

.1 Refer to [Mechanical Outline Specification].

25 00 00 INTEGRATED AUTOMATION

.1 Refer to [Mechanical Outline Specification].

26 00 00 ELECTRICAL

.1 Refer to [Electrical Outline Specification].

27 00 00 COMMUNICATIONS

.1 Refer to [Electrical Outline Specification].

28 00 00 ELECTRONIC SAFETY AND SECURITY

.1 Refer to [Electrical Outline Specification].

31 00 00 EARTHWORK

31 10 00 Site Clearing

.1 Clearing and Grubbing

.2 Selective Clearing

.3 Earth Stripping and Stockpiling

31 20 00 Earth Moving

.1 Off-Gassing Mitigation
- .1 Radon Mitigation
- .2 Radon Venting
- .3 Methane Mitigation
- .4 Methane Venting

31 22 00 Grading

.1 Rough Grading

31 23 00 Excavation and Fill

.1 Excavation and Backfilling for Buildings
- .1 Description: excavation for building foundations, [basements] [crawl space].
- .2 Fill Materials:
  - .1 Granular fill Type 1: granular
  - .2 Earth fill: native clay
- .3 Backfilling and Compaction
  - .1 Perimeter foundation walls: granular fill, compacted to 98 %

Piling

.1 Cast-in-place concrete friction piles

Paving and Surfacing

For paving and surfacing specify granular base and sub-base materials, and surfacing materials. Refer to soils investigation report if available.

.1 Roadways and Parking Lots
- .1 Asphalt Concrete Paving
- .2 Concrete Paving
- .3 Granular Paving
- .4 Unit Pavers

.2 Parking lot curbs and gutters

.3 Pavement Markings

.4 Traffic Barriers

.5 Parking Lot Signage

32 00 00 EXTERIOR IMPROVEMENTS

Landscaping

.1 Topsoil and Sodding:

.2 Trees, Shrubs and Ground Covers

.3 Planting Accessories

.4 Irrigation Systems

Site Development

.1 Fountains

.2 Fences and Gates

40 00 00 PROCESS INTEGRATION

41 00 00 MATERIAL PROCESSING AND HANDLING EQUIPMENT

42 00 00 PROCESS HEATING, COOLING, AND DRYING EQUIPMENT

43 00 00 PROCESS GAS AND LIQUID HANDLING, PURIFICATION, AND STORAGE EQUIPMENT

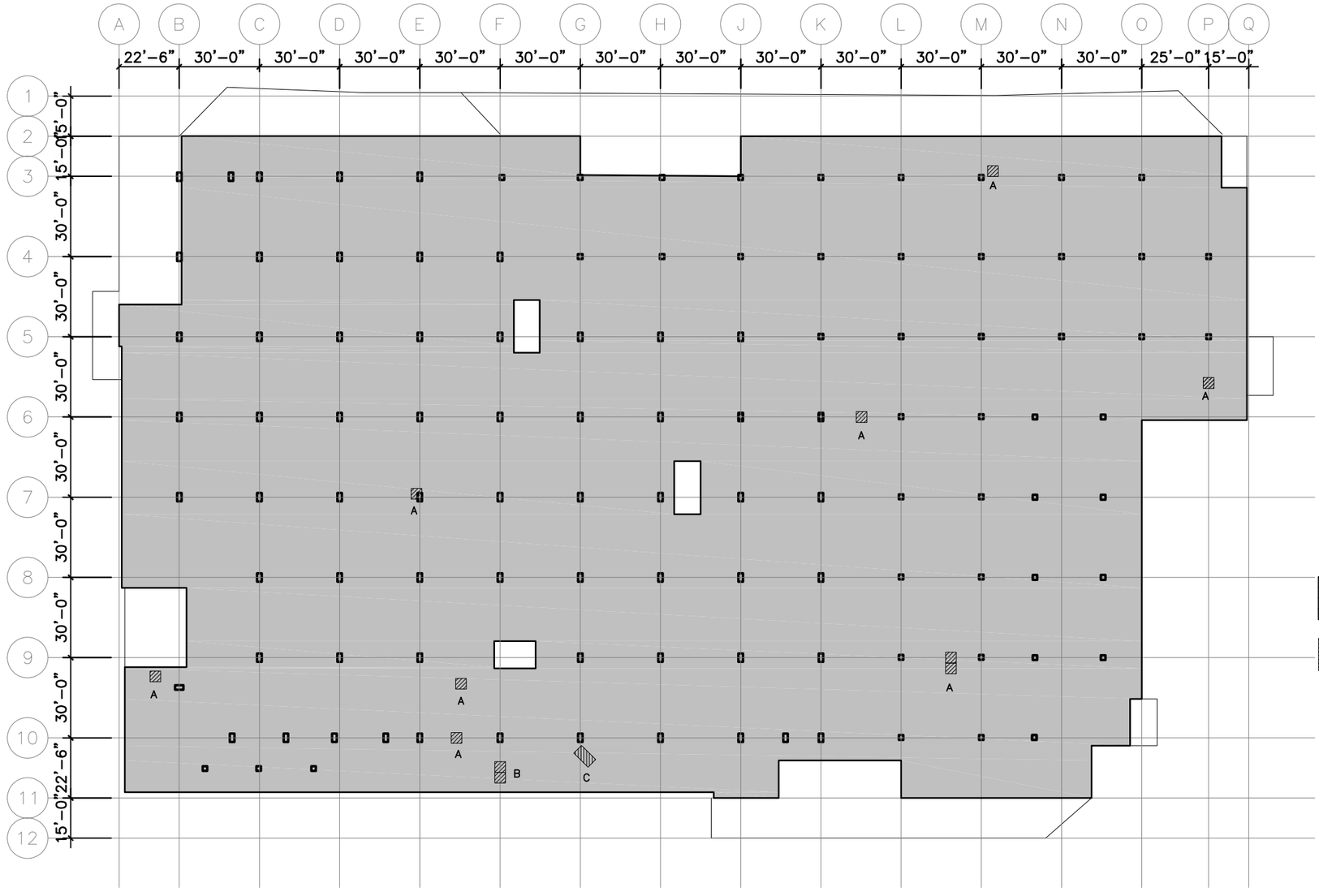
44 00 00 POLLUTION AND WASTE CONTROL EQUIPMENT

45 00 00 INDUSTRY-SPECIFIC MANUFACTURING EQUIPMENT

46 00 00

48 00 00 ELECTRICAL POWER GENERATION

KEY PLAN
UNDERGROUND PARKADE



APPROXIMATE SF	
A	2 S.F.
B	4 S.F.
C	4–6 S.F.

UNDERSIDE DEFICENCY
APPROX. 2 SF EA

1
S–101

SHORT TERM REPAIRS
UNDERSIDE ROOF SLAB
1/46"=1'–0"

ORIGINAL SHEET - ANSI B

2023-10-16
115422032

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Legend

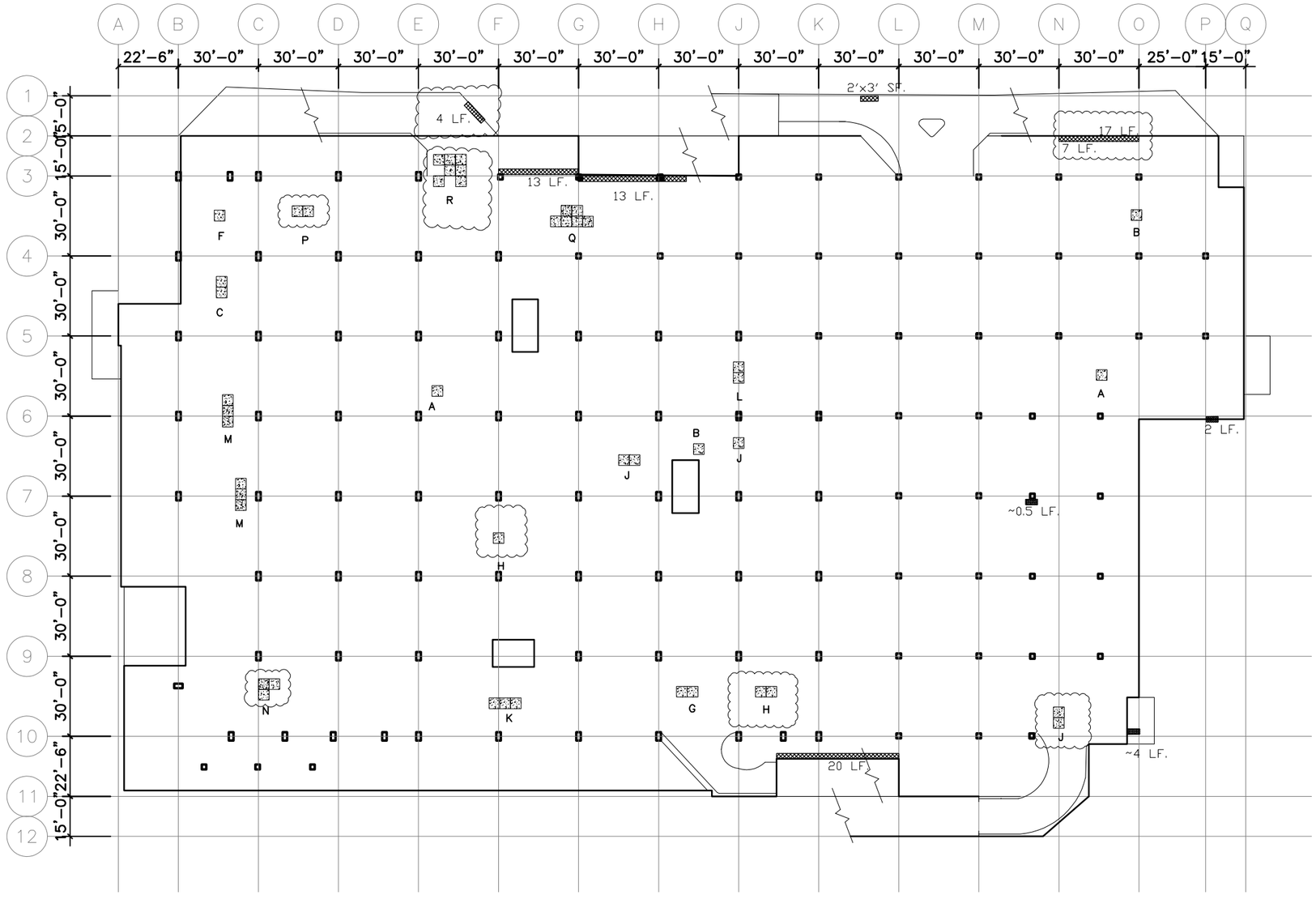
Notes

Client/Project
MILLENNIUM LIBRARY PARKADE
REHABILITATION

Figure No.
S-101

Title
SHORT TERM REPAIRS
UNDERSIDE ROOF SLAB

KEY PLAN
UNDERGROUND PARKADE



APPROXIMATE SF	
A	1 S.F.
B	2 S.F.
C	3 S.F.
D	4 S.F.
E	5 S.F.
F	6 S.F.
G	8 S.F.
H	9 S.F.
J	12 S.F.
K	15 S.F.
L	16 S.F.
M	18 S.F.
N	20 S.F.
P	21 S.F.
Q	60 S.F.
R	91 S.F.

MEMBRANE DEFICENCY

FULL DEPTH REPAIR
APPROX. 170 SF

P1 WALL DEFICENCY
APPROX. 86.5 LF

CY

1
S-102

SHORT TERM REPAIRS
TOPSIDE P1 SLAB
1/46"=1'-0"

ORIGINAL SHEET - ANSI B

2023-10-16
115422032

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2023/10/16 11:33 AM By: Auld, Chris

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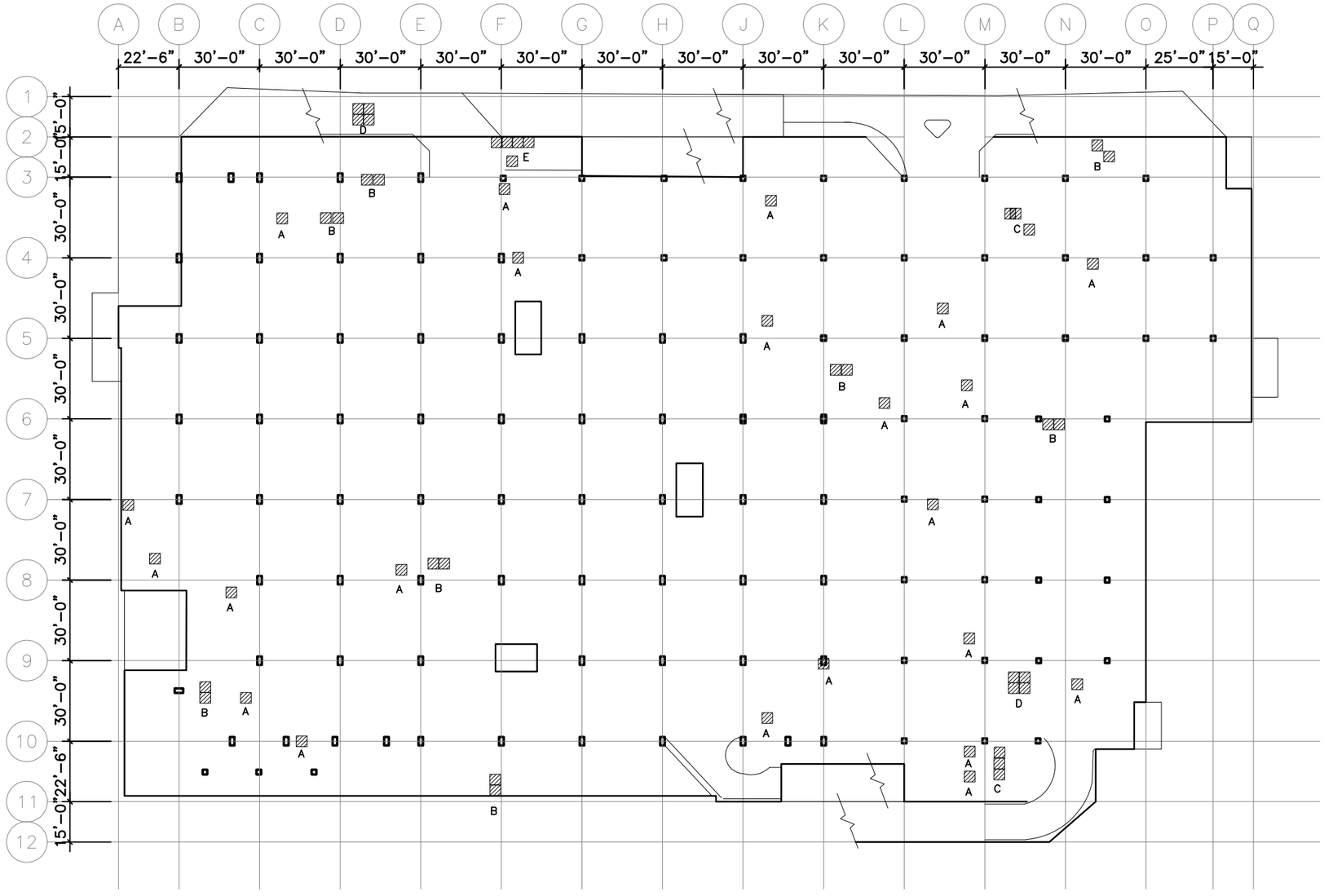
Client/Project
MILLENNIUM LIBRARY PARKADE
REHABILITATION

Figure No.
S-102

Title
SHORT TERM REPAIRS
TOPSIDE P1 SLAB

KEY PLAN
UNDERGROUND PARKADE



APPROXIMATE SF	
A	2 S.F.
B	4 S.F.
C	6 S.F.
D	8 S.F.
E	10 S.F.

UNDERSIDE DEFICENCY
APPROX. 2 SF EA

1
S-103

SHORT TERM REPAIRS
UNDERSIDE P1 SLAB
1/46"=1'-0"

ORIGINAL SHEET - ANSI B

2023-10-16
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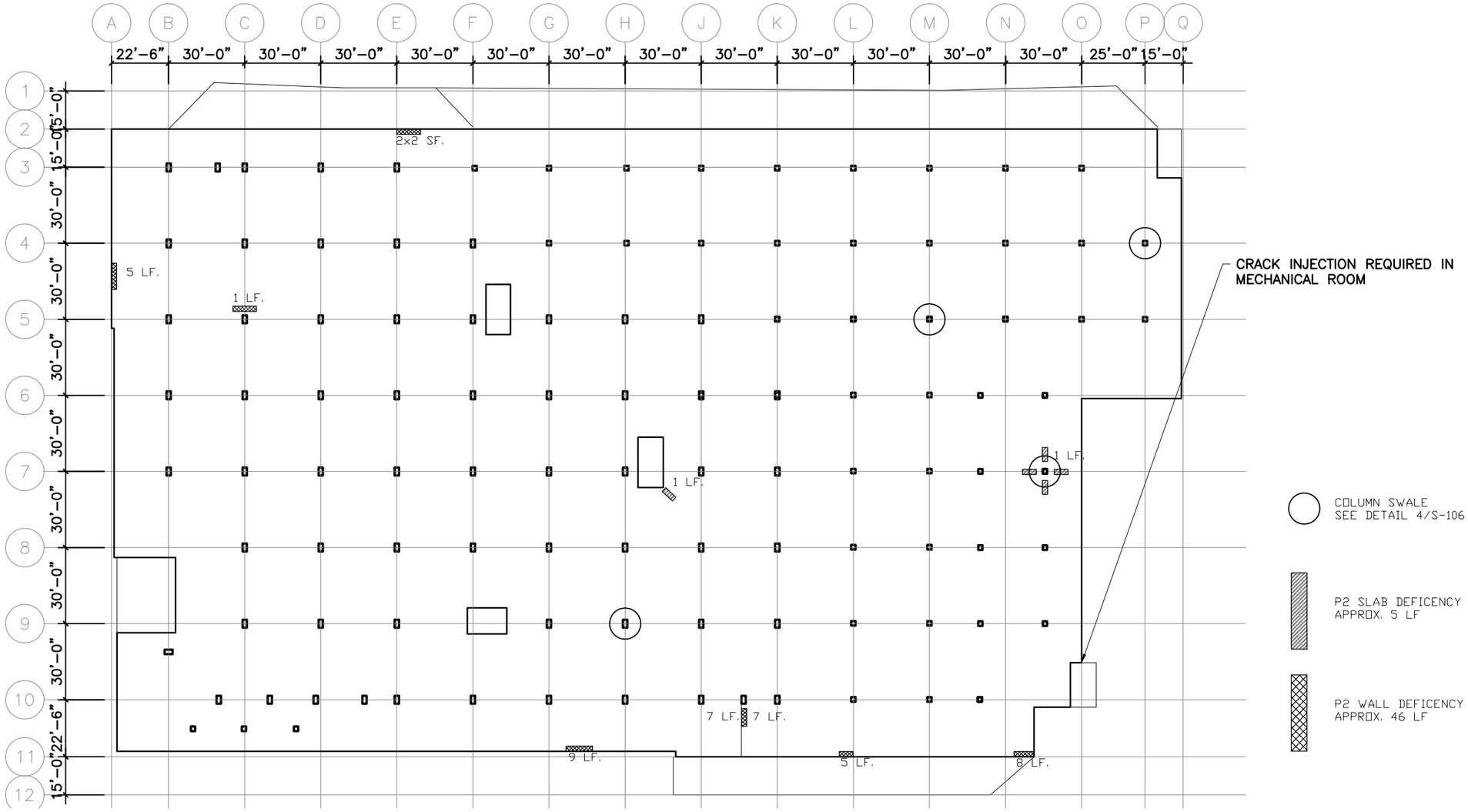
Client/Project
MILLENNIUM LIBRARY PARKADE
REHABILITATION

Figure No.
S-103

Title
SHORT TERM REPAIRS
UNDERSIDE P1 SLAB

KEY PLAN
UNDERGROUND PARKADE



1 / S–104 SHORT TERM REPAIRS TOPSIDE P2 SLAB
1/46"=1'–0"

Legend

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Client/Project
MILLENNIUM LIBRARY PARKADE REHABILITATION

Figure No.
S-104

Title
SHORT TERM REPAIRS TOPSIDE P2 SLAB

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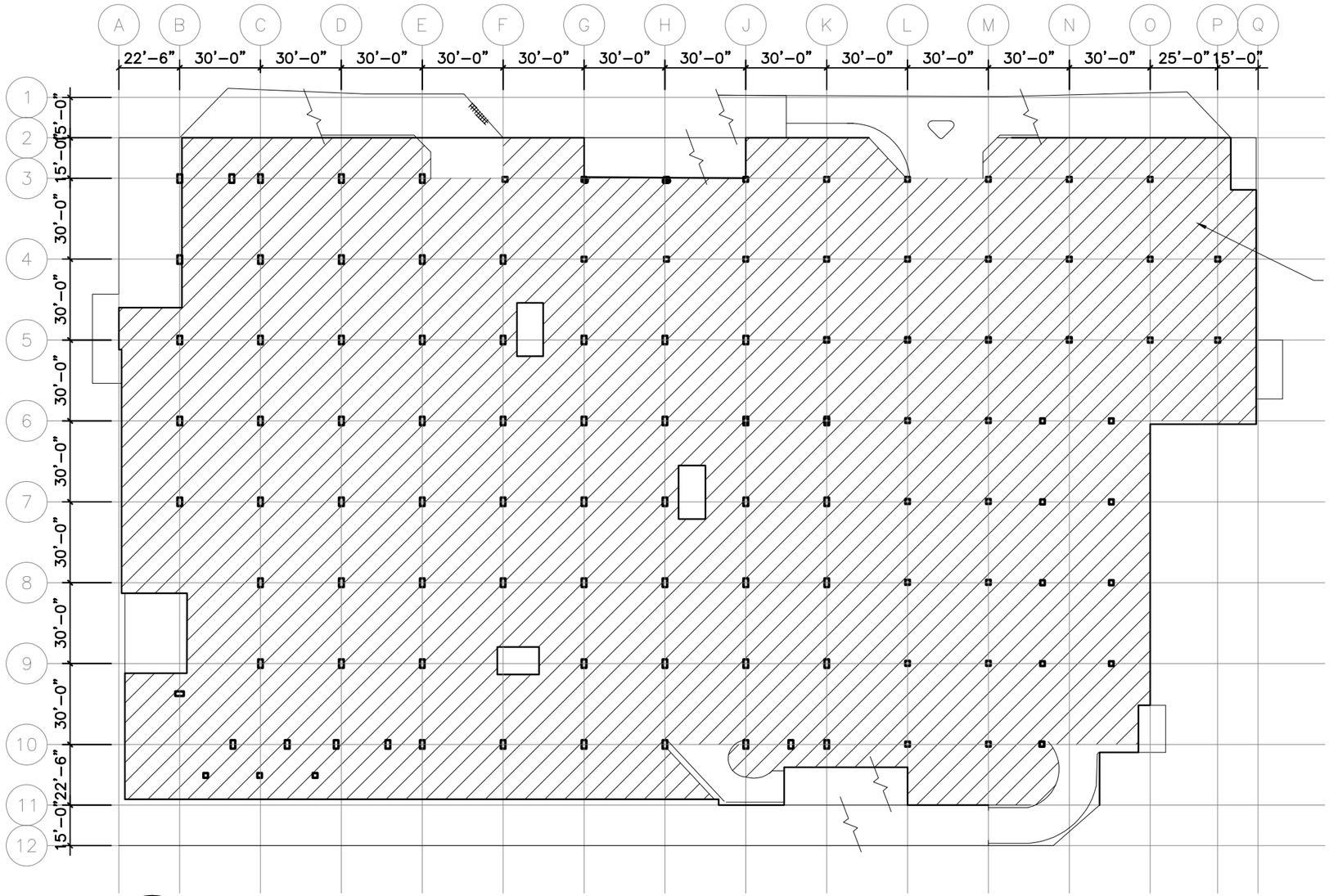
2023/10/16 11:35 AM By: Auld, Chris
ORIGINAL SHEET - ANSI B
2023-10-16
115422032

KEY PLAN
UNDERGROUND PARKADE



1 / S-105 P1 SURFACE REMOVAL, RESURFACING, WATERPROOFING
1/46"=1'-0"

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2023/10/16 11:40 AM By: Auld, Chris

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Client/Project
MILLENNIUM LIBRARY PARKADE REHABILITATION

Figure No.
S-105

Title
P1 SURFACE REMOVAL, RESURFACING, WATERPROOFING

KEY PLAN
UNDERGROUND PARKADE

INSTALL NEW TRAFFIC MEMBRANE ON ALL RAMPS

HYDRODEMOLISH 3" OF P1 SLAB AND REPLACE WITH 3" CONCRETE INSTALL NEW TRAFFIC MEMBRANE SEE DETAIL 3/S-107

A B C D E F G H J K L M N O P Q
22'-6" 30'-0" 30'-0" 30'-0" 30'-0" 30'-0" 30'-0" 30'-0" 30'-0" 30'-0" 30'-0" 30'-0" 30'-0" 25'-0" 15'-0"
1 2 3 4 5 6 7 8 9 10 11 12
15'-0" 30'-0" 30'-0" 30'-0" 30'-0" 30'-0" 30'-0" 22'-6" 15'-0"

1 / S-106 P1 SURFACE REMOVAL, RESURFACING, SLAB & RAMP WATERPROOFING
1/46"=1'-0"

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2023/10/16 11:53 AM By: Auld, Chris

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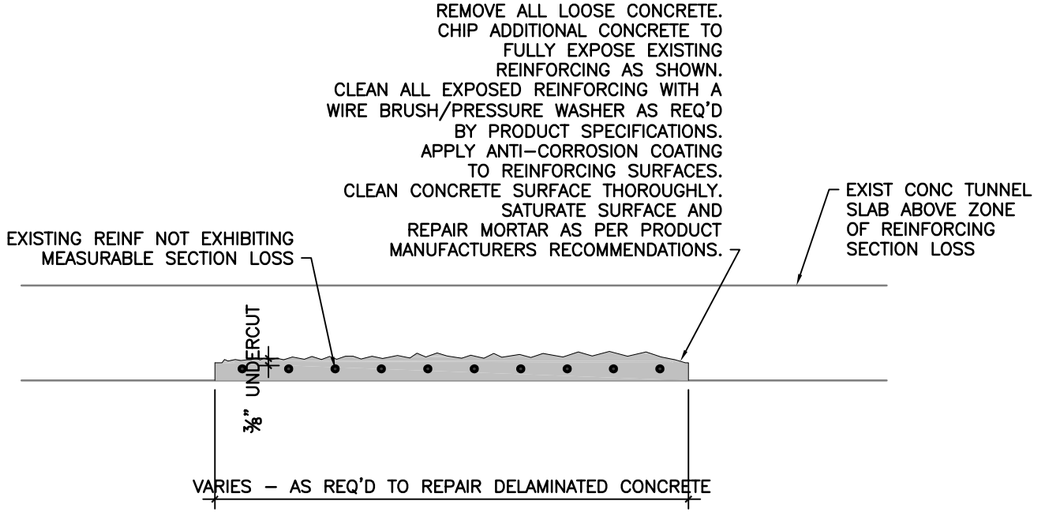
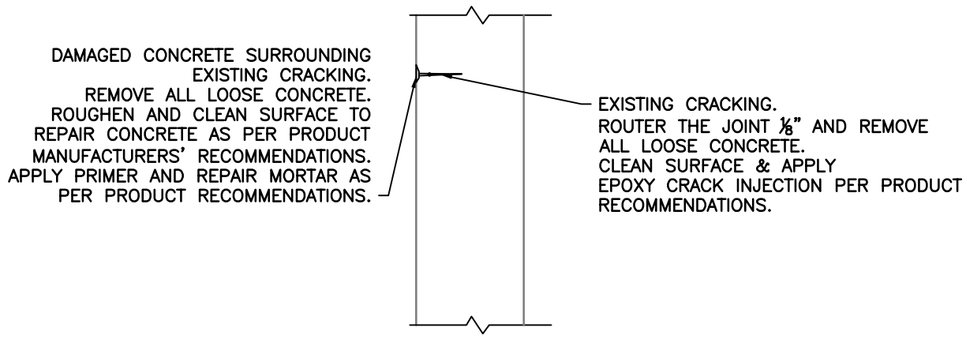
Client/Project
MILLENNIUM LIBRARY PARKADE REHABILITATION

Figure No.
S-106

Title
P1 SURFACE REMOVAL, RESURFACING, SLAB AND RAMP WATERPROOFING



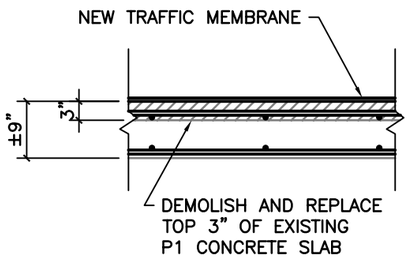
1 S–107 CONC REPAIR REINF SECTION
NTS



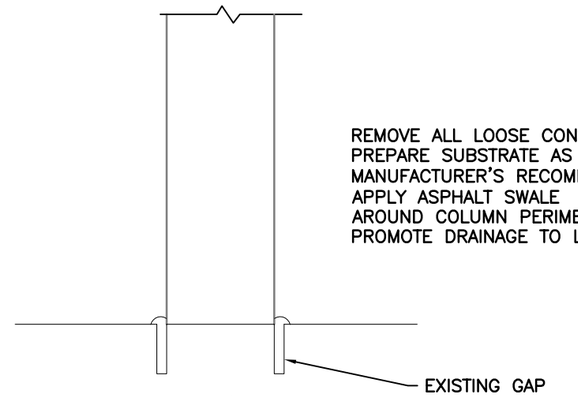
SECTION

2 S–107 CRACK REPAIR
NTS

REMOVE ALL LOOSE CONCRETE.
CHIP ADDITIONAL CONCRETE TO
FULLY EXPOSE EXISTING REINFORCING
AS SHOWN.
CLEAN ALL EXPOSED REINFORCING WITH A
WIRE BRUSH/PRESSURE WASHER AS REQ'D
BY PRODUCT SPECIFICATIONS.
APPLY ANTI-CORROSION COATING
TO REINFORCING SURFACES.
CLEAN CONCRETE SURFACE THOROUGHLY.
SATURATE SURFACE AND
REPAIR MORTAR AS PER PRODUCT
MANUFACTURERS RECOMMENDATIONS.
REPLACE DETERIORATED OR DAMAGED
REINFORCING AS REQ'D W/ 15M REBAR.
INSTALL NEW TRAFFIC MEMBRANE AS PER
MANUFACTURERS RECOMMENDATIONS.



3 S–107 CONCRETE SLAB RESURFACING
NTS



SECTION

4 S–107 COLUMN SWALE
NTS

ORIGINAL SHEET - ANSI B

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2023/10/16 11:48 AM By: Auld, Chris

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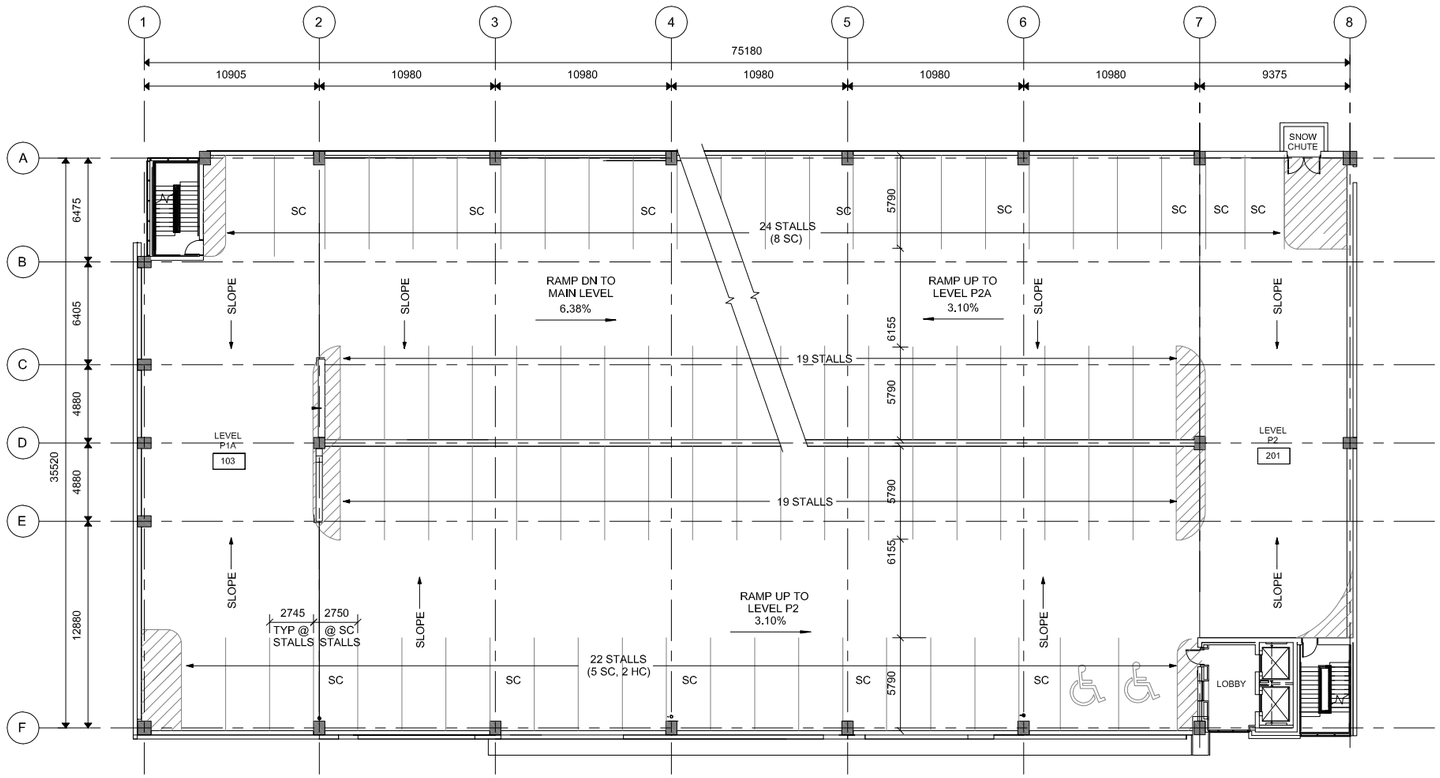
Client/Project
MILLENNIUM LIBRARY PARKADE
REHABILITATION

Figure No.
S-107

Title
REPAIR DETAILS

KEY PLAN
UNDERGROUND PARKADE



PARKADE CONCEPT PLAN VIEW

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Client/Project
MILLENNIUM LIBRARY PARKADE REHABILITATION

Figure No.
AS-101

Title
DEMOLISH EXISITING PARKADE AND BUILD NEW PARKADE

APPENDIX E – OUTLINE SPECIFICATION FOR OPTIONS

Stantec

PRELIMINARY PROJECT DESCRIPTION (PPD)

Millennium Library Parkade
Feasibility Study
Deliverable 2 - (Four Options)
251 Donald Street
Winnipeg, Manitoba

Option 2A:
Demolish Parkade and Construct New Parkade

Option 2B:
Close and Demolish Parkade

Option 2C:
Sell Parkade

Option 2D:

Repairs

Submitted for Class D Costing:
October 4, 2022

Prepared for:
City of Winnipeg

Prepared by:
Stantec Consulting Ltd.

Project Number:
115422032

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Table of Contents

INTRODUCTION

10 PROJECT DESCRIPTION

1010 Project Summary

1010.10 Summary of Work

.1 Demolish Parkade and Construct New Parkade (Option 2A)

.2 Close and Demolish Parkade (Option 2B)

.3 Sell Parkade (Option 2C)

1020 Project Criteria

1020.10 Code Analysis

.1 Comply with the Manitoba Building Code (MBC), National Building Code of Canada (NBCC) with Manitoba Amendments, the Manitoba Energy Code for Buildings (MECB), the National Fire Code (NFC), latest editions, including all amendments, the Building By-Laws of the City of Winnipeg and other codes of provincial, territory, or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

1030 Existing Conditions

1030.10 Assessment- Refer to previous report (Appendix A)

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A DEMOLISH PARKADE AND CONSTRUCT NEW PARKADE (OPTION 2A)

A0010 Parkade Demolition

.1 Demolish P1 slab and main floor.

.2 Infill demolished portion with compacted granular to 98% compaction in 150 mm lifts

.3 Compact granular to grade, slope granular to edges of property to promote drainage, crown to be 300 mm of 1% grade.

.4 Make good for future user. Future use undefined.

.5 Refer to sketches for demolition requirements and extents

.6 Demolish P1 slab, columns, and main floor slabs

.7 Basement slab (P2) shall be removed.

.8 Old piling shall be noted and recorded for future use.

.9 Perimeter concrete walls to remain and will be shored during parkade demolition.

.10 All structure below library to remain and connected to new foundation wall.

.11 Parkade ramps to be demolished.

A0020 Foundations

A0020.10 New Foundation Wall System

.1 Construct new reinforced concrete wall supported by new piling.

.2 700 mm-800 mm diameter piles 8 m long drilled to refusal, spaced at 3 m o/c.

.3 Pile cap below wall to be approximately 1 200 high by 900 mm wide along axis of wall.

.4 Reinforced Concrete walls approximately 6m high and 300 mm thick. Total length approximately 120 m.

.5 Concrete to be 35 MPa, HS concrete.

.6 Void form to be 150 mm.

A0020.20 Pile Foundations

.1 Piling to be pre-cast concrete 400 mm diameter hex piles below parkade main columns.

.2 Hex piles estimated to be 14 m long.

.3 Pile caps below main columns to be 1.2 m by 2.4 m by 2.4 m reinforced concrete.

A0030 Substructure and Superstructure

A0030.10 New Pre-Cast Concrete Parkade

.1 Parkade to be pre-cast reinforced concrete, leger beams, double tees, concrete shear walls, aluminum curtainwall framing and vision glass panels at stairwells, stairs to be steel pan, concrete filled.

.2 Concrete to be 35 MPa, HS concrete.

.3 Traffic membrane across each parkade level.

.4 Parkade to hold approximately 480 cars, 80 cars for each level, six levels.

.5 Main Floor to be prepared for future (retail) tenant(s).

A0030.20 Overhead Walkway to Police Headquarters Building (East Side)

.1 New truss style overhead walkway from new parkade to Police Headquarters Building approximately 5 m above grade.

.2 New drilled pile foundation beside police building to support new concrete hammerhead support.

.3 Hammerhead support to be reinforced concrete, 900 by 1 200 mm wide, column to be round 900 mm diameter from underside of walkway to grade.

