City of Victoria - Crystal Pool & Fitness Centre – Life Cycle Upgrades Design Report

Stantec

WILLIAMS ENGINEERING CANADA

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Prepared for:
The City of Victoria

Revision. 1

January 9, 2015

Sign-off Sheet

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Executive Summary

This report outlines options for improvements at the Crystal Pool & Fitness Centre in order to maintain building durability and occupant health and life safety. The repair/replacement of major systems and components will extend the life of the existing facility for up to 15 years and improve energy efficiency. The request for proposal that was issued by the City of Victoria required the following items be evaluated:

1. Roof dome and dome assembly replacement,
2. Pool finish replacement and rim flow gutter system repair,
3. HVAC system upgrade and replacement,
4. Mechanical system and filter upgrade, and
5. Pool drainage reconfiguration

This report outlines all of this original RFP scope in Option 2. In this option, the building electrical system would be upgraded to include changes to service distribution, service to upgraded mechanical systems, a new fire alarm system, a new emergency lighting system, and a replacement of energy efficient exterior and interior light fixtures.

A structural seismic feasibility review has been performed with a recommendation to not upgrade the existing structure. New addition(s) as described in Option 3, if funded, will meet current seismic criteria. A sprinkler system feasibility review has been performed and a recommendation has been made to fully sprinkler the existing building under Option 2 and 3 as described below. In order to fully outline the investment scenarios, Option 3 was prepared which included the repair/replacement of major systems and components along with a facility enhancement to increase energy efficiency options, improve revenue opportunities, and address common customer concerns regarding the facility. An energy assessment was prepared and is included in the appendix for review. The assessment outlines many cost saving measures and many of them have been carried in the options presented.

The general maintenance and repair program will continue and we have noted these items in Option 1. We recommend the scope of Option 1 be completed in 2015 if funded. The City will attend to minor maintenance and repair on a planned annual basis, and will address major issues as they become critical. The City will continue to carry the existing risk of one or more system failures until a long term plan for facility repair or replacement is adopted.

A full replacement is presented as Option 4 to provide a comprehensive range for comparison. The replacement value for the facility is an order of magnitude estimate, falling within a range depending on the size of the primary pool, additional pool components and the size and scope of the fitness elements and land-related costs.

The project package options that have been prepared each include an order of magnitude cost estimate. The costs noted below include construction, management, professional fees, permits and contingency. The options are as follows:

OPTION-1: Scope requiring attention.
$314,719
This option includes several items that require improvement in 2015 if funded. The items are noted in the report.

OPTION-2: Implementation of initial RFP scope and electrical.
$6,258,495

OPTION-3: Option-2 + Expanded fitness space, universal change rooms and universal washroom.
$12,768,011

OPTION-4: New Facility
$36,680,180

1.0 INTRODUCTION

1.1 FACILITY HISTORY

The City of Victoria "Community Aquatic Complex" was completed in 1971 to serve the community as a recreational facility and venue for competition. A replacement to the Crystal Garden facility, a design for the new pool was commissioned from Architect John Di Castri exemplifying contemporary values of architectural and engineering design. With a budget of $1.5 million (1970), an Olympic sized venue was incorporated, spanned by three acrylic domes for natural light. Brick, tile and wood finishes were employed throughout the spacious and open facility to lend a modern and urban experience for residents and visitors to the city.

Figure 1: Crystal Pool circa 1971

The facility adopted the name "Crystal Pool & Fitness Centre" in fond memory of its predecessor, and the building has seen various upgrades including a sauna, steam room, swirl pool, electronic timing, water slide and fitness/exercise areas to attract and maintain clientele. The building has performed well for its years of operation and is in need of some modern upgrades and finishes.

Situated within the downtown city core, the centrally located Crystal Pool & Fitness Centre continues to support community health and wellness by providing aquatic programs, outdoor sport activities, adventure programs, child and youth programs, and sport development.

1.2 CITY OF VICTORIA PROGRAM AND REQUIREMENTS

Crystal Pool & Fitness Centre provides the services that support health and wellness in the community. Re-investment into the existing facility through refurbishing or replacing the major systems will enable the facility to continue to function effectively for the next 15 years, while ensuring the physical health and safety of the clientele and staff. Further, should funding be available, the services can be expanded and enhanced to meet the community needs for barrier free access, universal change rooms, and consolidated and expanded fitness space. The enhancements would promote attendance.

1.3 PREVIOUS EVALUATION REPORT OUTCOME

The City of Victoria was provided with the final copy of an evaluation report prepared by CEI Architecture Planning Interiors on July 14, 2011. The report allowed the City to prioritize and determine what upgrades and developments will be essential in order to meet their requirements for the next 15 years. The City of Victoria subsequently issued RFP 14-010 on March 18, 2014 for consultant services in order to implement the following improvements at the Crystal Pool & Fitness Centre.

The following RFP scope is currently known as the Crystal Pool life cycle replacement program:

- Replace roof domes and dome assemblies
- Replace marcite pool finish and repair rim flow gutter system
- HVAC system upgrade/replacement
- Filter/Mechanical upgrades
- Reconfiguration of pool drainage to sewer from storm

The RFP also required a Seismic feasibility study and Sprinkler feasibility study be prepared.

Figure 2: Existing Dome over Main Pool

These improvements and studies are included in the report that follows, as is a subsequent client request incorporating a program design study to add a family change room, universal washroom, and a consolidated fitness facility. There are recommendations from the CEI report that were not listed in the issued RFP and are not included in the scope of work of this report. Some of these recommendations will require further review and evaluation if the 15 year period is exceeded. We identify the following potential scopes of work for future consideration:

- A full roof membrane replacement: Should the membrane be replaced, there will be presented an opportunity to provide new insulation to meet modern thermal requirements and thereby assist in an operational cost savings at the facility.
  - Implement within 5 years.

