Meadow Park Sports Centre

Wall and Window Condition Assessment

8625 Highway 99,
Whistler, BC V0N 1B8

Prepared for:

Resort Municipality of Whistler
8625 Highway 99
Whistler, B.C. V0N 1B8

Attention: Roger Weetman

Prepared by:

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EXECUTIVE SUMMARY

Read Jones Christoffersen Ltd. (RJC) has conducted a condition assessment of the wall and window assemblies at the Meadow Park Sports Centre located at 8625 Highway 99, Whistler, BC.

RJC's evaluation included a review of available original drawings, a visual review of the exterior walls and windows and exploratory cores through interior and exterior finishes. The wall and window assessment was conducted to identify the assemblies and to assess their condition. This report includes an Opinion of Probable Cost (OPC) to complete the recommended wall and window remediation and associated waterproofing work.

The exterior wall systems observed on the Meadow Park Sports Centre varied around the building with exterior insulating and finishing system (EIFS), metal cladding and masonry veneer on steel stud or concrete block structure. Significant corrosion was observed on the steel stud structure behind the face-sealed EIFS wall system around the pool. Unsealed control joints and wall penetrations, failed sealant, and cracks in the mortar joints along the masonry veneer were observed around the Sports Centre. The weep holes along the exterior wall assembly of the Ice Arena and Administration Building was blocked by landscaping and the pavement, restricting drainage of the exterior wall system.

Replacement of the existing EIFS and metal cladding wall assemblies and restoration of the corroded steel stud framing around the pool are recommended. Modifications to the masonry base of wall along the Ice Arena and Administration Building is also recommended. General annual maintenance, including cleaning, miscellaneous sealant and flashing repairs are recommended around the facility.

The window systems include double-glazed curtain wall and storefront window systems. The curtain wall system along the pool appears to be in serviceable condition. Replacement of the gaskets and sealants around the existing storefront windows at the Pool, Fitness Centre and Administration Building are recommended.

The vapour barrier along the Ice Arena exterior wall is not sealed to the window frames, allowing air and water to enter the building. The windows are attached to the structure with small metal clips and the supporting substrate beneath the arched windows appears to have settled and rotated. Due to possible structural deficiencies, further structural review of the arched storefront windows and canopy windows around the Ice arena is recommended to be completed as soon as practical.

An Opinion of Probable Cost (OPC) has been prepared for the recommended wall and window restorations and general annual maintenance.

1.0 INTRODUCTION

1.1 Terms of Reference

.1 Engagement

At the request of the Resort Municipality of Whistler, Read Jones Christoffersen Ltd. (RJC) has conducted a wall and window condition assessment at Meadow Park Sports Centre, located at 8625 Highway 99, in Whistler, BC.

The intent of the evaluation was to review and assess the present condition of the wall and window systems on the building and to provide recommendations for replacement or targeted remedial work. An Opinion of Probable Cost has been prepared for the recommended restoration work and is included in Table 3 in Section 3.0.

This report documents the current condition of the walls and windows evaluated under this scope and have been prepared in accordance with generally accepted engineering practices. No warranties, either expressed or implied, are made as to the professional services provided under the terms of our scope of work and included in this report.

Services performed and outlined in this report were based in part upon visual observations.

.2 Disclaimers

A structural design review was not conducted as it was beyond RJC's scope of work. Review of seismic aspects, mechanical, electrical, and fire safety systems, means of egress, and identification of mould-like substances were also beyond RJC's scope of work.

Neither RJC, nor any company with which it is affiliated, nor any of their respective directors, employees, agents, servants or representatives shall in any way be liable for any claim, whether in contract or in tort including negligence, arising out of or relating in any way to mould, mildew or other fungus, including the actual, alleged or threatened existence, effects, ingestion, inhalation, abatement, testing, monitoring, remediation, enclosure, decontamination, repair, or removal, or the actual or alleged failure to detect mould, mildew or other fungus.

2.0 OBSERVATIONS AND RECOMMENDATIONS

The following is a summary of the different assemblies and exploratory recesses presented in Appendix A and B. Photographs of observations are provided in Appendix C. Refer to Figure 1 in Appendix A for a layout of the general wall and window assemblies and areas of recommended restoration.

2.1 Exterior Walls

The exterior wall systems observed on the Meadow Park Sports Centre varied around the building with exterior insulating and finishing system (EIFS), metal cladding and masonry veneer on steel stud or concrete block structure.

.1 Pool and Fitness Centre Exterior Wall Assemblies

The EIFS wall assembly (W1) around the Pool and Fitness Centre is a face-sealed system, with no provisions for drainage and limited drying potential for the underlying materials. The air vapour barrier used beneath the EIFS system is not continuous and many wall penetrations were unsealed, allowing water to enter the wall assembly and cause deterioration. Deterioration of the existing steel stud framing was observed along the pool exterior.

The deterioration within the wall assembly was first observed during the pool roof replacement completed in October 2014. The existing air vapour barrier and membranes were not continuous between the roof and wall transition. The configuration of the exterior wall allowed hot and humid air from the interior space of the pool to travel up the wall cavity, condensing at the top of the parapet and along the cold outside wall surface. The 2014 temporary repairs were completed along the roof parapet, which were designed to accommodate future remediation of the deteriorated wall assemblies and tie-in to the newly replaced roof assembly.

RJC recommends restoration of the Pool exterior walls (W1 & W3), with a new rain screen wall assembly on the restored steel stud framing. A rain screen wall assembly creates an air cavity behind the main cladding system to allow for drainage and ventilation, and limits the amount of water in contact with the primary moisture barrier. The cladding material could be drained EIFS or metal cladding to match the other existing finishes around the building. The existing deteriorated steel stud framing would be cleaned, treated or replaced, where required. Additional structural reinforcement may also be required depending on the level of corrosion. The temporary repairs along the roof parapet will require removal and replacement. Where the deterioration and organic growth extends to the back side of the interior finishes, the interior finishes would be replaced. An OPC has been included for the recommended wall restoration, which assumes 50% steel stud replacement within the existing wall assembly.

The wall assembly around the Fitness Centre consisted of a combination of split-faced masonry veneer (W2) and metal cladding with insulation and membrane on the steel stud framing (W3). The wall assembly contained weep holes and an air cavity to allow for drainage and ventilation of the exterior wall system. The wall cavity was dry and clean and it appears to be in a serviceable condition. General annual maintenance is recommended, including replacement of sealants, patching of cracks in the masonry and repair of damaged flashings.

Water ingress and deterioration was observed along the exterior stucco finish of the concrete block firewall, located along the partial north elevation of the Fitness Centre. The exterior finishes are cracking where this wall assembly (W4) meets the typical EIFS wall assembly (W1). The cracking may be due to the differential movement of the materials, or, settlement of the building. RJC recommends installing a new exterior metal cladding over the existing finish to direct water off the wall assembly. Control joints should be installed along the wall transitions to accommodate differential movement between the different wall assemblies at the Administration Building and Fitness Centre (W1, W4 and W5).

.2 Administration Building and Ice Arena Exterior Wall Assemblies

The Ice Arena and Administration Building have two different wall assemblies along the ground floor and upper level. The ground floor concrete block structure was generally clad with masonry veneer and insulation (W5). A moisture barrier was not observed. No issues were mentioned by the Maintenance Staff during the condition assessment.