.4 Below grade new drilled pile approx. 900 mm diameter by 8 m long.

.5 All concrete to be reinforced.

.6 Walkway to be 3 m wide steel truss style with concrete slab on metal deck.

.7 Connection to Police Headquarters Building to be watertight but will have a flex connection to permit some movements between truss and building.

A0030.30 Overhead Walkway to Library Entrance (West Side)

.1 New truss style overhead walkway from new parkade to library entrance approximately 5 m above grade.

.2 New drilled pile foundation beside library entrance to support new concrete hammerhead support.

.3 Hammerhead support to be reinforced concrete, 900 by 1 200 mm wide, column to be round 900 diameter from underside of walkway to grade.

.4 Below grade pre-cast piling to refusal, 400 mm Hex 14 m long.

.5 All concrete to be reinforced.

.6 Walkway to be 3 m wide steel truss style with concrete slab on metal deck.

.7 Transfer Hub: New two storey reinforced concrete and glass structure including new passenger elevator and steel pan stair to permit vertical pedestrian transportation from overhead walkway to main floor. Approximate size of transfer hub to be 6 m by 6 m by 10 m tall. Structure supported on pre-cast piles. Exact location to be determined.

A0030.40 Typical Floor Construction

.1 Pre-cast concrete.

A0030.50 Roof Construction

.1 Parking Areas:

.1 Pre-cast concrete.
.2 Area: 3200 m^2.
.3 Vertical Circulation:
.1 Steel deck.
.2 Area: 100 m^2.

A0030.60 Framing Construction

.1 Column Supports:
.1 Pre-cast double tee concrete columns.
.2 Approximately 3.6 m width.

A0030.70 Stairs

.1 Stair Construction:
.1 Concrete filled steel pan stairs.
.2 Painted metal flat bar guard rail welded to stair stringer.
.3 Painted metal pipe hand rail welded to guard.

A0040 Shell

A0040.10 Exterior Vertical And Horizontal Enclosures

.1 Vertical Circulation:
.1 Exterior Wall Construction
.1 Aluminum Curtainwall Framing
1. Combination of vision and spandrel glazing panels
.2 Aluminum Composite Panel Rainscreen System
1. Concrete Masonry Unit
2. Vapour Impermeable Air Barrier Membrane
3. Mineral Wool Board Insulation
4. Thermally Broken Façade Substructure
.2 Roof Construction
.1 Modified Bituminous Membrane Roofing
1. 2-ply SBS Roofing Membrane
2. Sloped insulation
3. Vapour Impermeable Air Barrier Membrane
4. Exterior Sheathing
.2 Parking Areas
.1 Exterior Wall Construction
.1 Precast Concrete Panels
.3 Overhead Walkways
.1 Exterior Wall Construction
.1 Aluminum Curtainwall Framing
1. Combination of vision and spandrel glazing panels

.2 Roof Construction

.1 Modified Bituminous Membrane Roofing

1. 2-ply SBS Roofing Membrane
2. Sloped insulation
3. Vapour Impermeable Air Barrier Membrane
4. Exterior Sheathing

.3 Soffit Construction

.1 Aluminum Composite Panel Rainscreen System

1. Steel Stud Framing
2. Vapour Impermeable Air Barrier Membrane
3. Mineral Wool Board Insulation
4. Thermally Broken Façade Substructure

A0050 Services

A0050.10 Conveying

.1 Vertical Conveying Systems

.1 Elevators

.2 New machine room-less traction passenger elevator to be constructed with new stair at Transfer Hub adjacent to Donald Street. Elevator to accommodate 6-8 people.

.3 New machine room-less traction passenger elevator in parkade to be constructed with new stair. Elevator in parkade to accommodate 6-8 people.

A0050.20 Plumbing

.1 Allowance for 8 parkade area drains on each level (floor topping to be pitched to drain), roadway weight capacity, built in grit interceptors. All drainage lines to be insulated and heat traced, including risers to sewer connection.

.2 Elevator pit and weeping tile pits to be included in drainage system.

.3 Drainage piping for rooftop mechanical equipment on roof of elevator lobby space.

.4 Allowance for one barrier free, non-public W/C and caretaking space for attendant(s).

A0050.30 Fire Protection

.1 Dry sprinklers throughout with wet standpipes in heated stairwells. Fire department connections at each level.

A0050.40 Heating, Ventilation, And Air Conditioning (HVAC)

.1 Heating, Ventilation, and Air Conditioning in elevator lobbies for each floor. Assume one rooftop unit c/w heating, cooling, and ventilation for 15 tons, 6,000 CFM, 650 MBH heating, natural gas fired 10:1 turndown, five stage cooling.

.2 Assumed all levels above grade, naturally ventilated, automatic parkade entry / exit (no personnel required in an attendant booth).

.3 Exhaust for one non-public W/C and caretaking space connected to elevator lobby HVAC system.

.4 Fire dampers as required by Code.

A0050.50 Electrical

.1 General Electrical Requirements

.1 Electrical systems shall be in compliance with the current editions of the Canadian Electrical Code, National Building Code of Canada, and requirements of the Local Authorities Having Jurisdiction.

.2 Minimum wire size will be #12. Minimum conduit size will be 21mm.

.3 Panels will be identified with laminated phenolic nameplates.

.4 Arc flash labelling will be provided on all electrical equipment required in accordance with CEC and CSA Z462.

.5 All electrical materials specified will be ULC listed, or CSA approved for the application

.2 Building Power Distribution

.1 The new building will be serviced underground from a pad-mounted utility transformer located adjacent to the building.

.2 From the utility transformer secondary side, power service will be routed underground to an 1200A 347/600V-3Ph-4W customer service termination enclosure (CSTE) complete with utility metering. From the CSTE, service conductors will feed an 1200A 347/600V, 3-phase, 4-wire main distribution panel located in the main electrical room on the ground level of the new building. The main distribution panel will contain circuit breakers feeding major mechanical equipment, a sub-panel in the same room, another sub-panel on the top floor, an elevator, and a step-down transformer.

.3 A 450kVA 600-120/208V dry-type step-down transformer will be provided in the main electrical room to feed a 1200A 120/208V central distribution panel (CDP). The CDP will feed smaller mechanical equipment and 120/208V branch circuit panelboards located throughout the building, four panelboards per floor. These panelboards will power lighting, convenience receptacles, car receptacles in open parking areas, and miscellaneous outlets.

.4 Minimum panelboard size will be 225A, 42-circuit. Panelboards will be suitable for bolt-on breakers.

.5 Convenience receptacles will be located throughout the building to suit architectural layout.

.6 IPLC type intelligent car receptacles will service parking stalls in open parking areas.

.7 Power will be provided for all mechanical equipment.

.8 Power will be provided for all specialty equipment, such as EV chargers and access control systems.

.9 A complete grounding system consisting of ground rods, buried copper conductors, and other components will be provided to meet requirements of the Canadian Electrical Code.

.10 A complete bonding system will be provided throughout the facility to meet requirements of the Canadian Electrical Code.

.3 Lighting Systems

.1 Exterior Lighting

.1 LED luminaires will be utilized for exterior lighting.

.2 All exterior luminaires to be of cut-off type.

.3 Wall-mounted luminaires will be installed on building perimeter.

.4 Surface or recessed downlights under entrance canopies.

.5 Exterior lighting will be controlled by a time clock and photocell.

.6 Illumination levels will generally follow IES lighting design guidelines.

.2 Interior Lighting

.1 Luminaires will be selected to suit architectural layout and space utilization.

.2 Illumination levels will generally follow IES guidelines.

.3 LED will be the primary types of interior illumination.

.4 Surface mounted enclosed luminaires will be utilized in majority of areas, inclduing vehicle parking spaces, service rooms, and circulation areas.

.5 LED light engines will be high-CRI, 4000K.

.6 Central low voltage switching system will control lighting throughout the building.

.7 Unswitched night-lights will be provided in corridors and hallways.

.8 Occupancy sensors and daylight harvesting will be utilized in suitable areas.

.4 Life Safety Systems

.1 Fire Alarm System

.1 An addressable single-stage fire alarm panel shall be provided at the main entrance.

.2 Automatic fire detectors shall be provided to meet Building Code requirements.

.3 Manual pull stations shall be installed at means of egress.

.4 Audible/visual alarm devices shall be provided throughout the building to meet the required audibility and visibility levels.

.5 Fire alarm system shall supervise sprinkler system via flow and tamper switches.

.6 The system will be reporting to a monitoring service via an autodialer.

.2 Emergency Lighting and Exit Signage

.1 DC battery banks and emergency luminaires will be provided throughout the building to meet Building Code emergency illumination requirements.

.2 Pictogram style (“running man”) exit signs complete with LED light modules will be provided at the designated means of egress as required by the Building Code.

.5 Voice/Data Communication System

.1 Communication service to the facility will be delivered underground from a telecom utility service pedestal. From the service pedestal, a service conduit will be routed to the main telecommunication backboard in the ground floor telecom room.

.2 A floor-standing two-section wire management rack will be provided in the telecom room. The rack will be complete with a required number of patch panels, cable management, and power distribution strip.

.3 Two Category 6 drops will be extended to each voice/data outlet.

.4 Voice/data outlets will be provided in office, security, mechanical rooms, and at access control equipment locations.

.5 A system of conduits will be provided throughout the building for telecommunication cabling.

.6 Access Control System

.1 An electronic access control system will be provided to meet facility's security and parking control requirements.

.2 All controlled access points will be electronically connected to a central monitoring system, so that access to and from areas can both be programmed and recorded.

.3 The system is to monitor all access points into the building, as well as to selected areas inside the building, such as office, security post, and service rooms.

.7 Video Surveillance System

.1 A video surveillance system will be provided for the building complete with IP based, POE interior and exterior cameras.

.2 Security cameras will monitor building access, parking area, and designated areas inside the building, such as lobby, corridors, stairs, and exits from building.

.3 Security camera monitors will be located at security post.

.4 All closed-circuit video surveillance will be connected to a central CCTV system and recorded. The DVR and network switches will be located at security post.

A0060 Equipment and Furnishings

A0060.10 Equipment

.1 Parking Control Equipment

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B CLOSE AND DEMOLISH PARKADE (OPTION 2B)

B0010 Parkade Demolition

.1 Demolish P1 slab and main floor

.2 Infill demolished portion with compacted granular to 98% compaction in 150mm lifts

.3 Compact granular to grade, slope granular to edges of property to promote drainage, crown to be 300mm of 1% grade.

.4 Make good for future user. Future use undefined.

.5 Refer to sketches for demolition requirements and extents

.6 Demolish P1 slab, columns, and main floor slabs

.7 Basement slab (P2) shall be removed.

.8 Old piling shall be noted and recorded for future use.

.9 Perimeter concrete walls to remain and will be shored during parkade demolition.

.10 All structure below library to remain and connected to new foundation wall.

.11 Parkade ramps to be demolished.

B0020 New Foundation Wall System

B0020.10 Construct new reinforced concrete wall supported by new piling.

.1 700 – 800 mm diameter piles 8m long drilled to refusal, spaced at 3m o/c

.2 Pile cap below wall to be approximately 1200mm high x 900mm wide along axis of wall

.3 Reinforced Concrete walls approximately 6m high and 300mm thick. Total length approximately 120m

.4 Concrete to be 35 Mpa, HS concrete

B0030 Sitework

B0030.10 Park Demolition

.1 Remove lighting, stairs, ponds, insulation, membrane, turf, grass, paving, shrubs and vegetation,

.2 New fencing to be installed around perimeter during demolition.

.3 Fencing to be permanent until future use is determined.

B0040 Existing Site Utilities

B0040.10 HVAC Utilities

.1 Disconnect natural gas connection. Shut isolation valve and cap off line as per Manitoba Hydro Natural Gas standards. Coordinate with Utility.

B0040.20 Plumbing Utilities

.1 Disconnect, cap and abandon sewer and domestic water connections to 1 000 mm beyond the property line. Coordinate locations for future reference with City of Winnipeg Water and Waste department.

B0040.30 Fire Protection Utilities

.1 Disconnect, cap and abandon fire water service (if it exists) connections to 1 000 mm beyond the property line. Coordinate locations for future reference with City of Winnipeg Water and Waste department.

B0040.20 Electrical/Communication/Security/Life Safety

.1 De-energize and remove all Electrical Cabling extending to parkade electrical equipment and remove all conduit and terminate in safe manner per local codes and standards.

.2 Re-Program Fire Alarm Panel and remove network interconnection cabling. Re-verification of system and renewal of as-built device layout drawings.

.3 Disconnection and removal of CCTV cameras and interconnected cabling and termination in a safe manner per local codes and standards.

.4 Re-programming of Douglas lighting control system and removal of interconnected wiring and conduit and termination in a safe manner per local codes and standards. Revision of current layout drawings for lighting control system.

.5 Re-programming of Card Access control system to eliminate stations and Interconnected wiring and conduit from interconnected security items in a safe manner per local codes and standards.

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C SELL PARKADE (OPTION 2C)

C0010 Electrical Requirements to Separate Facilities and Sell Parkade

C0010.10 Electrical Services – The Millennium Library Parkade is currently connected from the Millennium Library main Electrical Service vault in the P2 parkade level. To separate the parkade to sell the facility to a new owner, a new electrical service and metering that serves only the parkade is required to be provided. The sizing of this distribution at an initial estimate should be 1200amps at 600 volts and a new electrical room serving only the parkade would be required for the equipment to reside in. Additionally, many of the circuits that feed equipment in the parkade are from panels within the Millenium Library. To separate the two facilities these circuits will have to be removed and re-fed from new panelboards that are installed in the parkade. Any panelboards that are fed from a 600-volt supply will need to have new transformers provided to reduce the voltage to 120/208V for parkade equipment.

C0010.20 Fire Alarm – Currently the parkade and Millennium Library have their own fire alarm panels that are interconnected as a network. To separate the facilities, the network cabling will have to be disconnected and complete re-programming of the two panels and re-verification will be required. A new network monitoring connection will be required and conduit and wiring to a new communication means will need to be provided.

C0010.30 CCTV – The current CCTV system serving the parkade will need to be disconnected and any cabling and conduit that feeds the library where monitoring of all the areas occurs will need to be disconnected and terminated safely in a manner that suits local codes and standards. Re-programming of some existing network switching and addressing may be required and updating of current drawings needs to be performed.

C0010.40 Card Access – The card access systems serving the parkade will be required to be disconnected and separated from the library systems. There are also interconnections with fire alarm and system monitoring that will need to be disconnected and conduit and wiring to be removed and safely terminated in a manner. New monitoring and control wiring will be required to separate the parkade from the library. Any interconnected wiring between the two facilities needs to be separated and new system server and programming will be required for the parkade. Interconnection to the fire alarm and local monitoring and updating of building diagrams will be required.

C0010.50 Communications – Currently the Millennium Library and the parkade share telecommunications utilities. To separate the facilities a new demarcation point and new communications room is required.

C0010.60 Lighting and Lighting Controls – The current Douglas lighting control system is interconnected with the Millennium Library control system and fire alarm. To separate the facilities to sell the parkade, re-programming of the lighting control system as a stand-alone system is required. Additionally, interconnection to the fire alarm system for lighting control under alarm conditions will be required if not already in place. Updating of building drawings and re-verification of the lighting system will need to be performed to complete this work.

C0010.70 Emergency Lighting – The current emergency lighting system in the parkade is comprised of mainly lighting and exit signs that are fed from the Millennium Library building emergency generator. In order to separate the two facilities a new central lighting inverter would need to be installed in a new electrical room created for the new service entrance distribution. Disconnection of the existing lighting and exit signs from the current circuits.

C0020 Vertical Circulation Requirements to Separate Facilities and Sell Parkade

C0020.10 Exit Stairs – The parkade currently has four exit stairs to grade, two of which are shared with the Millennium Library's vertical circulation to all floor above grade. In order to separate the facilities, the two exits stairs that are shared with the Library would require card access into the parkade floors integrated into the new server and programming. Alternatively, two new exit stairs would need to be constructed that would not be accessible from the Library.

C0020.20 Passenger Elevators – The passenger elevators that currently service the Parkade are shared with the Library and the Skywalk system. In order to separate the facilities, the existing passenger elevators would require card access to reach the parkade levels. Alternatively, a new, separate passenger elevator core would need to be constructed outside of the existing Library footprint, that would be accessible by card access only. The passenger elevator would require a vestibule/lobby superstructure at grade.

C0030 Mechanical Requirements to Separate Facilities and Sell Parkade

C0030.10 Mechanical Utilities – Sewer -Existing sewer connections to theParkade can remain as the City of Winnipeg derives sewer charges from domestric water consumption.

C0030.20 Mechanical Utilities – Domestic Water – The existing domestic water connections for Parkade services will be disconnected from the Library services lines and re-plumber to a new and dedicated incoming water service and associated backflows and metering. This new service will be coordinated with the fire suppression system so as to have one service to the Parkade.

C0030.30 Mechanical Services – Fire Protection Water – Fire protection water will be a combined connection with street bypass (as per City of Winnipeg waterworks standards) complete with backflows as required by City of Winnipeg Backflow Prevention standards and by-laws.

C0030.40 Fire Suppression System – The existing sprinkler and standpipe systems ideally would be separated from the Library Building proper and rezoned to cover only those areas within the Parkade property, Adjustments would also be required to isolate the Library fir suppression systems from the Parkade system. A new fir protection sprinkler tree would be installed at the location of the new water services with all valves and trim and the associated fire alarm monitoring.

C0030.50 It is assumed all ventilation air intakes and exhaust points are independent of the Library Building proper, however a small allowance should be made for minor adjustments if required.

D ALL REPAIRS (OPTION 2D)

D0010 Repairs to Existing Parkade

D0010.10 Al repairs as outlined in previous report to be undertaken.

D0010.20 Concrete to be rehabilitated based on provided sketches(concrete patching and crack repairs). Allow for 40% increase in costs for misc work. Repairs to utilize epoxy based grout.

D0010.30 Existing traffic membrane to be removed and new traffic membrane installed on P1 and on all ramps.

D0010.40 Concrete repair in stairwells as previously indicated.

D0010.50 Install concrete swalls (5 typical).

D0010.60 Replace Security Panel and Keypad in Car Park Kiosk. Provide and install Lamacoid labelling on all key electrical equipment, including switchboards, panelboards, transformers, etc. Replace non-functioning exit signs in stairwells and machine rooms.

D0010.70 Mechanical repairs – to include all repairs outlined in the previous report.

D0010.80 Mechanical repairs – removal and replacement of the complete existing heating and ventilation equipment including main air handler, gas-fired heating section, distribution ductwork, including all controls and associated trim with new.

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E GENERAL

E0010 General Requirements

E0010.10 Price and Payment Procedures

.1 Allowances:

.2 Cash Allowances (Option 1 - Only):

.1 Cast-in-Place Concrete: Concrete testing.

.2 Cast-In-Place Concrete: Floor level testing.

.3 Common Work Results for Masonry: Mortar testing.

.4 Structural Steel: Steel connection inspection.

.5 Fire Stopping: Fire stopping inspection.

.6 Glazed Aluminum Curtain Wall: Air, water intrusion, and smoke tests.

.7 Pile Foundations: Piling inspection.

.8 Excavation and Backfilling for Buildings:

.9 Subgrade and backfill compaction testing.

.10 Site inspection and quantity surveying for remediation of unsuitable subgrade material.

.11 Total Cash Allowance No. 2: $ 75,000.

E0020 Quality Requirements

E0020.10 References

.1 National Building Code of Canada 2010.

.2 Manitoba Building Code 2011.

.3 National Fire Code of Canada - 2010 (NFC).

.4 National Energy Code of Canada for Buildings - 2017 (NECB).

.5 Manitoba Energy Code for Buildings - 2014 (MECB).

.6 National Plumbing Code of Canada - 2015, including its amendments (NPC)

.7 CSA C22.1.21, Canadian Electrical Code, Part 1 - 2018, including its amendments (CE Code).

.8 CAN/CSA B651-18 Accessible Design for Built Environment 2012.

.9 Manitoba Green Building Program - 2013.

.1 Manitoba Power Smart.

END OF PRELIMINARY PROJECT DESCRIPTION

APPENDICES

APPENDIX A:

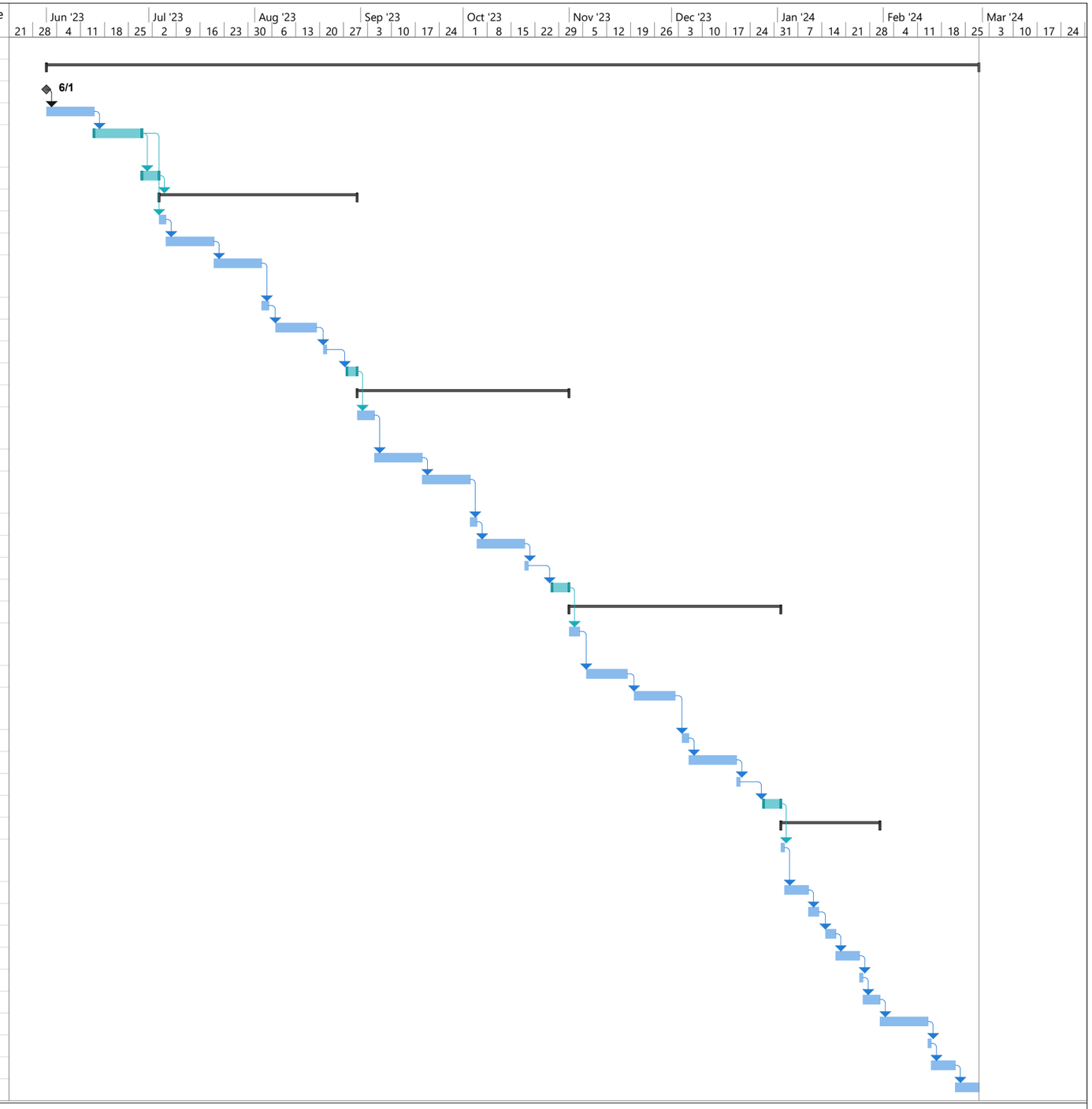
A.1 Report for Millennium Library Parkade – 251 Donald St., Parkade Condition Assessment

Prepared by Crosier Kilgour & Partners

April 01, 2021

APPENDIX F – CONSTRUCTION SCHEDULE

ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1						
2	**Parkade Repair**	**195 days**	**Thu 6/1/23**	**Wed 2/28/24**		
3	Award to Contractor	0 days	Thu 6/1/23	Thu 6/1/23		
4	Conctractor to mob to site	10 days	Thu 6/1/23	Wed 6/14/23	3	
5	Preconstruction tasks (shops, ordering etc)	10 days	Thu 6/15/23	Wed 6/28/23	4	
6	Prep Area for Work, Signage, Notices	3 days	Thu 6/29/23	Mon 7/3/23	5	
7	**Slab Repair Strip 1**	**42 days**	**Tue 7/4/23**	**Wed 8/30/23**	**6**	
8	Erect Safety barrier and preare for exhaust	2 days	Tue 7/4/23	Wed 7/5/23	5	
9	Hydro demolition of slab strips	10 days	Thu 7/6/23	Wed 7/19/23	8	
10	Prepare for concrete placement, drain repair	10 days	Thu 7/20/23	Wed 8/2/23	9	
11	Place Concrete	2 days	Thu 8/3/23	Fri 8/4/23	10	
12	Cure Concrete	10 days	Mon 8/7/23	Fri 8/18/23	11	
13	Move barriers to next strip and clean	1 day	Mon 8/21/23	Mon 8/21/23	12	
14	Install Membrane and cure	3 days	Mon 8/28/23	Wed 8/30/23	13	
15	**Slab Repair Strip 2**	**44 days**	**Thu 8/31/23**	**Tue 10/31/23**		
16	Erect Safety barrier and preare for exhaust	3 days	Thu 8/31/23	Mon 9/4/23	14	
17	Hydro demolition of slab strips	10 days	Tue 9/5/23	Mon 9/18/23	16	
18	Prepare for concrete placement, drain repair	10 days	Tue 9/19/23	Mon 10/2/23	17	
19	Place Concrete	2 days	Tue 10/3/23	Wed 10/4/23	18	
20	Cure Concrete	10 days	Thu 10/5/23	Wed 10/18/23	19	
21	Move barriers to next strip and clean	1 day	Thu 10/19/23	Thu 10/19/23	20	
22	Install Membrane and cure	3 days	Fri 10/27/23	Tue 10/31/23	21	
23	**Slab Repair Strip 3**	**44 days**	**Wed 11/1/23**	**Mon 1/1/24**		
24	Erect Safety barrier and preare for exhaust	3 days	Wed 11/1/23	Fri 11/3/23	22	
25	Hydro demolition of slab strips	10 days	Mon 11/6/23	Fri 11/17/23	24	
26	Prepare for concrete placement, drain repair	10 days	Mon 11/20/23	Fri 12/1/23	25	
27	Place Concrete	2 days	Mon 12/4/23	Tue 12/5/23	26	
28	Cure Concrete	10 days	Wed 12/6/23	Tue 12/19/23	27	
29	Move barriers to next strip and clean	1 day	Wed 12/20/23	Wed 12/20/23	28	
30	Install Membrane and cure	3 days	Thu 12/28/23	Mon 1/1/24	29	
31	**Slab Repair Misc Locations**	**21 days**	**Tue 1/2/24**	**Tue 1/30/24**		
32	Erect Safety barrier and preare for exhaust	1 day	Tue 1/2/24	Tue 1/2/24	30	
33	Hydro demolition of slab strips	5 days	Wed 1/3/24	Tue 1/9/24	32	
34	Prepare for concrete placement	3 days	Wed 1/10/24	Fri 1/12/24	33	
35	Place Concrete	3 days	Mon 1/15/24	Wed 1/17/24	34	
36	Cure Concrete	5 days	Thu 1/18/24	Wed 1/24/24	35	
37	Move barriers to next strip and clean	1 day	Thu 1/25/24	Thu 1/25/24	36	
38	Install Membrane and cure	3 days	Fri 1/26/24	Tue 1/30/24	37	
39	Clean up Site	10 days	Wed 1/31/24	Tue 2/13/24	38	
40	Final Review and Deficiencies	1 day	Wed 2/14/24	Wed 2/14/24	39	
41	Final Deficiencies Clean up	5 days	Thu 2/15/24	Wed 2/21/24	40	
42	Demobilize	5 days	Thu 2/22/24	Wed 2/28/24	41	



Date: Wed 11/30/22

Task	Summary	Inactive Milestone	Duration-only	Start-only	External Milestone	Manual Progress
Split	Project Summary	Inactive Summary	Manual Summary Rollup	Finish-only	Deadline	
Milestone	Inactive Task	Manual Task	Manual Summary	External Tasks	Progress	

APPENDIX G – CONSTRUCTION STAGING

MEMBRANE PHASING

4 phases of approximately 20,000 Ft² per

Scheduled between November 1st and December 15.

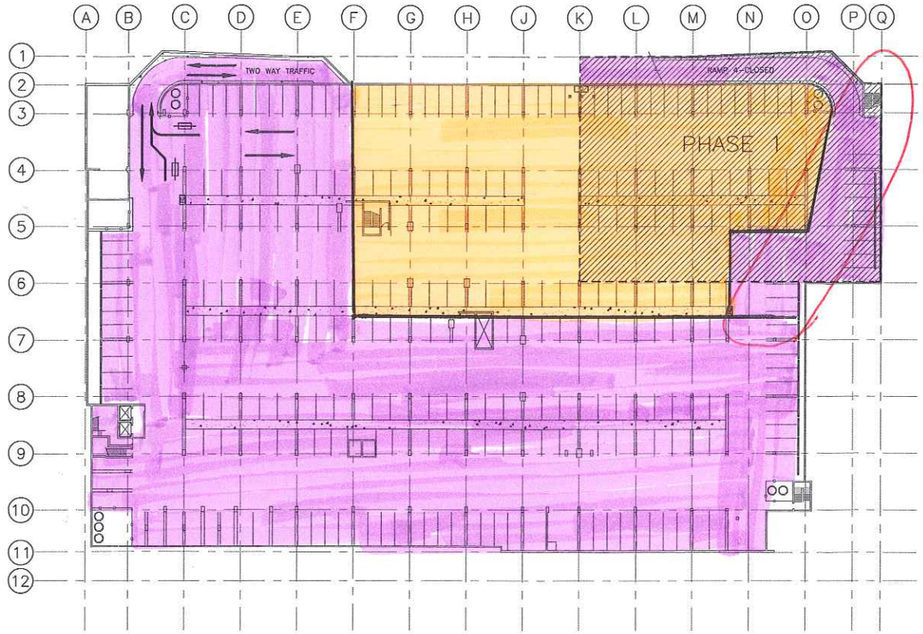
Area of concern 2

PHASE 1 - LEVEL P1 TRAFFIC FLOW
SCALE: NTS

WALKWAY

NOTE: CONTRACTOR TO PROVIDE TEMPORARY TRAFFIC FLOW SIGNAGE DURING CONSTRUCTION PHASES.

Area of Concern 1



PHASE 1 - LEVEL P2 TRAFFIC FLOW
SCALE: NTS

PHASE 1 (EXTENDED)

Schedule - Feb 1st to May 1st, 2013

Work Items - STAIRWELL 6 + 3 all P1 slab in phase

PHASE 2

Schedule - May 1st to August 1st (RAMP 5 - possible Temporary Exit)

Work Items - Completion of Stairwell 3 + 7 and all P1 slab in phase

- Ramp work to 5 + 6

PHASE 3

Schedule - August 1st to November 1st, 2013

Work Items - Stairwell 1

- Ramp work to 2 + 3

PHASE 1 - P2

Schedule - April 1st to May 1st, 2013

PHASE 2 P2

Schedule - May 1st to August 31, 2013

NO.	REVISION	DATE
1	ISSUED FOR COORDINATION	JULY 3, 2012
2	ISSUED FOR 68% REVEIW	SEPT 6, 2012
3	ISSUED FOR TENDER	NOV 7, 2012
4		
5		
6		
7		

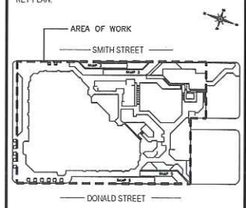
NOTES:

CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR REPORTING ALL DISCREPANCIES TO OWNER AND/OR CONSULTANT PRIOR TO TENDER CLOSING

LATEST APPROVED DRAWINGS ONLY TO BE USED FOR CONSTRUCTION

PRINTS ARE NOT TO BE SCALED.

KEY PLAN:



LEGEND:

TWO WAY TRAFFIC SIGNAL

PROPOSED TRAFFIC FLOW

CONCENTRIC ASSOCIATES INTERNATIONAL INCORPORATED
LONDON Tel. 1-519-452-7700 Toll Free1-866-919-4531
OTTAWA Tel. 1-613-824-8900 Toll Free1-866-919-4530
IQALUIT Tel. 1-867-979-3300 Toll Free 1-866-919-4533
SASKATOON Tel. 1-306-343-5500 Toll Free 1-866-919-8899
REGINA Tel. 1-306-520-6100 Toll Free 1-866-919-1861
WINNIPEG Tel. 1-204-783-1276 Toll Free 1-866-919-4531
YOU CHALLENGE US... TOGETHER WE SUCCEED
www.concentriceng.com

CLIENT NAME:
CITY OF WINNIPEG

PROJECT ADDRESS:
251 DONALD STREET
WINNIPEG, MANITOBA

PROJECT NAME:
REHAB OF MILLENNIUM LIBRARY PARKADE

DRAWING TITLE:
TRAFFIC FLOW FOR PHASE 1

DESIGN:	PSM	SCALE:	AS SHOWN
DRAWN:	JAW	DATE:	OCT/12
APP'VD:	PSM/ADM	FILE No.	11-4145

SHEET No.
S2

APPENDIX H – PHOTOGRAPHS

Figure 1: Traffic membrane repair on P1

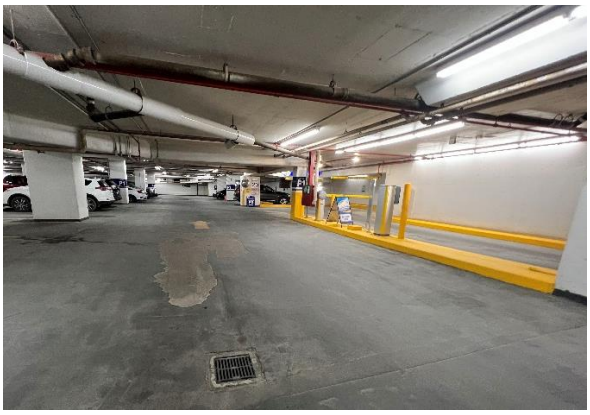


Figure 2: Traffic membrane repair on P1

Figure 3: Traffic membrane repair on P1

Figure 4: Exposed reinforcement

Figure 5: Exposed reinforcement

Figure 6: Exposed reinforcement

Figure 7: Wall Cracks

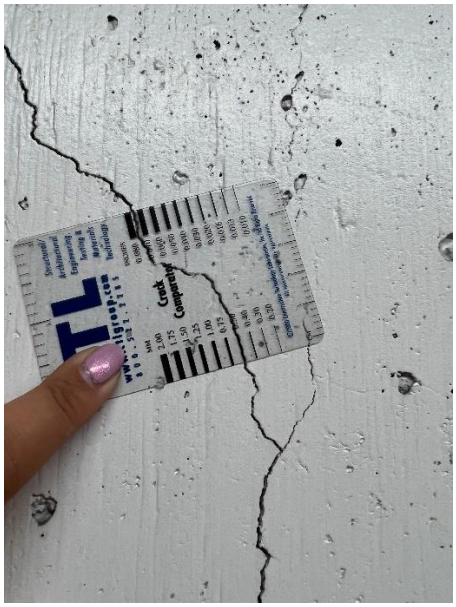


Figure 8: Wall Cracks

Figure 9: Vestibule Step Cracks

Figure 10: Mechanical Room

Figure 11: Mechanical Room

Figure 12: Mechanical Room

Figure 13: Staining around Column

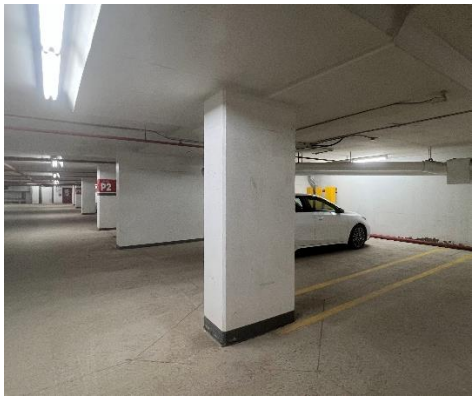


Figure 14: P2 Column

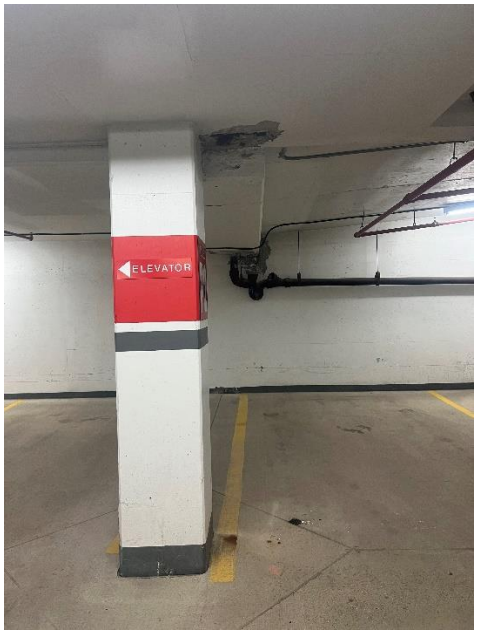


Figure 15: P2 Column

APPENDIX I – NET PRESENT VALUE AND BASIS OF ESTIMATE SPREADSHEETS

Project Options Analysis Summary

PROJECT DETAILS	
Investment Title:	**Millennium Library Parkade Feasibility Study**
NPV Author:	**Stantec**
Date:	**02-Oct-23**
Estimate Year	**2023**

FINANCIAL DATA		
Capital Inflation Rate:	**3%**	Source: Economic Research Office
Operating Inflation Rate:	**2%**	Source: Economic Research Office
Discount Rate:	**5%**	The discount rate represents the City's borrowing cost. This rate will be applied to initial capital costs and all operational/maintenance activities beyond year 0 within the lifecycle period. Discounting must also be applied to revenue should those values be available. Source: Corporate Finance - Treasury Division

PROJECT ANALYSIS SUMMARY

Status Quo Analysis

Baseline NPV Opex (Sk)	$ (12,482)

**Status quo is defined as maintaining the current operations and maintenance behaviour. This is typically the O&M recommendations defined by the manufacturer or designer. Status quo provides the realistic operating cost baseline to be used to compare the project options against.*

NPV and Benefit Options Summary Table

Option Number	Option Description	NPV Capex ($k)	NPV Opex ($k)	NPV ($k)	Benefit Score (in points)	Cost/Benefit	Cost/Benefit Rank
Option 1	Repair Existing Parkade (STN Option 2D)	$ 23,152	$ 11,189	$ 34,341	2,712	12.6620	1.00
Option 2	Build New Parkade (STN Option 2A)	$ 41,413	$ 17,606	$ 59,019	2,041	28.9227	2.00
Option 3	Demolish Parkade & Build New Park (STN Option 2B)	$ 12,595	$ 20,406	$ 33,000	696	47.4080	3.00
Option 4	Sell Parkade (STN Option 2C)	$ 8,943	$ 12,186	$ 21,129	46	463.9806	4.00

**Note: The Benefit/NPV ratio takes into account the number of projects included in a program*

NPV Selected Option & Rationale *(Inlcude key assumptions, notes, or commentary that support the option selected)*

The option ranked #1 in terms of cost/benefit is option 1 to repair the existing parkade. This option is recommended to be pursued based the NPV scoring and lifecycle cost analyis. It offers the best overall value to the City than any other option.