- A replacement of stucco cladding: There is evidence of water ingress through exterior wall assemblies clad with stucco.
  - Implement in 15 years, review existing condition on a 5 year increment.

A number of accessibility and exit safety measures were identified in the CEI report. Some of the items will be captured in Option 2 scope if funded.

1.4 ENERGY ASSESSMENT REPORT

Concurrent with the schematic design phase has been the development of a detailed energy assessment of the building, prepared by Stantec Consulting Ltd and completed on December 15, 2014. The assessment outlines a variety of operational and built solutions that may be implemented in an effort to reduce energy consumption of the existing building (not including fitness expansion). Several recommendations from the report have been included in the investment options. With a final copy of the assessment received, the owner and consultant team will continue to evaluate options and recommendations towards the implementation of the final set of solutions. The recommended energy conservation measures are noted in the report. A copy of the final Energy Assessment Report is included as an Appendix.

1.5 BUILDING CODE REVIEW

Improvements and functional program development recommendations as outlined in sections 2.0 and 3.0 will conform to all applicable general codes and regulations, including but not restricted to:

- 2012 British Columbia Building Code
- British Columbia Health Act document "Swimming Pool, Spray Pool and Wading Pool Regulations", current edition

A copy of our *British Columbia Building Code Compliance Summary* to accompany the contents of this report is included as an Appendix, and an overview of building code design requirements and considerations is provided as follows:

1.5.1 Overview of Building Code Requirements

A sprinkler fire suppression system will be installed at the Crystal Pool facility, which will then comply with BCBC construction article 3.2.2.29 for a non-combustible and sprinklered building, the following improvements will be required:

- Firestopping at all mechanical and electrical services that penetrate exit stairwells and floor assemblies will require inspection for conformance to a required 2 hour fire resistance rating, or replaced.

- The new door and interior glazing at the expanded stairwells in the building SW and NW corners will require a 90 minute fire resistance rating. Doors may be oversized and magnetically held open if desired to permit full visual access from the reception counter.
- Corroding door exit hardware shall be replaced.
- A minimum of one barrier free parking stall shall be 3.7m in width.
- The leading edges of level 2 stairwell landings are not currently provided with tactile warning strips. New strips to identify the top edge of stairs with a contrasting colour and texture will be installed at all exit stairwells.
- Leading edges of stair treads will be finished with a contrasting colour and texture.
- At least one handrail at each stairwell and landing will be continuous, extending horizontally at the top and bottom. The handrail shall meet dimensional requirements of the 2012 BCBC.
- The barrier free entry ramp from the parking lot shall be provided with a graspable handrail at each side of ramp.

2.0 OPTION 1: SCOPE REQUIRING ATTENTION

The following outlines the scope of this option and if funded, we recommend this work be designed and completed in 2015.

- Replacement of pipe brackets in the mechanical and filter rooms with new galvanized steel brackets
- Replacement of 4 damaged dome panels
- Installation of a new crane/hoist for in the filter room for filter tank maintenance
- Safety upgrades to the chlorine gas injection system and chlorine room ventilation system
- Installation of new storm and sanitary pipes to the street
- Inspection and testing of existing boilers
- Repair / replacement of existing windows in front stairwells
- Repair of cladding patches for previous exploratory recess test points
- Replacement of pool drain covers in the deep end

3.0 OPTION 2: IMPLEMENTATION OF INITIAL RFP SCOPE AND ELECTRICAL

The following sections outline the items identified in the original RFP. A seismic upgrade does not form part of this option.

3.1 ROOF DOME AND DOME ASSEMBLY REPLACEMENT

3.1.1 Background Evaluation(s)

The pool domes have deterioration, leakage and condensation identified as far back in time as 1976, owing to environmental and mechanical stresses on sealant and flashings. The 2011 CEI building assessment and the Stantec Crystal Pool Dome Feasibility report completed on June 3, 2013, echo the problems regarding the domes. Organic growth is occurring at the aluminum battens, batten fasteners are showing evidence of corrosion, maintenance ladders are non-operational, flashings and sealants are deficient and condensation control is failing. Moisture to the interior is resulting in condensation to the underside of the panels and as a result is causing deterioration to the main steel ring structure. There are areas of water ingress that is finding its way into the roof structure and interior stucco bulkheads. Presently one original dome panel is cracked and another three, non-original panels are in immediate need of replacement.

Figure 3: Photos showing poor condition of existing domes

3.1.2 Recommendation(s)

The June 3, 2013 Stantec report outlines three feasible options of roof dome rehabilitation at the facility:

- Maintain form and character with a new or rehabilitated assembly;
- New custom dome structure and glazing; or
- New low slope roof with a series of skylights

Option 2: Implementation of initial rfp scope and electrical
January 9, 2015

It is our recommendation to proceed with Maintaining the Form and Character for the following principal reasons:

- The existing building is of architectural interest and importance to the community. A rehabilitation strategy that preserves the original design intent will maintain the facility's architectural integrity.
- The existing roof meets the structural requirements of the day (1971), but is undersized to the meet requirements of the current British Columbia Building Code. The dome as presently configured represents the least impact to the existing building owing from the weight of building elements, and possible snow loading. The replacement of the existing dome assemblies with either a new custom dome assembly or new sloped roof with glazing will invariably increase the loading to the existing roof structure, and thereby increase the risk to the building occupants and ownership.