The upper level wall assembly consists of concrete block with a thin polyethylene vapour barrier, batt insulation (R-16) and metal cladding attached with non-thermally broken z-girts (W6). The vapour barrier was not sealed to the window frames. This condition allows water and air to pass through the wall assembly. As the Ice Arena is kept cold throughout the year, significant heat gains may be experienced during the warm summer months. The existing exterior wall assembly could be retrofit with additional insulation and thermally-broken z-girts to improve thermal performance and potentially achieve savings in annual energy costs. An energy study could be conducted to confirm if this type of retrofit would be beneficial. As this was not in the current scope of the condition assessment, an OPC has not been provided.

A summary of exterior wall observations is provided in the table below.

Table 1 – Meadow Park Sport Centre Wall Condition Summary	
EIFS on Steel Stud Framing (W1) - Pool and Partial Fitness Centre	
Observations: ▪ Corroded steel studs along the exterior wall and parapet ▪ Discontinuous air vapour barrier membrane around the windows and at the base of wall ▪ Deteriorated and failed sealants around the windows and at building transitions ▪ Saturated insulation, deteriorated sheathing and organic growth observed within the wall assembly at the exploratory recess	Recommendations: ▪ RJC recommends removing the existing wall assembly and replacing it with a rain screen wall assembly, which permits drainage ▪ EIFS or metal cladding could be used to match adjacent finishes ▪ The existing steel studs would be cleaned, treated or replaced and additional structural reinforcement may be required ▪ Replacement of the interior finishes due to the level of deterioration and organic growth observed
Masonry Veneer/Metal Cladding on Steel Stud Wall System (W2/W3) - Fitness Centre & Partial Pool Elevation	
Observations: ▪ Unsealed control joints in masonry veneer ▪ Unsealed, deteriorated or failed sealants around windows, doors, wall penetrations and building transitions ▪ Damaged flashings along the window sills ▪ Cracks in the masonry veneer at the corners of the windows ▪ Wall cavity appeared to be clean and dry	Recommendations: ▪ Seal control joints, wall penetrations and replace deteriorated sealant ▪ Replace or repair damaged flashings ▪ Grind out cracks in the masonry veneer and patch

Table 1 – Meadow Park Sport Centre Wall Condition Summary	
Stucco Finish on Concrete Block Firewall (W4) - Fitness Centre – Partial North Elevation	
Observations: ▪ Cracks observed at transition between EIFS and firewall and no control joints were observed ▪ Efflorescence along base of wall and incompatible membranes	Recommendations: ▪ Over-clad the existing wall assembly with metal cladding to direct water off the wall assembly ▪ Install control joints along wall transitions to accommodate movement
Masonry Veneer on Concrete Wall (W5) - Administration Bldg. and Ground Level of Ice Arena	
Observations: ▪ Unsealed control joints in masonry veneer ▪ Unsealed, deteriorated or failed sealants around windows, doors, wall penetrations and building transitions ▪ Cracks in the masonry veneer ▪ Paved road and landscaping around the exterior walls are 12" above the weeps holes, restricting drainage and ventilation ▪ Missing CMU at front entrance exterior wall	Recommendations: ▪ Seal control joints, wall penetrations and replace deteriorated sealant ▪ Grind out cracks in the masonry veneer and patch ▪ Remove masonry veneer along the base of wall, relocate existing weep holes above the landscaping and paved road, extend membrane up the base of wall min. 8" and reinstall masonry veneer ▪ Install new CMU at front entrance and patch
Metal Cladding and Insulation on Concrete Structure (W6) – Upper level of Ice Arena	
Observations ▪ Non-thermally broken z-girts ▪ Discontinuous air vapour barrier around window opening and adjacent assemblies	Recommendations ▪ As no interior issues were mentioned or observed, annual maintenance is recommended ▪ Seal vapour barrier to window frames as part of window replacement/retrofit ▪ A energy study could be conducted to determine if a building envelope retrofit would provide significant energy savings

2.2 Window Systems

The window systems include both curtain wall and storefront window systems.

A double-glazed curtain wall window system was observed at the southeast corner of the Pool area, which was protected by a large overhang. The window frames were not sealed to the adjacent walls, allowing air and water to enter the assembly. The curtain wall window system appears to be in serviceable condition and annual general maintenance, including cleaning and as a minimum, replacement of sealants is recommended. During the recommended Pool wall restoration, the membrane could be extending into the window opening and sealed.

The double-glazed thermally-broken storefront windows were observed around the facility, including the southwest corner of the Pool, Fitness Centre, Administration Building and Ice Arena. One unit was disassembled at the pool. Dry gaskets were used on the interior side of the glass and sealant was used to seal the window along the exterior. This system relies on sealant for waterproofing and permits the glass to sit against the aluminum frame, which may cause the glass to break. RJC recommends reusing the existing IGUs and frames and installing new custom sized gaskets along the interior and exterior side of the window to obtain a continuous pressure seal.

The vapour barrier along the Ice Arena exterior wall is not sealed to the existing storefront windows, allowing air and water into the building. The storefront windows along the east elevation

of the Ice Arena are attached to the interior steel columns with small metal clips. A number of clip fasteners were missing. The steel columns are anchored to the base concrete structure; however, the concrete slab under the windows appeared to have settled and rotated, possibly reducing the structural support for the windows above. The upper canopy windows are attached to the structure with exterior metal clips. The type of glass was not confirmed on site, but any glass extending over public space should be laminated.

A structural assessment of the glazing was outside the scope of this report. It is recommended that a structural review of the existing upper and lower windows at the Ice Arena is conducted to determine the type of glass, structural capacity of the window system and the structural connection to the base building.

For this report, we have included an OPC to complete the recommended structural review and an OPC to replace the existing window systems around the Ice Arena.

A summary of the window observations is provided in the table below.

Table 2 – Meadow Park Sport Centre Window Condition Summary

Curtain Wall Window System – Pool – Southeast Corner	
Observations: ▪ Air vapour barrier was not sealed to window frame ▪ Corroded fasteners	Recommendations: ▪ Annual general maintenance to be performed around windows, including cleaning and as a minimum, sealant replacement (typical for all window systems) ▪ Moisture barrier to be tied-in around window perimeter during recommended pool exterior wall
Storefront Window System - Pool – Southwest Elevation	
Observations: ▪ Thermally broken aluminum frame with double-glazed IGUs with interior dry gaskets and exterior sealant ▪ System relies on sealant for waterproofing ▪ Sill flashing allows water to enter wall assembly beneath window	Recommendations: ▪ Replacement of the interior gaskets and exterior sealant with new properly sized dry gaskets to provide a waterproofing seal ▪ Modification of the sill flashing to minimize water ingress into the wall system ▪ During the recommended pool exterior wall restoration, the wall membrane would be sealed to the window frame
Storefront Window System - Fitness Centre – West Elevation	
Observations: ▪ The double-glazed storefront windows are punched into the masonry veneer with interior dry gaskets and exterior sealants. ▪ Failed sealant, damaged flashings and slightly corroded steel ledgers	Recommendations: ▪ Replacement of the interior gaskets and exterior sealant with new properly sized dry gaskets to provide a watertight seal ▪ Replacement of the failed perimeter sealant between the window frame and masonry veneer ▪ Repair/replacement of damaged flashings
Storefront Window System - Administration Building – Lobby	
Observations: ▪ Storefront windows appear to be functioning as required with similar observations as listed above	Recommendations: ▪ Annual general maintenance to be performed around windows, included cleaning and sealant replacement