The Millennium Library Parkade with 480 parking stalls is a key asset in the Downtown area that supports parking for the library, the Canada Life Centre, the adjacent park, surrounding restaurants and neighbourhood shops while offering a covered, heated, secure parking experience with direct access to the Indoor Heated Skywalk making access to downtown parking convenient for customers.

As such, Option 1 (Repair Existing Parkade) is the recommended option as it would ensure that existing customers, along with transient customers continue to have a desirable parking choice in Downtown, as well as being a revenue generating asset for the City.

Lifecycle Cost Summary Table

Option Number	Description	Total Lifecycle Capital Cost ($k)	Total Lifecycle Operating Cost ($k)	Total Lifecycle Cost ($k)
Option 1	Repair Existing Parkade (STN Option 2D)	$ 28,804	$ 17,297	$ 46,101
Option 2	Build New Parkade (STN Option 2A)	$ 48,857	$ 26,244	$ 75,101
Option 3	Demolish Parkade & Build New Park (STN Option 2B)	$ 14,875	$ 35,857	$ 50,732
Option 4	Sell Parkade (STN Option 2C)	$ 10,313	$ 25,357	$ 35,670

Document Control	
Major Changes from Previous Version	

City of Winnipeg
Business Case Development
Operating Cost and NPV Calculation

NPV Total Operating Cost	$ (12,482)

Status Quo Analysis		Detail by Year ($k)																														
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Operating Cost	**Description**	Enter cash flow in current dollars ($K). Inflation will be automatically calculated.																														
Operate	Monthly Permits Revenue (projected 2023)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)	(960)									
Operate	Transient & Special Event Parking Revenue (projected 2023)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)	(887)									
Maintain	Maintenance Expenses (projected 2023)	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623	623									
Maintain	Parts, Supplies & Equipment (projected 2023)	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25									
Maintain	Debt & Finance Charges (projected 2023)	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337	337									
Maintain	Grants, Transfers & Other (projected 2023)	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92									
Operate	Recoveries (projected 2023)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)	(8)									
Salaries & Benefits	Facility Coordinator (25% of time)	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18									
Salaries & Benefits	Manager of Operations (5% of time)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4									
	Total Annual Opex:	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	(756)	0	0	0	0	0	0	0	0	0
	Total Annual Opex with Inflation:	(756)	(772)	(787)	(803)	(819)	(835)	(852)	(869)	(886)	(904)	(922)	(940)	(959)	(978)	(998)	(1,018)	(1,038)	(1,059)	(1,080)	(1,102)	(1,124)	(1,146)	0	0	0	0	0	0	0	0	0

TOTAL LIFECYCLE OPERATING COST	**$ (20,647)**

City of Winnipeg
Business Case Development
Lifecycle Cost and NPV Calculation

LIFECYCLE COST SUMMARY NET PRESENT VALUE (NPV)		
NPV Total Capital Cost	$	23,152
NPV Total Operating Cost	$	11,189
TOTAL NET PRESENT VALUE COST	**$**	**34,341**

Project:
Millennium Library Parkade Feasibility Study
Option 1: Repair Existing Parkade (STN Option 2D)

Cost Components		Detail by Year ($k)																														
Type	Description	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Capital Cost		**Enter cash flow in current dollars ($K). Inflation will be automatically calculated.**																														
Pre-Construction	2024-2027 Repairs: Detailed design and contract administration (75% in 2024, 10% in 2025, 10% in 2026, 5% in 2027)		506	67	67	34																										
Construction	2024-2027 Repairs: Concrete slab (75% of work in 2025, 10% of work in 2026, 15% of work in 2027)			3,191	426	638																										
Construction	2024-2027 Repairs: Traffic membranes slab repairs and ramps			395	53	79																										
Construction	2024-2027 Repairs: Mechanical (ventillation add)			40																												
Construction	2024-2027 Repairs: Electrical			164																												
Construction	2024-2027 Repairs: Mechanical - Air handling unit replacement			800	2,000	1,200																										
Construction	2024-2027: Third party materials and quality testing			38	38																											
Construction	2024-2027 Repairs: Permitting			60																												
Construction	2024-2027 Repairs: Commissioning		30	12	12	6																										
Construction	2024-2027 Repairs: Postma price escalation (8% of construction costs)			301	40	60																										
Construction	2024-2027 Repairs: Postma design and pricing contingency (15% of construction cost+price escalation)			609	81	122																										
Pre-Construction	2024-2027 Repairs: Stantec uncertainty on market conditions (15% of construction costs)			1,011	135	202																										
Pre-Construction	2024-2027 Repairs: Stantec design and construction allowance			337	45	67																										
Pre-Construction	2028 Repairs: Preliminary design				48																											
Pre-Construction	2028 Repairs: Detailed design and contract administration					145																										
Pre-Construction	2028 Repairs:Structural Concrete Repairs and Patchwork Traffic Membrane Resurfacing						185																									
Construction	2028 Repairs:Mechanical Repairs						343																									
Construction	2028 Repairs: Electrical repairs and 40 charging stations						1,410																									
Construction	2028 Repairs: Third party materials and quality testing						25																									
Construction	2028 Repairs: Permitting						42																									
Construction	2028 Repairs: Comissioning						60																									
Construction	2028 Repairs: Postma (cost consultant) price escalation (8% of construction costs)						160																									
Construction	2028 Repairs: Postma (cost consultant) design and pricing contingency of 20% after price escalation)						401																									
Construction	2028 Repairs: Stantec uncertainty on market conditions @ 15 %						291																									
Construction	2028 Repairs: Stantec design and construction allowance @ 5%						97																									
Construction	2030 Repairs: Preliminary design						73																									
Construction	2030 Repairs: Detailed design and contract administration							218																								
Construction	2030 Repairs:Structural Concrete Repairs and Patchwork Traffic Membrane Resurfacing								85																							
Construction	2030 Repairs: Electrical Repairs								5,723																							
Construction	2030 Repairs: Third party materials and quality testing								25																							
Construction	2030 Repairs: Permitting								42																							
Construction	2030 Repairs: Comissioning								60																							
Construction	2030 Repairs: Postma (cost consultant) price escalation (8% of construction costs)								470																							
Construction	2030 Repairs: Postma (cost consultant) design and pricing contingency of 20% after price escalation)								1,269																							
Construction	2030 Repairs: Stantec uncertainty on market conditions @ 15 %								871																							
Construction	2030 Repairs: Stantec design and construction allowance @ 5%								290																							
	Total Annual Capex:	0	536	7,025	2,944	2,554	3,087	218	8,835	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Annual Capex with Inflation	0	552	7,453	3,218	2,875	3,579	261	10,866	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operating Cost		**Enter cash flow in current dollars ($K). Inflation will be automatically calculated.**																														
Operate	Revenue loss 2024 - 2027 - Short Term Repair (half transient revenue lost as 1/4 of the parkade is closed during work			444	444	444																										
Operate	Revenue loss 2028 (half transient revenue lost as 1/4 of the parkade is closed during work)						444																									
Operate	Revenue loss 2030 (half transient revenue lost as 1/4 of the parkade is closed during work)						444																									
Debt & Financing Charges	Interest cost loan 1 for work 2024-2027		14	201	442	564	601	565	528	490	449	407	363	316	268	217	164	109	49	17	2											
Debt & Financing Charges	Interest cost loan 2 for work in 2028				1	8	98	180	171	161	151	140	129	118	106	93	80	66	51	36	20	2										
Debt & Financing Charges	Interest cost loan 3 for work in 2030						4	16	287	538	510	482	451	420	387	352	316	278	239	197	153	108	60	6								
	Total Annual Opex:	0	14	644	887	1,015	1,590	761	986	1,188	1,110	1,029	943	854	761	663	560	453	338	250	175	110	60	6	0	0	0	0	0	0	0	0
	Total Annual Opex with Inflation:	0	15	671	942	1,100	1,757	858	1,133	1,393	1,328	1,255	1,174	1,084	984	875	754	622	474	357	255	164	92	10	0	0	0	0	0	0	0	0

TOTAL LIFECYCLE CAPITAL COST	**$**	**28,804**
TOTAL LIFECYCLE OPERATING COST	**$**	**17,297**
TOTAL LIFECYCLE COST	**$**	**46,101**

City of Winnipeg
Business Case Development
Lifecycle Cost and NPV Calculation

LIFECYCLE COST SUMMARY NET PRESENT VALUE (NPV)		
NPV Total Capital Cost	$	41,413
NPV Total Operating Cost	$	17,606
TOTAL NET PRESENT VALUE COST	**$**	**59,019**

Project:
Millennium Library Parkade Feasibility Study
Option 2: Build New Parkade (STN Option 2A)

Cost Components		Detail by Year ($k)																														
Type	Description	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Capital Cost		**Enter cash flow in current dollars ($K). Inflation will be automatically calculated.**																														
Pre-Construction	Preliminary design		823																													
Pre-Construction	Detailed design and contract administration			1,853	371	124	124																									
Construction	Demolish existing parkade and build new parkade				13,570	13,570																										
Construction	Upgrade park (smaller footprint than existing park)						2,000																									
Construction	Third party materials and quality testing				19	56																										
Construction	Permitting				305																											
Construction	Design & construction allowance (20% of total construction cost)			4,371	583	583	291																									
Construction	Postma design and pricing contingency (Total postma contingency is $5.489M. For simplicity, this has been distributed relatively equally over the project timespan)				1,811	1,811	1,866																									
Construction	Commissioning (City added this cost, not Stantec)						60																									
	Total Annual Capex:	0	823	6,224	16,658	16,143	4,341	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Annual Capex with Inflation	0	848	6,603	18,203	18,170	5,033	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operating Cost		**Enter cash flow in current dollars ($K). Inflation will be automatically calculated.**																														
Operate	Revenue loss 2026 - 2027 (Monthly and Transient)				1,847	1,847																										
Operate	Expenditure Reductions				(740)	(740)																										
Debt & Financing Charges	Interest on loan		18	184	756	1,582	2,053	2,061	1,938	1,809	1,675	1,534	1,387	1,232	1,070	901	724	538	343	157	37	3											
	Total Annual Opex:	0	18	184	1,863	2,689	2,053	2,061	1,938	1,809	1,675	1,534	1,387	1,232	1,070	901	724	538	343	157	37	3	0	0	0	0	0	0	0	0	0	0
	Total Annual Opex with Inflation:	0	19	192	1,977	2,911	2,267	2,321	2,226	2,120	2,002	1,870	1,724	1,563	1,385	1,189	975	739	480	224	55	5	0	0	0	0	0	0	0	0	0	0	0

TOTAL LIFECYCLE CAPITAL COST	**$ 48,857**
TOTAL LIFECYCLE OPERATING COST	**$ 26,244**
TOTAL LIFECYCLE COST	**$ 75,101**

City of Winnipeg
Business Case Development
Lifecycle Cost and NPV Calculation

LIFECYCLE COST SUMMARY NET PRESENT VALUE (NPV)		
NPV Total Capital Cost	$	12,595
NPV Total Operating Cost	$	20,406
TOTAL NET PRESENT VALUE COST	**$**	**33,000**

Project:
Millennium Library Parkade Feasibility Study
Option 3: Demolish Parkade & Build New Park(STN Option 2B)

Cost Components		Detail by Year ($k)																														
Type	Description	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053
Capital		Enter cash flow in current dollars ($K). Inflation will be automatically calculated.																														
Pre-Construction	Preliminary design		143																													
Pre-Construction	Detailed design			323	65	43																										
Construction	Close and demolish parkade				4,263																											
Construction	Build New Park (same ammenities as existing park)					6,000																										
Construction	Third party materials and quality testing			204																												
Construction	Permitting			305																												
Construction	Design and contruction allowance				573	573																										
Construction	Postma report design and pricing contingency				955																											
	Total Annual Capex:	0	143	832	5,855	6,616	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Annual Capex with Inflation	0	148	883	6,398	7,446	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operating		Enter cash flow in current dollars ($K). Inflation will be automatically calculated.																														
Operate	Revenue loss 2026 - 2027 (Monthly and transient)				1,847	1,847	1,847	1,847	1,847	1,847	1,847	1,847	1,847	1,847	1,847	1,847	1,847	1,847	1,847	1,847	1,847	1,847	1,847	1,847								
Operate	Expense reductions				(740)	(740)	(740)	(740)	(740)	(740)	(740)	(740)	(740)	(740)	(740)	(740)	(740)	(740)	(740)	(740)	(740)	(740)	(740)	(740)								
Debt & Financing Charges	Interest expense		3	26	197	516	667	631	594	554	513	470	425	378	328	277	222	165	106	44	4											
	Total Annual Opex:	0	3	26	1,304	1,623	1,774	1,738	1,701	1,661	1,620	1,577	1,532	1,485	1,435	1,384	1,329	1,272	1,213	1,151	1,111	1,107	1,107	1,107	0	0	0	0	0	0	0	0
	Total Annual Opex with Inflation:	0	4	28	1,384	1,757	1,959	1,958	1,954	1,947	1,937	1,923	1,905	1,884	1,857	1,826	1,790	1,747	1,699	1,644	1,619	1,645	1,678	1,712	0	0	0	0	0	0	0	0

TOTAL LIFECYCLE CAPITAL COST	**$**	**14,875**
TOTAL LIFECYCLE OPERATING COST	**$**	**35,857**
TOTAL LIFECYCLE COST	**$**	**50,732**

City of Winnipeg
Business Case Development
Options Benefit Evaluation

Project:
Millennium Library Parkade Feasibility Study

BENEFIT EVALUATION

Investment Details						Multiplier		Level of Service - Benefit Analysis						Strategic Alignment - Benefit Analysis				Multiplier	Rank		
Options	Department	Service	Investment Type	Number of Projects in Program	Option Total NPV ($k)	Service Impact of Project	User-hrs (per year)	Compliance with New Legislation	Maintain Level of Service			Enhance Level of Service		Environmental Sustainability	Enables Growth	Operational Efficiency/Revenue Generation	Culture/ Heritage	Service Usage	Benefit Rank	Cost/ Benefit Points Ratio	Cost/ Benefit Rank
									Category	From	To	Category	Score								
Option 1: Repair Existing Parkade (STN Option 2D)	Public Works	Parking	Program		$ 34,341	Direct	2,403,195		Quality	HVH	VLVL			L			Yes	0.0152	1	12.66195	1
Option 2: Build New Parkade (STN Option 2A)	Public Works	Parking	Project		$ 59,019	Direct	2,403,195		Quality	HVH	MVH			L			Yes	0.0152	2	28.92266	2
Option 3 : Demolish Parkade & Build New Park (STN Option 2B)	Public Works	Parking	Project		$ 33,000	Direct	2,403,195		Quality	HVH	HVH			L			Yes	0.0152	3	47.40797	3
Option 4: Sell Parkade (STN Option 2C)	Public Works	Parking	Project		$ 21,129	Direct	2,403,195		Quality	HVH	HVH			L			No	0.0152	4	463.98059	4

Basis of Estimate (BoE) Capital Cost Detail

Investment Title	Millennium Library Parkade Repairs 2024-2027
Business Case ID	Millennium Library Parkade Repairs_05082021

BoE Date	September 27, 2023
In Service Year	2025-2027
Class of Estimate	Class 3
Is this a Major Capital project?	No

ESTIMATE DETAIL

	Construction / Capital Inflation		3%	3%	3%	3%	3%	3%	
		Estimate Year	**Year Project Work Undertaken**						
		2023	2024	2025	2026	2027	2028	2029	**Total**
Construction/Equipment Costs	% of Const.	($000's)							
Concrete Slab Repairs [1]	47%	$4,255	$0	$3,386	$465	$719	$0	$0	$4,570
Traffic Membrane Slab Repairs and Ramps [2]	6%	$527	$0	$420	$58	$90	$0	$0	$568
Mechanical (Ventillation Add in booth) [3]	0%	$40	$0	$43	$0	$0	$0	$0	$43
Electrical [4]	1%	$99	$0	$105	$0	$0	$0	$0	$105
Mechanical - Air handling unit replacement [3]	45%	$4,000	$0	$849	$2,186	$1,351	$0	$0	$4,386
Electrical-Separating library and parkade obsolete lighting controls [4]	1%	$65	$0	$69	$0	$0	$0	$0	$69
Construction Costs Sub-total	100%	**$8,986**	**$0**	**$4,872**	**$2,709**	**$2,160**	**$0**	**$0**	**$9,741**
Consultant Costs (Internal & External)	% of Const	($000's)							
Detailed Design & Contract Administration	8%	$674	$521	$72	$74	$38	$0	$0	$705
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
Consultant Costs Sub-total	8%	**$674**	**$521**	**$72**	**$74**	**$38**	**$0**	**$0**	**$705**
Construction & Consultant Sub-total		**$9,660**	**$521**	**$4,944**	**$2,783**	**$2,198**	**$0**	**$0**	**$10,446**
Utility Costs	% C&C	($000's)							
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
Utility Costs Sub-total	0%	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Other Costs	% C&C	($000's)							
Land Acquisition	0%		$0	$0	$0	$0	$0	$0	$0
Third-Party Materials & Quality Testing	1%	$75	$0	$40	$41	$0	$0	$0	$81
Permitting	1%	$60	$0	$64	$0	$0	$0	$0	$64
Commissioning	1%	$60	$31	$13	$14	$7	$0	$0	$65
Other Costs Sub-total	2%	**$195**	**$31**	**$117**	**$55**	**$7**	**$0**	**$0**	**$210**
Project Costs before Contingencies Sub-total		**$9,855**	**$552**	**$5,061**	**$2,838**	**$2,205**	**$0**	**$0**	**$10,656**
Contingencies Costs	% Proj Cost	($000's)							
Postma (cost consultant) price escalation (8% of construction costs)[5]	4%	$401	$0	$319	$44	$68	$0	$0	$431
Postma (cost consultant) design and pricing contingency (15% contingency of construction cost+ price escalation) [6]	8%	$812	$0	$646	$89	$138	$0	$0	$873
Uncertainty on market conditions (15 % of construction cost) [7]	14%	$1,348	$0	$1,073	$148	$228	$0	$0	$1,449
Design and construction allowance (5% of construction cost) [8]	5%	$449	$0	$358	$50	$76	$0	$0	$484
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
Contingencies Costs Sub-total	31%	**$3,010**	**$0**	**$2,396**	**$331**	**$510**	**$0**	**$0**	**$3,237**
Project Sub-total before Administrative Charges Subtotal		**$12,865**	**$552**	**$7,457**	**$3,169**	**$2,715**	**$0**	**$0**	**$13,893**
									108%
							Administrative Charges Detail		
Administrative Charges ***(consult with department Finance)***									
Departmental Staff Charges:		$0	$0	$0	$0	$0	$0	$0	$0
Corporate Admininstration *(max $100,000)* :	1.25%	$100	$100	$0	$0	$0	$0	$0	$100
Municipal Accommodations Admin Overhead *(ONLY if Municipal Accommodations is delivering the project)* :	Yes	$80	$12	$80	$52	$48	$0	$0	$192
Research (SMIR) *(Construction Only, ONLY applies to Public Works)* :		$0	$0	$0	$0	$0	$0	$0	$0
Corporate Interest:	2.00%	$257	$11	$149	$63	$54	$0	$0	$278
		$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0
Administrative Charges Sub-total	-	**$437**	**$123**	**$229**	**$115**	**$102**	**$0**	**$0**	**$570**
Project Sub-total before Interest Charges Sub-total		**$13,302**	**$675**	**$7,686**	**$3,284**	**$2,817**	**$0**	**$0**	**$14,463**
TOTAL CAPITAL PROJECT COST		**$13,302**	**$675**	**$7,686**	**$3,284**	**$2,817**	**$0**	**$0**	**$14,463**

Timeline for Repairs

2023
Estimate year
2024
Detailed Design
2025
Concrete slab repairs begin
Traffic membrane replacement on ramps begin
Mechanical AHU replacement begins, ventilation addition complete
Electrical repairs complete.
2026
Concrete slab repairs complete
Traffic membrane complete
Mechanical AHU replacement continues
2027
Remaining mechanical repairs complete
Remaining concrete work if required for mechanical AHU unit supports complete

BoE Capital Cost Detail Description

1. Concrete slab repairs include hydrodemolition, crack repair, and swale construction around columns. Work is estimated to be complete within a 12 - 16 month timeframe. The value for this work is calculated by taking the postma total (line 85) minus traffic membrane work (line 42) minus postma price escalation (line 82) minus postma contingency (line 84) minus testing (line 3) minus permitting (line 13). The BOE still captures the costs that were removed from the postma totals in different areas of the BOE and were removed here for ease of calcualting the total concrete repair costs. All postma cost estimates related to concrete work can be found on p.3-5 of the postma report where a cost estimate was prepared for the slab repairs.
2. New traffic membrane to be installed wherever slab repairs are conducted and on the ramps only where a majority of the existing membrane as deteriorated. Work is phased and was estimated to be complete within a three year timeframe. See p.4 of the postma report (line items39-41).
3. Mechanical repairs include AHU replacement and ventilation addition.
The AHU replacement is high priority as the existing unit has reached the end of its lifespan. This work is expected be completed over a period of two years to facilitate parkade operations during construction. The cost for the booth ventillation is on p.18 of the Postma report (line 69). The cost for the air handling unit replacement is not in the postma report and was provided verbally by Postma to Stantec.
4. Electrical repairs include replacing nonfunctional exit signs, electrical labelling, generator battery replacement, security booth alarm system replacement, obsolete disconnects and starters replacement, and providing single line diagram.
Work is estimated to be complete within a 12 month time frame with consideration to phasing and budget requirements. Details on each line item can be found on the postma report p.19 (lines 75-81). The lighting control system has to repaired as the system is now obsolete so there will be no parts availability.
5. Postma cost escalation- This is a price escalation the cost consultant applies to account for variance in the industry they are seeing across Winnipeg. They typcially use historical information that is 6 months to a year old.
6. Postma design and pricing contingency-This is a contingency the cost consultant applies to account for any potential changes to the design that affects pricing.

7. Market conditions-This is a contingency that Stantec is applying because of current uncertainty in market conditions. Recently Stantec is seeing projects go over the budget estimates that cost consultants are preparing . Some projects are even going up to 50% of the estimates by the time they go to tender. Stantec applies this contingency to account for this uncertainty as they know the cost consultant are using estimating that is 6 months + out of date to what the current market conditions.
8. Design and construction allowance-During construction there could be unforseen events resulting in design rework.
Risk events that could result in the Stantec design and contruction allowance are:
Additional concrete and concrete reinforcement may be required to replace existing damaged reinforcement
Larger areas of concrete may need to be chipped out and replaced if the total extent of the damaged concrete could not be visually observed upon inspection
Lead times for electrical or mechanical equipment
In the event that AHU can't get demolished and the new AHU can't be acquired, there will be an additional cost for temporary heating in the parkade

Detailed Design Cost Calculation

Consultant fees are taken as 10% of the construction cost. Construction fees are 25%, and Design fees were 75% up to tender.

Life Expectancy

Concrete slab once slab repairs are complete: 25 years
Air Handler Unit: 25 years
Ventilation Unit in booth: 25 years

Electrification of Heating System

Converting natural gas heat to electrical heat is a requirement of the City's Community Energy Investment Roadmap and aligns to goals in the Winnipeg Climate Action Plan. The cost is not included in this BOE because there is uncertainty on when Hydro would have enough distributiton available in the downtown to undertake this.
The City will do a further study into this prior to the bid being released to identify when this could be undertaken

Basis of Estimate (BoE) Capital Cost Detail

Investment Title	Millennium Library Electrical Repairs 2028
Business Case ID	Millennium Library Parkade Repairs_05082021

BoE Date	September 27, 2023
In Service Year	2028
Class of Estimate	Class 4

Is this a Major Capital project? No

ESTIMATE DETAIL

		Construction / Capital Inflation	3%	3%	3%	3%	3%	3%	
		Estimate Year	**Year Project Work Undertaken**						
		2023	2026	2027	2028	2029	2030	2031	**Total**
Construction/Equipment Costs	% of Const.	($000's)							
Structural Concrete Repairs [1] + Patchwork Traffic Membrane Resurfacing	10%	$185	$0	$0	$215	$0	$0	$0	$215
Mechanical Repairs [2]	18%	$343	$0	$0	$398	$0	$0	$0	$398
Electrical Repairs and Charging Station [3]	73%	$1,410	$0	$0	$1,635	$0	$0	$0	$1,635
Construction Costs Sub-total	100%	**$1,938**	**$0**	**$0**	**$2,248**	**$0**	**$0**	**$0**	**$2,248**
Consultant Costs (Internal & External)	% of Const	($000's)							
Preliminary Design	3%	$48	$53	$0	$0	$0	$0	$0	$53
Detailed Design & Contract Administration	8%	$145	$0	$164	$0	$0	$0	$0	$164
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
Consultant Costs Sub-total	10%	**$194**	**$53**	**$164**	**$0**	**$0**	**$0**	**$0**	**$217**
Construction & Consultant Sub-total		**$2,132**	**$53**	**$164**	**$2,248**	**$0**	**$0**	**$0**	**$2,465**
Utility Costs	% C&C	($000's)							
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
Utility Costs Sub-total	0%	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Other Costs	% C&C	($000's)							
Land Acquisition	0%		$0	$0	$0	$0	$0	$0	$0
Third Party Materials & Quality Testing	1%	$25	$0	$0	$29	$0	$0	$0	$29
Permitting	2%	$42	$0	$0	$49	$0	$0	$0	$49
Commissioning	3%	$60	$0	$34	$35	$0	$0	$0	$69
	0%		$0	$0	$0	$0	$0	$0	$0
Other Costs Sub-total	6%	**$126**	**$0**	**$34**	**$113**	**$0**	**$0**	**$0**	**$147**
Project Costs before Contingencies Sub-total		**$2,258**	**$53**	**$198**	**$2,361**	**$0**	**$0**	**$0**	**$2,612**
Contingencies Costs	% Proj Cost	($000's)							
Postma (cost consultant) price escalation (8% of construction costs) [4]	7%	$160	$0	$0	$186	$0	$0	$0	$186
Postma (cost consultant) design and pricing contingency of 20% after price escalation [5]	18%	$401	$0	$0	$465	$0	$0	$0	$465
Uncertainty on market conditions @ 15 % [6]	13%	$291	$0	$0	$337	$0	$0	$0	$337
Design and construction allowance @ 5% [7]	4%	$97	$0	$0	$113	$0	$0	$0	$113
	0%		$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0
Contingencies Costs Sub-total	42%	**$949**	**$0**	**$0**	**$1,101**	**$0**	**$0**	**$0**	**$1,101**
Project Sub-total before Administrative Charges Subtotal		**$3,207**	**$53**	**$198**	**$3,462**	**$0**	**$0**	**$0**	**$3,713**
									116%
							Administrative Charges Detail		
Administrative Charges ***(consult with department Finance)***									
Departmental Staff Charges:		$0	$0	$0	$0	$0	$0	$0	$0
Corporate Admininstration *(max $100,000)* :	1.25%	$40	$1	$2	$43	$0	$0	$0	$46
Municipal Accommodations Admin Overhead *(ONLY if Municipal Accommodations is delivering the project)* :	Yes	$53	$2	$4	$55	$0	$0	$0	$61
Research (SMIR) *(Construction Only, ONLY applies to Public Works)* :		$0	$0	$0	$0	$0	$0	$0	$0
Corporate Interest:	2.00%	$64	$1	$4	$69	$0	$0	$0	$74
		$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0
Administrative Charges Sub-total	-	**$157**	**$4**	**$10**	**$168**	**$0**	**$0**	**$0**	**$182**
Project Sub-total before Interest Charges Sub-total		**$3,364**	**$57**	**$208**	**$3,630**	**$0**	**$0**	**$0**	**$3,895**
TOTAL CAPITAL PROJECT COST		**$3,364**	**$57**	**$208**	**$3,630**	**$0**	**$0**	**$0**	**$3,895**

Timelines
Preliminary design-2028
Detailed design 2029
Construction begins and is complete in 2029

Capital Cost Notes
1. Structural concrete repairs are to repair the underside of the roof slab, repairing topside of P1 slab, P1 wall repairs, column swale, concrete repairs in stairwells (see Postma report on lines 19-27). The structural work also includes the traffic membrane work on line 39 of the Postma report.
2. Mechanical repairs include fuel oil vent fan install, natural gas line paint, fuel oil tansk seal tappings, vent office space upgrade and NO2 detection in all spaces (see line items 65-72 in the Postma report, noting that line item 69 booth ventillation is not included in this BOE as it is being addressed in a separate capital project positioned to take place between 2024-2027)
3. Electrical repairs include all medium term electrical repairs in the postma report on lines 83-85 which include replacing obsolete disconnects and starters, adding 40 electrical charging stations and replacing the fire alarm
4. Postma cost escalation- This is a price escalation the cost consultant applies to account for variance in the industry they are seeing across Winnipeg. They typically use historical information that is 6 months to a year old.
5. Postma design and pricing contingency-This is a contingency the cost consultant applies to account for any potential changes to the design that affects pricing.
6. Market conditions-This is a contingency that Stantec is applying because of current uncertainty in market conditions. Recently Stantec is seeing projects go over the budget estimates that cost consultants are preparing . Some projects are even going up to 50% of the estimates by the time they go to tender. Stantec applies this contingency to account for this uncertainty as they know the cost consultant are using estimating that is 6 months + out of date to what the current market conditions.
7. Design and construction allowance-During construction there could be unforseen events resulting in design

Detailed Design Calculation
Consultant fees are taken as 10% of the construction cost. Construction fees are 25%, and Design fees were 75% up to tender.

Postma Report for detailed cost estimates- Insert here once Stantec provides it to us

Basis of Estimate (BoE) Capital Cost Detail

Investment Title	**Millennium Library Electrical Repairs 2030**
Business Case ID	**Millennium Library Parkade Repairs_05082021**
BoE Date	**September 27, 2023**
Is this a Major Capital project?	**No**
In Service Year	**2030**
Class of Estimate	Class 4

ESTIMATE DETAIL

		Construction / Capital Inflation	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	
		Estimate Year	**Year Project Work Undertaken**										
		2023	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	**Total**
Construction/Equipment Costs	% of Const.	($000's)											
Structural Concrete Repairs and Traffic Membrane Resurfacing [1]	1%	$85	$0	$0	$105	$0	$0	$0	$0	$0	$0	$0	$105
Electrical Repairs [2]	99%	$5,723	$0	$0	$7,039	$0	$0	$0	$0	$0	$0	$0	$7,039
Construction Costs Sub-total	100%	**$5,808**	**$0**	**$0**	**$7,144**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$7,144**
Consultant Costs (Internal & External)	% of Const	($000's)											
Preliminary Design	1%	$73	$85	$0	$0	$0	$0	$0	$0	$0	$0	$0	$85
Detailed Design & Contract Administration	4%	$218	$0	$261	$0	$0	$0	$0	$0	$0	$0	$0	$261
	0%		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Consultant Costs Sub-total	5%	**$290**	**$85**	**$261**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$346**
Construction & Consultant Sub-total		**$6,098**	**$85**	**$261**	**$7,144**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$7,490**
Utility Costs	% C&C	($000's)											
	0%		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Utility Costs Sub-total	0%	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Other Costs	% C&C	($000's)											
Land Acquisition	0%		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Third Party Materials & Quality Testing	0%	$25	$0	$0	$31	$0	$0	$0	$0	$0	$0	$0	$31
Permitting	1%	$42	$0	$0	$52	$0	$0	$0	$0	$0	$0	$0	$52
Commissioning	1%	$60	$0	$36	$37	$0	$0	$0	$0	$0	$0	$0	$73
	0%		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other Costs Sub-total	2%	**$126**	**$0**	**$36**	**$120**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$156**
Project Costs before Contingencies Sub-total		**$6,224**	**$85**	**$297**	**$7,264**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$7,646**
Contingencies Costs	% Proj Cost	($000's)											
Postma price escalation (8% of construction cost) [3]	8%	$470	$0	$0	$578	$0	$0	$0	$0	$0	$0	$0	$578
Postma (cost consultant) design and pricing contingency (20% after price escalation) [4]	20%	$1,269	$0	$0	$1,561	$0	$0	$0	$0	$0	$0	$0	$1,561
Uncertainty on market conditions @ 15 % [5]	14%	$871	$0	$0	$1,072	$0	$0	$0	$0	$0	$0	$0	$1,072
Design and construction allowance @ 5% [6]	5%	$290	$0	$0	$358	$0	$0	$0	$0	$0	$0	$0	$358
	0%		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	0%		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Contingencies Costs Sub-total	47%	**$2,900**	**$0**	**$0**	**$3,569**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$3,569**
Project Sub-total before Administrative Charges Subtotal		**$9,125**	**$85**	**$297**	**$10,833**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$11,215**
												% increase from base	123%

Administrative Charges Detail

Administrative Charges ***(consult with department Finance)***			2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	Total
Departmental Staff Charges:		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Corporate Admininstration *(max $100,000)* :	1.25%	$100	$100	$0	$0	$0	$0	$0	$0	$0	$0	$0	$100
Municipal Accommodations Admin Overhead *(ONLY if Municipal Accommodations is delivering the project)* :	Yes	$80	$2	$6	$80	$0	$0	$0	$0	$0	$0	$0	$88
Research (SMIR) *(Construction Only, ONLY applies to Public Works)* :		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Corporate Interest:	2.00%	$183	$2	$6	$217	$0	$0	$0	$0	$0	$0	$0	$224
		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Administrative Charges Sub-total	-	**$363**	**$104**	**$12**	**$297**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$412**
Project Sub-total before Interest Charges Sub-total		**$9,487**	**$189**	**$309**	**$11,130**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$11,627**
TOTAL CAPITAL PROJECT COST		**$9,487**	**$189**	**$309**	**$11,130**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$11,627**

Timelines
Preliminary design-2028
Detailed design 2029
Construction begins and is complete in 2030

Capital Cost Notes
1. Structural concrete repairs are to repair the underside of the roof slab, repairing topside of P1 slab, P1 wall repairs, column swale, concrete repairs in stairwells (see Postma report on lines 19-27). The structural work also includes the traffic membrane work on line 39 of the Postma report. In 2030 the remaining 20% of this work will be done as 80% will have been done through a separate project/separate BOE in 2028.

2. Electrical repairs include all long term electrical repairs in the postma report on lines 87-95 which include electrical service replacement, subdivision and transformaer replacment, building lightin and control system replacement, car parking quipment doors, exit sign replacement, CCTV replacement, branch conduit and wiring replacement, generator replacement.
3. Postma cost escalation- This is a price escalation the cost consultant applies to account for variance in the industry they are seeing across Winnipeg. They typcially use historical information that is 6 months to a year old.
4. Postma design and pricing contingency-This is a contingency the cost consultant applies to account for any potential changes to the design that affects pricing.
5. Market conditions-This is a contingency that Stantec is applying because of current uncertainty in market conditions. Recently Stantec is seeing projects go over the budget estimates that cost consultants are preparing . Some projects are even going up to 50% of the estimates by the time they go to tender. Stantec applies this contingency to account for this uncertainty as they know the cost consultant are using estimating that is 6 months + out of date to what the current market conditions.
6. Design and construction allowance-During construction there could be unforseen events resulting in design

Detailed Design Calculation
Consultant fees are taken as 10% of the construction cost. Construction fees are 25%, and Design fees were 75% up to tender.