The new dome replacements will include new acrylic panels, battens, spacers, sealant, and curved dome structures to replicate the existing form and character. We currently plan to re-furbish the existing steel ring beams and use them for supporting the new domes. New flashings and membranes will be provided around the perimeter of the existing ring beams.

An option of re-furbishing the existing domes was reviewed and has since been set aside due to cost, schedule risks and potential asbestos in the existing sealants. In this option, we planned to replace all components along with the acrylic panels. The existing curved dome structures and steel ring beams were planned to be re-furbished.

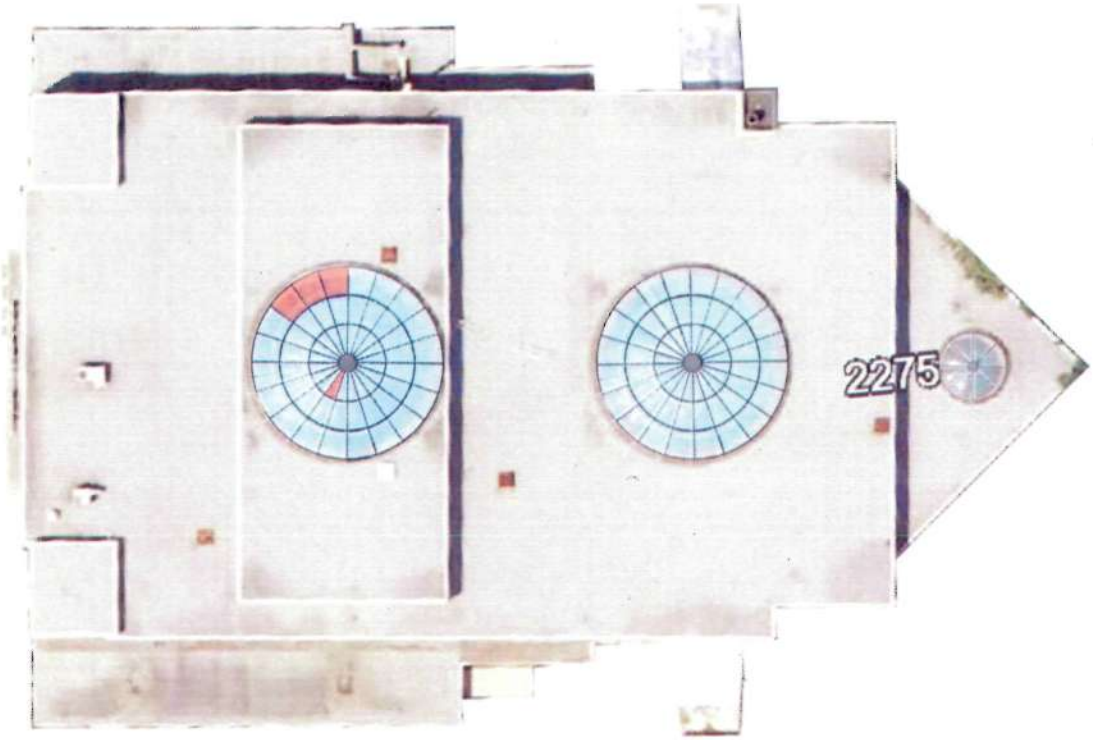

Figure 4: Damaged dome panels in need of replacement (highlighted in red)

The replacement of the acrylic panels identified in OPTION-1 represents the most economical approach. However, the pool will continue to experience water damage from excessive condensation, poor ventilation at the domes, and leakage from an inadequate dome assembly.

3.1.2.1 Architectural

A full dome replacement would entail the removal of all aluminum battens that secure the glazing to the dome structure, as well as fasteners, spacers, sealant and glazing. The dome structure would be disconnected from the structural ring beam, and removed by means of a crane in appropriate sized sections. Roof membranes, insulation, and decking will be removed at the domes in order to permit access to the ring beams. Instances of damage from corrosion will be repaired and painted with a rust inhibitor finish.

With each ring beam re-finished, newly fabricated structural dome frames will be installed. The dome frames will be factory finished, however the rings will be site painted as insurance from possible future moisture ingress. The new dome frame design will incorporate a radial pattern of ribs held in place by a series of concentric rings, comprised of rounded members in order to replicate the existing skylight configurations.

Dome panels will be comprised of a single pane of acrylic, custom curved to suit the compound curved structure. New sealant, neoprene spacers, and aluminum battens will be installed. Below each glazing seam will be incorporated an aluminum drainage channel, integral with the structural frame, directing condensation to the exterior of the assembly. At the perimeter of the domes along the exterior edge, a continuous gutter to catch rainwater will be installed and will be directed to precast concrete splash pads at the roof surface.

At each dome, the curb assembly will be upgraded to include new flashings, rigid insulation, sheathing board, and layers of SBS roof membrane. The curb assembly will be protected with pre-finished sheet metal flashing extending from the new skylight assembly above.

New interior moisture resistant gypsum wall board will be installed to repair the existing sloped sills at the skylight perimeter, and a new paint finish will be applied to all gypsum wall board elements. The slope of the sills will be increased from existing to reduce the risk of condensation collecting on these surfaces.