Table 2 – Meadow Park Sport Centre Window Condition Summary	
Storefront Window System - Ice Arena – East Elevation Window Wall	
Observations: ▪ Missing fasteners at interior metal clips ▪ Anchors replaced with bolts along base of window connection to concrete curb ▪ Concrete curb below the windows appears to have settled, with a visible air space under the window system ▪ The air vapour barrier was not sealed to the window frame and daylight was observed along the jambs, allowing water and air to enter the assembly	Recommendations: ▪ Additional structural review of the window attachment prior to proceeding with any building envelope repairs around the window opening and replacement of the existing storefront window system
Storefront Window System - Ice Arena – Canopy Windows	
Observations: ▪ Inner pane of IGU damaged in one location ▪ Window system attached to structure with exterior clips ▪ Multiple fasteners at the exterior window frame support clips were missing	Recommendations: ▪ Additional structural review of the window attachment prior to proceeding with any building envelope repairs around the window openings and replacement of the existing storefront window system

3.0 OPINIONS OF PROBABLE COST

The Opinions of Probable Cost (OPC) are presented by RJC to provide an expectation as to the magnitude of costs required to complete the recommended wall and window replacement and restoration work. The opinions provided are based on recently obtained broad unit rates, and past experience with similar projects. A detailed estimate of costs has not been provided, as it would require the preparation of plans, details, specifications and schedules to achieve a quantified summary of estimated costs. Opinions of Probable Cost are based on RJC's review of the present condition of the building. Values are presented in third-quarter 2015 dollars.

An owner contingency has been included in the OPC, in the order of 5% of construction costs. This contingency should be included in all construction budgets to allow for variation in estimated unit prices due to competitive bidding, and additional work required to repair any damage to structural, electrical or mechanical systems caused by or discovered during construction. Should the contingency not be required during construction, it could potentially be used to fund the Annual Maintenance Work.

Unless noted as consulting services, the figures presented in the various sections do not include costs such as permits, testing during construction and consulting services. For planning purposes, RJC recommends maintaining a soft cost allowance of approximately 10% to account for such expenses. The Resort Municipality of Whistler may wish to engage an Architect to review the proposed restoration design package if considering future expansion to the facility. A fee for this review has been included in the soft cost allowance. The contingency and fee allowances are included in the summaries below. Actual fees for projects will depend on the scope of work selected and will be presented via a separate proposal when the work is scheduled to proceed. GST is not included.

Table 3. Opinion of Probable Costs – Wall and Window Restoration		
Item	**Description**	**Estimate Cost**
Restore Wall Assemblies		
1	Pool and Fitness Centre Exterior Walls: Removal of EIFS Wall System (W1), restoration of the existing steel stud framing and replacement with new rain screen system	$ 1,050,000
2	North Elevation – Fitness Centre: Over-clad existing stucco finish on the concrete block firewall and install control joints along wall transitions	$ 48,000
3	Ice Arena & Administration Ground Floor: Remove bottom 3 courses of masonry veneer, tie-in new base of wall membrane, rebuild masonry veneer and relocate weep holes above perimeter landscaping and roads to provide drainage and reinstate perimeter finishes	$ 80,000
4	Seal Control Joints, Repair Damaged Flashings and Grind & Patch Cracked CMUs around the building (W2/W3)	$ 5,000
5	Remove and replace all window perimeter sealants as part of the wall restoration (Ice Arena window systems not included)	$ 10,000
Restore Window Assemblies		
6	Install new interior and exterior gaskets around existing storefront windows (Ice Arena window systems not included)	$ 27,000
7	Replacement of the existing window systems around the Ice Arena and secure into base structure	$ 850,000
	Construction Costs	$ 2,070,000
	Structural Restoration Allowance	$ 50,000
	Owner Contingency Allowance (~5%)	$ 100,000
	Allowance for Professional Fees, Permits and Testing (~10%)	$ 200,000
	Subtotal	$ 2,420,000
	GST (5%)	$ 121,000
	Total	**$ 2,541,000**

Note that in place of the Ice Arena window replacement (item 7), a $5,000 allowance should be carried to conduct the recommended Structural Assessment.

Deferral of the work will most likely result in increased repair costs. Please note that the cost of remediation could vary greatly depending upon the materials chosen and deterioration uncovered during the work.

4.0 CLOSING COMMENTS

This Report was prepared for the Resort Municipality of Whistler. It is not for the use or benefit of, nor may it be relied upon, by any other person or entity, without written permission of RJC and the Resort Municipality of Whistler.

We trust the information contained within this report satisfies your current requirements. Should you have any comments, questions or concerns, please contact the undersigned.

Yours truly,
Read Jones Christoffersen Ltd.

Reviewed by:

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SNM/jcl

Cc: Michael Blackman,RJC
Douglas Watts, RJC

Enc.: Appendix A: Wall and Window Assemblies
Appendix B: Exploratory Recesses
Appendix C: General Observations

APPENDIX A

WALL AND WINDOW ASSEMBLIES

The following Architectural and Structural Drawings were reviewed in regards to the existing wall and window assemblies:

- Renovations to Meadow Park Aquatic Centre - As-Built Drawings, dated February 1998 by John R. Lauder Ltd.
- Whistler Community Pool - Architectural Drawings, dated September 22, 1993 by Vic Davies Architect Ltd.
- Whistler Ice Arena - Structural Drawings, Issued for Construction and dated May 21, 1992 by Read Jones Christoffersen Ltd.

The Record Drawings were compared to the observations made on site during the Wall and Window Condition Assessment.

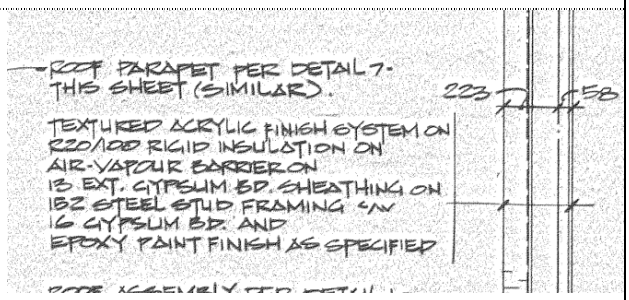
Refer to Figure 1 at the end of the Appendix that outlines the general location of the wall and window assemblies.