Postma Report for detailed cost estimates- Insert here once Stantec provides it to us

APPENDIX J – ENGAGEMENT SESSION PRESENTATION

Stantec

City of Winnipeg Feasibility Study

Millennium Library Parkade

1

LAND ACKNOWLEDGEMENT

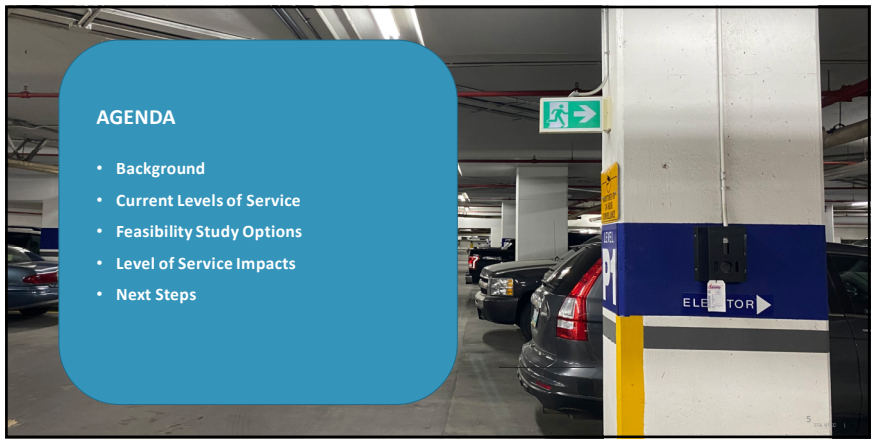
2

SAFETY MOMENT

3

INTRODUCTIONS

4



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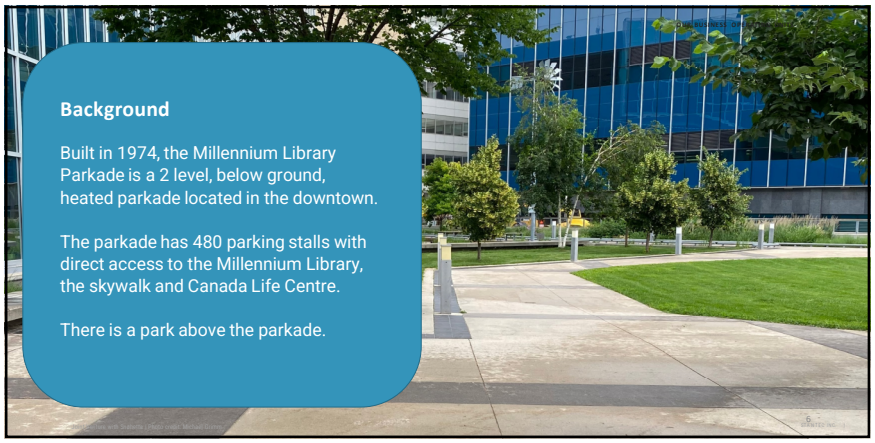

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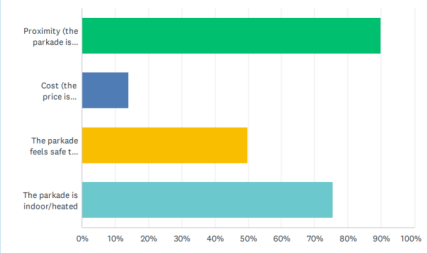
Levels of Service - Why People Park at the Parkade



ANSWER CHOICES	RESPONSES
Proximity (the parkade is close to my destination)	89.89%
Cost (the price is reasonable)	14.08%
The parkade feels safe to me	49.82%
The parkade is indoor/heated	75.45%

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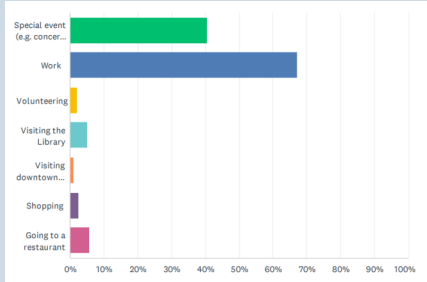
Levels of Service - Typical Destinations



ANSWER CHOICES	RESPONSES
Special Event (e.g. concert or Winnipeg Jets Game)	40.43%
Work	67.15%
Volunteering	2.17%
Visiting the Library	5.05%
Visiting downtown resident	1.08%
Shopping	2.53%
Going to a restaurant	5.75%

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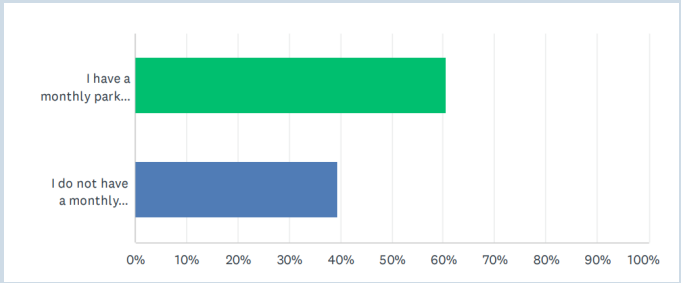
Levels of Service - Breakdown of Monthly Versus Hourly Parkers



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Levels of Service: Current vs Target Service Levels

Customer Objectives	Customer Service Measure	Technical Operations and Asset Measures	2022 Performance Grade	Target Performance Grade
Capacity and Use	Public parking is provided for patrons attending the Millennium Library and patrons visiting downtown	% of overall parking stalls dedicated to transient/hourly parking (not applicable during special event parking)	Good	Good
Quality and Functionality	City-owned parking lots and parkade are well-maintained	Millennium Library Parkade structural elements are in good condition or better	Fair	Good
		Millennium Library Parkade mechanical and electrical systems are in good condition or better	Poor	Good
		Millennium Library Parkade is secured and accessible to parking patrons only	Very Good	Very Good

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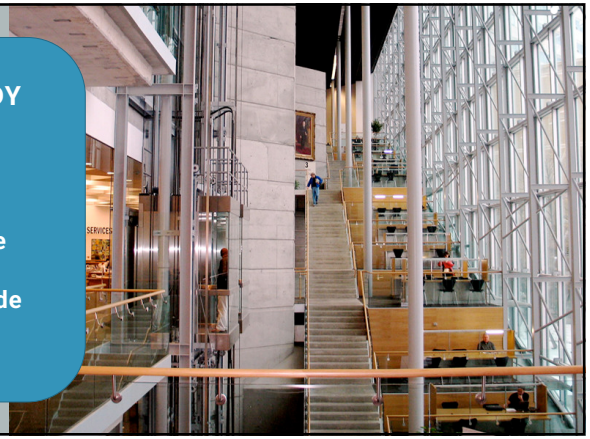
FEASIBILITY STUDY OPTIONS

- Repair the Parkade
- Build a New Parkade
- Demolish the Parkade
- Sell the Parkade



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OPTION 1: Repair the Parkade

Capital Cost: ~$31 million

Description:
- Repairs to concrete structure
- Electrical and mechanical system replacements

Timeline:
- 2024-2027
- 2028-2029
- 2030

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OPTION 2: Build a New Parkade

Capital Cost: ~$51 million

Description:
- **Six storey above ground open-air parkade**
- **Smaller greenspace/park**

Timeline:
2024-2028

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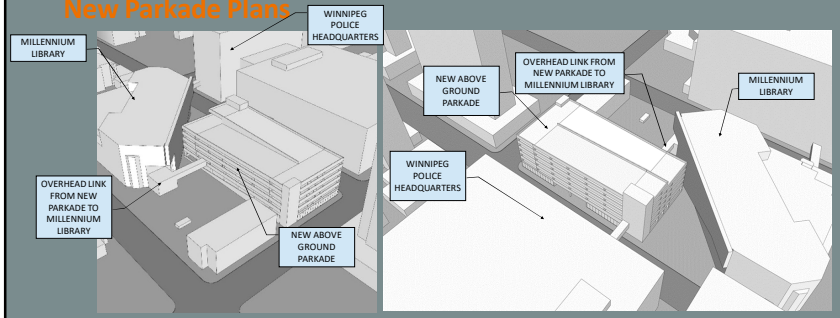
New Parkade Plans



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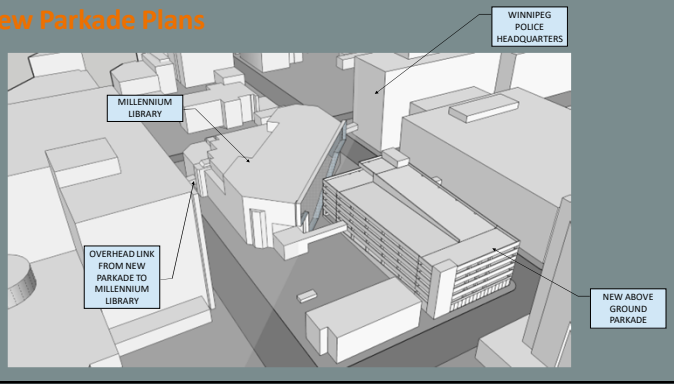
New Parkade Plans



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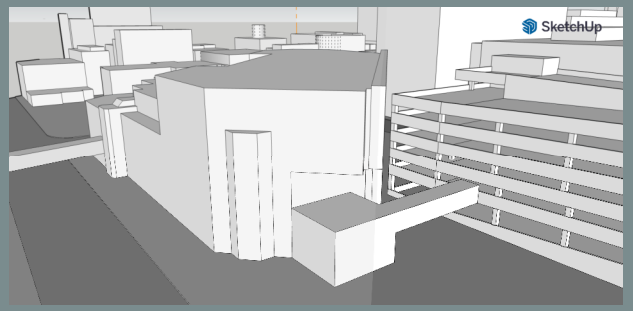
New Parkade Plans



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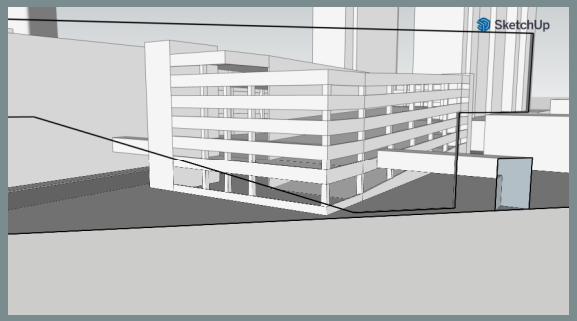
New Parkade Plans



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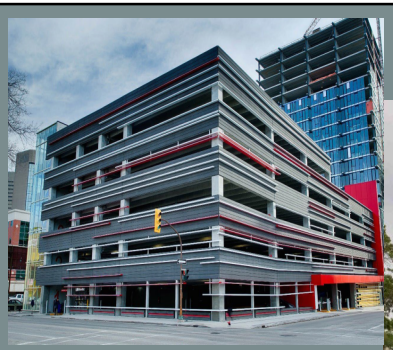
EXAMPLE OF AN OPEN-AIR PARKADE



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OPTION 3: Demolish the Parkade

Capital Cost: ~$15 million

Description:
- Demolish & close the parkade
- Rebuild the greenspace/park

Timeline:
2025-2027

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OPTION 4: Sell the Parkade

Capital Cost: ~$10 million

Description:
- Split services from library
- Sell the parkade
- Asset will likely continue as a parkade
- Greenspace may not remain

Timeline:
2025-2026

20

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Service Level Impacts – REPAIR THE PARKADE	Alignments to Council Approved Plans & Policies
❑ 480 parking stalls in a heated downtown parkade remain available ❑ The structural mechanical and electrical systems are in good condition or better (no unforeseen closures) ❑ Park above the parkade would continue to be available to the public ❑ Car wash remains	**Strategic Priorities Action Plan** • Supports access to downtown libraries and greenspace **Complete Communities 2.0** • Supports attractions in the Sports, Hospitality, and Entertainment District and residential/office areas • Does not support promoting Transportation Demand Management (TDM) strategies in the downtown **Winnipeg Climate Action Plan** • Supports implementing low carbon and energy efficient City Facilities and Buildings • Does not support advancing sustainable transportation and shifting residents out of single occupancy vehicles with lower or no emissions **Community Energy Investment Roadmap** • Supports retrofitting building heating systems to be electric

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HOW WILL **REPAIRING THE PARKADE** IMPACT YOUR SERVICE AREA?

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Service Level Impacts – BUILD A NEW PARKADE	Alignments to Council Approved Plans & Policies
❑ 480 parking stalls in a heated downtown parkade remain available ❑ Mechanical and electrical systems are in new condition ❑ The parkade is no longer heated ❑ No car wash ❑ Close proximity to the library glass wall (obstructing views) ❑ Smaller park	**Strategic Priorities Action Plan** • Supports access to downtown libraries and greenspace **Complete Communities 2.0** • Supports attractions in the Sports, Hospitality, and Entertainment District and being a high-density residential and office area • Does not support promoting Transportation Demand Management (TDM) strategies in the downtown **Winnipeg Climate Action Plan** • Supports implementing low carbon and energy efficient City Facilities and Buildings • Does not support advancing sustainable transportation and shifting residents out of single occupancy vehicles with lower or no emissions **Community Energy Investment Roadmap** • Supports retrofitting building heating systems to be electric

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HOW WILL **BUILDING A NEW PARKADE** IMPACT YOUR SERVICE AREA?

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Service Level Impacts – DEMOLISH THE PARKADE	Alignments to Council Approved Plans & Policies
❑ 480 parking stalls in the downtown area **will no longer** be available for use by patrons visiting the library, and patrons visiting or working in the downtown. ❑ After demolition, the current park will be rebuilt to have the same footprint and same amenities as the existing park and will continue to be available to the public. ❑ There will no longer be indoor parking for patrons with accessibility requirements visiting the library or accessing the skywalk.	**Strategic Priorities Action Plan** • Supports access to downtown greenspace • Does not support access to downtown libraries **Complete Communities 2.0** • Does not support attractions in the Sports, Hospitality, and Entertainment District and being a high-density residential and office area

25

HOW WILL **DEMOLISHING** THE PARKADE IMPACT YOUR SERVICE AREA?

26

Service Level Impacts – SELL THE PARKADE	Alignments to Council Approved Plans & Policies
❑ If the buyer continues to use the land for a parkade, 480 parking stalls in a downtown parkade remain available for use by patrons visiting the library, and patrons visiting or working in the downtown. ❑ If the buyer builds a new parkade, it will likely have to be six storeys high, in very close proximity to the library glass wall, obstructing views. ❑ The buyer will not likely build a public park.	**Strategic Priorities Action Plan** • Supports access to downtown libraries • Does not support access to greenspace in the downtown **Complete Communities 2.0** • Supports attractions in the Sports, Hospitality, and Entertainment District and being a high-density residential and office area • Does not support promoting Transportation Demand Management (TDM) strategies in the downtown **Winnipeg Climate Action Plan** • Does not support advancing sustainable transportation and shifting residents out of single occupancy vehicles with lower or no emissions

27

HOW WILL **SELLING THE PARKADE** IMPACT YOUR SERVICE AREA?

28

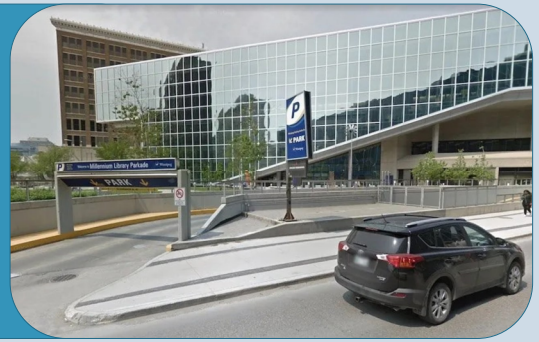
TELL US WHAT OPTIONS BEST SUPPORT YOUR SERVICE AREA?

29

NEXT STEPS:

Using the feedback you provided today we will assess the cost/benefit of each option in the feasibility study

We will then prepare a report to Council with the recommended option (aiming for a report to be considered in Dec 2024/Jan 2025)



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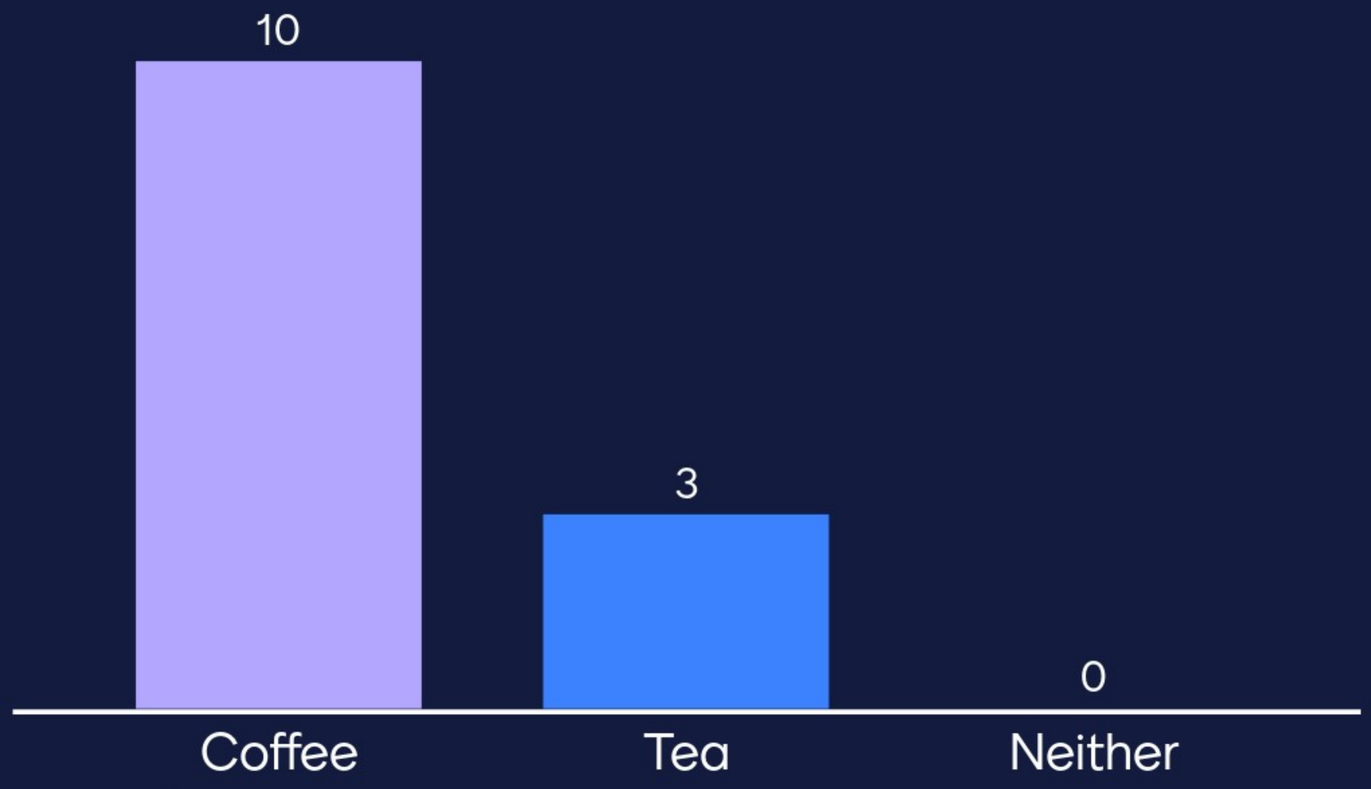
Thank You!

31

Millennium Library Parkade Feasibility Study

Mentimeter

Are you a coffee or tea person?



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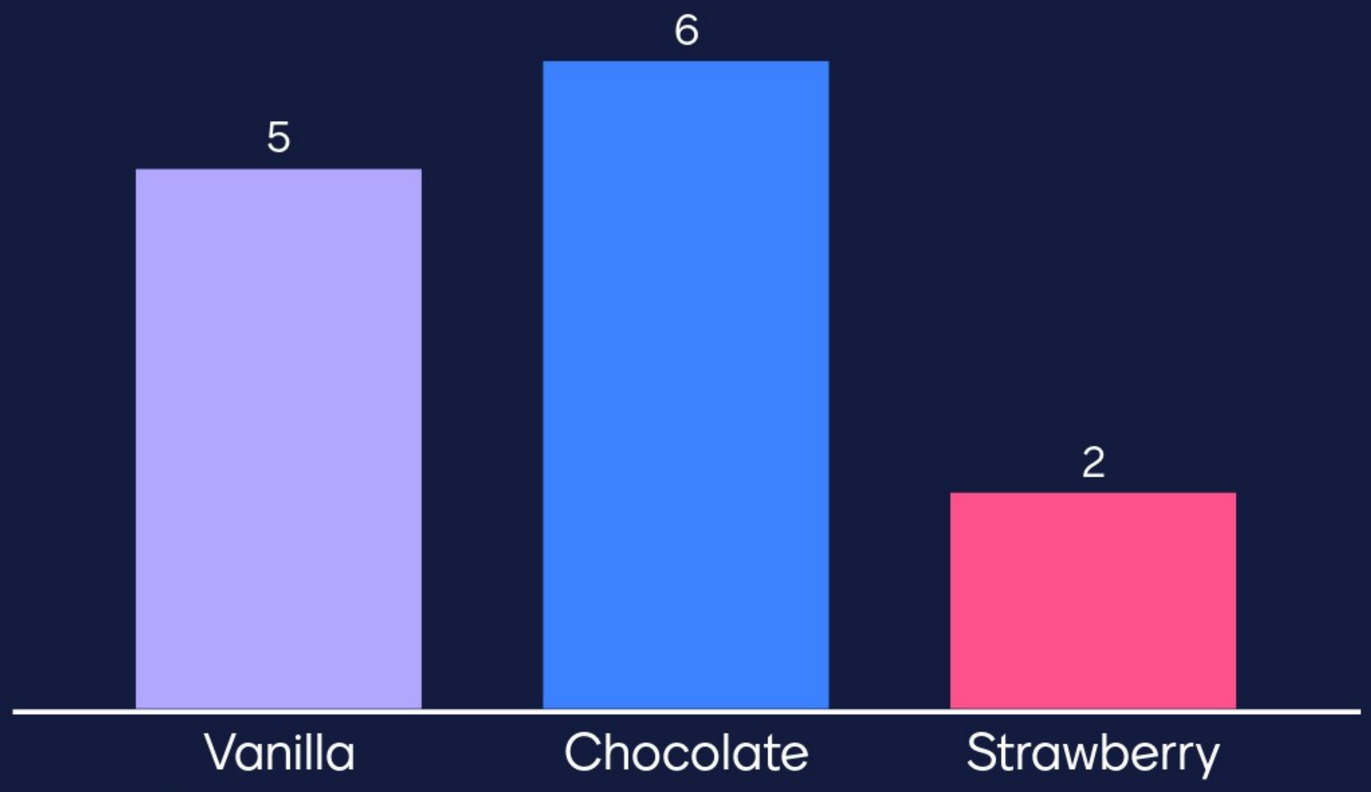
Mentimeter

Favourite Flavour of Ice-Cream?



1 13

What was the latest event or activity that brought you to the downtown?

29 Responses

REPAIR THE EXISTING PARKADE

16 Responses

Downtime for members during renovation work	No impact	No impact
Keeping available parking downtown	Most aligned with current policies and plans	Keeps the park as is
Library does require parking and accessible parking	Positive optics, showing investment into city facilities	Pro - keeps existing services, with improved parkade services.

REPAIR THE EXISTING PARKADE

16 Responses

Impacts service delivery for our department. Also the timing may have a bigger impact if we were to repair one of our floor at the same time.

Allows green space

Prefer this option over the above ground parkade

No improvement to accessibility

Aligned with plans

This is good for access to entertainment venues and support redesign of Graham Ave.

Maintains current LOS capacity at an improved condition level

REPAIR THE EXISTING PARKADE

1 Response

Poverty Reduction Strategy

REPAIR THE EXISTING PARKADE

13 Responses

Too many surface lots in downtown

Line of sight - underground parkade is preferred

Easy access to Graham Ave -" Destination Space"

Library just recently built a bike room in the library

Aligns with our Winnipeg, complete communities, and parks strategy

Parks plan - not enough green space in the downtown

This supports CentrePlan 2050 direction.

This supports CentrePlan 2050 direction.

Multi- use library (different services - programming/events)

REPAIR THE EXISTING PARKADE

13 Responses

Least disruptive option

Poverty Reduction Strategy

If we improve then elevators can be addressed for accessibility

Meets current building code

BUILD A NEW ABOVE GROUND, OPEN-AIR PARKADE

4 Responses

Remaining public spaces would be largely useless- too small, in shadow, unsafe

Not permitted under zoning - preference for mixed use infill

Would Need to replace the park space elsewhere

Impacts on Smith Street - would become dark and unsafe

BUILD A NEW ABOVE GROUND, OPEN-AIR PARKADE

24 Responses

Loss of greenspace

Safety

Security concerns, underground is preferred for secure access

Wind? Shading?

Dead space / landlocked Parkade beneath library

Loss of green space, line of sight, use of resources to build new

Obstruction of glass wall feature

Financially may be most viable

Pro: connectivity, securityCon: line of sight, higher cost

BUILD A NEW ABOVE GROUND, OPEN-AIR PARKADE

24 Responses

Compromises view from library

People like to sit near glass wall - addresses Mental health issues - loss natural sunlight from glass wall

Flexibility for dedicated police occupancy still possible.

May be a less costly financial option for a new asset

Lack of connectivity and interest

Line of sight is lost - safety

Security issues seeing cars in parkade

This is a terrible option. Loss of green space which is a need Downtown. It would destroy the design vision for the Library and the huge investment we made in the library.

Con: not a positive view for those using the library

BUILD A NEW ABOVE GROUND, OPEN-AIR PARKADE

24 Responses

Lobby - interconnected space, security and safety issues

It would add security concerns to a site that has security issues.

Cons, loss of conditioned parking area, big convenience for staff members

how would a new parkade address the lobby area (safety, welcoming point of entry)

The SHED District has a large need for park space. This would be a huge loss.

Retain parking LOS capacity at new condition

BUILD A NEW ABOVE GROUND, OPEN-AIR PARKADE

8 Responses

OurWinnipeg - Parks

Our Winnipeg , complete communities, parks strategy, urban forest strategy (proposed).

What's the vision for downtown for the next 50 years - how many people will be living downtown

Current parking policy suggests new Parkade development should be tied to major infill development , so is this the right location for a new Parkade ?

Is there a need for more parking capacity - have we looked at a hybrid model

Adaptive re-use spaces - other North American cities are looking at that

Glass wall - that investment is lost if we build new

Climate strategy

DEMOLISH THE PARKADE AND BUILD A NEW PARK

1 Response

Removes a long term liability (repair, operating and maintenance expenses) for the city, particularly in an environment of shrinking parking revenues

DEMOLISH THE PARKADE AND BUILD A NEW PARK

23 Responses

Huge detriment for library users and staff

Limited to no effect on park service

detriment to outside services - home deliveries, festivals

Cons, loss of parking for staff members. Already a sensitive topic.

The parkade is a good selling feature - for people that book meetings at library

Library van - delivery service (daily use)

Detriment to staff, future prospects for community development, future programming

Loss of revenue from event parking

Revitalizing downtown library

DEMOLISH THE PARKADE AND BUILD A NEW PARK

23 Responses

Pro, redevelopment of park space

Reduced LOS capacity

Huge impact for us, we will not support this option.

Library Stats: please send to awilliams@winnipeg.ca

Additional investment to add capacity for staff members would be required

Were would people park - where would the accessible parking be

Bike parking in catacombs

Employee parking

Impacts development of Graham Ave

Mentimeter

DEMOLISH THE PARKADE AND BUILD A NEW PARK

23 Responses

How important is this parkade to downtown development? More important if we lose surface lots. More demand with more downtown residents.

More residential properties driving parking demand in area

Developers are not wanting to build parking - too costly.

It's attached to Skywalk - attracts special event Parkers

Utility access complications, mech/elec systems

7

DEMOLISH THE PARKADE AND BUILD A NEW PARK

1 Response

Potential to promote and advance alternative modes of transportation in consideration of the climate action plan and transportation master plan

Mentimeter

SELL THE PARKADE

How does this option affect the level of service in your department?

SELL THE PARKADE

14 Responses

Security issues for members on monthly parking subscriptions

Loss orders park space

Uncertainty of what would go in its place

Potential loss of greenspace

Divesting investment responsibilities to private entities

Leasing option?

May end up with something similar to building new (blocking curtainwall, etc)

Uncertainty, what come nextAir rights will be an issue

Model City use space (same as True North square)

SELL THE PARKADE

14 Responses

Partnership with private enterprise creates dependancies, high risk

Pro - potential for a positive mixed use development

It may be difficult to find a suitable buyer that will take on repair costs and improve the site in an acceptable manner

What if we decide to redo the library in the feature

*future

SELL THE PARKADE

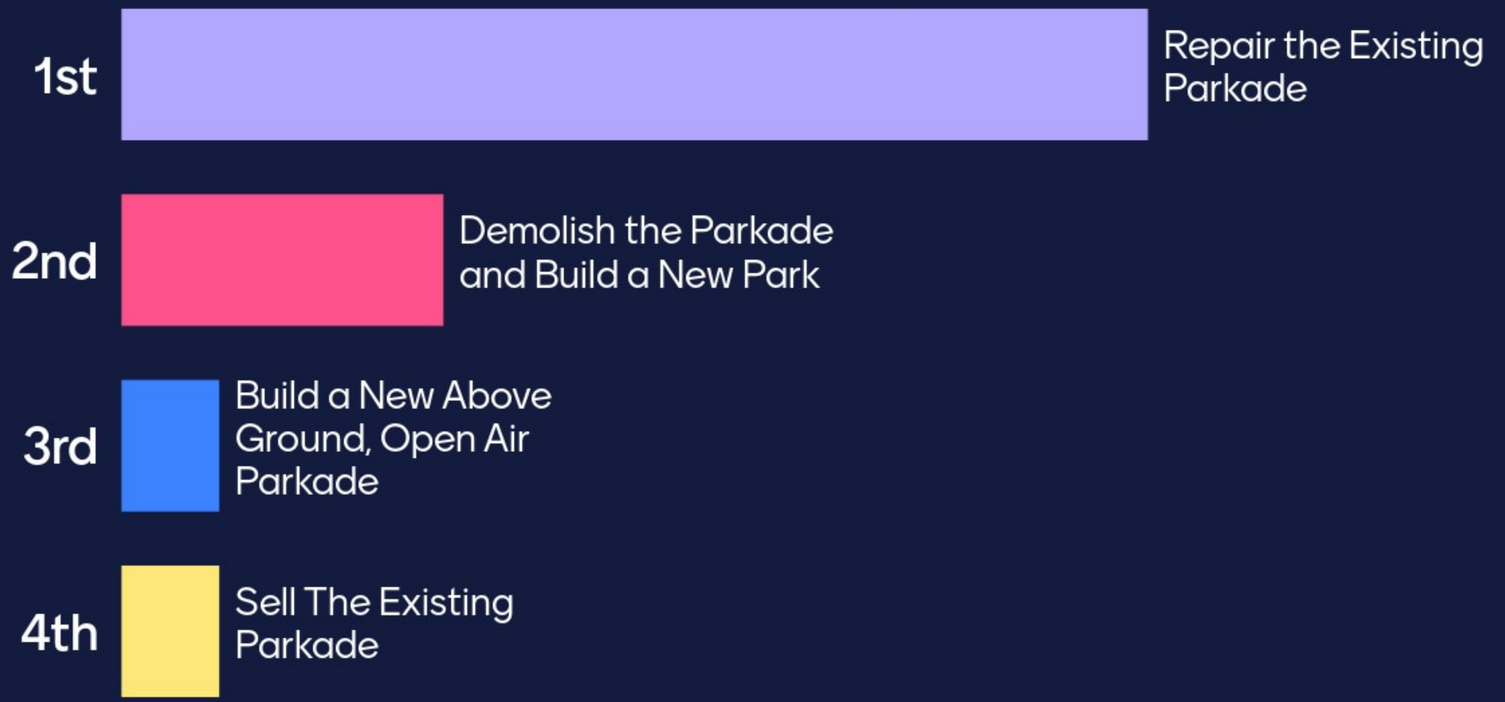
How does this affect any councilor approved action plans? If so, what are they?

Mentimeter

What additional items do you think should be considered in this project?

Waiting for responses ...

Which option do you prefer?



Ask me anything

0 questions
0 upvotes

Thanks for the input!

Will get back to you on the decided topic.

APPENDIX K – PREVIOUS CONDITION ASSESSMENT

REPORT FOR:

Millennium Library Parkade – 251 Donald St. Parkade Condition Assessment

Submitted to:	City of Winnipeg
Attention:	Mr. Jason Wiebe C.E.T.
Date:	April 1, 2021 (Revised April 8, 2021)
Submitted by:	Crosier Kilgour & Partners Ltd. 300-275 Carlton Street Winnipeg, Manitoba R3C 5R6 Phone: 204.943.7501 Fax: 204.943.7507 Website: www.ckpeng.com
Contact:	Derek J. Mizak, P.Eng.
Our File No.	2020-1183

Crosier Kilgour & Partners Ltd.™

CONSULTING STRUCTURAL ENGINEERS

Table of Contents

Executive Summary

A multi-disciplinary building condition assessment of the Millennium Library Parkade – 251 Donald Street, was completed by Crosier Kilgour & Partners Ltd. and SMS Engineering Ltd. The purpose of the assessment was to provide an opinion on the current condition of the building and its components and present recommendations for immediate, short, mid, and long-term repair/replacement costs.

The results of the investigation indicate that the parkade structure is in fair condition as defined by the CIRC 5-Point Scale for Rating Asset Condition, it shows general signs of deterioration and requires attention. A significant quantity of concrete deterioration has been identified on the top surface of the Level P1 structural slab. Although concrete deterioration was anticipated, the quantity of deterioration identified during the investigation is greater than expected given the recent structural restoration. The structural analysis of a representative design strip indicates that the structural slab remains suitable for continued use, however concrete repairs will be required in the short-term.

The results of the core sampling and testing indicate that the top surface of the structural slab is chloride contaminated and will require a large-scale remediation to address existing deterioration. A restoration option was presented as the minimum scope of work at an estimated cost of $1.6 million and an expected service-life of 5 to 7 years (Option 1). An alternative restoration option was also presented which includes replacement of the contaminated top surface through hydro-demolition at an estimated cost of $3.77 million (Option 2). This option is expected to have an effective service-life in the order of 20 years with normal maintenance.

The existing Level P2 slab-on-grade is in good overall condition. Installation of column swales are recommended as preventative maintenance to address areas of ponding water and reduce the rate of future deterioration.

The condition of the existing waterproofing varies throughout the parkade. The waterproofing on Level P1 is generally in fair condition with localised repairs required. However, the existing coatings in the mechanical rooms, vestibules and stairwells is in poor condition, replacement with a similar coating is recommended as a non-mandatory maintenance item.

SMS performed a building condition assessment of the Millennium Library Parkade. The condition assessment included a review of record information and annual test reports. A brief visual review was performed for the two parkade levels. The scope of work was limited to elements in the parkade and excluded the plaza or the Library building.

The majority of the mechanical systems are original to the facility with the exception of some piping, drains and the snow-melt systems for the entrance and exit ramps, and are in poor condition as defined by the CIRC 5-Point Scale for Rating Asset Condition. There are two elements which require repairs in the short term. These elements include the addition of the generator room fuel oil ventilation fan and the addition of NO_2 detection throughout the Parkade levels. The main ventilation systems, which are dedicated to the parkade, are beyond the expected service life and carry the largest opinion of probably costs for replacement. The added cost is due to the need for a code compliant upgrade which will require larger systems be installed. The total opinion of probable cost for the repairs over the next 10 year period is estimated to be $9,965,000.00 with an additional $1,289,000.00 estimated beyond the 10 year period.

The majority of the electrical systems are original to the facility with the exception of lighting and select electrical systems (CCTV, card access, fire alarm, etc), and are in poor condition as defined by the CIRC 5-Point Scale for Rating Asset Condition. There are two elements which require repairs in the short term. These items include changing the remaining red exit signs to green pictogram and installing covers on junction boxes and splitters in a few of the electrical and mechanical rooms. The total opinion of probable

cost for the repairs over the next 10 year period is estimated to be $8,505,500.00 with an additional $350,000.00 estimated beyond the 10 year period.

The following table provides a breakdown of the anticipated repair costs in 2021 dollars. Based on the level of investigation and available information, the budget estimates are considered Class 4 (-30% to +50%) for years 1 through 6 and Class 5 (-50% to +100%) for years 7 through 10. The budget estimates are prepared based on limited information with no engineering work completed and preliminary scope determination. Please note that the costs presented are for construction only, and excludes taxes, contingencies, and professional fees.

Summary of All Priorities

Category	Estimated Costs	
	Structural Option 1	**Structural Option 2**
Total Required Repairs (within 3 months)	$103,000	$103,000
Total Short Term Recommendations (within 1 year)	$1,967,000	$4,140,000
Total Medium Term Recommendations (Year 1 to 5)	$12,510,000	$12,510,000
Total Long Term Recommendations (Year 5 to 10)	$17,080,000	$15,240,000
Long Term Considerations/Recommended Improvements (not time critical)	$1,739,000	$1,739,000
Total of All Recommendations	**$33,399,000**	**$33,732,000**

1. Introduction

At the request of the City of Winnipeg, a multi-disciplinary parkade condition assessment of the Millennium Library Parkade – 251 Donald Street, Winnipeg, Manitoba was completed by Crosier Kilgour & Partners and SMS Engineering personnel. The purpose of the assessment was to provide an opinion on the current condition of the parkade and its components and present recommendations for immediate, short, mid, and long-term repair/replacement costs. The assessment involved a visual walk-through survey of the parkade structure and the mechanical and electrical systems. The walk-through survey consisted of nonintrusive visual observations of readily accessible, easily visible components and systems of the property and excludes the operation of equipment, exploratory probing, removal or relocation of materials, testing, or the use of equipment, etc. In addition, a sounding survey, membrane condition survey and core testing were completed on the upper parking level. Where applicable, opinions of probable construction costs for suggested remedial work have been provided. The following report summarizes our significant observations, findings, and recommendations.

1.1 Limitations

Our assessment is based on an examination of representative portions of the building under review which were easily visible, exposed and could be examined. We cannot warrant any different conditions that may exist, but which are covered by finishes, or other materials, or not accessible at the time of the site visit.

This report has been prepared for the sole benefit of City of Winnipeg. The report may not be reviewed, referred to, or relied upon by any other person or entity without the prior written permission of Crosier Kilgour & Partners Ltd. and the City of Winnipeg.

1.2 Scope of Investigation

The intent of this project is to complete a condition assessment of the parkade structure, mechanical and electrical systems, and provide recommendations for immediate, short, medium, and long term repairs.

The investigation included, a review of available documentation such as original construction drawings, engineering reports, maintenance reports, and discussions with personnel familiar with the facility.

A visual review was completed throughout representative portions of the parkade which were exposed and readily accessible including parking decks, stairwells, and representative non-public areas such as accessible mechanical rooms.

A sounding survey of the readily accessible upper parking level, including a chain drag of the top surface and representative hammer sounding of the exposed soffit.

Core sampling and testing of the upper parking structural slab, including chloride testing, carbonation testing and compressive strength.

A membrane condition survey of the upper parking level, including visual assessment to identify areas of wear and bond testing.

1.3 Priority of Recommendations

All recommendations for parkade systems or components identified in the following sections have been assigned a priority based on the following criteria for the purposes of scheduling and budgeting in accordance with the following:

- Required Repairs (within 3 months) – Items that require immediate action as a result of any of the following: potential unsafe conditions, material building or fire code violations, or conditions that if left unremedied, uncorrected, have the potential to result in or contribute to critical element or system failure within one year or will result most probably in a significant escalation of its remedial cost. Repairs required within 3 months.
- Short Term Recommendations (within 1 year) – High priority for repairs/maintenance including code and regulatory issues.
- Medium Term (within 5 Years) – Repairs required to address ongoing or low-risk deterioration, replacement of end of service-life building components, regular and/or proactive maintenance.
- Long Term (within 10 years) – Repairs required to address ongoing or low-risk deterioration, replacement of end of service-life building components.
- Long Term Considerations/Recommended Improvements (not time critical) – Optional work including recommended improvements presented for future consideration and planning.
- Maintenance (ongoing) – Repairs required to address ongoing, or routine maintenance. Work considered to be normal maintenance has not been included.