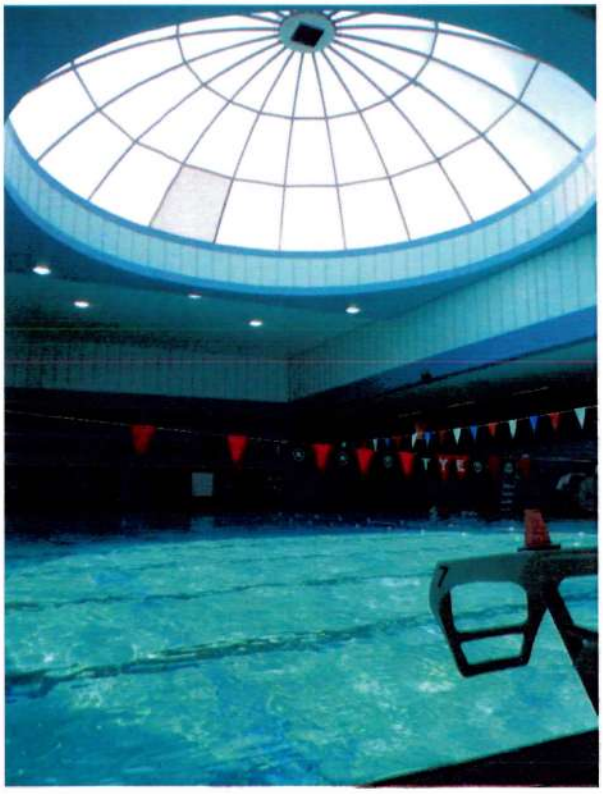

Figure 5: Existing dome providing light to pool below

3.1.2.2 Structural

Replacement of the 4 damaged acrylic panels will include the design of distributed combination loads to include the panel dead, live and wind loads in accordance with BCBC 2012.

The replacement design of new panels, battens and curved structure shall be grandfathered into the existing roof design loads. Combined snow and wind loads shall include the dead load of new panels, battens and curved structure onto existing dome rib support frames, and shall not exceed the maximum support load on the existing ring beam. No further strengthening upgrades to the existing periphery roof structure will be required, as all replacement glazing and batten upgrades will meet the existing structural requirements of the day (1971) with respect to loading.

Further examination and condition assessment of the tension rings will be required.

Dissimilar materials which are not compatible shall be isolated by an insulator to prevent galvanic corrosion.

3.1.2.3 Mechanical

In an attempt to reduce the condensation which currently forms on the glazing and frames of the roof domes, two essential modifications will be made. The ventilation air from the grilles around the roof domes will no longer come from the main pool air handling fans. This air from the natatorium environment is warm and moist; essentially unsuitable for keeping condensation from forming on the domes. Instead, the dome perimeter air will come from a separate air handling unit which will use recovered heat and drier outdoor air. This air will flow directly over the dome glazing to reduce the incidence of condensation. The second modification will be the removal of relief air vents from the top of the dome assembly, and these will be capped to reduce the flow of moist air across the glass and frames.

As outlined in the following section, roof drains will be placed around the domes near the heat tracing cable system to remove any snow melt, and therefore reduce snow load on the roof during winter weather.

Figure 6: Vents to be removed

3.1.2.4 Electrical

Electric heat trace cabling will be provided around the dome assembly. A master control panel will be located in the main electrical room with temperature sensors located along the roof of the facility.

3.2 POOL FINISH REPLACEMENT AND RIMFLOW GUTTER SYSTEM REPAIR

3.2.1 Background Evaluation(s)

A condition assessment of the pool marcite (pool basin coating) was prepared and submitted by Goal Engineering to the City of Victoria on September 9, 2014. The report outlines extensive etching, crazing, and debondment of the pool marcite surface. The report's major recommendation entails a thorough marcite finish removal and replacement. Further observations include corroded support brackets in the filter room, copper staining at drainage pipes, painted tiles, and a loss of tile surface texture.

Figure 7: Pool (deep end)

3.2.2 Recommendation(s)

3.2.2.1 Architectural

3.2.2.1.1 MAIN POOL

All marcite and tile surfacing at the main pool floors and walls will be removed to the concrete substrate, replaced by a new installation of marcite to all surfaces. Tile will be added as a new 300mm high mosaic tile band at the water's edge, and 300mm wide mosaic lane markers at the pool floor. Tile depth markings will be installed around the perimeter deck. A new ramp and stair will be provided at the pool south-east corner, finished with tile.

New stainless steel handrails, ladders, and rungs will be permanently affixed to the pool and deck, to replace existing. A new rail system will be provided with the new ramp and stair. A new barrier free accessible lift system will be installed at the main pool, as will be new diving boards.

New wall attachments for floating lane dividers will be installed, as will be new starter block attachment plates.

The existing expansion joint sealant will be replaced, and joint cover plates refurbished and augmented with additional plates.

Additional protection to the viewing windows from the Basement floor area will be provided with the installation of a vented Lexan panel on the inside at each window in a wood trim.

Two new drain covers will be installed on the main drains at the deep end of the pool, as well as new brass floor and wall supply outlets. Existing brass vacuum connections will remain.

3.2.2.1.2 TOTS' POOL

Existing tile will be removed to the concrete substrate, and the pool will receive a new tile finish throughout. The new finish will include a 300mm horizontal mosaic tile accent at the water level. New tile depth markers will be installed, as will new stainless steel handrails.

New drain covers, brass floor supply outlets and brass wall supply outlets will be provided.

3.2.2.1.3 DECK AND RIM FLOW

The existing main and tots' pool deck tile will be removed to the concrete substrate, and replaced with new tiles to the pool edge.

The inside surfaces of the rim flow will be provided with a two part liquid applied epoxy moisture barrier. The expansion joints that cross through the rim flow will be completed with new expansion joint sealant.

Figure 8: The only existing rim flow access

The existing pre-cast concrete panels around the perimeter of the pools that form the top of the rim flow will be removed and replaced with a modern system. A new continuous plastic or fiberglass trench drain will be installed along the perimeter of the pools in approximately the same location as the existing. To restrain the upper section of the concrete rim flow structure, a

series of stainless steel braces or concrete struts will be installed along the length of the rim flow connecting the two rim flow wall sections. Currently just one access point exists at the top of the rim flow. This will be increased in the new design to provide access points around the full pool perimeter.