Table A1 – Description of Wall Assemblies

Wall Type 1 (W1) - Typical EIFS on Steel Stud Frame

Exterior
- Acrylic finish on 100mm of Expanded Polystyrene Insulation (EIFS)
- Self-Adhered Membrane
- 13mm Exterior Gypsum Board
- 152mm Steel Stud Framing
- 16mm Interior Gypsum Board
- Epoxy Paint Finish

Interior



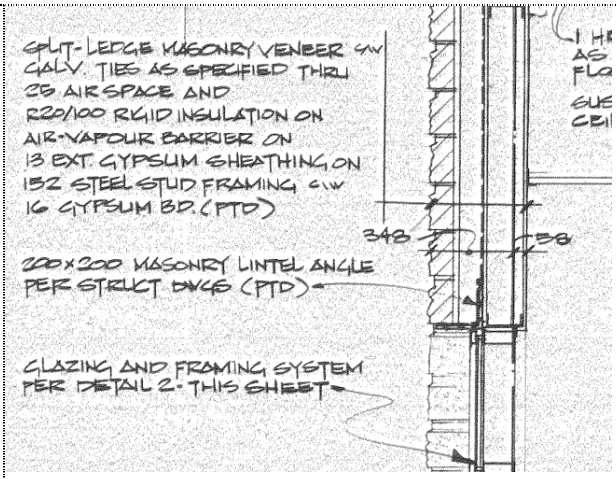
General Notes
1. This wall assembly was observed around the pool area
2. A moisture barrier was not observed on the concrete foundation.

Wall Type 2 (W2) – Typical Masonry Veneer on Steel Stud Frame

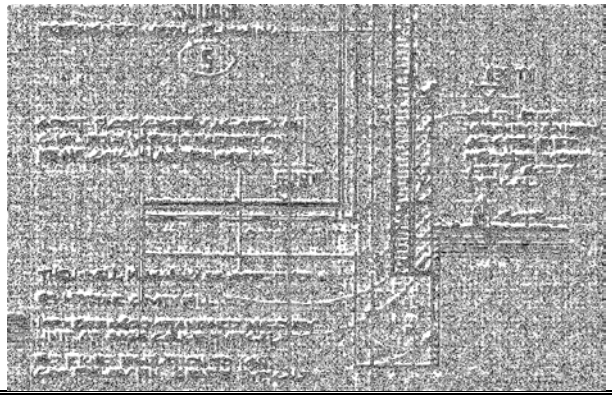
Exterior
- Masonry Veneer
- 25mm Air Cavity
- 100mm Rigid Insulation
- Self-Adhered Membrane
- 13mm Exterior Gypsum Board
- 152mm Steel Stud Framing
- 16mm Interior Gypsum Board

Interior

General Notes
1. This wall assembly was observed along the west elevation at the ground floor of the Fitness Centre.



A similar exterior wall assembly was observed along the east elevation at the ground floor of the Fitness Centre; however, the structure was reinforced concrete (as shown on record drawings).

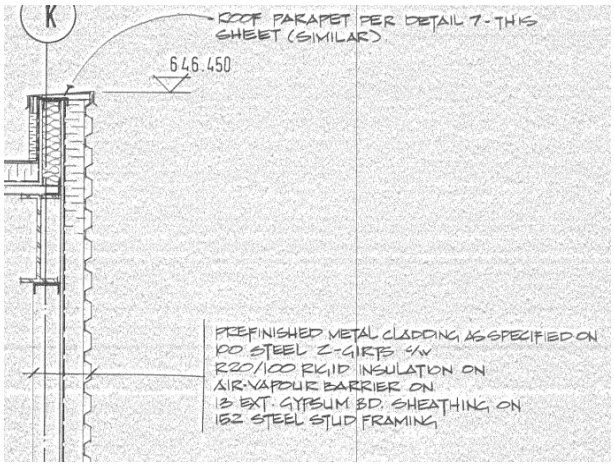


Wall Type 3 (W3) – Metal Cladding on Steel Stud Frame

Exterior
- Prefinished Metal Cladding on
- 100mm Z-girts infilled with rigid insulation
- Self-Adhered Membrane
- 13mm Exterior Gypsum Board
- 152mm Steel Stud Framing (filled in with spray foam along pool parapet)
- 16mm Interior Gypsum Board

Interior

General Notes
1. This wall assembly was observed along a portion of the pool south elevation and around the 2nd floor of the Fitness Centre, including the 1998 renovation.
2. This wall assembly was also observed along the pool's high parapet walls. The steel studs were cleaned and treated and infilled with spray foam to provide a continuous seal at the roof level during the roof replacement project in 2014.
3. Only one interior exploratory recess was completed at the Fitness Centre wall assembly and the wall cavity was clean and dry at the time of review.

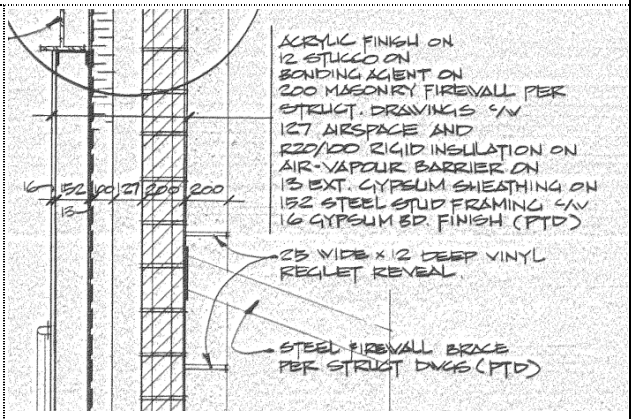


Wall Type 4 (W4) – Stucco Finish on Concrete Block Firewall

Exterior
- 12mm Stucco Finish
- 200mm Concrete Masonry Firewall
- 127mm Air Cavity
- 100mm Rigid Insulation
- Self-Adhered Membrane
- 13mm Exterior Gypsum Board
- 152mm Steel Stud Framing
- 16mm Interior Gypsum Board

Interior

General Notes
1. This wall assembly was observed along the north elevation of the Fitness Centre adjacent to the Administration roof.
2. Note that an exploratory recess was not conducted into this assembly.

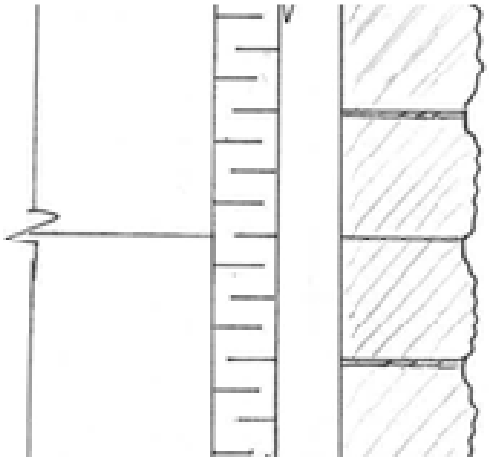


Wall Type 5 (W5)– Masonry Veneer on the Concrete Block Structure

Exterior
- 100mm Masonry Veneer
- 50mm Air Cavity
- 50 mm Rigid Insulation
- Reinforced Concrete Block

Interior

General Notes
1. This wall assembly was observed along the north and west elevation of the Ice Arena at the ground floor.
2. See Wall Type 6 below for the other wall assembly along the Ice Arena.
3. A moisture barrier was not observed in the wall assembly.
4. Existing architectural drawings of the Ice Arena were not available for review.