2. Property Description

The following sections are based on a review of the existing architectural and structural drawings, and visual observations made during the site review. The following drawings were available for review:

- Architectural drawings A-1 through A-29 by Macdonald Cockburn McLeod McFeetors Architects dated Dec 30, 1974. The drawings include the library and attached parkade.
- Electrical drawings E-1 through E-12 by Scouten Mitchell Sigurdson & Assocs. Ltd. Consulting Engineers dated Dec. 30, 1974. The drawings include the library and attached parkade.
- Mechanical drawings M-1 through M-16 by Scouten Mitchell Sigurdson & Assocs. Ltd. Consulting Engineers dated Dec. 30, 1974. The drawings include the library and attached parkade.
- Structural drawings S-1 through S-18 by Crosier, Greenberg & Partners Consulting Civil and Structural Engineers dated Dec. 30 1974. The drawings include the library and attached parkade.
- Repair drawings S1 through S10, M1 through M2 and P1 and specifications by Concentric Associates International Incorporated dated, November 7, 2012.
- Repair drawings S0 through S2, M1 through M4, E1, Addendum drawings S1, S2 and M2, and specifications by Concentric Associates International Incorporated dated June 4, 2018.

Testing reports, including but not limited to; VFA Report (2020), Annual Backflow Device Test Report (2020), Sprinkler Inspection Report (2020), Emergency Lighting Annual Inspection (2020), Annual Generator Report (2020), and Fire Alarm System Annual Test & Inspection Report (2020) were also made available for review and reference.

2.1 Structural System

The Millennium Library Parkade was designed in late 1974 and constructed shortly thereafter. It consists of two underground, interior, heated parking levels. The structural system for the upper parking level (P1) consists of a 9” thick, conventionally reinforced two-way concrete slab with 10’-0” x 10-0” x 6” deep drop panels at column locations. The slab has a design live load capacity of 50 psf which is consistent with current code requirements. The total area of Level P1 is approximately 98,000 ft². The lower parking level (P2) occupies approximately 100,000 ft² and was originally constructed of a 5” thick concrete slab on compacted granular fill.

Based on the information available, Levels P1 and P2 were waterproofed with a coal-tar based membrane in 1985, replaced with a presumed urethane-based membrane in 1988, and periodically repaired/recoated. The available 2012 repair drawings suggest that the existing waterproofing system was removed down to concrete substrate and replaced in the drive aisles. Whereas the existing waterproofing system was recoated with localised base coat repairs for the parking stalls. The 2012 repair drawings also indicate that the existing slab-on-grade on Level P2 and interior ramps between Levels P1 and P2 was removed and replaced with a 4" concrete slab on existing granular.

The parkade is accessed by structural ramps off Smith Street and Donald Street, each incorporating a heating system in the concrete topping for de-icing control. Interior, inter-level access is provided by a one-way cast-in-place concrete ramp structure.

2.2 Background of Structural Deterioration

Deterioration may be defined as any internal or external process, which may adversely affect the structural integrity or function of an individual member or of the structure as a whole. The processes of deterioration can include items such as internal material reactions, the external environment, as well as aging. The manifestation of deterioration may range from aesthetic concerns, through serviceability issues, to complete failure.

Deterioration of concrete structures exposed to moisture and chlorides has become a widespread problem throughout the world. In areas of steel reinforcing, long term moisture and chloride penetration can cause corrosion of both structural steel and embedded steel reinforcing within the concrete. Moisture arises from many sources; however, the main sources are rain, melting snow, and the deposition of moisture and salts brought in by vehicles. In the absence of a protective cover on the top surfaces of the concrete, moisture will permeate through the concrete and eventually induce corrosion in the presence of oxygen. As chloride contamination increases and carbonation of the soffit continues, there is a potential for the rate of deterioration to increase. Chlorides brought onto the deck by vehicles significantly accelerate the deterioration processes.

The exact level of chloride concentration required in reinforced concrete to promote corrosion varies, as many variables exist. However, extensive research and field experience has suggested that approximately 0.15 to 0.20% chlorides by weight of cement content, represents the corrosion threshold for normal reinforcing steel. That is, the concrete is no longer capable of protecting the embedded steel from corrosion in the presence of an electrolyte, such as moisture. Note that moisture in the liquid phase is not necessarily required for the corrosion process; research has suggested that a relative humidity above 50% is all that is required to provide sufficient electrolyte to facilitate corrosion.

The relatively high alkalinity or pH of concrete normally protects embedded steel from corrosion. The high pH, or alkaline environment of concrete facilitates the formation of a protective film on the steel, which prevents corrosion. Once the pH drops below approximately 9 due to the process of carbonation, destruction of this protective film ensues; thereby creating the potential for corrosion.

Unfortunately, chloride-laden moisture destroys the protective film, thereby initiating corrosion of the steel. Carbon dioxide present in the atmosphere can penetrate the concrete over time and lower its naturally high pH through a process termed carbonation. Cracks aggravate corrosion by providing a more direct path for the penetration of moisture, carbon dioxide, and oxygen.

Corrosion of the reinforcing steel is an electrochemical process, in which metallic iron is oxidized, converting iron to rust. This process of converting iron to rust is expansive; that is, the rust occupies a much larger volume than the steel. Depending on the state of oxidation, the volume increase may be as large as 600% of the original metal. This volume increase causes cracking of the concrete and delamination of the adjacent concrete surface. In severe cases, loss of steel/concrete bond and

reduction of cross-section can lead to structural failure. Obviously, as concrete cracking occurs, the rate and depth of penetration of chloride-laden moisture increases dramatically.

This moisture will not only cause problems due to corrosion of the steel within the concrete, but it will also dissolve certain constituents of the concrete, specifically calcium hydroxide. The calcium hydroxide-laden moisture reacts with the carbon dioxide present in air, forming a white crust. This white precipitate is calcium carbonate. The problem typically manifests itself through white stalactites emanating from cracks within the concrete. The phenomenon is termed efflorescence and is usually considered an aesthetics problem rather than a structural problem. However, the high alkalinity of water leaching through cracks and joints has been known to cause damage to vehicle paint if not removed in a timely manner.

Cracks presumably exist in all reinforced concrete structures and can occur as a result of numerous factors. In most instances, cracks only become significant if by their presence, they allow moisture or deleterious substances to penetrate the concrete, thereby hastening deterioration. In some instances, however, cracking can be an indicator of more significant structural concerns such as, delamination due to corrosion of the embedded reinforcing steel, freeze-thaw deterioration, or even structural failure. It is for the above reason that an accurate evaluation of the causes of the visible cracking is essential.

3. Observations and Findings

The following summarizes the results of the November 25, 2020 walk-through survey including significant observations, findings, and recommendations. The results of the sounding survey, membrane condition survey, core sampling and testing, and representative structural analysis are also summarized below. Copies of SMS Engineering's mechanical and electrical report have been included in Appendix B.

The structural assessment of the parkade included a visual review of accessible areas of the parkade structure, a sounding survey of the top surface and soffit of the upper parking level (P1), a membrane condition survey of the existing coating on Level P1, core sampling and testing of the Level P1 slab and a structural analysis of representative sections.

3.1 Visual Observations

The visual review consisted of a walkthrough of the exposed and readily accessible sections of the parkade including the parking decks and stairwells, as well as representative non-public areas such as mechanical rooms.

3.1.1 Level P1

The waterproofing membrane appears to be in overall good condition. Three locations of severe deterioration were observed along the north drive aisle, where the waterproofing is either loose or has been worn away (Photograph #1). It was also noted that a few localized waterproofing repairs have been completed (Photograph #2).

Although not apparent due to the presence of the waterproofing membrane, widespread top surface concrete deterioration is present throughout Level P1. The approximate extents of deterioration were identified during the sounding survey and marked onsite to allow a visual review of the locations and general scale of the deterioration (Photographs #3 & #4). The locations of deterioration appear to be sporadic in location and size (Photograph #5).

Localized areas of deterioration were also identified on the soffit (underside) of Level P1 during the sounding survey (Photograph #6). In general, the observed soffit deterioration consisted of relatively small locations ranging from 1 to 4 sq.ft. and sporadically located throughout the parkade.

The concrete walls and columns are in overall good condition. Localized spalling and evidence of concrete deterioration were identified at a few columns (Photograph #7).

The existing drains appear to be in good condition (Photograph #8). It was noted that several drains have been installed in the drive aisles and along the center of the parking aisles. It is our understanding that these were added during the 2012 repairs presumably to help address the minimal existing drainage profile.

The rubber curbs installed in the parking stalls appear to be in good condition. A few curbs were observed to be damaged but are likely due to isolated vehicle impacts (Photograph #9). The condition of the concrete curbs at the entrance and exit ramps varies (Photograph #10). Approximately 85 sq.ft. of curb deterioration was observed. Localized repairs and or full depth replacement is recommended in the short term to minimize the risk of tripping hazards and damage to vehicles.

3.1.2 Level P2

It is our understanding that the entirety of the Level P2 slab-on-grade was replaced during the 2012 repairs with the exception of the mechanical pits and slabs-on-grade within the stairwells. The slab-on-grade generally appears to be in good condition. However, the original waterproofing and slab-on-grade that were not replaced at the mechanical pits are in poor condition (Photograph #11). Installing waterproofing membranes on slabs-on-grade is generally not recommended due to concerns of vapour drive, which can result in premature failure of the membrane and deterioration of the underlying concrete. The membrane that had been installed on the lower level slab failed in this manner. Recoating of the slab-on-grade is not recommended. Localized replacement of the concrete slab-on-grade is recommended in the short term as required to address tripping hazards and to maintain functionality. As these locations are not accessible to the general public, full replacement is discretionary but could be considered in the long term.

The concrete walls and columns are in overall good condition. Localized spalling and scaling were identified at a few of the columns. Localized cracking, spalling, and scaling were noted along the perimeter concrete walls (Photograph #12). Concrete repairs to address spalling and concrete deterioration is recommended in the short term.

Multiple locations of ponding water were observed at the bases of concrete columns and along the walls (Photograph #13). Chloride laden moisture ponding against structural members is a primary cause of concrete deterioration and delamination. Multiple locations of scaling are present along the base of the wall and at columns with observed ponding (Photograph #14). It is recommended that concrete swales be installed at known locations of ponding in the medium term with consideration for installation of concrete swales at all columns and walls in the long term.

It was also noted that the concrete column jackets at 5 locations did not extend down to the pile caps. As a result, the new slab-on-grade elevation has caused a gap between the slab-on-grade and bottom of the pile cap (Photograph #15). Although the gap itself is not a structural concern, its presence allows moisture to flow into the cut-out and pond against the column and pile cap. The gap has been partially closed with plywood formwork; however, this is not an effective protective measure against moisture. It is recommended that concrete swales be installed at these locations in the short term.

The drains on Level P2 are in fair condition. The presence of corrosion was noted on the drain covers and suggests the drains will need to be replaced in the long term.

Random cracking was observed throughout the slab-on-grade (Photograph #16). Chloride laden water can penetrate into these random cracks and lead to localized deterioration of the concrete. It is recommended that these cracks be routed and sealed in the short to medium term. It is also recommended that failed sealant along control joints be removed and replaced in the short to medium term.

3.1.3 Mechanical Rooms

In general, the mechanical rooms are in fair condition. Although not sounded, localized top surface deterioration, was apparent in the mechanical rooms (Photograph #17). Locations of concrete deterioration were also noted on the walls, ramps, columns, soffits, and curbs (Photograph #18). It is recommended that localized concrete repairs be completed in the short term.

The existing coating, present in most of the Level P1 mechanical rooms, is in poor condition and is at or near the end of its service life (Photograph #19). Replacement of end-of-life

coatings outside of areas exposed to moisture and road salts, such as within the mechanical rooms, is recommended but not required for durability and has been identified as a non-mandatory maintenance item. However, replacement of the coatings on Level P2 are not recommended due to concerns of moisture vapour drive causing debonding and premature failure of the coating.

Locations of efflorescence were observed to be present in the corners and soffits beyond the footprint of the library and plaza (Photograph #20). The building representative indicated that ongoing leakage has not been noticed at these locations. However, the presence of efflorescence is indicative of moisture seepage through the concrete and suggests that the existing waterproofing is at or nearing the end of its service life.

It is our understanding that the exterior waterproofing beyond the footprint of the library and plaza is original and has been in service for 45+ years. Replacement of the waterproofing will likely be required in the medium term. In the short term, locations of known leakage could be injected with a polyurethane resin to prevent further moisture ingress until the exterior waterproofing can be replaced.

Evidence of leakage was noted at the penetrations for the heated ramps (Photograph #21). The building representative indicated that periodic leakage has been observed in the past. The penetrations can be injected with a polyurethane resin to prevent further moisture ingress.

The existing drains, where present, were observed to be in poor condition (Photograph #22). It is recommended that replacement of the drains be scheduled with the localized concrete repairs or prior to application of a waterproofing membrane.

3.1.4 Stairwells

The stairwells at approximate Gridlines Q-3 and O-10 are of concrete construction and appear to be in good condition. Localized cracks were observed on the landings, routing and sealing of the cracks is recommended in the short term (Photograph #23). The coating in the vestibules on P1 appear to be at the end of its service life, replacement with a waterproofing membrane is recommended in the medium term (Photograph #24). It was also noted that a few guardrail anchors were not installed during installation of the guardrails (Photograph #25). Installation of the anchors is recommended in the short term.

The stairwell at approximate Gridlines A-8 is a combination of concrete construction (lower portion) and steel pan construction (upper portion). The lower portion of the stairwell is in fair condition. Locations of concrete deterioration were noted, and repairs are recommended in the short term. The existing coating has been worn down to the concrete substrate along the center of the landings and treads.

Although not within scope, the upper portion of the stairwell was reviewed for informational purposes. The structural steel and steel pans of the upper portion appear to be in good condition (Photograph #26). Cracking and minor deterioration of the concrete treads was noted at some locations (Photograph #27). Replacement of deteriorated concrete treads is recommended in the medium term. The costs to complete this work are not included in the tables below.

Full review of the stairwell at approximate Gridlines F-5 was not completed as the upper portion (steel pan) was not accessible at the time of the site visit. The lower portion (concrete construction) appears to be in good condition.

Consideration should be given to application of a waterproofing membrane on the concrete stairwells. Application of a waterproofing membrane will protect the concrete from chloride laden moisture tracked by pedestrians.

3.1.5 Other Observations

Localized areas of efflorescence and concrete deterioration were observed on the plaza deck soffit (underside)(Photograph #28). Repair of the deteriorated concrete locations is recommended in the short-term. Our records indicated that the plaza deck was remediated in 2007 and included replacement of the existing waterproofing membrane. It is not anticipated that the plaza deck waterproofing will require replacement within the timeframe considered in this report.

The four exterior ramps generally appear to be in good condition. Of the four exterior ramps, three are uncoated, whereas the Smith Street entrance is coated with a waterproofing system. A few cracks were observed in the waterproofing but appear to only penetrate the wear coarse layer (topcoat). Random cracking in the concrete topping was observed at the other three ramps. Localised repairs are recommended in the short term. The two interior ramps were also observed to be in good overall condition.

3.2 Sounding Survey

Delamination and/or deterioration of the exposed concrete surfaces can be readily identified by sounding surveys. Although crude in appearance, sounding surveys are a powerful tool for identifying, mapping, and quantifying corrosion-related deterioration within cast-in-place concrete. This test method is recognized by such agencies as the American Concrete Institute and the International Concrete Repair Institute (ICRI) as a primary investigative technique.

A sounding survey was completed throughout the accessible sections of the parkade. Areas of delamination were identified on-site, quantified, and recorded on drawings for future reference. The following tables provide a summary of our findings.

3.2.1 Top Surface

A chain drag sounding survey of the accessible Level P1 structural slab was completed. The following table summarizes the results of the top surface sounding survey.

Table 1: Top Surface Sounding Survey

Location	Area		Top Surface Delamination	
	Total	Sounded	ft²	%
Level P1	86,000 ft²	86,000 ft²	8,696 ft²	10.1%

As can be seen in Table 1 above, the sounding survey found 8,696 ft^2 of deteriorated top surface concrete which represents 10.1% of the surface. In total approximately 950 top surface concrete repair locations were identified providing an average size of approximately 9.1 ft^2. Although this may be surprising considering localised concrete repairs were completed starting in 2012, it is consistent with available records which indicate that the structural slab was exposed to moisture and chlorides for 10+ years before any waterproofing was applied, and thus prone to corrosion-related deterioration.

During concrete repairs, the demolition will inevitably grow beyond the extents of deterioration to provide a sound substrate. Although it is difficult to predict the increase in patch size, it is estimated that the patch could grow from 2 to 6 inches in each direction. For budgeting and planning purposes we recommend allowing for a growth of in area of 40%. Therefore, the total top surface concrete repair area is estimated to be in the order of 12,250 ft^2.

3.2.2 Soffit Sounding Survey

A hammer sounding survey of the accessible Level P1 structural slab was completed. The following table summarizes the results of the top surface sounding survey.

Table 2: Soffit Sounding Survey

Location	Area		Slab Soffit Delamination	
	Total (ft²)	Sounded	ft²	%
Level P1	95,000 ft²	95,000 ft²	582 ft²	0.6%

The sounding survey found 582 ft² of slab soffit delamination which represents 0.6% of the surface area. In total approximately 170 soffit repair locations were identified providing an average size of approximately 3.4 ft². For the purposes of budgeting and planning we recommend allowing for a 40% increase in area to account for growth in the patch area. The total area of concrete soffit repairs is therefore estimated to be in the order of 800 ft².

3.3 Core Sampling and Testing

To help determine the existing condition of the structure and the potential for further corrosion, core samples were taken and tested to determine compressive strength, chloride content and carbonation penetration. In total twelve cores were taken as follows: 3 for compressive strength testing, 6 for chloride ion concentration testing and 3 for carbonation testing. The results of the testing can be found in the tables below.

3.3.1 Compressive Strength

Concrete typically slowly strengthens overtime if it is kept in pristine condition and is not allowed to deteriorate. Unfortunately, this is very rarely the case and the penetration of substances such as chlorides, moisture, oxygen, and carbon dioxide will cause deterioration. It can also provide an indication of the overall quality of the original construction. The current compressive strength of an existing concrete is therefore important when conducting a structural analysis. The report submitted by the third-party testing agency can be found in Appendix D.

Table 3: Summary of Compressive Strength Testing

Test No.	Location	Compressive Strength	
		psi	MPa
TH 1B	Drive Aisle – Between Gridlines 7 to 8 and G to H	5,192	35.8
TH 2B	Parking Stall – Between Gridlines 10 to 11 and C to D	2,350	16.2
TH 6B	Parking Stall – Between Gridlines 2 to 3 and N to O	2,944	20.3
$f'_{c(eq)}$	Equivalent Compressive Strength (ACI 562)	1,668	11.5

The results of the compressive strength testing are used to calculate the equivalent compressive strength in accordance with ACI 562, *Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures.* ACI 562 requires the calculation of an equivalent compressive strength that considers the number of results, safety factors and the standard deviation. The three results were used to calculate an equivalent compressive strength of 1668 psi (11.5 MPa) which is considerably lower than the design concrete strength of 3000 psi (20.7 MPa).

3.3.2 Chlorides

Since the presence of chlorides in concrete is one of the primary causes of corrosion, the results of the testing help to establish the potential for corrosion and determine if existing chloride concentrations are high enough to induce or enhance corrosion of the embedded reinforcing steel. Although the actual quantity of chlorides required to initiate corrosion varies from site to site, the industry accepts that chloride concentrations above 0.15 to 0.20% by weight of cement are sufficiently high to induce corrosion of the reinforcing steel in the presence of moisture and oxygen. Note that considerable variations can occur depending upon the mix constituents, moisture levels, and temperature. The reports submitted by the third-party testing agency can be found in Appendix D.

Table 4: Summary of Chloride Testing

Test No.	Location	Sample Depth (mm)	Water Soluble Chloride Content	
			% by mass concrete	% by mass cement
TH 1A	Drive Aisle – Between Gridlines 7 to 8 and G to H	20 to 30	<0.010	<0.08
TH 2A	Parking Stall – Between Gridlines 10 to 11 and C to D	20 to 30	0.086	0.67
TH 3A	Drive Aisle – Between Gridlines 3 to 4 on C	20 to 30	0.288	2.2
TH 4A	Drive Aisle – Between Gridlines 7 to 8 and H to J	20 to 30	0.025	0.20
		100 to 110	<0.010	<0.08
TH 5A	Drive Aisle – Between Gridlines 8 to 9 and M to N	20 to 30	0.081	0.63
TH 6A	Parking Stall – Between Gridlines 2 to 3 and N to O	20 to 30	0.086	0.67
		100 to 110	0.010	0.08

The testing agency submitted the chloride concentrations as percentage by mass of concrete. These values were converted to percentage by mass of cement as this is a better representative for comparison. All six of the core samples were tested for chlorides at a depth of 20 to 30 mm. This depth was selected as it is the approximate depth of the top level of reinforcing in the structural slab. As can be seen in the table the chloride concentration results for five of the six cores are sufficiently high to induce corrosion. Two of the cores were also tested at a depth of 100 to 110 mm to provide an indication of the embodied chlorides when the structural slab was originally cast. As can be seen in the table above in both cases, the embodied chlorides are well below the threshold indicating that the concrete has been exposed to chlorides prior to application of the waterproofing membrane.

3.3.3 Carbonation

Carbon dioxide in the air, from processes such as combustion, will penetrate the concrete, react with the calcium hydroxide in the cement paste producing calcium carbonate and cause the alkalinity of the paste to decrease. In this manner the naturally protective film around the reinforcement will be lost at a pH of about 9, and corrosion will start in the presence of sufficient moisture and oxygen. For this investigation, a proprietary chemical solution was applied to the surface which reacts with the concrete and changes colour depending on pH. To measure the pH of the cement paste, a newly cut out core is split in half and sprayed with the indicators and allowed to dry. The pH is then revealed by comparison with the pH color spectrum.

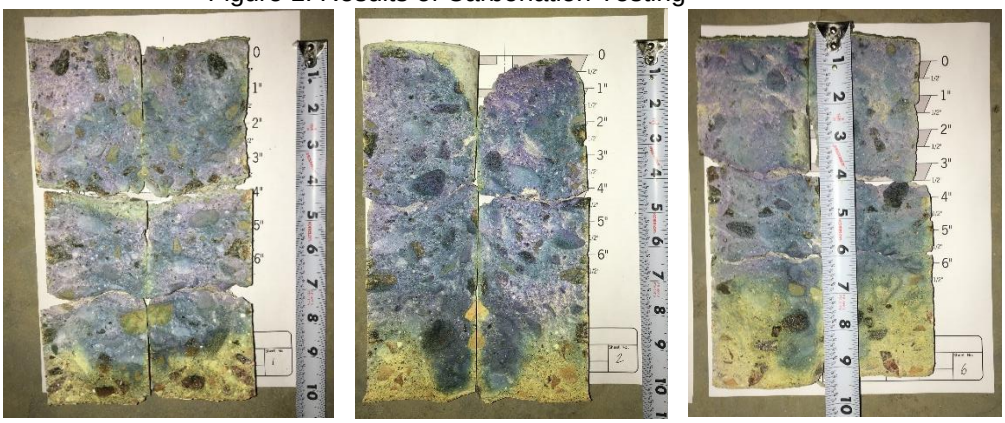
Colour:					
pH	5 (Orange)	7 (Yellow)	9 (Green)	11 (Purple)	13 (Blue)

Table 5: Summary of Carbonation Testing

Test No.	Location	pH	Carbonation Depth	
			Inch	mm
TH 1C	Drive Aisle – Between Gridlines 7 to 8 and G to H	7 - 9	1.25	32
TH 2C	Parking Stall – Between Gridlines 10 to 11 and C to D	7 - 9	1.5	38
TH 6C	Parking Stall – Between Gridlines 2 to 3 and N to O	7 - 9	2	51

For this investigation, the cores were extracted full depth to provide results at the top surface and soffit of the structural slab. The results of the carbonation testing indicated a pH ranging from 7 to 9 on the bottom of the structural slab core samples. The depth ranges from 1 ¼" to 2" which suggests the carbonation has reached the bottom reinforcing steel and the protective film is no longer present. The pH at the top surface generally appears to be above 9. The results of the carbonation testing confirm that the passive protective film provided by a high pH is no longer present at the bottom reinforcing and the reinforcing steel is vulnerable to corrosion in the presence of moisture and oxygen.

Figure 1: Results of Carbonation Testing



3.3.4 Summary

The results of the core sampling reflect that the Level P1 structural slab is heavily contaminated. The chloride testing indicates that the top layer of reinforcing steel is vulnerable to rapid corrosion in the presence of moisture due to the high chloride concentration. The carbonation testing indicated that the bottom reinforcing is also vulnerable to corrosion in the presence of moisture due to a pH below 9. Taking both of the results into consideration combined with the low compressive strength, moisture protection of the structural slab is crucial.

Localized repairs to address the known locations where the waterproofing membrane has exhibited excessive wear and/or debonded exposing the underlying concrete is recommended in the short term. It should also be noted that top surface concrete repair locations will need to be recoated and lapped onto the existing waterproofing.

In addition to general wear caused by vehicular traffic, waterproofing membranes tend to become more brittle over time due to oxidization of the constituents and loss of volatiles such as plasticizers and extender oils. This results in shrinkage and cracking which can affect bond of the membrane, reduce flexibility and the ability to bridge cracks in the structure. Although the parking stalls may not need recoating until the long-term, it is recommended that the drive aisles and turning zones be recoated in the medium term.

3.4 Structural Analysis

A structural analysis was completed to evaluate the theoretical capacity of the structure and determine the implications of concrete deterioration. The analysis was based on the design methods in the latest edition of CSA A23.3, *Design of Concrete Structures.* The results were then used to calculate the demand-capacity ratio in accordance with ACI 562-19, *Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures.* ACI 562 is published by the American Concrete Institute (ACI) and provides design professionals a code for the assessment and repair of existing concrete structures. Although this code is written for concrete construction in the United States and has not been adopted in Canada, the concepts described in the document are still relevant.

The demand-capacity ratio (D/C) compares the strength required to support the design loads (demand), to the strength of the structure in its deteriorated state (capacity). In general, structural repairs are necessary whenever the demand-capacity ratio of the deteriorated member exceeds 1.0. When the D/C is equal to or exceeds 1.5, ACI 562 defines this as an unsafe structural condition. The following summarizes the interpretation of D/C.

D/C < 1.0	The structure is not unsound or structurally deficient.
1.0 ≤ D/C < 1.5	The structure is considered safe. Structural repairs are required but the structure is suitable for continued use on an interim basis as deemed necessary by a professional engineer.
D/C ≥ 1.5	Unsafe structural condition (ACI 562). Temporary measures, such as shoring may be necessary, as determined by a professional engineer, until repairs can be made.

Since Level P1 is a two-way structural slab the slab spans in both the north-south and east-west directions. The column spacing and reinforcing also appear to be the same in both directions. Therefore a design strip along the center parking stall bay (Gridline 6) was selected as a representative design strip. Deterioration was estimated based on the results of the sounding surveys.

Design Assumptions

Typical Slab:	9” structural concrete slab 10’-0” x 10’-0” x 6” drop panels
Design Dead Loads:	5.4 kPa Uniform Dead Load (DL) 9.0 kPa at drop panels
Design Live Loads	2.4 kPa Uniform Live Load (LL)
Concrete Strength:	f'_c = 20.7 MPa (3,000 psi), typical f'_{ceq} = 11.5 MPa (1668 psi)
Steel Strength:	f_y = 414 MPa (60 ksi)

Table 6: Column Strip Demand-Capacity Ratio (Bending)

Column Strip as Designed					Current Condition		
Grids	Location	D (M_f)	C (M_r)	D/C	% Delam	C_{det} (Mr)	D/C_{det}
D	Support	443.09	510.24	**0.87**	28%	349.15	**1.27**
	Midspan	206.78	328.22	**0.63**	0%	302.75	**0.68**
E	Support	443.09	510.24	**0.87**	25%	363.70	**1.22**
	Midspan	206.78	328.22	**0.63**	0%	301.54	**0.69**
F	Support	443.09	510.24	**0.87**	13%	421.89	**1.05**
	Midspan	206.78	328.22	**0.63**	0%	301.54	**0.69**
G	Support	443.09	510.24	**0.87**	16%	409.28	**1.08**
	Midspan	206.78	328.22	**0.63**	1%	300.09	**0.69**
H	Support	443.09	510.24	**0.87**	10%	438.86	**1.01**
	Midspan	206.78	328.22	**0.63**	1%	298.72	**0.69**
J	Support	443.09	510.24	**0.87**	21%	383.09	**1.16**
	Midspan	206.78	328.22	**0.63**	8%	279.86	**0.74**
K	Support	443.09	510.24	**0.87**	22%	378.25	**1.17**

Table 7: Middle Strip Demand-Capacity Ratio (Bending)

Middle Strip as Designed					Current Condition		
Grids	Location	D (M_f)	C (M_r)	D/C	% Delam	C_{det} (Mr)	D/C_{det}
D	Support	147.70	200.26	**0.74**	26%	141.76	**1.04**
	Midspan	143.16	200.26	**0.71**	1%	189.88	**0.75**
E	Support	147.70	200.26	**0.74**	41%	113.03	**1.31**
	Midspan	143.16	200.26	**0.71**	0%	191.57	**0.75**
F	Support	147.70	200.26	**0.74**	18%	156.90	**0.94**
	Midspan	143.16	200.26	**0.71**	1%	189.44	**0.76**
G	Support	147.70	200.26	**0.74**	33%	128.93	**1.15**
	Midspan	143.16	200.26	**0.71**	0%	191.57	**0.75**
H	Support	147.70	200.26	**0.74**	11%	170.50	**0.87**
	Midspan	143.16	200.26	**0.71**	4%	183.06	**0.78**
J	Support	147.70	200.26	**0.74**	45%	105.36	**1.40**
	Midspan	143.16	200.26	**0.71**	1%	190.31	**0.75**
K	Support	147.70	200.26	**0.74**	29%	135.44	**1.09**

The results of the structural analysis indicate that the two-way structural slab as designed has a D/C ratio below 1.0. This suggests that the structural slab can accommodate minor top surface and soffit deterioration without being overstressed.

The volume of delamination was estimated for each section of the representative design strip based on the results of the sounding survey. As can be seen in the tables above, when taking the estimated deterioration into consideration, the D/C ratio at the supports ranges from 1.01 to 1.27 for the column strip and from 0.87 to 1.40 for the middle strip. Although the D/C ratio has exceeded 1.0 at most of the supports it does not exceed 1.5 and thus is considered safe and suitable for continued use in the short term until repairs can be considered.

The current condition capacities above were calculated using the ACI 562 equivalent compressive strength of 11.5 MPa. This is a very low value that was greatly reduced by the low number of compressive strength cores tested and the large variation between the compressive strength results. If additional compressive strength tests were taken, we expect the equivalent compressive strength would approach the design strength of 20.7 MPa. Note that the D/C ratio at the supports range from 0.96 to 1.21 for the column strip and from 0.83 to 1.34 for the middle strip when a compressive strength of 20.7 is used. Furthermore, the D/C ratio could be further reduced if a reduced live load that is more consistent with actual loads for parking structures were considered.

Notwithstanding the prior, it is recommended that all known locations of concrete deterioration be repaired in the short term. Concrete deterioration is an ongoing process that will continue to grow in size and severity if not addressed.

Table 8: Demand-Capacity Ratio (Shear)

Two Way Shear as Designed					**Current Condition**		
Grids	Location	D (V_f)	C (V_r)	D/C	% Delam	C_{det} (Vr)	D/C_{det}
D	Panel Edge	907.91	1664	**0.55**	11%	1102.01	**0.82**
	Column	907.91	1417	**0.64**	16%	884.71	**0.98**
G	Panel Edge	907.91	1664	**0.55**	4%	1195.08	**0.76**
	Column	907.91	1417	**0.64**	0%	1057.00	**0.86**
One Way Shear as Designed					**Current Condition**		
Grids	Location	D (V_f)	C (V_r)	D/C	% Delam	C_{det} (Vr)	D/C_{det}
D	Panel Edge	431.60	927	**0.47**	22%	542.07	**0.80**
G	Panel Edge	431.60	927	**0.47**	19%	559.33	**0.77**

The D/C ratios were also calculated for shear capacity at two column locations. For this calculation it was assumed that the depth of deterioration would extend beyond the top layer of reinforcing in the slab (panel edge) or drop panel (column) for the length of deterioration intercepting the shear plane. As can be seen in the table above, the D/C ratio remains below 1.0. Again these values were calculated using the equivalent compressive strength of 11.5 MPa. The D/C ratio for the column at Gridlines D-6 is reduced to 0.73 if the design compressive strength of 20.7 MPa is used. Therefore the structural slab is considered safe and suitable for continued use, however concrete repairs will be required and are recommended in the short term.

3.5 Membrane Condition Survey

Protection of the Level P1 structural slab is provided by a traffic-bearing waterproofing membrane. According to available information, the existing membrane was removed from the drive aisles and replaced with a new multicoat membrane system in 2012. However the information also suggests that the membrane in the parking stalls was repaired where required and recoated with a new wear coarse coating.

3.5.1 Visual Review

A visual review of the traffic bearing membrane was completed throughout the parkade. The existing waterproofing membrane on Level P1 is in overall good condition. However, the existing coatings in the mechanical rooms, vestibules, and lower-level mechanical pits are in poor condition.

The parking stall areas are generally in good condition with visible aggregate remaining in the top coat. The drive aisles and turning zones are also generally in good condition however the aggregate appears to be worn down in the high traffic areas.

Three locations of severe deterioration were observed in the high-traffic north drive aisle where the waterproofing is missing. It appears as though the waterproofing debonded and was worn away at these locations. Additional localized areas of deterioration were noted adjacent to drains and at a few concrete delamination locations. It was also noted that a few localized waterproofing repairs have been completed after the 2012 repairs.

3.5.2 Bond Testing

Membrane adhesion pull tests were completed at six locations on Level P1: three locations in the drive aisles and three locations in the parking stalls. The tensile bond strength test is a good indicator of the service life condition of the existing traffic bearing membrane. The results of the bond tests are shown in Table 9 below.

Table 9: Membrane Bond Test Summary

Test No.	Location	Bond Failure Plane	Bond Stress		Mil Thickness
			psi	MPa	
BT 1	Drive Aisle	Failure in membrane between layers	320	2.21	63
BT 2	Parking Stall	Failure in membrane between layers	300	2.07	64
BT 3	Parking Stall	Failure in membrane between layers	327	2.25	61
BT 4	Drive Aisle	Failure in membrane between layers	317	2.19	53
BT 5	Drive Aisle	Failure in membrane between layers	405	2.79	56
BT 6	Parking Stall	Failure in membrane between layers	323	2.23	62
Average			**332**	**2.29**	**60**

The current Standard CSA S413 “Parking Structures” indicates “The strength of the bond between elastomeric membrane and the substrate shall be not less than 1.4 MPa when tested in accordance with CSA A23.2-6B.”. As can be seen in the table above the existing waterproofing membrane appears to be well bonded with bond stresses in excess of 2.0 MPa.

The thickness of the existing waterproofing was also measured at each of the test locations using a digital caliper. The average mil thickness was measured to be 60 dry mils, which is slightly less than typical waterproofing membrane systems.

3.5.3 Summary

The results of the membrane condition survey indicate that the existing traffic bearing membrane is in fair condition given its age. Notwithstanding the prior, it should be noted that localized repairs will be required periodically to address areas of excessive wear, debonding and/ or concrete deterioration. An annual visual inspection, localized chain-drag sounding survey and maintenance program are recommended to ensure the effectiveness of the traffic bearing membrane system.

4. Analysis and Structural Recommendations

The results of the investigation indicate that the parkade structure is in overall fair condition considering age and exposure conditions over its service life. The Level P2 slab-on-grade and Level P1 waterproofing membrane that were installed during the 2012 repair project are generally in good condition. However, the Level P1 structural slab is generally in fair condition.

Although the representative structural analysis that was completed suggested that immediate repairs are not required, localised removal of loose concrete and patching of tripping hazards are recommended. Loose concrete can become dislodged and potentially fall on vehicles and/or pedestrians. In addition, localised patching of top surface repairs that are considered tripping hazards is also recommended. Several locations of loose overhead concrete and two potential tripping hazards were identified during the visual review and sounding survey. It is recommended that these locations be addressed as soon as reasonably possible.

4.1 Option 1: Structural Recommendations - Concrete Repair and Waterproofing

The lower parking level (Level P2) was found to generally be in good condition. The concrete slab-on-grade installed during the 2012 repair project appears to be holding up well with minimal random cracking and deterioration of joint sealant. Failed control joint sealants and random cracks can allow chloride laden moisture to penetrate along the cracks and lead to premature deterioration. Random cracks can be addressed by routing out a groove along the crack and installing a sealant complete with a bond breaker at the base of the groove to allow movement. Failed control joints sealants can be removed, the joints cleaned, and new sealant installed along the joints. It is our recommendation that these be addressed in the short to medium term. It should also be noted that periodic maintenance of the joint sealants will be required throughout the service life of the slab-on-grade and repairs should be anticipated every 2 to 3 years.

During the visual review of Level P2 it was noted that there is an existing gap between the top of the slab-on-grade and the bottom of the column jacket that was installed at 5 locations. This existing gap a low spot against the existing column and pile cap and provides a direct path for chloride laden moisture to pool. In order to protect and direct moisture away from the columns, it is our recommendation that concrete swales be installed in the short term. In addition, ponding was observed at the base of columns at several other locations. The presence of scaling at some these locations suggests that concrete deterioration has begun and will continue to grow in extent and severity if not addressed. It is our recommendation that consideration be given to installation of concrete swales at all columns in the medium term. This could be phased over several years beginning with areas of known ponding.

Considering concrete repairs and waterproofing replacement were completed on Level P1 in 2012, the extents of concrete deterioration identified during the sounding surveys may come at a surprise. In total, approximately 8,700 ft^2 of top surface concrete deterioration and 600 ft^2 of soffit deterioration were marked. To account for the inevitable growth in patch area during demolition we recommend that the estimated total be increased by approximately 40% to 12,250 ft^2 of top surface repair and 800 ft^2 of soffit repair. Typical concrete repairs would include the following: removal of all delaminated and loose concrete; trenching of exposed and corroded reinforcing steel; sand blasting of the reinforcing steel to remove corrosion from the bars, sandblasting of the concrete substrate to clean and texture the surface of the concrete; and infilling with new concrete or repair material. Where top surface repairs align with soffit repairs, through-slab replacement tends to be more economical and provides a better repair. Upon adequate cure of the patches, a waterproofing membrane would be installed in repair areas and lapped with the existing.