3.2.2.1.4 SWIRL POOL

The existing tile will be removed and replaced with new tile. Similarly, the tile at the shower area floor and walls will be removed and replaced with new tile. All fittings and accessories at the swirl pool will be removed and replaced.

3.2.2.2 Mechanical

The improved access proposed in this renovation, maintenance will be simpler and more frequent in future.

3.2.2.3 Electrical

The existing pool grounding system will be reviewed as part of this scope of work. Faulty or loose connections to existing and / or proposed metallic components around the pool vicinity will be corrected if deemed necessary.

3.3 HVAC SYSTEM UPGRADE AND REPLACEMENT

3.3.1 Recommendation(s)

3.3.1.1 Architectural

The existing masonry exhaust flue extending from the basement level mechanical room to above the roof is exhibiting cracks. In addition, although not required, the flue does not meet current seismic standards and should be replaced. If new condensing boilers are installed, then without question due to technical requirements, the concrete masonry unit flue will need to be removed and replaced (with a ULC listed metal boiler flue assembly). A new shaftwall assembly, with prefinished metal cladding, weather barrier, and non-combustible sheathing above the roof line would form the new chimney system for the boiler flue. The new flue assembly would be seismically braced to meet current requirements. As per the dome repair, a repair to affected roof areas consisting of rigid insulation, sheathing board, and a SBS roof membrane will be provided.

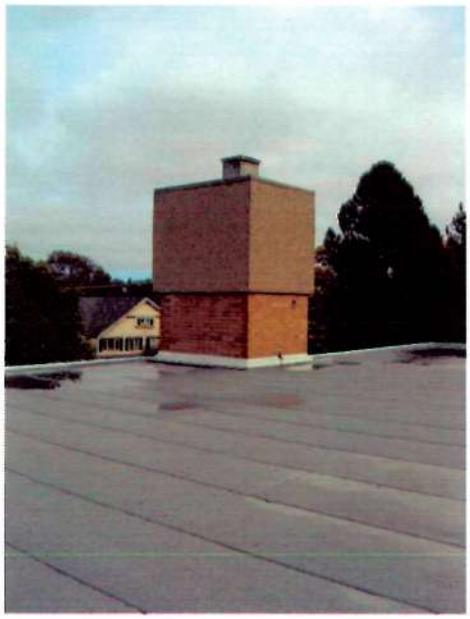

Figure 9: Boiler flue to be replaced

3.3.1.2 Mechanical

The heating, ventilation and air conditioning system (HVAC) at the Crystal Pool is over 40 years old and requires a major upgrade. Most major components are far beyond their expected lifespan and should be disconnected, removed and replaced with new modern energy efficient equipment.

Currently, Crystal Pool is using outdoor air to provide dehumidification and healthful ventilated conditions for the natatorium. To dehumidify and ventilate in this manner, the municipality is spending a large sum of money on natural gas and electricity to heat up and move the outdoor air into the space and exhaust warm moist indoor air to the atmosphere. This is no longer done in modern pools for the obvious reasons of greenhouse gas output and operating cost. Energy recovery and other efficiency strategies should be implemented.

The following sections outline the major components, their condition and ends with a discussion on heat recovery.

3.3.1.2.1 Boilers

The existing 40+ year old Cleaver Brooks Fire Tube Boilers were evaluated in 2012 by the mechanical maintenance company of that time. We understand that they have not been inspected (opened up) since then. In 2012, the boilers were in good condition and efficiency tests indicated that they were running at between 82% - 84% efficiency. This is a good result for this era of boiler, and implies that they are in good shape. These were top quality boilers in their day, and experience with other installation on the island show they have longevity.

Maintenance personnel indicate that the main boilers #1 and #2 are cycled to have relatively equal hours of operation. The smaller boiler #3 is essentially used for the summer (low demand) season.

Figure 10: One of three existing boilers

Based on this and the Energy Assessment Report, it is recommended that:

- The existing boilers be retained and only a controls upgrade be implemented if a fitness expansion is not contemplated
- The existing boilers be removed and replaced with high efficiency boilers and controls if a family change room, universal washroom renovation and fitness expansion is contemplated

The reason for maintaining the existing boiler plants (without conducting a facility expansion) is due to the expected remaining life in the existing equipment, that there is 2N redundancy in the existing plant to mitigate/reduce the chance of an unexpected shutdown, and that they are well sized and cascaded (good original design) for the demand of the existing footprint of the building. If the footprint were to be increased, there emerge additional opportunities for energy recovery and a new boiler plant, sized for the existing and new footprint, should be implemented. As well, energy savings will further increase and greenhouse gases will be reduced.

Finally, if the existing boilers are to remain, it is recommended that they be inspected (opened up) before a final decision is made on keep or replace.

Hydronic Heating System
The hydronic heating system underwent an ultrasonic pipe wall thickness test, or Non-destructive Testing procedure (NDT). The results indicate that the hydronic systems (pipes and coils) are in good shape. Pipe and coil wall thicknesses are well within acceptable ranges and should last another 15 years.

A few exceptions are the Main Heating Coils in the north and south main pool fan rooms. These coils are located in the corrosive (chlorinated) return air stream from the natatorium. They are at life's end as their heating fins are badly corroded or they have already been removed. These coils require replacement.

The main shell and tube and plate and frame heat exchangers in the boiler room and pool filter room will be replaced. Some of them are from the original Crystal Gardens and most of the remainder are over 40 years old and well beyond their life expectancy. A few of the plate and frame heat exchangers are newer, but will be evaluated during the construction documents stage if they can be re-used, but likely replaced. These devices are corroded and damaged.