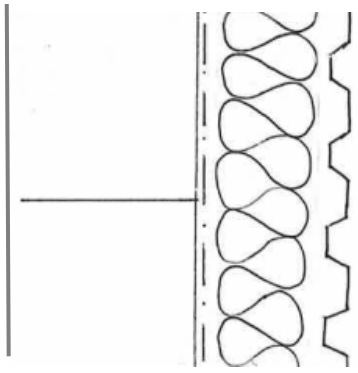
Sketches drawn by RJC based on site observations

Wall Type 6 (W6) – Metal Cladding on Concrete Block Structure

Exterior
- Corrugated Metal Cladding attached with non-thermally broken z-girts
- 100mm Fibreglass Batt Insulation
- Polyethylene Vapour Barrier
- Reinforced Concrete/Concrete Block

Interior

General Notes
1. This wall assembly was observed along the upper level of the Ice Arena.
2. The vapour barrier is not sealed around wall penetrations and window frames.



Sketches drawn by RJC based on site observations

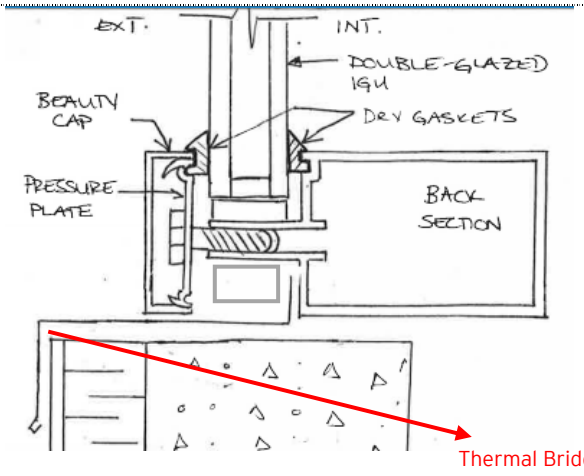
Table A2 – Description of Window Assemblies

Window Type 1 (WD1)– Double-Glazed Curtain Wall System

The double-glazed curtain wall system was located at the southeast corner of the pool area. Weeps holes were observed along the bottom pressure plate to allow for drainage. Multiple fasteners were corroded.

Typically, it would be good practice to extend the wall membrane into the window opening to create a continuous seal. Also, an anti-rotation block should be installed underneath the fastened pressure plate. These typical details were not observed.

Note that the location of the frame within the wall assembly causes thermal bridging, which increases the potential for condensation.



Sketches drawn by RJC based on site observations

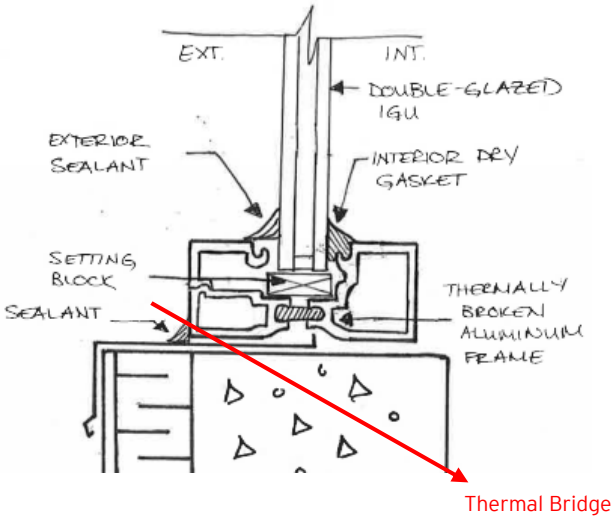
Window Type 2 (WD2) – Double-Glazed, Thermally-Broken Storefront System

The double-glazed thermally-broken storefront windows are located at the following areas:

- the south and west elevation of the pool and Fitness Centre,
- Front entrance of the Administration building
- East elevation of Ice Arena
- Upper Level roof perimeter of the Ice Arena. Note that some of the canopy windows were over public space.

Dry gaskets were used on the interior and sealant was used on the exterior. This condition allows the glass to sit against the aluminum frame, which could cause the glass to break. Typically, This window system implements dry gaskets on both sides of the insulated glass unit (IGU).

Typically, it is good practice to extend the wall membrane into the window opening and up and over an aluminum angle installed on the interior side of the window frame. Note that the location of the frame within the wall assembly causes thermal bridging, which increases the potential for condensation.



Sketches drawn by RJC based on site observations

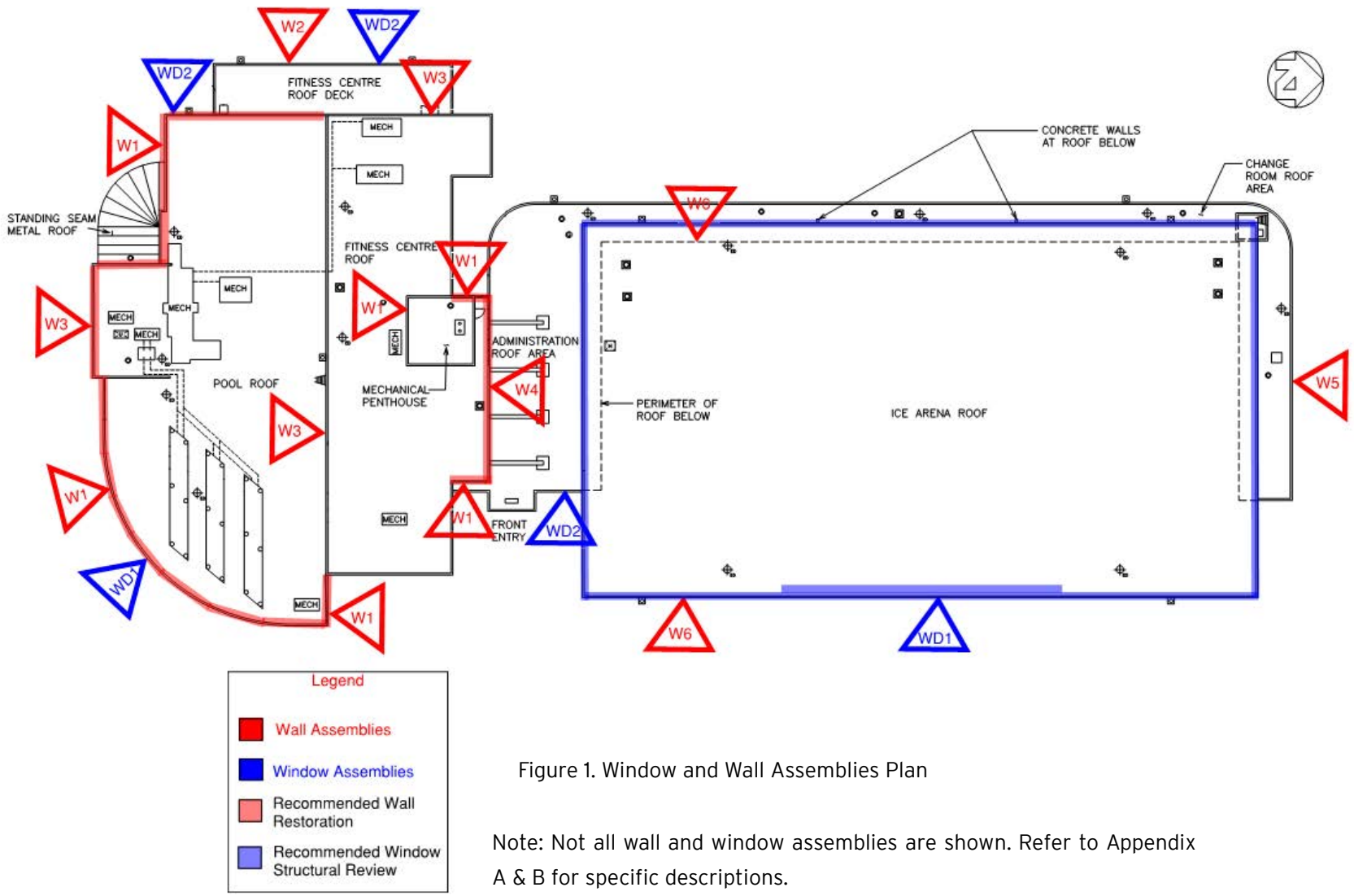


Figure 1. Window and Wall Assemblies Plan

Note: Not all wall and window assemblies are shown. Refer to Appendix A & B for specific descriptions.