The concrete walls, columns and curbs throughout the parkade are generally in good condition. In total, 15 ft^2 of column deterioration, 25 ft^2 of wall deterioration and 85 ft^2 of curb deterioration were identified. To account for the inevitable growth in patch area during demolition we recommend that the estimated

total be increased by approximately 50% to an estimated 25 ft² of column deterioration, 40 ft² of wall deterioration and 125 ft² of curb deterioration. The process for column and wall repairs would involve removal of the deteriorated concrete to a sound substrate, sandblasting of exposed reinforcing steel and concrete substrate, forming the repairs to match existing profiles and infilling with a repair material. Curb repairs would consist of full depth removal to the concrete slab top surface, sandblasting of exposed reinforcing steel and concrete substrate, and infilling with new concrete or repair material.

The table below summarizes the estimate of probable construction costs for the recommendations discussed in this section. Based on the level of investigation and available information, the budget estimates are considered Class 4 (-30% to +50%) and excludes taxes, contingencies, and professional fees for design and specification preparation, tendering, field reviews, and contract administration services.

Table 10: Option 1: Concrete Repair and Waterproofing

	Description	Est. Qty	Unit Price	Estimated Total Price
1	Top Surface Repairs			
	1.1 0" to 3"	12,250 ft²	$35.00 /ft²	$428,750
	1.2 3" to 6"	6,000 ft²	$30.00 /ft²	$180,000
	1.3 Through slab	300 ft²	$65.00 /ft²	$19,500
2	Soffit Repairs			
	2.1 0" to 3"	800 ft²	$120.00 /ft²	$96,000
	2.2 3" to 6"	200 ft²	$60.00 /ft²	$12,000
3	Column and Wall Form and Pour Repairs			
	3.1 0" to 3"	75 ft²	$115.00 /ft²	$8,625
	3.2 3" to 6"	40 ft²	$90.00 /ft²	$3,600
4	Concrete Curb Repairs	125 lin.ft.	$60.00 /lin.ft.	$7,500
5	Concrete Column Swales	5 locations	$2,000 /loc.	$10,000
6	Galvanic Anodes	5,000 anodes	$75.00 /loc.	$375,000
7	Membrane Repairs and Recoating	13,000 ft²	$12.00 /ft²	$156,000
8	Crack Routing and Sealing	4,000 lin.ft.	$14.00 /lin.ft.	$56,000
9	Crack Polyurethane Injection	50 lin.ft.	$150.00 /lin.ft.	$7,500
10	Miscellaneous Concrete Repairs	Allowance		$30,000
11	General Conditions	Allow Approximately 15%		$209,525
Total Estimated Price (not including GST)				**$1,600,000**

Based on the table above, an estimated budget in the order of $1.6 million is recommended to address the known locations of concrete and waterproofing deterioration. Although this budget estimate includes an allowance for the installation of galvanic anodes, it should be noted that this will not address the existing structural slab contamination. The galvanic anodes will only slow ongoing deterioration at the locations where they are installed. Concrete deterioration will continue outside of these repair locations and repairs of a similar magnitude should be expected every 5 to 7 years unless a more aggressive restoration is implemented which addresses the underlying causes of the deterioration. For comparison purposes, an allowance for a second structural restoration of equal magnitude has been included in the summary table in Section 5.6 of this report. Thus, the total costs for structural repairs that would be necessary within the timeframe considered in this report would be in the order of $3.2 million if the recommendations in Table 10 are implemented.

4.2 Option 2: Structural Recommendations - Top Surface Removal, Resurfacing and Waterproofing

When taking the results of the core sampling and testing into consideration, the estimated top surface and soffit repair quantities are not overly surprising. The chloride concentration tests indicate that the top surface is contaminated with chloride concentrations well above the threshold required to induce corrosion of the top reinforcing steel. Whereas the carbonation tests indicate that the soffit has been carbonated to a pH between 7 and 9 and has likely lost the naturally protective film protecting the bottom reinforcing steel. These results indicate that the structural slab is contaminated and prone to further deterioration.

While it is recommended that all the known locations of concrete deterioration be addressed in the short term, the repairs will likely have a short life expectancy due to the existing contamination of the slab. It is likely that this is in part due to a phenomenon known as the anodic ring or “halo” effect. The anodic ring effect is a process which commonly occurs when concrete repairs are cast with new concrete with low chloride concentrations into repair areas surrounded by existing concrete with high chloride concentrations. The difference in chloride concentrations creates an electrochemical imbalance between the existing concrete and repair material. This potential difference in turn causes accelerated deterioration of the concrete along the perimeter of the repairs due to rapid corrosion of the embedded reinforcing steel. The anodic ring effect is likely one of the primary causes of the considerable extents of concrete deterioration that has occurred following the repairs in 2012.

There are a few options to address the slab contamination that warrant consideration; however they range substantially in effectiveness, invasiveness and in cost. In our experience the most effective method is to remove as much of the chloride contaminated material as possible, implement galvanic protection where chloride contaminated material remains and install a protective moisture barrier to eliminate moisture which is necessary for corrosion.

The least invasive and least expensive method is to introduce galvanic protection as concrete repairs are being completed. This would include the installation of sacrificial zinc anodes into concrete repair patches. Sacrificial zinc anodes are electrically more active than typical reinforcing steel and will dissolve preferentially in lieu of corrosion of the reinforcing steel. Although galvanic protection is effective at reducing the rate of corrosion it does not stop corrosion, nor does it affect areas beyond the repair patches in which they were installed. It would also be recommended that any repair areas be coated with a protective waterproofing membrane system and lap onto the existing system. It should be noted that periodic maintenance and repairs would be required to address new locations of concrete deterioration and locations where the existing repairs and/or protection has failed.

Full depth replacement of the structural concrete slab would effectively address the contaminated concrete, however, the capital costs and invasiveness to the parkade would be high. A possibly more cost-effective alternative is partial depth removal of the top surface across the entire structural slab. The chloride testing suggests that the chloride concentration drops to near negligeable at a depth of 100-110mm (4-4.5 inches). Therefore, removal and replacement of the top three to four inches from the structural slab could effectively eliminate the majority of the chloride contamination from the structural slab. Although this would also have a large upfront capital cost and be invasive to the parkade, the benefits of a new concrete overlay may be justified by substantially greater anticipated effective service life compared to localized repairs only. For this option we anticipate that a service life in the range of 20 to 25 years with significantly reduced annual repairs and maintenance costs.

When considering the existing condition of the structural slab and the extents of concrete deterioration that have occurred since the last restoration in 2012, a localised repair program of the same magnitude should be expected every 5 to 7 years. Therefore, including the short term recommendations for 2021, four to five large scale remediations would be anticipated over the next 20 to 25 years.

In lieu of traditional percussion-type demolition (electric chipping hammers), the removal could be completed using hydro-demolition. Hydro-demolition uses water jets with pressures upward of 17,000 psi to pulverize the concrete. Although the noise generated by hydro-demolition equipment is considerably loud in the area of work, the decibel level decreases significantly with distance. Since hydro-demolition is non percussive, the noise does not tend to travel through the structure and would therefore limit noise transmission and disturbance to the library above. In addition, hydro-demolition can be relative quick in comparison to traditional percussing-type demolition resulting in a quicker turn over of repair phases.

Although the existing waterproofing installed on Level P1 is generally in good condition, it should be noted that the concrete repairs will require localised waterproofing repairs to protect the new concrete. This will result in a large number of waterproofing patches spread throughout the parkade. While waterproofing patches are effective at preventing water infiltration, colour and texture matching is not always possible and may not be aesthetically pleasing. It was also noted during the visual review that the drive aisles and turning zones appear to be wearing faster than the parking stalls, which is a typical wearing pattern for parkades. To maintain the protective coating, it is recommended that recoating of the drive aisles and turning zones be scheduled to occur in the medium term. It is also recommended that budgeting be retained for recoating of the parking stalls within the long term.

The existing coatings in the mechanical rooms, stairwells, and vestibules, are at the end of their service life. Although these areas will not be exposed to the same level of chloride laden moisture as the parking deck, they will be exposed to contaminants being tracked by pedestrians and mechanical spills. Though limited, these contaminants will cause deterioration overtime as can be confirmed by the concrete deterioration identified in the mechanical rooms. It is our recommendation that the existing coatings in these areas, where present, be removed and replaced with a waterproofing membrane system. We recommend that this be completed in the medium term.

The table below provides estimated construction costs for removal of approximately 2½” to 3” of the top surface across the entire structural slab using hydro-demolition and includes all of the recommendations listed in Table 10 above. Note that hydro-demolition would not be feasible within the stairwells, vestibules nor within the mechanical rooms. Repairs in these areas would be completed via conventional demolition. Based on the level of investigation and available information, the budget estimates are considered Class 4 (-30% to +50%) and excludes taxes, contingencies, and professional fees.

Table 11: Option 2: Top Surface Removal, Resurfacing and Waterproofing

	Description	Est. Qty	Unit Price	Estimated Total Price
1	Hydro-Demolition 0” to 3”	86,000 ft²	$25.00 /ft²	$2,150,000
2	Top Surface Repairs			
	2.1 0" to 3"	500 ft²	$35.00 /ft²	$17,500
	2.2 3" to 6"	6,000 ft²	$30.00 /ft²	$180,000
	2.3 Through slab	300 ft²	$65.00 /ft²	$19,500
3	Soffit Repairs			
	3.1 0" to 3"	800 ft²	$120.00 /ft²	$96,000
	3.2 3" to 6"	200 ft²	$60.00 /ft²	$12,000
4	Column and Wall Form and Pour Repairs			
	4.1 0" to 3"	75 ft²	$115.00 /ft²	$8,625
	4.2 3" to 6"	40 ft²	$90.00 /ft²	$3,600
5	Concrete Column Swales	5 locations	$2,000 /loc.	$10,000
6	Traffic bearing membrane	86,000 ft²	$8.00 /ft²	$688,000
7	Crack Routing and Sealing	4,000 lin.ft.	$14.00 /lin.ft.	$56,000

	Description	Est. Qty	Unit Price	Estimated Total Price
8	Crack Polyurethane Injection	50 lin.ft.	$150.00 /lin.ft.	$7,500
9	Miscellaneous Concrete Repairs	Allowance		$30,000
10	General Conditions	Allow 15%		$490,000
Total Estimated Price (not including GST)				**$3,770,000.00**

Though replacement of the top surface via hydro-demolition as a short-term option has a large estimated upfront cost, in the order of $3.77 million when including the remaining structural short-term recommendations, the potential benefits warrant its consideration as a short-term option. As described above, replacement of the contaminated top surface and installation of a new waterproofing membrane would be expected to extend the service life of the existing structural slab by an order of 20 years with proper maintenance. It should also be noted that replacement of the structural slab top surface and installation of a new traffic bearing waterproofing membrane, will reduce the extents and costs of yearly maintenance.

4.3 Regular Maintenance and Inspections

The processes which cause deterioration are inherently present within the structure and will continue to occur over the life of the structure. It has been our experience, and that of research conducted by the NRC, that regular maintenance will reduce overall life-cycle costs. It has also been our experience that when a regular maintenance program is adopted, the annual expenditures for repairs tend to lessen from year to year once all areas of existing deterioration are addressed. Therefore, to minimize the cumulative effects of the deterioration process, extend the service-life of the repairs, and maximize time between major restorations, it is strongly recommended that an annual maintenance program be adopted. The following table summarizes typical maintenance work required over the next ten years.

In order to reduce the potential for infiltration of chlorides, and reduce wear on the surface and joints, regular cleaning of the parkade is recommended. In general, sweep cleaning of all levels is recommended each fall and more thorough cleaning using copious amounts of water every spring. Monthly cleaning of floor drains is also recommended to ensure that water does not have a chance to pond on the surface. Mechanically cleaning of drain lines is recommended annually.

Table 12: Maintenance Recommendations

	Description	Priority	Timing
1	Removal of concrete which is loose and in danger of falling.	Safety	As required
2	Structural concrete repairs.	High Priority	As required
3	Joint and crack sealing including replacement of existing joints.	Maintenance	Required on an annual and/or periodic basis
4	Membrane repairs to address snow clearing damage and wear-and-tear.	Maintenance	Complete annually (spring)
5	Check floor drain operation cleaning and clean sediment buckets.	Maintenance	Complete at monthly intervals
6	Mechanically clean drain lines.	Maintenance	Maintenance
7	Power washing parkade floors.	Maintenance	Complete annually (spring)
8	Repaint traffic marking and stall lines.	Maintenance	Complete annually (spring)
9	Visual walk-through structural inspection.	Recommended	Complete annually (fall)
10	Sounding survey	Recommended	Complete every three (3) years

5. Estimates of Probable Construction Costs

Accurate estimation of construction costs for remediation projects is difficult to provide because of the inherent number of variables associated with working on an existing structure. Hidden conditions inevitably exist which can result in increases in the overall cost of repairs. Based on the results of our investigation and combined with the experience of restoration on similar projects, the following summarizes the estimate of probable construction costs for the recommendations discussed within this report. Based on the level of investigation and available information, the budget estimates are considered Class 4 (-30% to +50%) for years 1 through 6 and Class 5 (-50% to +100%) for years 7 through 10. The budget estimates are prepared based on limited information with no engineering work completed and preliminary scope determination.

Please note that the costs presented are for construction only, and excludes taxes, contingencies, and professional fees for design and specification preparation, tendering, field reviews, and contract administration services. In addition, the estimates provided do not include soft costs related site-specific requirements such as security, protection, phasing, etc. which can affect total construction costs. For this reason, further investigation and updating of budget construction costs should be completed prior to finalizing repair options. All costs are presented in 2021 dollars.

5.1 Required Repairs

Items that require immediate action as a result of any of the following: potential unsafe conditions, material building or fire code violations, or conditions that if left unremedied, uncorrected, have the potential to result in or contribute to critical element or system failure within one year or will result most probably in a significant escalation of its remedial cost. Repairs required within 3 months. Localized areas of loose concrete and potential tripping hazards were observed during our investigation. To reduce the potential for concrete to dislodge and fall, it is recommended that any loose concrete be removed as soon as reasonably possible. It is also recommended that potential tripping hazards be patched as soon as reasonably possible. We recommend a budget of $10,000.00 to complete this work.

Table 13: Required Repairs

	Description	Allowance	Estimated Total Price
Structural			
1	Loose Overhead Concrete		$7,500
2	Tripping Hazards		$2,500
		Subtotal Structural	***$10,000***
Mechanical			
3	Fuel Oil Ventilation Fan Installation		$80,000
		Subtotal Mechanical	***$80,000***
Electrical			
4	Exit Lighting Repairs		$3,000
5	Distribution Repairs		$10,000
		Subtotal Electrical	***$13,000***
Total Estimated Required Repairs (not including GST) – Within 3 Months			**$103,000**

5.2 Short Term Recommendations

Recommendations in this section address high priority repairs and/or maintenance items including code and regulatory issues which should be implemented within 1 year.

With respect to the structural recommendations described in Section 4.1 of this report, repairs under Structural Option 1 do not address the underlying cause(s) of the deterioration which will limit their durability and performance over the long term. In contrast, Option 2 in Section 4.2 of this report, includes additional recommendations aimed at addressing the underlying causes of the deterioration and improving long term durability. If required to meet budgetary or phasing constraints, these repairs could be phased over a period of two to three years, however deferral beyond 2021 is not recommended. The following table summarizes the proposed scope of work for the short-term recommendations and associated construction costs.

Table 14: Summary of all Short Term Recommendations

Description		Estimated Costs	
		Structural Option 1	**Structural Option 2**
Structural			
1	Tables 10 and 11 Above – *Note: General Conditions have been removed*	$1,390,475	$3,280,000
	Subtotal Structural	***$1,390,475***	***$3,280,000***
Mechanical			
2	Natural Gas Piping - Painting	$10,000	$10,000
3	Fuel Oil Tanks – Seal Tappings	$3,000	$3,000
4	Parking Booth Ventilation Addition	$40,000	$40,000
5	Ventilation Addition for Office Spaces	$45,000	$45,000
6	Addition of NO2 detection at all required locations	$180,000	$180,000
	Subtotal Mechanical	***$278,000***	***$278,000***
Electrical			
7	Improved labeling for electrical equipment	$15,000	$15,000
8	Creation of Single Line Diagram	$7,500	$7,500
9	Emergency Generator – Battery Replacement	$10,000	$10,000
10	Alarm System Replacement (Booth Only)	$10,000	$10,000
	Subtotal Electrical	***$42,500***	***$42,500***
10	General Conditions – Allow Approximately 15%	$256,025	$539,500
Total Estimated Short Term Recommendations (Within 1 Year)		**$1,967,000**	**$4,140,000**

5.3 Medium Term Recommendations

Medium term recommendations include repairs to address ongoing or low-risk deterioration, maintenance of existing protective systems and repairs designed to improve long term durability. It is recommended that repairs in this category be implemented within 5 years. Please note that there is no cost difference between the two structural options and is presented for consistency.

Table 15: Summary of all Medium Term Recommendations

Description		Estimated Costs	
		Structural Option 1	**Structural Option 2**
Structural			
1	Staircase Concrete Repairs	$10,000	$10,000
2	Concrete Column Swales ~ 100 locations	$200,000	$200,000
3	Crack Routing and Sealing ~ 6,000 lin.ft.	$85,000	$85,000
4	Membrane Recoating - Drive Aisles / Turn Zones ~ 44,000 ft²	$350,000	$350,000
	Subtotal Structural	***$645,000***	***$645,000***
Mechanical			
5	Storm Drainage Piping Replacement	$900,000	$900,000
6	Sump Pump Discharge Piping Replacement	$20,000	$20,000
7	Sanitary Drainage System – Original System Replacement	$900,000	$900,000
8	Domestic Cold Water – Insulation Repair	$70,000	$70,000
9	Carwash Pumps Replacement	$8,000	$8,000
10	Terminal Heating Units Replacement	$80,000	$80,000
11	Hydronic Heating Piping Replacement	$600,000	$600,000
12	Stairwell Force Flow Units - Replacement	$24,000	$24,000
13	Make-up Air Unit Replacement	$4,200,000	$4,200,000
14	Main Exhaust Fans - Replacement	$1,350,000	$1,350,000
15	Hydro Vault Exhaust Fan Replacement	$100,000	$100,000
16	Upgrade Controls from Pneumatic to DDC	$80,000	$80,000
	Subtotal Mechanical	***$8,332,000***	***$8,332,000***
Electrical			
17	Emergency Lighting Replacement	$100,000	$100,000
18	Exit Lighting Replacement	$50,000	$50,000
19	Fire Alarm Replacement and Upgrade	$1,750,000	$1,750,000
	Subtotal Electrical	***$1,900,000***	***$1,900,000***
20	General Conditions – Allow Approximately 15%	$1,633,000	$1,633,000
Total Estimated Medium Term Recommendations (Years 1 to 5)		**$12,510,000**	**$12,510,000**

5.4 Long Term Recommendations

Long term recommendations include repairs to address ongoing or low-risk deterioration and replacement of end of service life components. It is recommended that repairs in this category be implemented within 10 years. Note that Table 16 assumes that the short term structural recommendations are implemented and includes an allowance for a second structural restoration as discussed in Section 4.1.

Table 16: Long Term Recommendations

Description		Estimated Costs	
		Structural Option 1	**Structural Option 2**
Structural			
1	Allowance for second structural restoration	$1,600,000	$0
2	Slab-on grade replacement at pits/ stairwells/vestibules ~ 3,000 ft²	$90,000	$90,000
3	Exterior waterproofing ~ 10,000 ft²	$5,000,000	$5,000,000
4	Membrane recoating of parking stalls ~ 42,000 ft²	$336,000	$336,000
	Subtotal Structural	***$7,026,000***	***$5,426,000***
Mechanical			
5	Sanitary Drainage System – Original System Replacement	$900,000	$900,000
6	Sanitary Drainage – Parkade System – Localized Repairs	$5,000	$5,000
7	Natural Gas Piping – Replacement	$300,000	$300,000
8	Fire Protection – Dry Valves Replacement	$70,000	$70,000
	Subtotal Mechanical	***$1,275,000***	***$1,275,000***
Electrical			
9	General Lighting Replacement	$2,000,000	$2,000,000
10	Main Distribution Replacement	$1,500,000	$1,500,000
11	Distribution Replacement (CDPs. Panelboards, transformers, etc.)	$1,500,000	$1,500,000
12	Branch Circuit Wiring Replacement	$1,300,000	$1,300,000
13	CCTV Replacement	$250,000	$250,000
	Subtotal Electrical	***$6,550,000***	***$6,550,000***
14	General Conditions – Allow Approximately 15%	$2,229,000	$1,989,000
Total Estimated Long Term Recommendations (Years 6 to 10)		**$17,080,000**	**$15,240,000**

5.5 Long Term Considerations / Recommended Improvements

Long term considerations and recommended improvements include optional repair work and recommended improvements for future consideration and planning.

Table 17: Long Term Considerations

Description		Estimated Total Price
Structural		
1	Coating Replacement in Mech, Stairwells and Vestibules ~ 10,000 ft^2	$120,000
	Subtotal Structural	***$120,000***
Mechanical		
2	Parkade Drains – Lower Level – Monitor Corrosion	$45,000
3	Sprinkler Systems - Piping Replacement	$1,224,000
	Subtotal Mechanical	***$1,269,000***
Electrical		
4	Emergency Generator Replacement	$350,000
	Subtotal Electrical	***$350,000***
Total Estimated Long Term Considerations (not time critical)		**$1,739,000**

5.6 Summary

The following table provides a summary of the budget estimates by order of priority. Please note that the costs presented are for construction only, and excludes taxes, contingencies, and professional fees for design and specification preparation, tendering, field reviews, and contract administration services. In addition, the estimates provided do not include soft costs related site-specific requirements such as security, protection, phasing, etc. which can affect total construction costs. All costs are presented in 2021 dollars.

Table 18: Summary of All Priorities

Category	Estimated Costs	
	Structural Option 1	Structural Option 2
Total Required Repairs (within 3 months)	$103,000	$103,000
Total Short Term Recommendations (within 1 year)	$1,967,000	$4,140,000
Total Medium Term Recommendations (Year 1 to 5)	$12,510,000	$12,510,000
Total Long Term Recommendations (Year 5 to 10)	$17,080,000	$15,240,000
Long Term Considerations/Recommended Improvements (not time critical)	$1,739,000	$1,739,000
Total of All Recommendations	**$33,399,000**	**$33,732,000**

6. Closure

At the request of the City of Winnipeg, a multi-disciplinary parkade condition assessment of the Millennium Library Parkade was completed by Crosier Kilgour & Partners Ltd. and SMS Engineering Ltd. The purpose of the assessment was to provide an opinion on the current condition of the parkade structure, mechanical, and electrical systems.

The assessment involved a visual walk-through survey of the parkade structure and the mechanical and electrical systems. In addition, a sounding survey, membrane condition survey and core testing were completed on the upper parking level. Recommendations for immediate, short, mid, and long-term repair/replacement costs were provided along opinions of probable construction costs for suggested remedial work.

We trust that this provides the information you require. Upon your review if you have any questions, or require further information, please contact the undersigned.

Structural
CROSIER KILGOUR & PARTNERS LTD.

Reviewed by,

Jean Sawatzky, E.I.T.

Originally Sealed April 1, 2021
Derek J. Mizak, P.Eng.
Principal

https://ckpeng.sharepoint.com/sites/2020-1183/Shared Documents/General/01 Corres/2020-1183Report_01.docx

Appendix A

Photographs

Photograph #1:

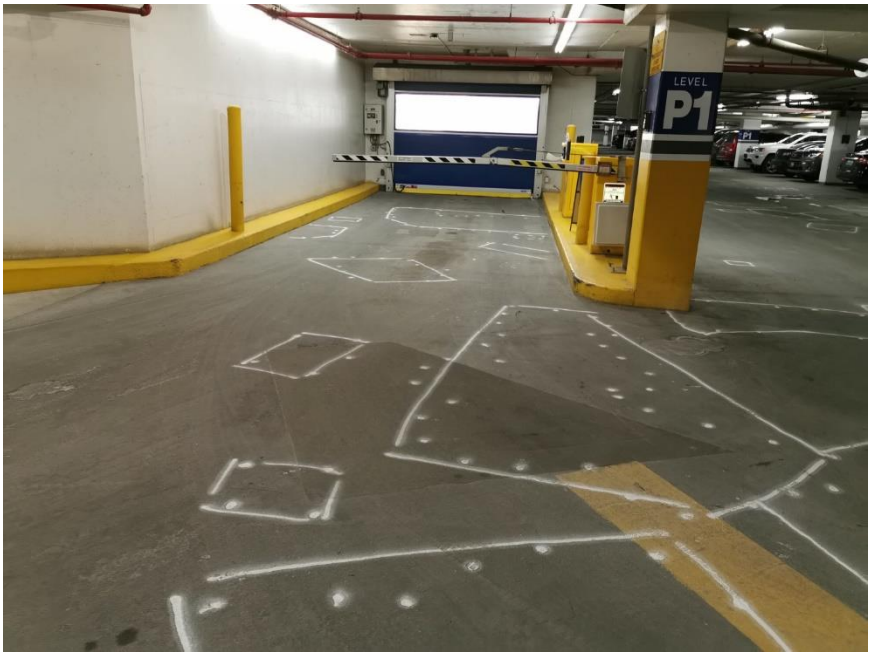
Waterproofing worn down to concrete in north drive aisle

Photograph #2:

Previous waterproofing repair location.

Photograph #3:

Approximate extents of apparent concrete delamination marked onsite.



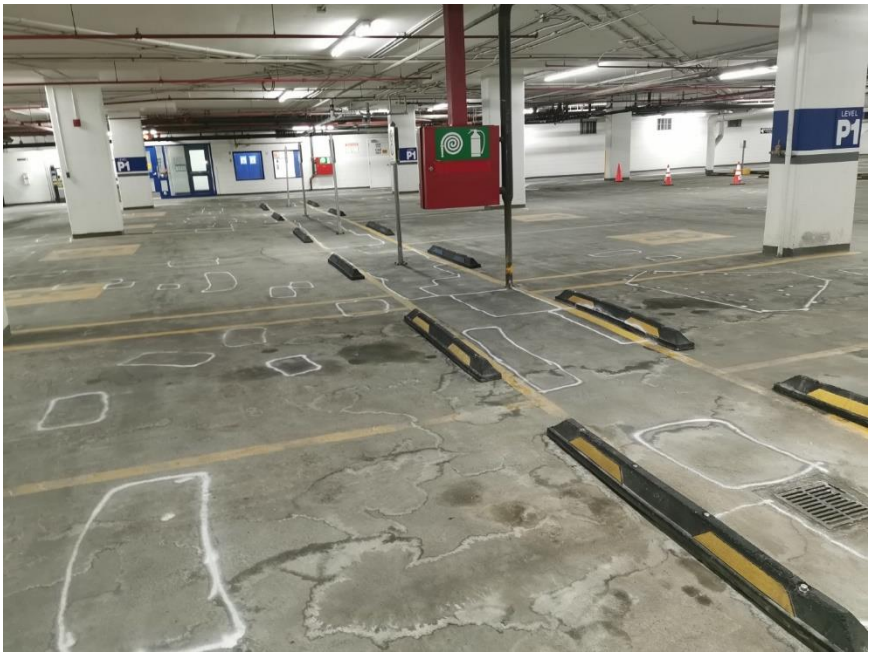
Photograph #4:

Approximate extents of apparent concrete delamination marked onsite.

Photograph #5:

Approximate extents of apparent concrete delamination marked onsite.

Note variation in location and size.



Photograph #6:

Soffit deterioration at mechanical.

Photograph #7:

Approximate extents of apparent concrete delamination marked on column.

Photograph #8:

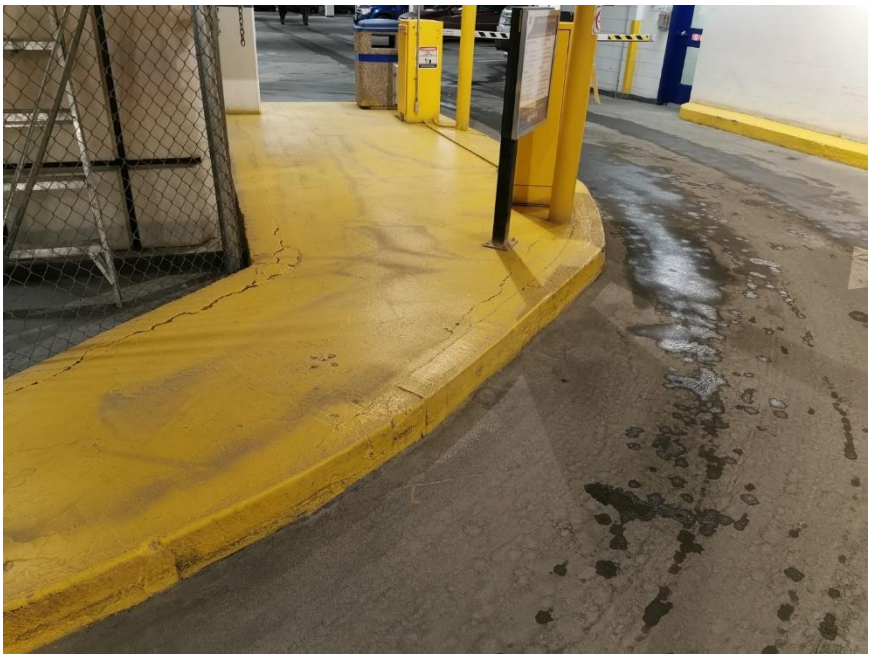
Typical condition of observed drains.

Photograph #9:

Typical condition of existing asphalt curbs.

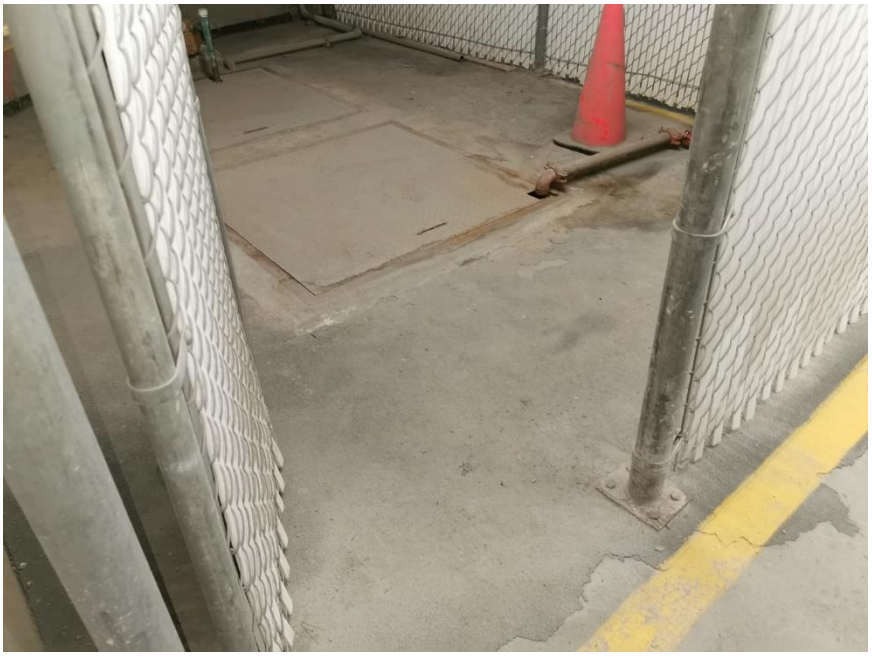
Photograph #10:

Existing concrete curb at Donald street entrance.



Photograph #11:

Existing waterproofing in Level P2 mechanical pit enclosure in poor condition.



Photograph #12:

Typical scaling along base of wall on Level P2.

Photograph #13:

Water ponding against base of column on Level P2.

Photograph #14:

Visible scaling and efflorescence along base of column on Level P2.

Photograph #15:

Plywood formwork installed to cover gap between existing concrete column jacket and slab-on-grade.

Photograph #16:

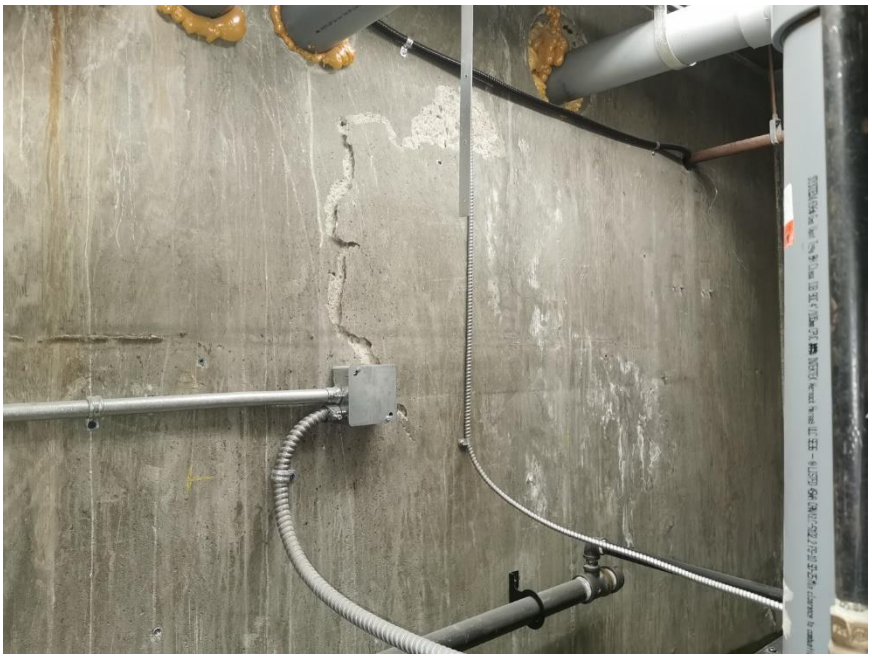
Random cracking in slab-on-grade.

Photograph #17:

Visible concrete delamination in washroom.

Photograph #18:

Visible concrete wall delamination in mechanical room on side of ramp.



Photograph #19:

Typical condition of existing coating in mechanical rooms.

Note apparent concrete delamination beneath coating.

Photograph #20:

Efflorescence visible in top exterior corner of mechanical room.

Photograph #21:

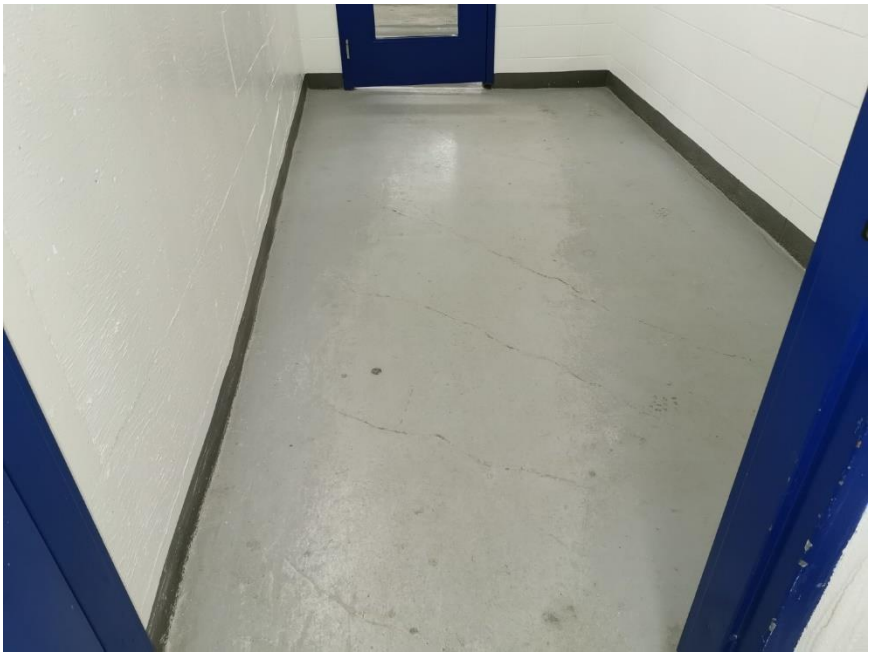
Typical observed condition of drains in mechanical rooms.

Photograph #22:

Existing crack in concrete stair landing.

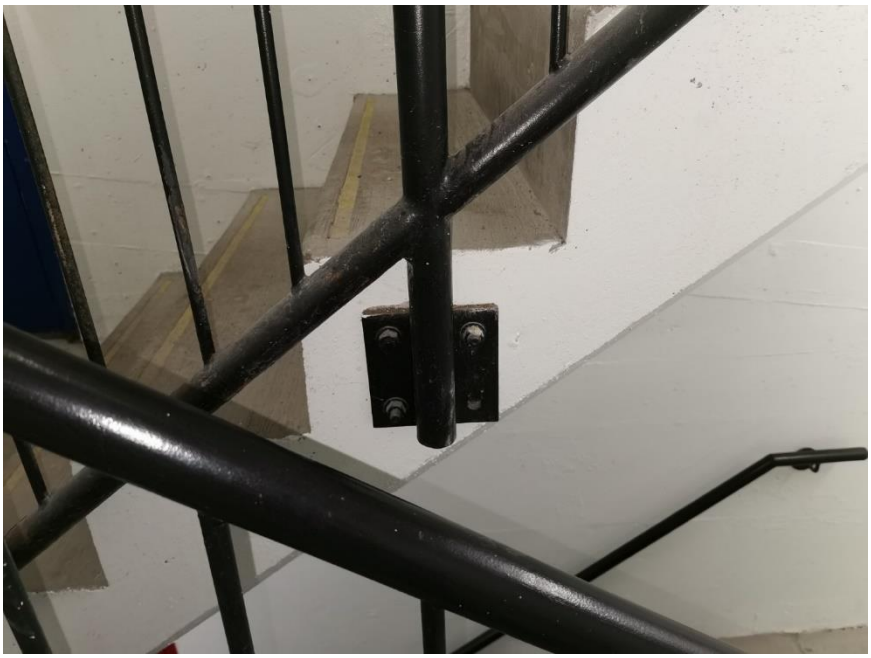
Photograph #23:

Existing coating in stairwell vestibule. Note cracking and apparent concrete delamination visible beneath coating.