All hydronic system valves and controls will be replaced and updated; both on the primary loop and the secondary loops.

3.3.1.2.2 Ventilation Systems

The Main Fans for the pool ventilation are operational but corroded and beyond life expectancy. Both the return-air centrifugal fans and supply air side centrifugal fans will be replaced. This will include motors and trim. The supply and return control dampers and actuators will also be replaced.

Similarly for the north-west and south-west fan rooms that serve the front of house and the change rooms; both the return-air centrifugal fans and supply air side fans will be replaced. This will include motors and trim. The supply and return control dampers and actuators will also be replaced.

The main ventilation fans will be fitted with variable speed drives and high efficiency motors to conserve energy during low occupancy periods and when the facility is closed (for example at night).

The existing packaged rooftop units on the front of the building serving the workout rooms and front of house are operational and would be replaced when they fail or if the fitness expansion proceeds.

The Tots Pool Fan will be replaced and a new heat recovery coil will be provided with a new exhaust fan.

All other exhaust fans throughout the facility will be replaced.

As discussed in section 2.1.2 of this report, the dome ventilation systems will be modified to provide optimal ventilation and prevent condensation.

3.3.1.2.3 Pumps

The primary heating system circulation pumps will be replaced with efficient variable speed drive (VFD) pumps. All secondary circulation pumps will be replaced as well, as many are beyond life expectancy and require increasing maintenance.

There are a few newer existing pumps that may be able to be re-used, however this will be evaluated during the construction document stage.

All sump pumps will be replaced with new efficient equipment.

3.3.1.2.4 Control Systems / DDC

The remaining pneumatic control systems will be removed and replaced with modern Direct Digital Control (DDC) systems.

3.3.1.2.5 Heat Recovery

Either a glycol runaround loop or a heat tube loop will be provided between the 4 main supply and return air systems. Essentially, a coil will be placed at each of the exhaust air outlets and the outdoor air inlets to transfer the heat from the exhaust air to the incoming air. This simple but effective system will consist of two coils, glycol pipe loop and a pump. DDC controls will be put in place for the operation of the pump.

If the fitness expansion is contemplated, significant additional heat recovery opportunities become available. There would be room on the new roof / new expansion for simultaneous heating and cooling equipment. A chiller or heat pump would be provided that could transfer heat from one area of the building to another at a high coefficient of performance (COP). This high COP is due to the ability of the heat pump to capture the sensible and latent heat from the exhaust streams. This building is particularly well suited for efficient heat recovery due to the ~80F temperature of the pool water. For example, with the southern exposure of the new fitness area, heat could be recovered from the cooling needed in that area. This heat could be transferred to the pool water or pool ventilation system; significantly reducing the demand on the boilers and on natural gas consumption (and in turn greenhouse gas reduction).

Any additional heat could be used for domestic hot water pre-heat for the shower demand.

3.3.1.3 Electrical

Modifications to electrically connected mechanical HVAC equipment will include the removal of the following equipment:

- North and South Fan Room equipment, including the existing supply air fan, pre-heat coils, exhaust air fan, outside air control dampers & actuators, and pre-heat coil circulation pumps.

- North West and South West Fan Room equipment, including the existing air handling unit, exhaust air fan, outside air control dampers & actuators, and pre-heat coil circulation pumps.
- Existing air handling units above existing Cardio Room 203 and Cardio Room 208.

Modifications will include connections to the following new electrically connected mechanical HVAC equipment:

- North and South Fan Room new equipment, including pool hall supply fans, pre-heat coils, heat recovery circulation pumps, heat recovery coils, tots pool heat recovery circulation pump, and heating cooling recovery unit.
- North West and South West Fan Room new equipment, including heat recovery coils, change room exhaust fans, general area air handling units, and heat recovery circulation pumps.
- New air handling units above the existing Cardio Room 203 and Cardio Room 208.

Refer to mechanical drawings for locations on proposed equipment connections.

3.4 MECHANICAL SYSTEM AND FILTER UPGRADE

3.4.1 Recommendation(s)

3.4.1.1 Mechanical

The current antiquated and corroded filter room equipment, tanks and derelict ozone treatment equipment will be demolished and removed. The equipment is at end of life, and some maintenance procedures necessary on the old equipment and infrastructure are questionable. The new system will consist of open DE filter tanks, UV treatment and chlorine gas injection. This new system of filtration and treatment was chosen based on experience, proven effectiveness and maintenance staff familiarity with the systems.