APPENDIX B

EXPLORATORY RECESSES

Table B – Meadow Park Sports Centre - Exploratory Recesses Summary

Wall Type 1 (W1) – Pool Wall Assembly – 1993 Original Construction

At the base of the wall, the assembly consists of:

Exterior
Acrylic Finish on 100mm Expanded Polystyrene Insulation (with 50mm air cavity to the side) (EIFS)
Concrete Structure
Interior

Exploratory Recess No.1

A continuous air vapour barrier was not observed between the window frame and exterior wall assembly, allowing water and air to enter the assembly. The window system is sheltered by an overhang. Corroded fasteners were observed along the pressure plates of the curtain wall window system. Refer to Appendix A for a description of Window Type 1.

Photo A1-1 South Elevation Adjacent to Curtain Wall Windows

Photo A1-2 Pool – Exploratory Recess No.1

Photo A1-3 Pool – Curtain Wall System - Jamb

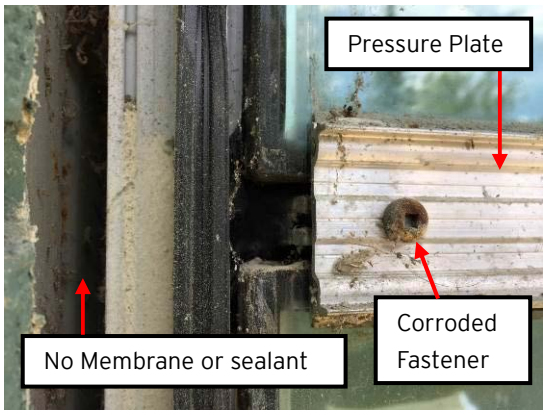


Table B – Meadow Park Sports Centre - Exploratory Recesses Summary

Exploratory Recess No.2

The insulation within the wall cavity was saturated and significant deterioration was observed along the exterior gypsum board sheathing. Surface corrosion was observed on the steel studs. The air vapour barrier membrane was not continuous at the base of the wall and around the window.

Photo A1-6 shows the condition of the roof parapet during the roof replacement project completed in 2014.

Refer to Appendix A for a description of W1.

Photo A1-4 Connection between Standing Seam Metal Roof and South Wall of Pool

Photo A1-5 Pool - Exploratory Recess No.2

Photo A1-6 Pool Parapet - Deterioration

Table B – Meadow Park Sports Centre - Exploratory Recesses Summary

Exploratory Recess No.3

The air vapour barrier membrane along the exterior wall is not continuous. The wall membrane terminates at the base of the wall overtop of the steel beam and does not transition into the window opening. The sealant between the EIFS and masonry veneer was deteriorated and cracked, allowing water to enter the wall assembly. Surface corrosion was observed on the metal angle above the window.

Photo A1-7 Roof Deck

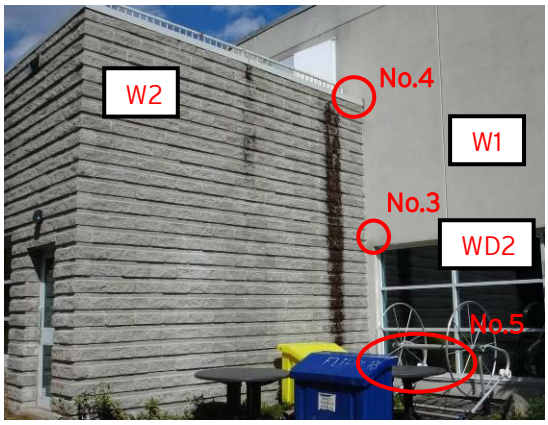


Photo A1-8 Exploratory Recess No.3

Exploratory Recess No.4

The wall membrane does not overlap the saddle flashing and unsealed fasteners were puncturing the membrane. The leg of the saddle extends up the wall 50mm. Typically, it is good practice to fasten materials a minimum of 200mm above the horizontal surface and to extend the wall membrane over transition flashings to provide a continuous seal.

Photo A1-9 Exploratory Recess No.4

Table B – Meadow Park Sports Centre - Exploratory Recesses Summary

Exploratory Recess No.5

The double-glazed unit was removed from the thermally-broken storefront window frame along the west elevation of the pool. The weep holes at the base of the window frame align with the window sill flashing joint, allowing water to travel behind the flashing and into the wall assembly. The air vapour barrier membrane was not sealed to the underside of the window frame.

Dry gaskets were used on the interior and sealant was used on the exterior. This condition allows the glass to sit against the aluminum frame, which could cause the glass to break.

Refer to Appendix A for a description of Window Type 2 (WD2).

Photo A1-10 Pool Window – West Elevation Exploratory Recess No.5

Photo A1-11 Pool Window - Exploratory Recess No.5

Table B – Meadow Park Sports Centre - Exploratory Recesses Summary

Exploratory Recess No.6

The exterior gypsum board sheathing was wet, suggesting that water is entering the wall assembly through defects and damages in the EIFS and membrane above.

Refer to Appendix A for a description of W1 & W4 and Appendix C for the cracking observed along the wall transition.

Photo A1-12 Fitness Centre – Northeast Corner - Exploratory Recess No.6

Photo A1-13 Fitness Centre – Northeast Corner - Exploratory Recess No.6

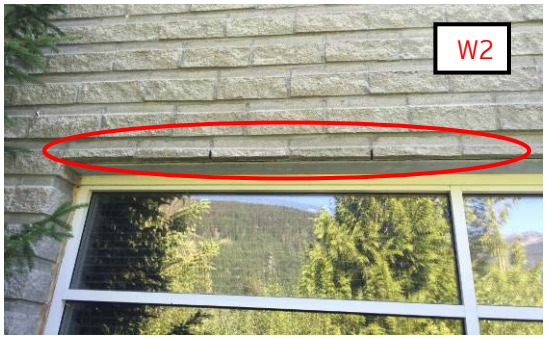
Table B – Meadow Park Sports Centre - Exploratory Recesses Summary	
Wall Type 2 (W2) – Fitness Center Wall Assembly	
The masonry veneer sits on the window ledger with weep holes spaced at every second head joint. Cracks in the masonry were observed at the upper south corner of the window, which may be due to settlement. The sealant around the window was deteriorated and appeared to have failed in multiple areas. <u>Exploratory Recess No.7</u> The cavity in the exterior Fitness Centre wall along the ground floor of the west elevation appeared to be clean and dry at the time of review.	Photo A1-14 Fitness Centre - West Elevation  Photo A1-15 Fitness Centre - West Elevation  Photo A1-16 Fitness Centre – Exploratory Recess No.7 