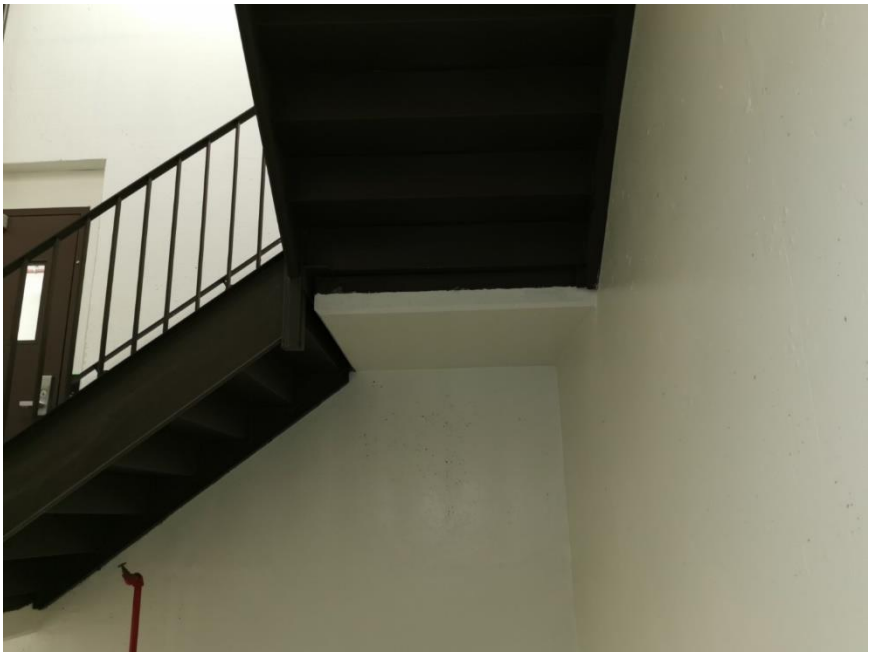
Photograph #24:

Anchor missing from existing stair guardrail.



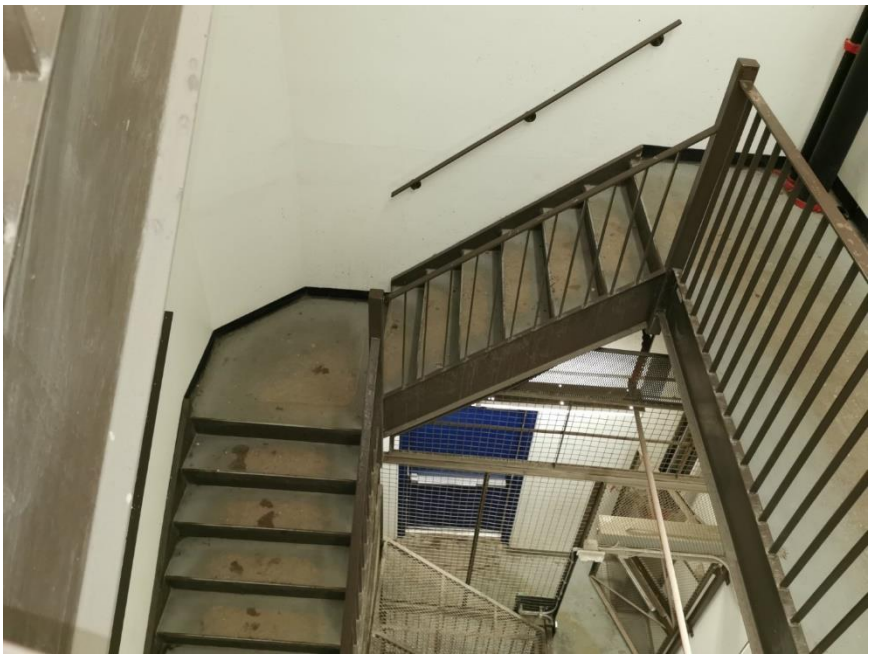
Photograph #25:

Typical condition of structural steel and steel stair pans.



Photograph #26:

Typical condition of concrete stair treads.



Photograph #27:

Cracking and minor deterioration of treads.

Photograph #28:

Concrete soffit deterioration at underside of exterior plaza.

Appendix B

Mechanical and Electrical Report by SMS Engineering Limited

Millennium Library Parkade Condition Assessment – Mechanical and Electrical

March 11, 2021

City of Winnipeg
4th Floor, 185 King Street
Winnipeg, MB, R3B 1J1

SMS Project No.: 20-337-01

SMS ENGINEERING

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ELECTRICAL

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1 INTRODUCTION AND SCOPE OF REPORT

1.1 INTRODUCTION

The Millennium Library Parkade is a two level parkade below the Millennium Library in downtown Winnipeg, located at 251 Donald Street. The parkade is owned and managed by the City of Winnipeg. The library and parkade were originally constructed in 1977. A large project started in 2002 and was completed in 2005 to renovate the library which impacted the parkade and saw the installation of the large Erlenmeyer flask art, "Emptyful". The art installation is a water feature which has all the equipment housed in the upper parkade level. In 2012 the parkade started a multi-year renovation which included some plumbing modifications, stairwell replacement and one entrance slab replacement including in-slab heating.

1.2 GENERAL BUILDING DESCRIPTION

The parkade is approximately 204,000 ft^2 over two parking levels. Most of the parkade is located below the plaza area above. There are four ramps into the facility, two located on Donald Street and two located on Smith Street. The ramps have in-slab heating systems. One entrance ramp was replaced in 2021 and the remaining three in 2017. The Parkade houses an office for the City of Winnipeg Parking Authority. The facility also has a car-wash bay which is located on the upper level. For the most part, mechanical systems between the parkade and the library are separate with the exception of:

- The boiler system from the library serves the unit heaters in the parakade.
- The sanitary drainage from the library passes through the parkade.
- The domestic water services for both portions of the facility are within the upper level of the parkade.
- Portion of the fire protection systems serving the library pass through the upper parkade.

1.3 SCOPE

The scope of this report was to perform a site review to identify and observe conditions of the existing mechanical and electrical systems. This review is limited to a visual review of the systems and equipment to determine apparent condition and evaluate the age against industry standard service life information. Current code compliance has been reviewed and where deficiencies are noted they have been identified in the report. The scope of work does not include any physical testing of equipment or systems and excludes any assessment for hazardous material or environmental concerns.

By providing this building condition assessment report, SMS is providing an opinion and does not warranty or guarantee the present or future condition of the subject property including all systems and components. The opinions are based on historical and professional judgment based on the brief visual review of the system. The report is not a

code compliance audit but does identify those items found during our site visit and visual review. SMS cannot be held liable for any loss, or damages which may arise from the results of any recommendation in the report.

1.4 EXCLUSIONS

This report is based on a review of the available construction drawings and a brief visual review of the site to determine general quality of the systems.

The performance levels of the systems were not verified and the references to system capacities are based on information from the original design documents, where available, or our site review.

When this building was built it was common to use materials that are now considered hazardous. Such material included PCBs and a number of asbestos products. It might be assumed that such materials exist in the mechanical and electrical system. We would expect that special precautions will be required when removal of hazardous material takes place during alterations, all in accordance with existing regulations that are practiced by competent contractors. All hazardous material assessments have been excluded from our review.

The drawings reviewed are not considered as-built and site verification of the as-built condition is not included in this report.

The scope of work extents were limited to systems within the parkade. Since the plaza level is above, drainage piping and electrical services that serve the plaza are reviewed just for the interior condition of the systems. The devices or equipment on the plaza are excluded from review. In addition, the “emptyful” sculpture and the fountain system associated with the sculpture are excluded from the scope. The entrance and exit ramps have been included. Where services from the library pass into the parkade, the visual condition has been reviewed but any services or systems above the parkade have been excluded.

2 SUMMARY

2.1 GENERAL

2.1.1 The recommendations made below are based on code deficiencies, life safety items and expected service life of the equipment. The recommendations do not mean that the equipment will not operate, or that immediate failure will occur but aim to target the critical items. The table below outlines the deficiency and the potential repair or solution. All systems were visually reviewed, and no physical testing was complete. All conditions were reviewed based on the "as is" condition. Our summary excludes any mention of hazardous materials in the building. The tables below provides a brief summary of our findings related to items which would have costs associated with them or are life safety issues. The following categories are provided.

.1 Required Repairs (within 3 months) – Repairs necessary to address specific safety issues.
.2 Short Term Recommendations (within 1 year) – High priority for repairs/maintenance including code and regulatory issues.
.3 Medium Term (Year 1 to 5) – Repairs required to address ongoing or Medium-risk deterioration, replacement of end of service-life building components.
.4 Long Term (Year 5 to 10) – Repairs required to address ongoing or low-risk deterioration, replacement of end of service-life building components.
.5 Long Term Considerations and Recommended Improvements (not time critical). Optional work including recommended improvements presented for future consideration and planning.
.6 Maintenance (ongoing) – Repairs required to address ongoing, or routine maintenance.

2.2 MECHANICAL

Item	Description	Code Req.	Recommendation	Time Frame
PARKADE				
1	Storm Drainage Piping Replacement	No	Replace the aging storm drainage piping which is nearing the expected service life.	Medium Term
2	Sump Pump Discharge Piping Replacement	No	Replace galvanized sump pump discharge piping.	Medium Term

3	Sump Pump Replacement	No	On-going maintenance for sump pump replacements.	Maintenance
4	Sanitary Drainage System – Original System Replacement	No	The sanitary drainage piping in the facility that is original is nearing the expected service life of 50 years and will start to require additional maintenance. Sections should start to be replaced with the goal of replacing the entire system in the long-term horizon.	Medium/Long Term
5	Sanitary Drainage – Parkade System – Localized Repairs	No	Localized repair of corroded pipe sections.	Long Term
6	Parkade Drains – Lower Level – Monitor Corrosion	No	Monitor condition of lower level drains for corrosion. The drains appear to be corroding quickly.	Long Term Consideration
7	Domestic Cold Water – Insulation Repair	No	Replace the insulation on the domestic cold-water piping as it is in poor condition.	Medium Term
8	Carwash Pumps Replacement	No	Replace the high-pressure pumps serving the carwash as they are at the expected service life.	Medium Term
9	Natural Gas Piping - Painting	No	The piping is getting older and sections have corrosion. Portions have been painted but sections are bare. Paint bare sections.	Short Term
10	Natural Gas Piping – Replacement	No	Replace the natural gas piping in the parkade	Long Term
11	Fire Protection – Dry Valves Replacement	No	Replace the dry valves for the sprinkler system as they near the end of their expected service life.	Long Term
12	Sprinkler Systems - Piping Replacement	No	The piping is getting older and will need to be replaced. It is expected some section will need to be replaced before others but at this time it is a long-term consideration.	Long Term Consideration
13	Terminal Heating Units Replacement	No	The unit heaters in the parkade are dated and believed to be original and are beyond the expected service life. The units are in poor condition and expected to need replacement.	Medium Term

14	Hydronic Heating Piping Replacement	No	The heating piping serving the terminal units is believed to be original, is nearing the expected service life and in poor condition. The insulation and piping is recommended for replacement. It is noted the piping is fed from the Library boiler plant.	Medium Term
15	Stairwell Force Flow Units - Replacement	No	The force flow units in the stairwells are in varying degree of condition. Two are new while the others are original. Replace the original units.	Medium Term
16	Fuel Oil Tanks – Seal Tappings	No	The fuel oil tanks appear to be leaking a small amount of fuel oil at the tappings. Replace connections and re-seal piping.	Short Term
17	Fuel Oil Ventilation Fan Installation	Yes	A ventilation fan is required for any are where fuel oil is stored.	Required Repair
18	Make-up Air Unit Replacement	Yes	The existing make-up air unit is beyond the expected service life and should be scheduled for replacement. As part of the replacement the unit would need to be upsized to meet current code requirements	Medium Term
19	Main Exhaust Fans - Replacement	Yes	The main exhaust fans are beyond the expected service life and should be scheduled for replacement. The fans are undersized based on current code requirements for a CO/NO_2 purge system	Medium Term
20	Parking Booth Ventilation Addition	Yes	The parking attendant booth is required to have ventilation air by current code. The booth currently does not. Air cannot be taking from the parkade for this occupancy.	Short Term
21	Ventilation Addition for Office Spaces	Yes	The use of parkade air for ventilating office spaces does not meet code requirements.	Short Term
22	Hydro Vault Exhaust Fan Replacement	No	The fan is beyond the expected service life and should be replaced to ensure conditioning for the hydro vault can be maintained.	Medium Term

23	Addition of NO_2 detection at all required locations	Yes	The system is currently predominantly CO system. As part of current code requirements for parking garages where diesel vehicles could enter NO_2 detection is required.	Short Term
24	Upgrade Controls from Pneumatic to DDC	No	This should be done at the same time as the make-up air and exhaust fan replacement to both save energy on compressor power as well as connect all systems to the central monitoring systems for the City of Winnipeg.	Medium Term

2.3 ELECTRICAL

Item	Description	Code Req.	Recommendation	Time Frame
PARKADE				
1	General Lighting Replacement	No	As this equipment is aging, replacement for these systems should be planned.	Long Term
2	Emergency Lighting Replacement	No	As this equipment is aging, replacement for these systems should be planned.	Medium Term
3	Exit Lighting Repairs	Yes	Replace remaining red exit signs with green pictogram signs	Required Repairs
4	Exit Lighting Replacement	No	As this equipment is aging, replacement for these systems should be planned.	Medium Term
5	Main Distribution Replacement	No	As this equipment is aging, replacement for these systems should be planned.	Long Term
6	Improved labeling for electrical equipment	No	Provide new labels for all equipment.	Short Term
7	Creation of Single Line Diagram	No	Provide a new single line for the facility mounted in the amin electrical room.	Short Term
8	Emergency Generator Replacement	No	As this equipment is aging, replacement for these systems should be planned.	Long Term consideration
9	Emergency Generator – Battery Replacement	No	Replace generator batteries.	Short Term

10	Distribution Replacement (CDPs. Panelboards, transformers, etc.)	No.	As this equipment is aging, replacement for these systems should be planned.	Long Term
11	Distribution repairs	Yes	Re-install junction box covers and missing panel covers throughout.	Required Repairs
12	Branch Circuit Wiring Replacement	No	As this infrastructure is aging, replacement for these systems should be planned.	Long Term
13	Fire Alarm Replacement and Upgrade	Yes	Install new Fire alarm system and add new strobes through out	Medium Term
14	CCTV Replacement	No	Replace entire system	Medium Term
15	Alarm System in Attendants Booth	No	Replace entire system	Short Term

3 OPINION OF PROBABLE CONSTRUCTION COSTS

3.1 NOTES

3.1.1 The cost estimates are an opinion of probable cost for the mechanical and electrical work only. The costing Class for years 1-5 are Class 4 and Class 5 for years 6-10 as outlined in the City of Winnipeg Cost estimate guidelines. All related architectural, structural or other discipline work is not included. All estimates do not include applicable taxes and contain no contingency or consulting fees. All estimates do not include soft costs such as permitting etc….

3.2 MECHANICAL

The table below references the item outlined in the summary above and opinion of probable cost.

Item	Description	Cost ($)	Time Frame
	PARKADE		
1	Storm Drainage Piping Replacement	$900,000	Medium Term
2	Sump Pump Discharge Piping Replacement	$20,000	Medium Term
3	Sump Pump Replacement	N/A	Maintenance
4	Sanitary Drainage System – Original System Replacement	$1,800,000	Medium/Long Term
5	Sanitary Drainage – Parkade System – Localized Repairs	$5,000	Long Term
6	Parkade Drains – Lower Level – Monitor Corrosion	$45,000	Long Term Consideration
7	Domestic Cold Water – Insulation Repair	$70,000	Medium Term
8	Carwash Pumps Replacement	$8,000	Medium Term
9	Natural Gas Piping – Painting	$10,000	Short Term
10	Natural Gas Piping – Replacement	$300,000	Long Term
11	Fire Protection – Dry Valves Replacement	$70,000	Long Term
12	Sprinkler Systems – Piping Replacement	$1,224,000	Long Term Consideration
13	Terminal Heating Units Replacement	$80,000	Medium Term
14	Hydronic Heating Piping Replacement	$600,000	Medium Term
15	Stairwell Force Flow Units – Replacement	$24,000	Medium Term
16	Fuel Oil Tanks – Seal Tappings	$3,000	Short Term
17	Fuel Oil Ventilation Fan Installation	$80,000	Required Repair
18	Make-up Air Unit Replacement	$4,200,000	Medium Term
19	Main Exhaust Fans – Replacement	$1,350,000	Medium Term
20	Parking Booth Ventilation Addition	$40,000	Short Term
21	Ventilation Addition for Office Spaces	$45,000	Short Term
22	Hydro Vault Exhaust Fan Replacement	$100,000	Medium Term
23	Addition of NO2 detection at all required locations	$180,000	Short Term
24	Upgrade Controls from Pneumatic to DDC	$80,000	Medium Term
	Sub-Total	$11,234,000	

The breakdown based on time frame can be seen in the chart below. Where items span multiple time frames the cost have been prorated to each category.

Time Frame	Corresponding Year Range	Cost ($)
Required Repairs	3 Months	$80,000
Short Term	0-1 Year	$278,000
Medium Term	1-5 Years	$8,332,000
Long Term	5-10 Years	$1,275,000
Long Term Consideration	>10 Years	$1,269,000
Maintenance	On-Going	N/A

3.3 ELECTRICAL

The table below references the item outlined in the summary above and opinion of probably cost.

Item	Type	Cost ($)	Time Frame
	PARKADE		
1	General Lighting Replacement	$2,000,000	Long Term
2	Emergency Lighting Replacement	$100,000	Medium Term
3	Exit Lighting Repairs	$3,000	Required Repairs
4	Exit Lighting Replacement	$50,000	Medium Term
5	Main Distribution Replacement	$1,500,000	Long Term
6	Improved labeling for electrical equipment	$15,000	Short Term
7	Creation of Single Line Diagram	$7,500	Short Term
8	Emergency Generator Replacement	$350,000	Long Term Consideration
9	Emergency Generator – Battery Replacement	$10,000	Short Term
10	Distribution Replacement (CDPs. Panelboards, transformers, etc.)	$1,500,000	Long Term
11	Distribution repairs	$10,000	Required Repairs
12	Branch Circuit Wiring Replacement	$1,300,000	Long Term
13	Fire Alarm Replacement and Upgrade	$1,750,000	Medium Term
14	CCTV Replacement	$250,000	Long Term
15	Alarm System Replacement (Booth Only)	$10,000	Short Term
	Sub-Total	$8,855,500	

The breakdown based on time frame can be seen in the chart below. Where items span multiple time frames the cost have been prorated to each category.

Time Frame	Corresponding Year Range	Cost ($)
Required Repairs	3 Months	$13,000
Short Term	0-1 Year	$42,500
Medium Term	1-5 Years	$1,900,000
Long Term	5-10 Years	$6,550,000
Long Term Consideration	>10 Years	$350,000
Maintenance	On-Going	N/A

3.4 VFA REPORTS REVIEW

3.4.1 The VFA report for the Millennium Library parkade was provided to SMS as part of the background information for the parkade. The reports are dated November 24, 2020 and consisted of the following documents:

.1 2020 VFA Asset – Detailed Report – Millennium Parkade (PK-01) - November 24, 2020

.2 2020 VFA Asset – Requirement Forecast Report – Millennium Parkade (OK-01) – November 24, 2020

.3 The forecast requirement was also submitted in excel format.

3.4.2 The reports are all based on an assessment of the facility performed in 2015 and have not been updated for recent projects which have occurred.

3.4.3 A number of items are outside the scope of mechanical and electrical review but for the items within the mechanical and electrical scope of work the total cost for the next 10 years is 27,453,431.32, of which $14,489,739.86 is associated with mechanical leaving $12,963,691.46 for the electrical scope. The distribution is broken down in the chart below.

Year	Total Cost	Mechanical Cost	Electrical Cost
2020	$ 21,968,732.00	$ 13,597,240.00	$ 8,371,492.00
2021	$ 77,103.24	$ 77,103.24	$ -
2022	$ 1,767.59	$ -	$ 1,767.59
2023	$ 765,872.71	$ 765,872.71	$ -
2024	$ 314,421.96	$ -	$ 314,421.96
2025	$ 108,116.09	$ 49,523.92	$ 58,592.18
2026	$ -	$ -	$ -
2027	$ -	$ -	$ -
2028	$ 4,217,417.72	$ -	$ 4,217,417.72
2029	$ -	$ -	$ -
2030	$ -	$ -	$ -

It is our recommendation that a number of the large costs associated with full system replacements for the sanitary piping, storm piping, domestic water systems, branch circuiting can be relocated into later years or addressed as part of on-going repair work.

4 MECHANICAL SYSTEMS DESCRIPTION

4.1 GENERAL

4.1.1 The parkade is below grade and heated by one central air handler and localized terminal heating units. The systems have been partially upgraded but some are original to the construction of the building. All references to expected remaining service life are based on ASHRAE – HVAC Application Handbook - 2019.

4.2 PLUMBING

4.2.1 Storm Drainage

.1 There is storm drainage piping which serves the plaza above. The condition is unknown as the piping is mostly insulated and re-covered with PVC jacketing. Most of the piping connected to the drains serving the plaza level were replaced when the plaza was redeveloped but the mains and branch piping is believed to be original. The new piping is within the expected service life but any original piping would be nearing the expected service life of 50 years. The storm drainage piping runs to the south end of the parkade where it is connected to the municipal main on the lower level.

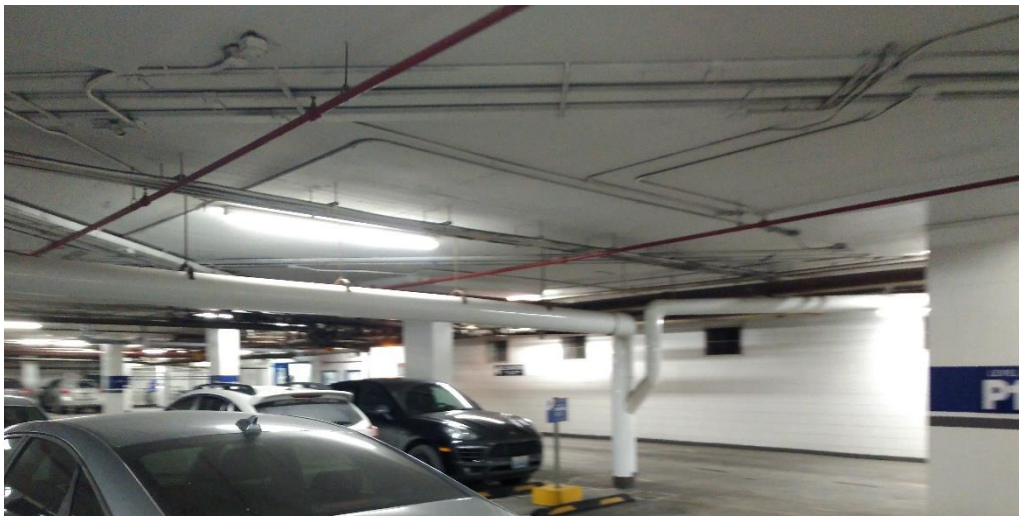


Figure 1: Storm drainage piping fully insulated.

4.2.2 Sump Pumps

.1 There are several sump pumps located in the facility. The pits are located mostly on the lower level of the parkade. There are several localized pits which serve applications like weeping tile or localized drainage. There are however, two larger interceptors which capture the drainage from

the upper and lower parkade sanitary drainage system. The pit in the Northwest corner of the lower level is a three compartment arrangement and discharge to the sanitary drainage on the lower level. The second large pit is a double compartment arrangement located in the Southwest corner of the lower parkade and discharges to the sanitary drainage system. All the pumps reviewed appeared to be in fair condition. The exact age is not known but the pumps should be monitored and confirmed operational. Facility staff have indicated they have not had any issues with the pumps recently. The pit condition was not reviewed but facility staff indicated they have not had any issues.

.2 Some of the sump pump discharge piping is galvanized and is showing signs of corrosion on the pipe and fittings. The piping is believed to be original to the facility and nearing the expected service life of 50 years. Once galvanized piping starts to fail it will fail quickly. It is recommended to replace the galvanized piping.

Figure 2: Galvanized discharge piping from lower level sump pits.

4.2.3 Sanitary Drainage

.1 The sanitary drainage system for the parkade consists of piping from the library and plaza above as well as the piping serving the drainage for the parkade. Most of the piping for the facility is original with some sections

having been replaced. The piping is in poor condition, is nearing the expected service life of 50 years and it is recommended for replacement. The condition of the piping in the library above is not included in the scope.

.2 Piping serving the parkade level drainage is in good condition with the majority of it replaced as part of the parkade renovation work in 2015. The piping serving the upper level was mostly cast iron and is in good condition with some local signs of corrosion. The drains on the upper level are all new galvanized drains and appear in good condition. The drains are well within the expected service life.

Figure 3: Localized corrosion on new cast iron pipe around drain.

Figure 4: Galvanized drain on upper parkade level.

.3 The drains on the lower level are noted to have been replaced as part of the renovation project in 2015 but show signs of significant corrosion. The drain type form the record drawings appears to be different from the lower level and are not a galvanized rain body. We would recommend monitoring the drains to confirm if the condition worsens.

Figure 5: Drain on lower level showing signs of corrosion.

.4 There is a grit interceptor on the lower level for the carwash. The interceptor is in fair condition and is required by code. No further recommendation.

.5 The piping below the slab on grade section below appears to be plastic and is expected to have been replaced during the parkade renovation based on record information and section of visible plastic piping extending below the slab. All plastic piping as it passes below the slab is equipped with expansion joints as required by current plumbing code.

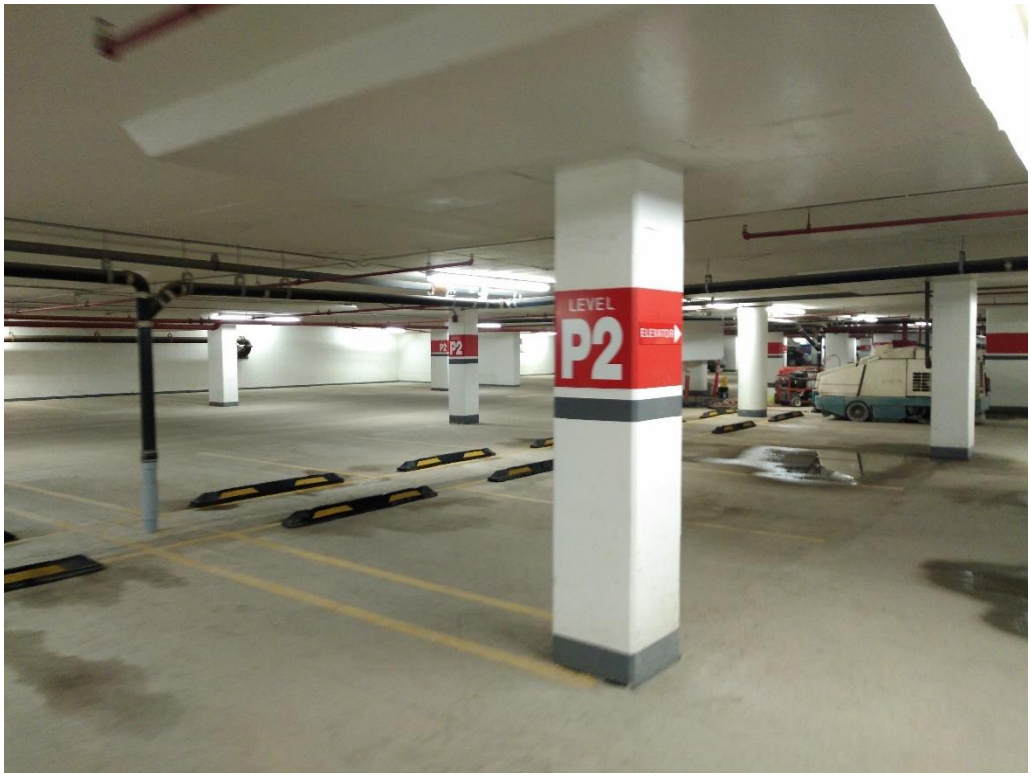


Figure 6: Lower level sanitary piping serving the parkade drainage with plastic piping passing below grade.

.6 There are two sanitary services on Donald and one on Smith street. Both appear to be original and would fall into the same category for replacement as the original piping in the parkade.

.7 The trench drains for the ramps were replaced as part of the ramp replacement. They are only a few years old and are in good condition.

Figure 7: Trench drain on one of the four entrance ramps.

4.2.4 Domestic Water Systems

.1 The domestic water system serves hose bibbs, the one washroom and the car wash on the parkade levels. There is other processes that use domestic water like “emptyful”, but it is not within the scope of this report.

.2 The domestic water piping is believed to be mostly original to the facility. The insulation is in poor condition. The piping looks to be mostly copper and is within the service life of 80 years. It is recommended to replace the insulation to prevent condensation and possible mould growth.

.3 The carwash area has a dedicated hot water tank which was replaced in 2017. The pumps for the high-pressure wash system are roughly 10 years old according to facility staff and would be nearing the end of their expected service life of 14 years. The pumps appear in fair condition and should be slated for replacement in coming years.

Figure 8: High pressure car wash pumps and dedicated hot water tank.

.4 The carwash system is separated from the rest of the piping by a reduced pressure backwater flow preventer which is required by code. The backflow has been tested and is operational according to the service tag.

.5 There are two main water service entrances into the building. The main domestic water service entry for the library and parkade enters on the upper level in the northwest corner. The water service entry room has several take offs for the various uses in the facility. The main service comes in and is protected by a double check valve assemble as required by code. The backflow preventer was included in the test report and passed. The manifold splits the incoming service to two metered take-offs. One serves the parkade and plaza and the second serves the library building. The water service also feeds the fire pump for the building which is separated from the domestic water by a backflow assembly. The service entrance appears to be in good condition.

Figure 9: Separate meters for the library and parkade.

.6 There is one washroom located in the parkade. The washroom is in the upper parkade located in the Northwest corner. The washroom is dated and although the age of the fixtures is unknown, they are in fair condition. The washroom fixtures do not meet barrier free requirements. The washroom would be an existing condition which can remain but should any modifications occur it would likely be required to be brought up to current barrier free requirements. The fixtures are considered to be maintenance items and should be monitored for leaking or failure.

4.2.5 Natural Gas Piping

.1 The natural gas piping in the facility comes in on the West wall of the lower parkade and is routed over to the South wall of the upper parkade. It is protected by metal posts connected to the floor and ceiling. The natural gas piping appears to be original to the facility but has a new meter upgrade by MB Hydro. The piping is in fair condition with sections that are painted and expected to be within the service life. Localized corrosion was noticed and should be painted, or the pipe section replaced in the near future. Long term recommendations would be to replace the entire natural gas piping systems but this would be outside the window of review for this report.

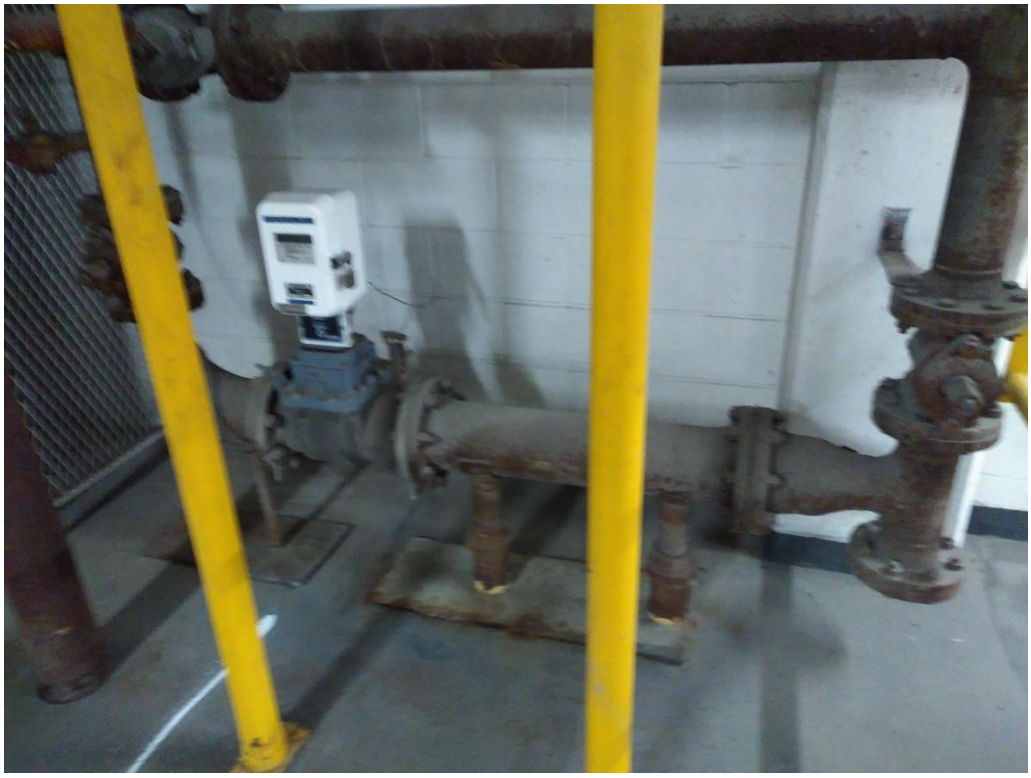


Figure 10: Natural Gas Main.

.2 The natural gas piping in the parkade only appears to serve the make-up air unit and the boilers within the parkade.

4.3 FIRE PROTECTION

4.3.1 General

.1 The entire parkade is sprinklered. There are wet sprinkler systems in the facility but the parkade is entirely served by dry systems. From the annual test report prepared by Vipond Fire Protection, only hoses failed due to the age or they were missing. All other devices passed.

4.3.2 Wet Sprinkler System

.1 The parkade does not have any wet sprinkler systems.

4.3.3 Dry Sprinkler System

.1 The parkade is split up into four sections. Two dry sprinkler zones exist per level and are separated north and south.

.2 The North zones are served by a water service which enters in the northeast corner of the upper level. The sprinkler system is equipped with a main flow switch for indication and backflow preventer.

Figure 11: Sprinkler Header in Northeast service entrance room.

.3 The header in the Northeast corner has three dry zones. The two zones are for the P1 and P2 north zones and the third is for the main floor dry zone.

.4 The header which serves the south portion of the parkade is located on the Donald Street side in the Southwest corner of the upper level. The boiler system for the ramp heating is also installed in this room. The water service entrance comes from the level below. The vintage appears to be the same as the Northeast sprinkler system and would have the same recommendations.

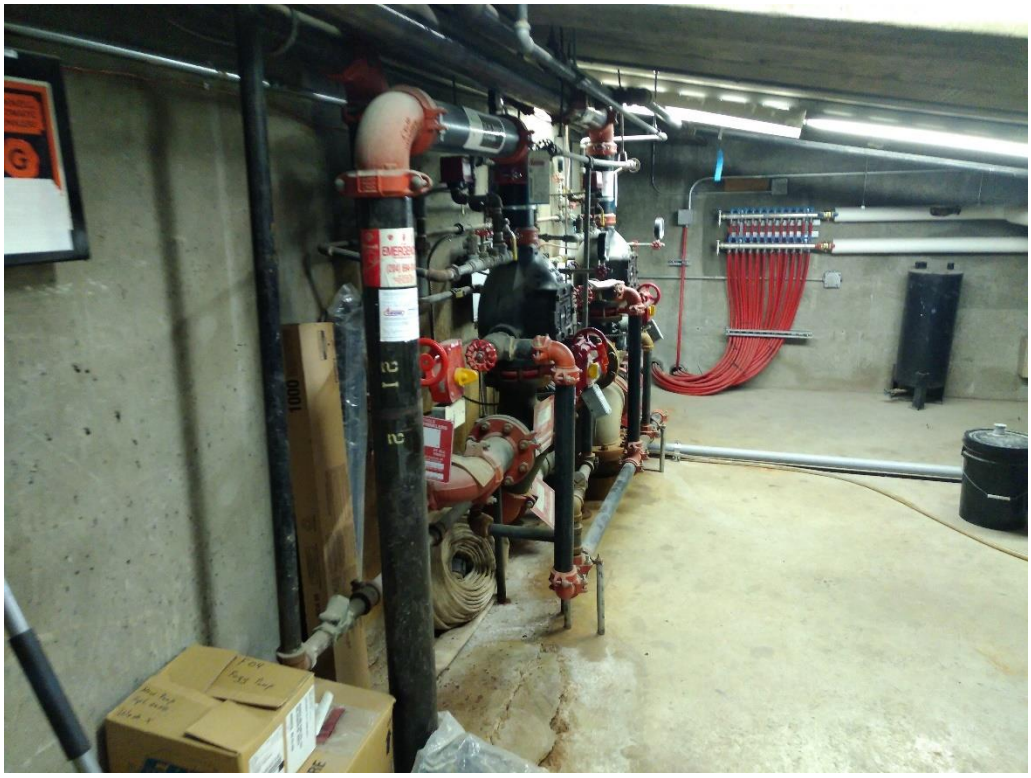


Figure 12: Sprinkler header in the Southwest corner of the upper parkade.

.5 The exact age of the sprinkler system is unknown, but it appears to have been modified recently. It is expected parts were updated as part of the renovation project. The valves are in fair condition with some signs of corrosion. It is expected parts of the piping system are nearing the expected service life of 25-30 years for black steel pipe as part of a dry sprinkler system. It is recommended to monitor the piping systems and schedule replacement of sections annually once leaks become a larger concern.

.6 The sprinkler heads in the parkade were all replaced as part of the Millennium Library renovation project. The heads would therefore be within the expected service life and no additional testing is expected to be required for an additional 35 years. Some heads were observed to have dust and debris on them. It is recommended that all heads be cleaned to ensure spray pattern or discharge are not affected by debris build-up. This would be a maintenance item.

.7 The fire department connection is in a pedestal on Donald Street near Graham. There is a second fire department connection for the Library located on the building at the corner of Graham Avenue and Smith Street.

Figure 13: Fire department connection on building face.

4.3.4 Standpipe Systems

.1 The stairwells have a wet standpipe system installed at the lowest, intermediate and the upper landing where they open to the plaza level. The standpipe system was installed as part of the renovation project for the library and therefore is within the expected service life of 30 years for a wet sprinkler system.

.2 There are some additional hose cabinets installed on the upper and lower parkade levels. The cabinets are located roughly on the north end, middle and south end of the parkade and are typically three wide with one on the east, one on the west and one down the centre. These cabinets are in good condition and within the expected service life.

Figure 14: Hose cabinet and fire extinguisher installed as part of renovation project for Library

4.4 HYDRONICS

4.4.1 In-slab Heating Systems

.1 The ramp snow melt systems were replaced in two phases. In 2013 one ramp was replaced with all new in-slab piping and manifold. In 2018 the remaining three ramps were replaced including new in-slab piping, manifolds, boiler systems and hydronic accessories. There are two boiler plants on the upper level of the parkade; one on the Donald Street side which serves the two ramps located there and one on the Smith Street side which serves the two remaining ramps.