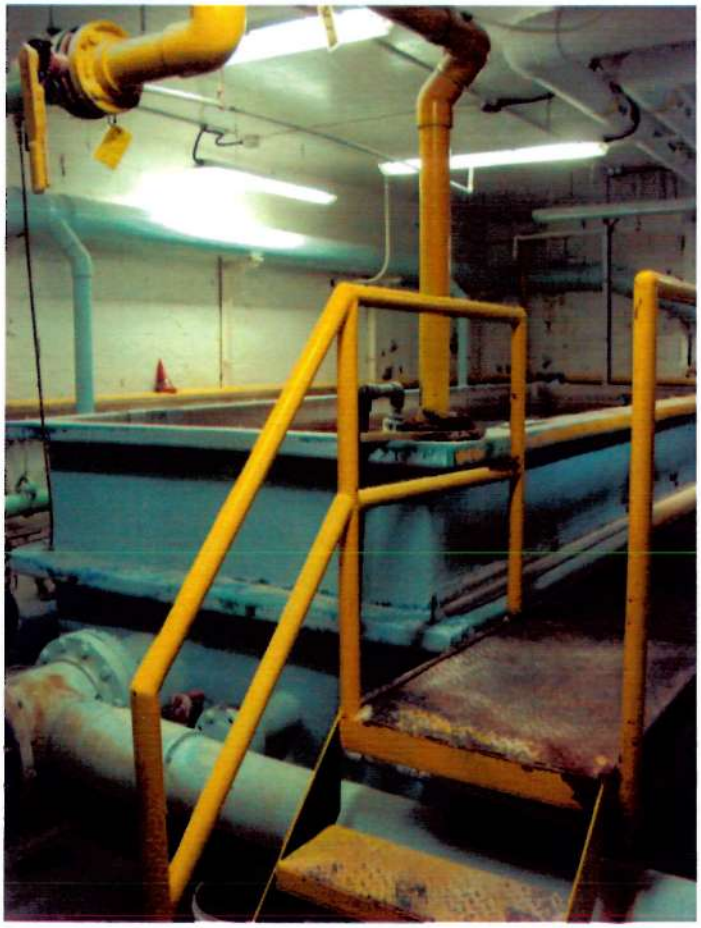

Figure 11: Existing Main Pool filter tank

In any natatorium, good filtration not only supports healthful conditions for bathers, but also has a significant effect on the consumption and level of chlorine in the water and can reduce energy consumption for ventilation. As well, during low occupancy periods and at night, pumping energy can be reduced with the use of good filtration and VFD's. Three open diatomaceous earth (DE) fiberglass filter tanks are proposed for the main pool and a single tank for the Tots pool. Three tanks provide as much filter area as possible and will also allow operational staff to maintain one tank at a time without the need for pool shut-down or maintenance during off hours.

Above the filter tanks on the ceiling, it is recommended to install a linear crane to assist operational staff with filter maintenance procedures. Each filter cassette that needs to be lifted out is approximately 400 pounds. This will assist with compliance to modern Worksafe requirements.

A variable voltage UV light system will be provided to reduce waterborne pathogens further and enable lower free chlorine concentrations in the pools. A variable voltage system is preferred as it can ramp down during off hours to reduce energy consumption; as well as support lower chlorine use.

The chlorine gas injection system will require modification to bring it up to current WorkSafe BC requirements and safety standards. The chlorine gas piping and injector fittings should all be relocated out of the normal occupied service area to the protected chlorine rooms. The injection or mixing process should occur in the specially protected room and then permit only chlorinated water to leave the chlorine rooms. The existing loosely hung plastic tubing which is currently delivering the chlorine gas to the filter room injection points creates potential for a chlorine gas leak within the building. Although there are vacuum regulators preventing a serious leak; the health or possible deadly consequences of a chlorine gas leak inside the building should be corrected at least as part of this renovation, if not immediately.

The filter room will be provided with improved ventilation in order to exhaust the corrosive air within the space. The current system is inadequate.

The Swirlpool has a separate filter/treatment room on the south-east side of the building. It is understood that new filter tanks were installed in the summer of 2014. Since this filtration system is completely independent of the main pool and tots pool; it is currently not being modified as part of this study.

As part of the pool and filter tank drainage system, a media reclamation system will be provided to recover the DE before it goes to the city mains. DE is not good for the city mains nor is it good for aquatic wildlife.

3.4.1.2 Electrical

Modifications to electrically connected mechanical equipment will include the removal of the following equipment:

- Pool Filter Room equipment, including tots and main pool heat exchangers, tots and main pool level control tanks, tots and main pool circulation pumps, vacuum pump, main pool sump pump, and system control panel.
- Ozone Room equipment, including ozone by-pass pumps, ozone control panel, ozone monitoring system, pump disconnects and starters (pump 1, 2 and 3), gas detector panels, and ozone room exhaust fan.
- Boiler Room equipment, including crawl space exhaust fan, domestic hot water recirculation pump, heat exchangers, water feature circulation pumps, whirlpool circulation pump, main and 2nd floor heat circulation pump, basement heating circulation pump, main and tots pool heat exchanger, abandoned heat pump system heat exchanger, abandoned heat pump circulation pump, control panel, and perimeter drainage sump pump.

Modifications will include connections to the following new electrically connected mechanical equipment:

- Pool Filter Room new equipment, including filter room exhaust fan, main and tots pool chemical feed pumps, main and tots pool UV filters, sump pump, and new DDC control panels.
- Boiler Room equipment, including water feature circulation pumps, swirl pool circulation pump, variable frequency drives (for domestic heating circulation pumps, tots pool, basement zone, north fan room zone, main pool heating, main & second floor heating circulation pump), relocated domestic hot water pump, exhaust fan, and sump pump

Refer to mechanical drawings for locations on proposed equipment connections.

3.5 POOL DRAINAGE RECONFIGURATION

3.5.1 Recommendation(s)

3.5.1.1 Mechanical

The pool and filter tanks discharge to the municipal sanitary drainage system from the large sump in the pool filter room. As the 8" sanitary line and 12" storm lines within the building are corroded from contact with chlorinated water and air, it is recommended to replace them with new piping of the same size.

Except for pool and filter tank overflow, there is no cross connection between the sanitary and storm services. This should be considered acceptable practice and safe for pool operations going forward.

3.5.1.2 Electrical

No electrical modifications are anticipated as part of this scope of work.

3.5.1.3 Civil

Refer to Section 2.9 *CIVIL* for a complete scope of civil work pertaining to the pool drainage reconfiguration.