Table B – Meadow Park Sports Centre - Exploratory Recesses Summary	
Wall Type 3 (W3) – Fitness Center Wall Assembly – 1998 Renovation	
<u>Exploratory Recess No.8</u> The cavity in the exterior Fitness Centre wall along the second floor of the west elevation appeared to be clean and dry at the time of review.	Photo A1-17 Fitness Centre – Exploratory Recess No.8  Photo A1-18 Fitness Centre – Exploratory Recess No.8 
Wall Type 4 (W4) – Fitness Center Wall Assembly	
No recess was completed into Wall Type 4. Refer to Appendix A for the wall assembly and Appendix C for general observations along this wall.	Photo A1-19 Fitness Centre – Northeast Corner 

Table B – Meadow Park Sports Centre - Exploratory Recesses Summary

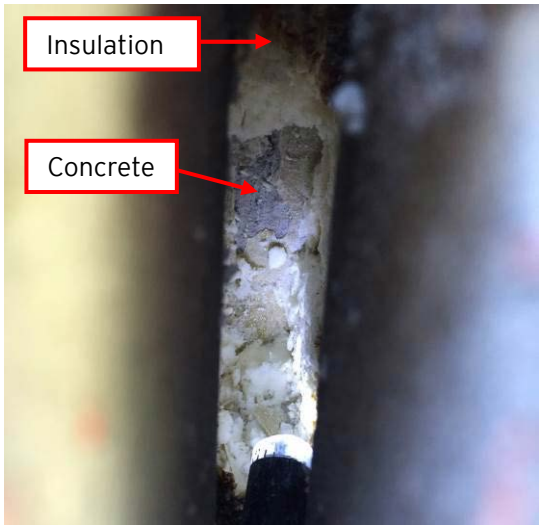
Wall Type 5 (W5) – Ice Arena Wall Assembly – 1992 Original Construction

Exploratory Recess No.9

The borescope was used to determine the composition and condition of the exterior wall assembly through the unsealed control joint. Note that no air vapour barrier membrane was observed on the concrete wall structure. Maintenance staff did not mention water ingress issues along the exterior walls of the Ice Arena.

Photo A1-20 Ice Arena – Unsealed Control Joints

Photo A1-21 Ice Arena – Exploratory Recess No.9



Exploratory Recess No.10

Soft landscaping was removed along the base of the Ice Arena wall along the north elevation. Both the landscaping and pavement are installed approximately 12" above the weep holes in the masonry veneer, which restricts drainage of the wall assembly.

Photo A1-22 Ice Arena – Exploratory Recess No.10

Table B – Meadow Park Sports Centre - Exploratory Recesses Summary	
Wall Type 6 (W6) – Ice Arena Wall Assembly – 1992 Original Construction	
<u>Exploratory Recess No.11</u> Once the perimeter metal cladding was removed, an air gap between the window frame and the concrete block wall was observed. There was no tie-in between the wall air vapour barrier and window frame. Note that the concrete curb under the window system appeared to have settled and rotated. An air gap was observed under the window frame. The connection between the steel structural and concrete substrate varied from wedge anchors to bolt inserts cast into the concrete. The base of the window appeared to be supported by a metal strap riveted to the frame.	Photo A1-23 Ice Arena – East Elevation - Exploratory Recess No.11 - Exterior  Photo A1-24 Ice Arena – East Elevation - Exploratory Recess No.11 - Interior  Photo A1-25 Ice Arena – Concrete Curb Deflection 

APPENDIX C

GENERAL OBSERVATIONS

Table C – General Observations

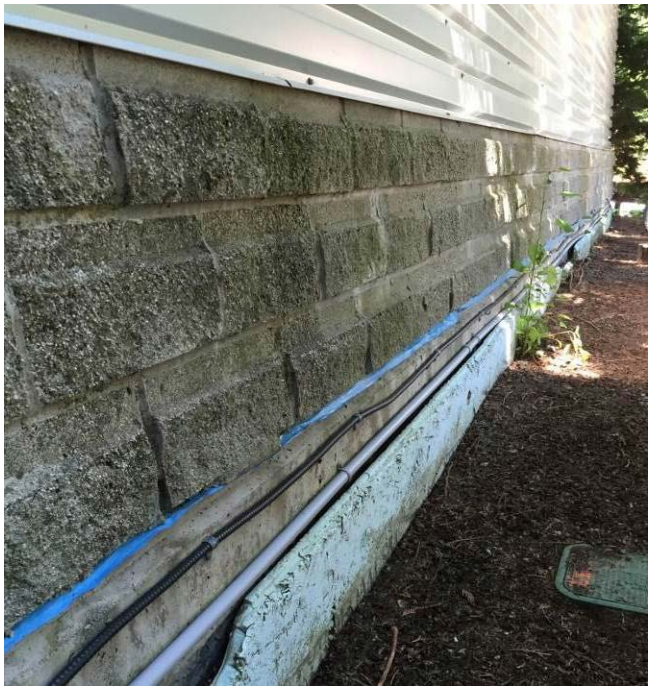
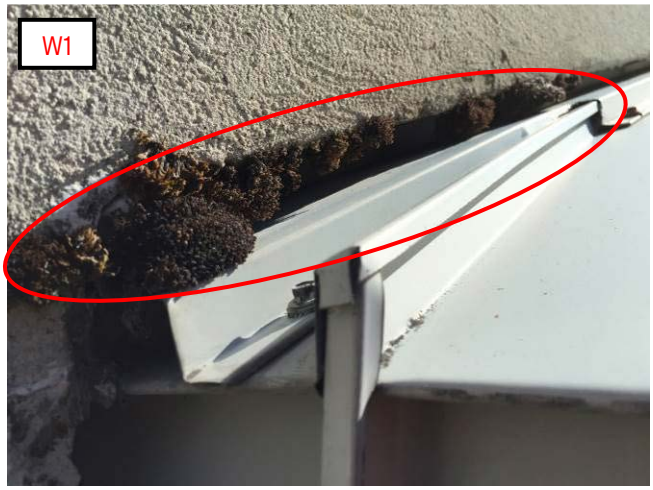
Table C – General Observations	
Location: Fitness Centre – East Elevation Reference: Overview of east elevation of the Fitness Centre (Similar to W2/W3 with concrete substrate instead of steel stud). The self-adhered bitumen wall membrane is visible beneath the concrete masonry units and damp-proofing and insulation was observed along the base of the foundation. The waterproofing system is not continuous along the wall as the wall membrane does not overlap the damp-proofing.	 Photo 1
Location: Pool – South Elevation Adjacent to the Standing Seam Metal Roof Reference: Organic growth was observed along the length of the roof perimeter flashing, suggesting a presence of water at the base of wall, which was confirmed by exploratory recess No.2.	 Photo 2