.2 The boiler systems were replaced in 2018 and consists of three Weil-McLean Evergreen 299 MBH high-efficiency boilers per system. The combined output for all three boilers is 807 MBH for both snow melt systems, based on name plate data. The system type is identical between the two boiler plants and they were installed at the same time. The boilers are all equipped with a condensate neutralizer on the drain line as required by code. The boilers all have injection pumps to feed hot water into the secondary heating loop. The boilers are within the expected service life of 19 years and are in good condition.

Figure 15: Boiler plant on Smith Street side of parkade.

.3 The boilers are manifolded together with a common circulating pump system and operate in a primary-secondary loop arrangement, the pumps are inline vertical style pumps with sensorless VFD drives. The pumps were installed as part of the modification in 2018, are within the expected service life of 19 years for hydronic pumps, and in good condition.

Figure 16: VFD driven pumps on hydronic system, in-line separator and glycol fill tank

.4 The hydronic system is equipped with an in-line tangential air separator, glycol fill tank and expansion tank. The pieces of equipment were all installed at the same time as the boiler modification and are in good condition.

.5 The main hydronic loop connects to two sets of manifolds for the in-ramp heating system. The manifolds are of different material types on the Smith Street side due to the varying ages of installation. One set is brass while the other is stainless steel. Whether or not it was replaced in 2013 or 2018 both are within their expected service life of 25 years and are in good condition. The manifolds for the other side of the facility were both installed in 2018 and are in good condition.

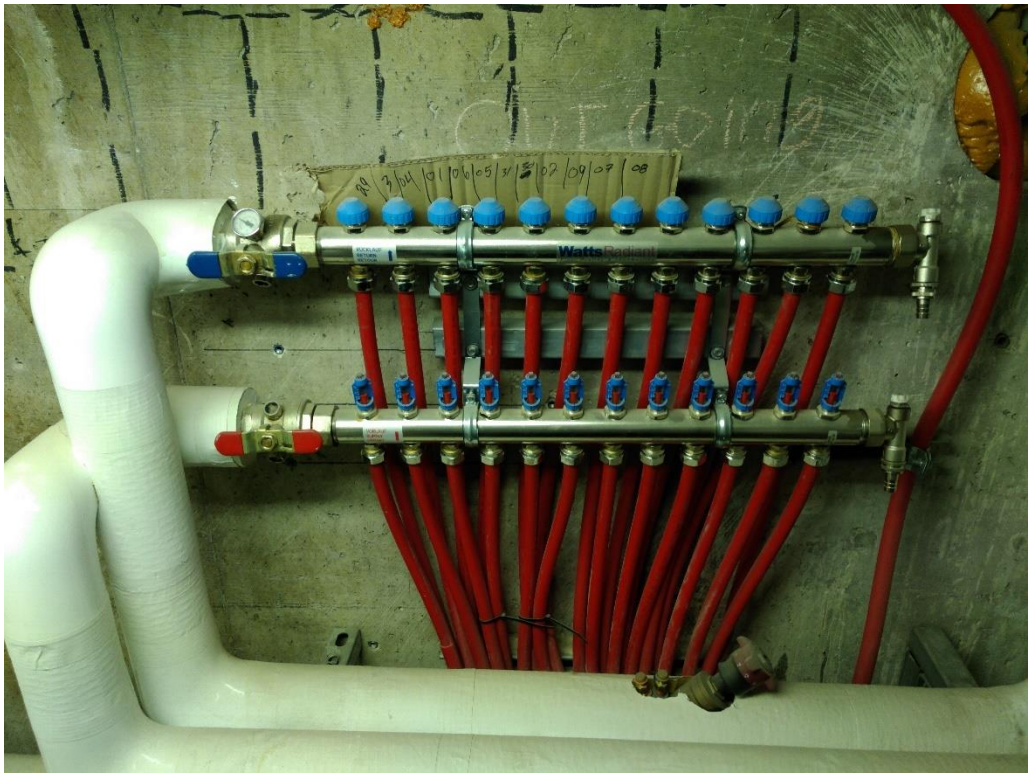


Figure 17: Stainless steel snow melt manifold installed in 2018.

4.4.2 Terminal Heating Systems

.1 There are several unit heaters located on both the upper and lower levels for terminal heat. The unit heaters are mostly hydronic and are fed from the library boiler plant. The insulation on the piping is in poor condition and should be replaced. The unit heaters vary in condition from fair to poor. The unit heaters appear to be original to the facility and are beyond the expected service life of 18 years. Replacement is recommended.

Figure 18: Unit heater located on the upper level of the parkade.

.2 The hydronic piping is expected to be original to the facility and would be nearing the expected service life of 50 years. It is recommended to perform destructive testing on the piping to confirm the condition. In the long term the piping would need to be replaced in its entirety.

.3 The stairwells have force flow units at the top of most and a few have electric unit heaters installed as additional heat. These unit heaters are relatively new but an exact age is unknown. The new unit heaters are within the expected service life. The other two stairwells have force flow heaters which are original and need to be replaced. The units are in poor condition. Replacement is recommended.

4.4.3 Generator

.1 There is an emergency generator located on the upper level. The generator will be reviewed as part of the electrical scope, but the fuel oil supply and ventilation will be reviewed under this section.

.2 The fuel oil for the facility is fed from two-day tanks next to the generator. The tanks appear to be Westeel double wall tanks with a storage capacity of 200 gallons each. The tanks are manifolded together. There

are two supply pumps to the generator and a fill station up on Graham Avenue. There are signs of leaking on the fittings as there is staining on the concrete. The tanks appear have a manufacture date of 2004 on them and would be within the expected service life. Repairs to the piping and cleaning of the spilled fuel oil are recommended.

Figure 19: Double wall tank with signs of fuel oil leaking at tapings.

.3 There is an abandoned fuel oil tank and pumps on the lower levels which are no longer used.

.4 The generator ventilation system works on a recirculation and exhaust strategy. The unit will run in recirculation until the room is warm at which time the dampers will modulate and discharge air to the outdoors. The test reports indicate this system appears to be operating correctly.

4.5 HVAC

4.5.1 Ventilation

.1 The generator room does not have a dedicated ventilation system. The system is required by code to prevent the diesel fume accumulation to a point where an explosion could occur. Current code requirements indicate either the fan has to run continuously or be controlled on a sensor. It is recommended a ventilation fan and detection system be installed.

.2 The parkade is ventilated and partially heated by one main direct natural gas fired make-up air unit that is installed on the upper parkade in the north mechanical room. The unit is manufactured by B.M.S and has an input of 8,200MBH per burner for a total input of 16,400MBH. The name plate data indicates the unit is capable for 71,000cfm. The original control diagrams for the unit indicate that the fresh air is drawn from the area well on Graham Avenue. The unit arrangement from intake to discharge is as follows.

.1 Intake
.2 Glycol Heat reclaim coil (run-around loop) – No longer in operation
.3 Stage one electric heating
.4 Stage two electric heating
.5 Natural gas direct fired heating section
.6 Supply fan 1 and 2
.7 Electric re-heat coils (one per level)
.8 Exhaust fan system (separate)

.3 The original intent of the unit was that on intake temperature of 35 F the first stage heating for glycol heat reclaim and for electric pre-heat would be engaged. When the intake air was below 0F the second stage of glycol heat reclaim and electric heat would be engaged as well as the natural gas burner to raise the temperature. The electric re-heat coils would be controlled based on level temperature and discharge air. The fans are controlled based on timeclocks and CO/NO_2 sensors on each level. SF-1 serves the upper level and SF-2 serves the lower level. Damper arrangements allow for air to be directed to the corresponding level and shut-off if there is only a call from one level.

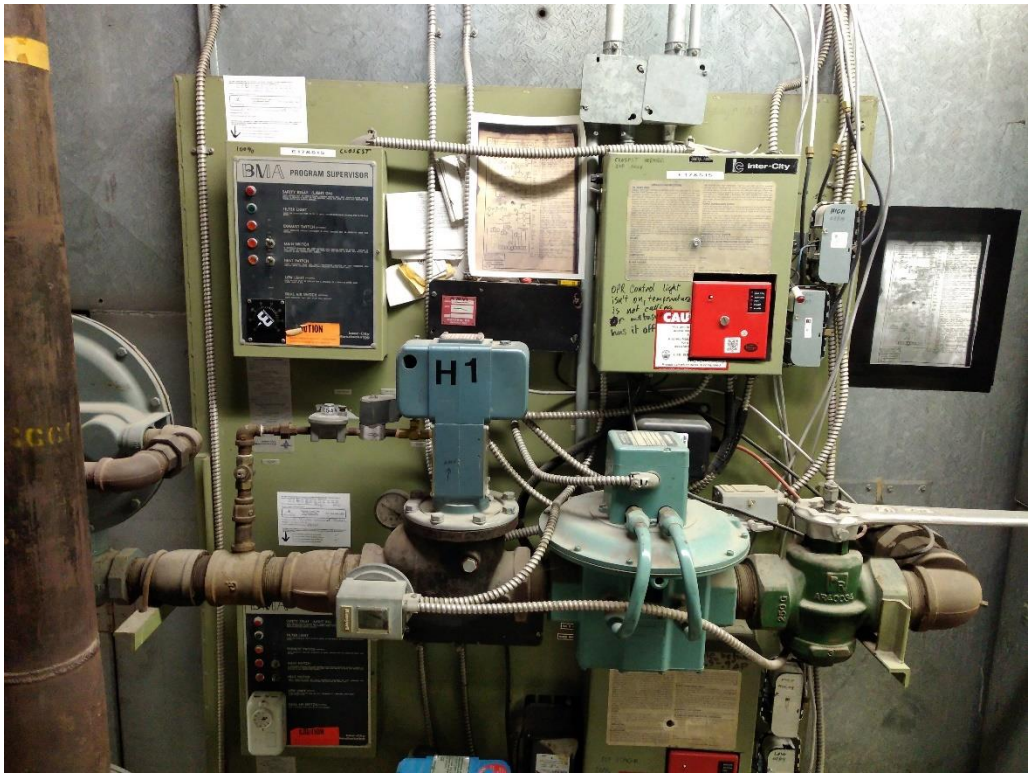


Figure 20: Natural gas manifold for direct fired burner on make-up air unit

.4 The glycol heat reclaim coil is no longer in operation and has been capped on both ends.

Figure 21: Capped glycol heat reclaim system.

.5 The remainder of the unit is original to the parkade and is beyond the expected service life. Parts appear to have been upgraded but the exact age of these modifications is unknown. The expected service life for direct fired make-up air units is 23 years. The unit is beyond the expected service life and appears to be in fair condition. Under current code the unit would not be sufficiently sized to meet minimum purge ventilation for a CO/NO_2 system and therefore would need to be increased in size.

4.5.2 Exhaust Fans

.1 The make-up air is interlocked to two exhaust fans located on the upper level of the parkade. The exhaust fans are staged similar to the make-up air unit and can be controlled for upper and lower levels. The glycol run-around loop is disconnected similar to the make-up air unit. The fans are installed in a sealed room which acts as a negative air plenum with ductwork connections for the lower level and two branches for the upper level. The exhaust fans are original to the facility and appear to be in fair to poor condition. The fans are undersized based on current code requirements for CO/NO2 purge systems. The capacity would need to be upgraded. Replacement is recommended.

Figure 22: Exhaust fan serving parkade ventilation system.

4.5.3 Localized systems

.1 There are several localize systems within the parkade. These systems recirculate air from the parkade to the space and back into the parkade.

.2 The attendant booth is located on the Smith Street side of the facility. It is equipped with a cooling and heating unit on top. The unit does not have ducted outdoor air which is a code requirement. The heating and cooling unit appears to be new and in fair condition. It is recommended to install dedicated supply air to the attendant booth to provide proper ventilation and comply with current code requirements.

.3 The Parking Authority offices in the centre of the upper parkade are equipped with fans and filters that draw air from the parkade into the office area and exhaust it to the parkade. There is a portable A/C unit installed in the office area with the heat discharge to the parkade. Ventilating the office area with parkade air is not permissible by current code requirements. It would be recommended to provided dedicated make-up air to the office space in order to meet indoor air quality and current code requirements.

Figure 23: Intake and portable AC unit for Parking Authority office

.4 Adjacent to the Parking Authority office is the main server room and small electrical room. The room is equipped with a small exhaust fan which is not connected to anything and appears to not be operational. The room was quite warm during our visit. It would be recommended to install a ventilation fan or connect ductwork to the existing in order to maintain the temperature of the room.

Figure 24 Exhaust fan not connected to anything in electrical room next to Parking Authority office.

.5 There are two elevator machine rooms located on the upper parking level. Both machine rooms are equipped with a ventilation fan that draws air from the parkade and exhausts back to the parkade. The fans appear to have been changed recently but an exact age is unknown. The fans appear to be in fair condition.

.6 The main hydro vault is equipped with a large exhaust fan and ductwork. The fan was in fair condition but is beyond the expected service life of 19 years. It is recommended to replace the fan to maintain conditioning in the electrical room.

4.5.4 CO/NO_2 Detection

.1 The entire parkade utilizes a CO detection system to control the make-up air unit and interlocked exhaust fans. It appears that the CO detection system is throughout the parkade and spaced in accordance with typical manufacturer requirements. The systems have been tested recently.

.2 It was noted that there were lower and upper detection in some locations but not consistently throughout the parkade. Typically, CO detection is at the occupied breathing height with NO_2, another common hazardous gas generated by diesel vehicles located at high level. There

were high level detectors in only portions of the parkade and most detector inspection tags only indicated CO detection. It is recommended that NO_2 detectors be installed to align with proper spacing requirements per manufacturer recommendations.

Figure 25: CO detector located on column in parkade.

4.5.5 Intake and Louvers

.1 The intake louver for the make-up air serving the parkade is in an area well on Graham Avenue. The intake is approximately 10 feet from the street and therefore is not an ideal location to pull ventilation air from due the consistent bus traffic on Graham Avenue. It is an existing condition which will remain.

Figure 26: Intake louver for parkade make-up air unit.

.2 The exhaust louver is located on the plaza area and is a concrete structure which is approximately 10 feet above the plaza . The location is adequate and would discharge air above pedestrian level.

4.6 CONTROLS

4.6.1 General Building Systems

.1 The majority of the building systems had pneumatic controls. The make-up air unit, the exhaust fans and several local items were on the pneumatic system. The existing pneumatic system is original to the facility and is recommended to be replaced with a DDC system.

.2 There are two new panels located by the new boilers that serve the ramps on the upper levels. The control system is a DDC system installed by Johnson Controls and connects to the City of Winnipeg Remote Monitoring station. The control system was installed at the same time as the boiler and is in good condition.

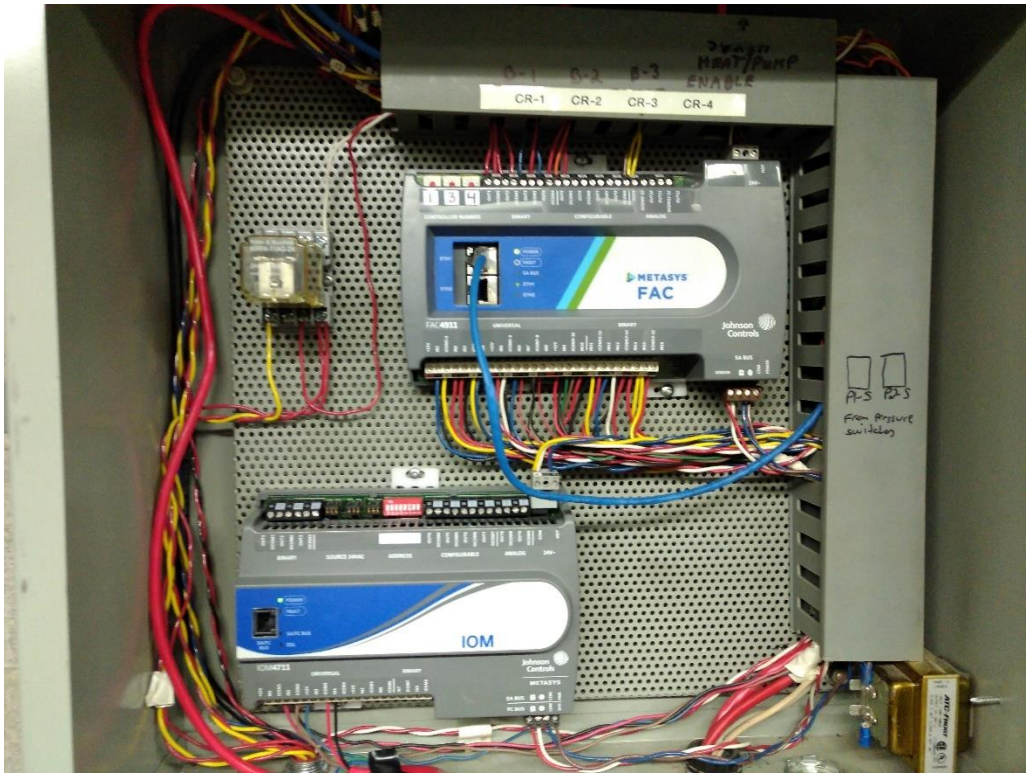


Figure 27: New Johnson Controls system for ramp snow melt.

5 ELECTRICAL SYSTEMS DESCRIPTION

5.1 LIGHTING AND CONTROLS

Lighting is mainly recessed surface mounted fluorescent fixtures with electronic ballasts and Led tubes. Stairwells ramps and general entrances all appear to be similar type fixtures.

Figure 28: Parkade Lighting

Back of house areas including service rooms are 2 lamp T8 fixtures with on/off switches.

Figure 29: Back of house lighting

All observed light fixtures were in fair to good condition.

Illuminating Engineering Society (IES) guidelines recommend parkade light levels are the following from RP-20-98.

Table 1. RP-20-98 Parking Structure Illuminance Recommendations.

		Minimum Horizontal Illuminance	Maximum/Minimum Horizontal Uniformity Ratio	Minimum Vertical Illuminance
Basic		1 fc	10:1	0.5 fc
Ramps				
	Day[1]	2 fc	10:1	1.0 fc
	Night	1 fc	10:1	0.5 fc
Entrance Areas[2]				
	Day[1]	50 fc		25 fc
	Night	1 fc	10:1	0.5 fc
Stairways		2 fc		1.0 fc

[1]Daylight may be considered in the design calculation.

[2]A high illuminance level for about the first 65 feet inside the structure is needed to help with the transition from bright daylight to a lower internal level.

No light levels were recorded but appeared above adequate levels in all observed spaces.

Lighting control in general parkade is on 24 hours a day, 7 days a week. Lighting appears to be maintained well throughout the parkade, but planning should be in place for potential replacement in the next 5 years.

5.2 EMERGENCY AND EXIT LIGHTING

5.2.1 Emergency lighting is provided by connecting general lighting fixtures to the emergency generator located on Level P1. There are also 10 battery banks located in the generator room, stairwells and electrical rooms. These are tested annually, and reports are generated for the site record.

Exit signs are a green pictogram throughout the parkade and appear to be in fair to good condition. There was one red exit sign leading from the elevator room to the general parkade.

The emergency lighting appears to be in good condition.

All exit signs appeared to be over exits and in the path of egress. The one red exit sign needs to be replaced with a green pictogram type exit sign to match the rest of the building.

Emergency and exit lighting appears to be maintained well throughout the parkade, but planning should be in place for potential replacement in the next 5 years.

5.3 DISTRIBUTION

5.3.1 The main electrical distribution is located on level P2. The equipment appears original to the building but is still in fair working condition. Electrical equipment has a normal service life of 35 years. Although the equipment is still functioning, provisions should be made for replacement in the near future.

Figure 30: Part of the main distribution.

5.3.2 Additional labelling of equipment and the creation of a single distribution schmatic is strongly recommended. The single line should be mounted in the main electrical room under a plexi-glass cover.

5.3.3 The parkade also houses the emergency generator for the library and the parkade. Based on the latest annual inspection report the only recommendation for the generator at this time is to replace the batteries. It is recommended that batteries get replaced every 4 years. It is not anticipated that this generator would require replacement for the next 10 years. Please note that general maintenance will still be required on an ongoing basis.

5.3.4 Electrical panels and transformers are placed in mechanical/electrical rooms throughout the parkade. There is a significant amount of dust accumulation on the equipment and most equipment requires cleaning. One panel was missing a wireway along the top of the panel exposing the branch circuit wiring. The cover needs to be re-installed to conceal this wiring.

Figure 31: Wire-way missing cover

5.3.5 Panel, transformers, splitters are strategically spaced throughout the parkade and display a varying degree of age and condition. Most equipment appears operational and in fair condition but are nearing the end of their useful life. Replacement should be considered in the next 5-10 years.

5.3.6 Feeder wiring is a mixture of wire in conduit and armoured teck cable. Branch circuit wiring within the building is typically RW90 conductors in EMT conduit. It is not anticipated that branch circuit wiring require replacement at this time. Based on the typical life span of electrical equipment, replacement should be considered in the next 10 years.

5.3.7 There were select junction boxes that were missing covers. Covers are to be installed on all junction boxes.

Figure 32: Junction box missing cover.

In the general parkade areas, various junction boxes require new supports or need to be re-fastened to the concrete.

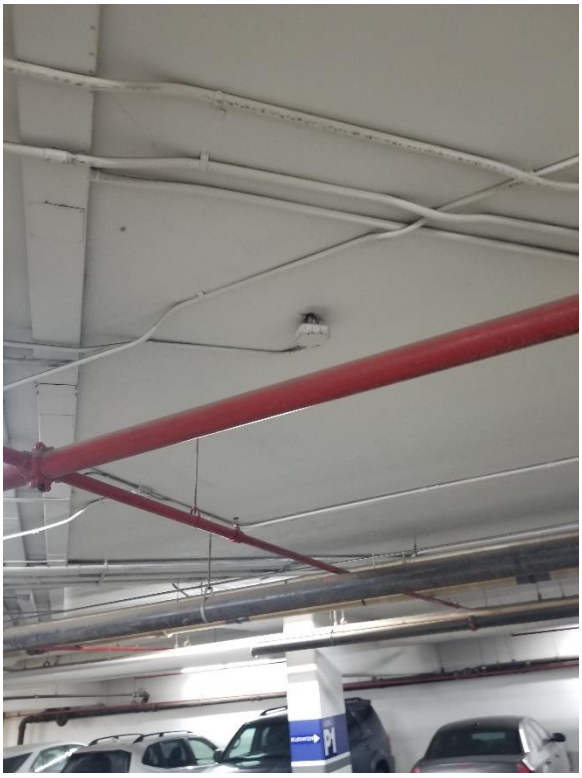


Figure 33: Conduit missing supports and anchors.

5.4 FIRE ALARM SYSTEM

5.4.1 The fire alarm system consists of a single stage addressable system and is located in the main electrical room. The existing system manufacturer is Simplex and model is 4100U. Internal batteries provide power to the fire alarm panel during power outages. The initiating devices consist of smoke detectors, heat detectors, monitoring devices (flow, supervisory, tamper) and pull stations. Annunciation devices consist of horns and combination horn strobes. The notification devices are all horns with no strobes. The fire alarm system is monitored by a third-party agency.

Figure 34: Main fire alarm panel

5.4.2 The fire alarm system is in fair to good condition and meets NBC fire alarm code requirements. The system does not have strobe devices which are now required by code for new construction, but as this system was installed prior to this code requirement was adopted, the system is grandfathered, and upgrades are not required at this time. When the fire alarm system is replaced, strobes will need to be added throughout the parkade. Based on the latest verification report, the system is still functional. It is recommended that it be upgraded/udated in the next 1-5 years. Strobes could be added to the system at that time and the system would be ready for the next expected service life.

5.5 SECURITY SYSTEM

5.5.1 The parkade has a number a CCTV cameras installed throughout the general areas. Cameras are controlled at the attendant's booth, parking authority's office, and WPA Dispatch. The CCTV system appears to be working order and in good condition.

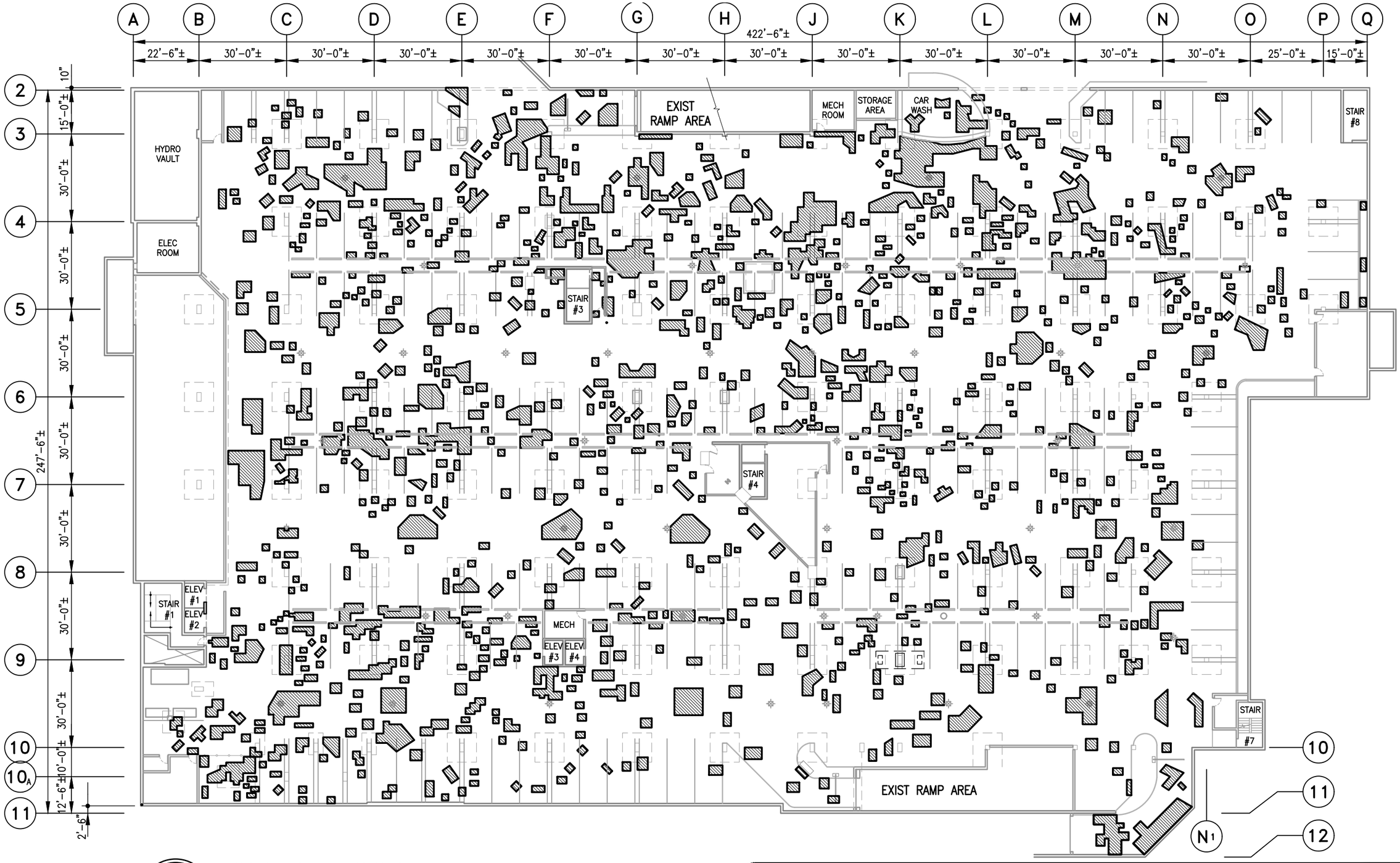
5.5.2 Anticipated upgrades/replacement should be planned for in the next 5 years.

5.5.3 The building contains an alarm system in the attendant's booth. The booth's door and window both have sensors in the event they are opened when the alarm system is active. The keypad for the system is located within the booth. This system appears to be deficient and should be replaced.

SMS Engineering Limited 770 Bradford Street, Winnipeg, MB, Canada R3H 0N3 **T** 204 775 0291 SMS@SMSeng.com **SMSeng.com**

Appendix C

Drawings



UPPER FLOOR PARKING PLAN

1/32" = 1'-0"

LEGEND

DENOTES APPROX EXTENT OF TOP SURFACE CONCRETE DETERIORATION

300-275 Carlton Street
Winnipeg, Manitoba R3C 5R6
T 204. 943. 7501
F 204. 943. 7507

Crosier Kilgour & Partners Ltd.
CONSULTING STRUCTURAL ENGINEERS

Project: MILLENNIUM LIBRARY PARKADE
PARKADE INVESTIGATION — WINNIPEG, MANITOBA

Sheet Title	Sheet No.
UPPER FLOOR PARKING PLAN	S1.1

Design	Drawn	Date	File
JLS	LOL	2021-01-06	2020-1183

Appendix D

Test Results

Stantec Consulting Ltd.
199 Henlow Bay, Winnipeg MB R3Y 1G4

December 10, 2020
File: 123315240

Attention: Mr. Richard Lobban
Crosier Kilgour & Partners Ltd.
300-275 Carlton Street
Winnipeg, MB R3C 5R6

Good day Richard,

Reference: Millennium Library Parkade – Core Testing

On November 26, 2020, Stantec Consulting was retained to recover twelve (12) core samples from the structural slab on level 1 of the Millennium Library Parkade located at 251 Donald Street in Winnipeg, Manitoba. The core sample locations are summarized in the attached Table 1. Three (3) core samples were handed over to Crosier Kilgour personnel on site for Petrographic analysis. Photographs of the nine (9) core samples returned to our office are attached to this report. The testing performed and the corresponding results for each core sample are identified below.

CHLORIDE ION CONENT

Six (6) core samples were prepared for chloride ion content determination by trimming 10 mm slices at prescribed depths on the core samples. Testing of the 10 mm slices were performed by CARO Analytical Services in accordance with *CSA A23.2-4B; Sampling and Determination of Water-Soluble Chloride Ion Content in Hardened Concrete.*

The Chloride ion content results ranged from <0.010 to 0.286% (by mass of concrete), with an average of 0.075%. A summary of the chloride ion content test data is provided in the attached Table 2. A copy of CARO's analytical report is also attached.

COMPRESSIVE STRENGTH

Three (3) core samples were tested for compressive strength in accordance with *CSA A23.2-14C; Obtaining and Testing Drilled Cores for Compressive Strength*. The core sample were conditioned in air at room temperature for 24 hours prior to testing. The compressive strength test results ranged from 16.2 to 35.8 MPa, with an average of 24.1 MPa.

A summary of the compressive strength test data is provided in the attached Table 3.

PETROGRAPHIC ANALYSIS

As stated above, three (3) core samples (identified as 1C, 2C, and 6C) were relinquished to Crosier Kilgour site personnel for petrographic analysis.

Reference: **Millennium Library Parkade – Core Testing**

CLOSING

We appreciate the opportunity to assist you on this project. Please contact the undersigned if you have any questions regarding this report.

Regards,

Stantec Consulting Ltd.

Jason Thompson C.E.T.
Principal - Manager, Materials Testing Services

Phone: 204 928 4004
Mobile: 204 981 8445
jason.thompson@stantec.com

Attachment: Table 1 – Core Location Details
Table 2 – Chloride Ion Content Test Data
Table 3 – Compressive Strength Test Data
Photographs

Reference: **Millennium Library Parkade – Core Testing**

TABLE 1 – CORE LOCATION DETAILS

Core No.	Core Location
1A, 1B, 1C	Parking stall - between gridlines 7 to 8 and G to H
2A, 2B, 2C	Parking stall - between gridlines 10 to11 and C to D
3A	Drive aisle – on gridline C between gridlines 3 to 4
4A	Drive aisle - between gridlines 7 to 8 and H to J
5A	Drive aisle – between gridlines 8 to 9 and M to N
6A, 6B, 6C	Parking stall – between gridlines 2 to 3 and N to 0

TABLE 2 – CHLORIDE ION CONTENT TEST DATA

Core No.	Sample Depth (mm)	Water-Soluble Chloride Ion Content (% by mass of concrete)
1A	20 to 30	<0.010
2A	20 to 30	0.086
3A	20 to 30	0.288
4A	20 to 30	0.025
	100 to 110	<0.010
5A	20 to 30	0.081
6A	20 to 30	0.086
	100 to 110	0.010

Note:
The threshold necessary to permit corrosion in the reinforcing steel with the presence of oxygen and water must be greater than 0.025% by mass of concrete. The chloride results that exceed this threshold are noted in red in Table 3 above.

TABLE 3 –COMPRESSIVE STRENGTH TEST DATA

Core No.	Diameter (mm)	Length (mm)	LD Ratio	Correction Factor	Peak Load (kN)	Compressive Strength (MPa)	
						Measured	Corrected
1B	76	139	1.83	0.986	164.8	34.3	35.8
2B	76	123	1.43	0.952	77.3	17.0	16.2
6B	76	143	1.88	0.990	92.8	20.5	20.3

Reference: **Millennium Library Parkade – Core Testing**

Figure 1 - Core no. 1A

Figure 2 - Core no. 1B

Reference: **Millennium Library Parkade – Core Testing**

Figure 3 - Core no. 2A

Figure 4 - Core no. 2B

Reference: **Millennium Library Parkade – Core Testing**

Figure 5 - Core no. 3A

Figure 6 - Core no. 4A

Reference: **Millennium Library Parkade – Core Testing**

Figure 7 - Core no. 5A

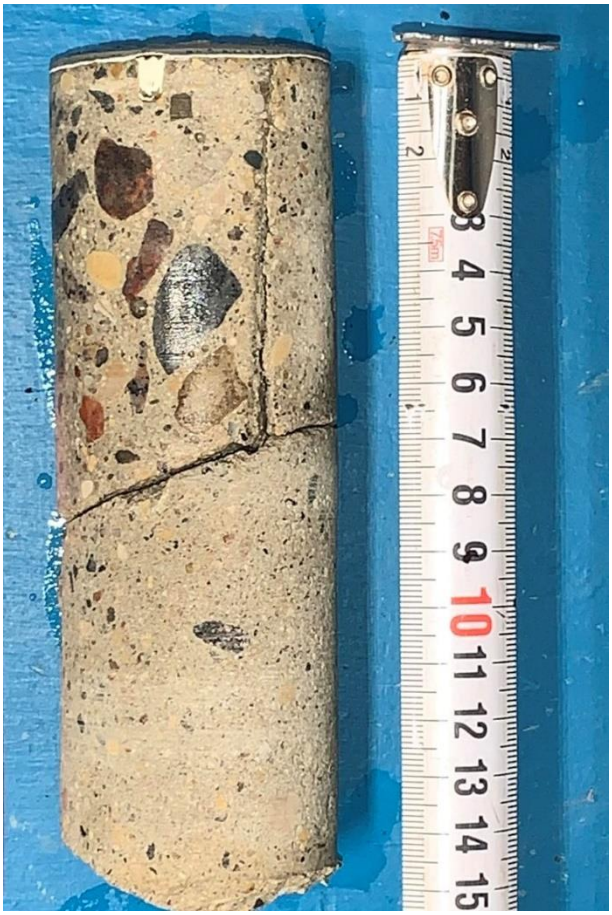


Figure 8 - Core no. 6A

Reference: **Millennium Library Parkade – Core Testing**

Figure 9 - Core no. 6B

CERTIFICATE OF ANALYSIS

REPORTED TO	Stantec Consulting Ltd. (Winnipeg) 199 Henlow Bay Winnipeg, MB R3Y 1G4		
ATTENTION	Jason Thompson, C.E.T	**WORK ORDER**	20L0161
PO NUMBER		**RECEIVED / TEMP**	2020-12-01 11:00 / NA
PROJECT	123315240	**REPORTED**	2020-12-10 11:54
PROJECT INFO		**COC NUMBER**	No #

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry

It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve

Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

If you have any questions or concerns, please contact me at nyipp@caro.ca

Authorized By:

Nicole Yipp
Team Lead, Client Service

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Stantec Consulting Ltd. (Winnipeg)	**WORK ORDER**	20L0161
PROJECT	123315240	**REPORTED**	2020-12-10 11:54

Analyte	Result	RL	Units	Analyzed	Qualifier
5789 20-30mm (20L0161-01) | Matrix: Solid | Sampled: 2020-11-30					
General Parameters					
Chloride, Water-Soluble	< 0.010	0.010	% dry	2020-12-10	
5791 20-30mm (20L0161-02) | Matrix: Solid | Sampled: 2020-11-30					
General Parameters					
Chloride, Water-Soluble	**0.086**	0.010	% dry	2020-12-10	
5793 20-30mm (20L0161-03) | Matrix: Solid | Sampled: 2020-11-30					
General Parameters					
Chloride, Water-Soluble	**0.288**	0.010	% dry	2020-12-10	
5794 20-30mm (20L0161-04) | Matrix: Solid | Sampled: 2020-11-30					
General Parameters					
Chloride, Water-Soluble	**0.025**	0.010	% dry	2020-12-10	
5794 100-110mm (20L0161-05) | Matrix: Solid | Sampled: 2020-11-30					
General Parameters					
Chloride, Water-Soluble	< 0.010	0.010	% dry	2020-12-10	
5795 20-30mm (20L0161-06) | Matrix: Solid | Sampled: 2020-11-30					
General Parameters					
Chloride, Water-Soluble	**0.081**	0.010	% dry	2020-12-10	
5796 20-30mm (20L0161-07) | Matrix: Solid | Sampled: 2020-11-30					
General Parameters					
Chloride, Water-Soluble	**0.086**	0.010	% dry	2020-12-10	
5796 100-110mm (20L0161-08) | Matrix: Solid | Sampled: 2020-11-30					
General Parameters					
Chloride, Water-Soluble	**0.010**	0.010	% dry	2020-12-10	

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Stantec Consulting Ltd. (Winnipeg)	**WORK ORDER**	20L0161
PROJECT	123315240	**REPORTED**	2020-12-10 11:54

Analysis Description	Method Ref.	Technique	Accredited	Location
Chloride, Water-Soluble in Solid	CSA A23.2-4B	Hot Water Extraction / Potentiometric Titration		Richmond

Glossary of Terms:

RL	Reporting Limit (default)
% dry	Percent (dry weight basis)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
CSA	Canadian Standards Association Chemical Test Methods

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued or once samples expire, whichever comes first. Longer hold is possible if agreed to in writing.

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline (s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Stantec Consulting Ltd. (Winnipeg)	**WORK ORDER**	20L0161
PROJECT	123315240	**REPORTED**	2020-12-10 11:54

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in “batches” and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk)**: A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup)**: An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS)**: A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS)**: A second aliquot of sample is fortified with with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM)**: A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
General Parameters, Batch B0L0798										
Blank (B0L0798-BLK1)				Prepared: 2020-12-09, Analyzed: 2020-12-10						
Chloride, Water-Soluble	< 0.010	0.010	% dry							