Table C – General Observations	
Location: Fitness Centre – North Elevation – 2nd Level Reference: Multiple cracks were observed around the building, which had been previously repaired with sealant. The sealant was deteriorated and failed in multiple locations. Two different wall assemblies (W1 & W4) intersected at this location. No control joint was observed along the transition to allow for movement between the two walls, causing the exterior finish to crack. Similar observations can be seen in Photo 4 below, which shows the condition at the ground level between the two different wall assemblies.	 Photo 3
Location: Fitness Centre – Administration Building Transition – Ground Level Reference: The sealants had previously failed and polyurethane foam sealant was then used to fill the void.	 Photo 4

Table C – General Observations	
Location: Fitness Centre – West Elevation Reference: Photo 5 shows the typical condition of the sealant around the window frame perimeters. The sealant was deteriorated and had failed in multiple areas.	 Photo 5
Location: Fitness Centre – North Elevation Reference: Efflorescence was observed at the base of the Fitness Centre wall and onto the Administration roof area. Efflorescence is caused when water evaporates, leaving a salt residue. This suggests the presence of water within the wall assembly (W4). Note that bitumen self-adhered membrane was lapped onto the EPDM roof membrane at this location. These two products are chemically incompatible and the EPDM has become brittle as a result.	 Photo 6
Location: Administration Building – Front Entrance Reference: A concrete masonry unit was missing at the top of the ground floor wall at the building's front entrance. The hole had been stuffed with extra pieces of insulation, allowing water to enter the wall assembly.	 Photo 7

Table C – General Observations	
Location: Ice Arena – South Elevation Reference: Photo 8 and 9 shows the general configuration of the upper level of the Ice Arena, with perimeter windows and metal cladding over the concrete structure. Note that the metal cladding was not removed in this location. Refer to exploratory recess No.11 for the typical wall assembly.	 Photo 8
Location: Ice Arena – South Elevation	 Photo 9

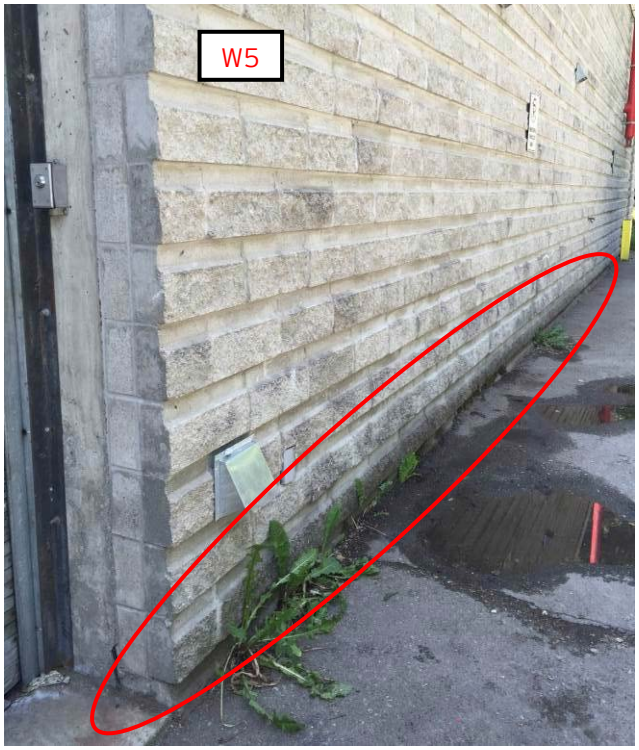
Table C – General Observations	
Location: Ice Arena – East Elevation Reference: A damaged inner pane of glass was observed along the canopy windows along the east elevation of the Ice Arena. Note that the type of glazing was not confirmed; however, it is required that the outer pane be laminated where it extends over public space.	 Photo 10
Location: Ice Arena – North Elevation Reference: Behind the existing concrete masonry unit there is a 50mm air cavity, with weep holes at the base of wall to allow for drainage. Along the north elevation, the pavement and landscaping were installed 12" above the weep holes. This detail restricts drainage, causing water to remain within the wall assembly. Sealant was not observed around the penetrations through the exterior wall. Refer to Exploratory Recess No.10 in Appendix B.	 Photo 11

Table C – General Observations	
Location: Ice Arena – Northwest Corner – Roof Access Reference: The perimeter concrete block structure at the roof access location is not sealed to the roof structure. There is no drip edge around the parapet of the roof access point, allowing water to enter the wall assembly. Metal clips between the concrete roof slab and the concrete block wall were observed. Efflorescence was also observed at this location.	 Photo 12
Location: Ice Arena – East Elevation - Interior Reference: The storefront windows along the east elevation of the Ice Arena sit on the concrete curb below. See photos below for close-up of window system.	 Photo 13

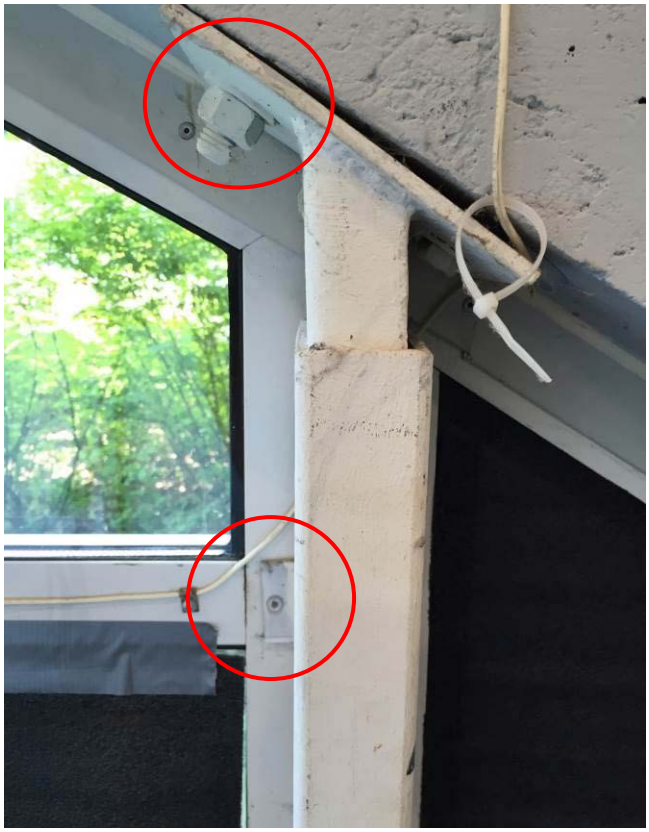
Table C – General Observations	
Location: Ice Arena – East Elevation - Interior Reference: The concrete curb below the window appeared to have settled and rotated outward.	 Photo 14
Location: Ice Arena – East Elevation - Interior Reference: The window system was fastened to the steel columns with clips. The steel structure is anchored into the reinforced concrete at the top and bottom.	 Photo 15

Table C – General Observations	
Location: Ice Arena – East Elevation - Interior Reference: The steel structure was connecting to the concrete slab with a variety of anchors. The window appeared to be supported by a metal strap riveted to the frame.	 Photo 16
Location: Ice Arena – East Elevation - Interior Reference: The window system is fastened to the steel columns with metal clips. Some of the metal clips observed were missing fasteners.	 Photo 17