3.6 SEISMIC FEASIBILITY REVIEW

3.6.1 Analysis

A seismic upgrade assessment report was provided for the Crystal Pool building, dated November 7, 2014. The current building configuration does not provide seismic resistance to the 60% level of the British Columbian Building Code (BCBC), 2012 Edition.

Schematic retrofit drawings are included within the report to upgrade the building to 60% of the current code seismic requirements. An Order of Magnitude Estimate was provided under separate cover for all proposed seismic upgrades.

The November 7 assessment report to the City of Victoria includes a Ryzuk Geotechnical engineering field review dated August 6 2014.

3.6.2 Recommendation(s)

The existing lateral capacity of the Crystal Pool structure will be maintained at its current level and will not be upgraded to the current code requirement.

A seismic upgrade to the building is not required due to the nature of the renovation, the existing structure and seismic force resisting systems not being affected, and the expansion being seismically separated from the existing building.

The new Fitness Facility Building addition, if built, will be designed to meet gravity, wind and seismic load requirements in accordance to BCBC 2012 code standards, including a building seismic separation joint provided between the existing building and the new addition.

3.7 SPRINKLER SYSTEM FEASIBILITY REVIEW

3.7.1 Analysis

The Crystal Pool currently has an antiquated sprinkler system in the boiler room and three fire hose stations only. This partial fire suppression method was typical from the 1950's to early 1970's when boiler rooms were fed from a fuel oil tank that could potentially continue providing fuel in a fire situation. The fuel oil system has been removed and the facility (boilers) has been converted to operate on a modern natural gas supply feed. This existing boiler room sprinkler system will be removed, and will be replaced with a new sprinkler system throughout the facility that meets current standards. The existing standpipe and hose cabinets will also be removed.

Under article 3.2.2.29 of the BCBC, if the building was to be constructed today, it would be required to be sprinklered throughout. Local Bylaw updates will soon mandate existing facilities undergoing this level of upgrade to be sprinklered throughout.

From discussions with the Authority Having Jurisdiction, upgraded areas are to be provided with sprinklers and standpipe systems. It was also indicated that the main pool area would not require sprinklers due to low fire load and the high ceiling.

Per NFPA 13, the sprinkler density in service and storage areas will be designed to the ordinary hazard, group 1 classification and in all other areas light hazard requirements. Please refer to the mechanical design development drawings for sprinkler system locations.

The existing fire department connection is located on the North side of the building. It is recommended to maintain this location for fire department operations and ease of mechanical design. The location will be coordinated with the fire department response location (fire alarm panel and annunciator). A consultation meeting should take place with the Victoria Fire Department to confirm coordination with their modern operations.

A new 6" diameter fire main will be required from the city water main to the north side of the building. A water entry / fire sprinkler room will be located on the lower service level on the north side of the building.

Per clause 3.2.5.8.(1)(c), the facility will not be required to have a standpipe system if it is sprinklered throughout.

If the new fitness expansion is constructed, an interconnected floor space (ICFS) will be created by the glazed openings facing the natatorium. Clause 3.2.8.2.(6)(b) and Article 3.2.2.29 of the BCBC 2012 require the ICFS to be "sprinklered throughout" in order to allow an extent of un-rated glazed openings between the second floor fitness room and the natatorium, as is here proposed. Early discussions with the City's Authority did not contemplate an inter-connected expansion next to the natatorium, and had indicated that the pool and deck area could remain unsprinklered. This building code related issue requires further discussion with the Authority and may perhaps require an alternate solution comprised of the installation of specially designed close spaced sprinklers along both sides of the glazed opening.

Refer to Section 2.9 *CIVIL* for a complete scope of civil work pertaining to a new sprinkler system water supply service.

3.8 ELECTRICAL

3.8.1 Main Electrical Service

No changes are anticipated to the main electrical service.

The existing main electrical service is currently set at 1200A 208V 3-phase. This service is supplied via a unit substation, located within the main electrical room in the basement.

Based on the information retrieved from the City of Victoria's Pulse Energy Management System, the peak demand load on the service was recorded to be 160kW over the past 12 months. This equates to approximately 444A. As a result, there appears to be approximately 516A of capacity in the existing service for future growth and expansion.

A detailed load calculation will be performed during detailed design.

3.8.2 Service Distribution Equipment

Electrical distribution equipment modifications will involve replacement and addition of the following equipment. This equipment is considered at or past its expected life expectancy.

- Panel boards G, F, D, K, J, Q, and N.

Existing circuit breakers for each of these panel boards will also be replaced. The associated branch wiring is in the process of being tested. The intent is to retain this wiring if the test results are positive.

3.8.3 Mechanical Systems Distribution Equipment

Mechanical equipment modifications will be limited to the following scope of work:

- North and South Fan Rooms (Section 2.3)
- North West and South West Fan Rooms (Section 2.3)
- Mechanical System and Filter Room (Section 2.4)
- Boiler Room (Section 2.4)
- Existing Ozone Room (Section 2.4)

Refer to the associated sections for each item above and to mechanical and electrical drawings for a list of removed, relocated and new proposed equipment.

3.8.4 Fire Alarm System

The existing facility's fire alarm system will be replaced. All existing fire alarm devices, including all associated wiring will be removed.

A new fire alarm system will be provided. The master fire alarm control panel will be located in the existing electrical room in the basement. The remote fire alarm annunciator will be located in the lobby of the facility. A new device layout will be determined during detailed design.

Refer to the electrical drawings for proposed device location and quantities.

3.8.5 Emergency Lighting

The existing facility's emergency lighting system will be replaced. All existing emergency lighting devices, including all associated wiring will be removed.

New emergency lighting will be provided. A new layout will be determined during detailed design.

Refer to the electrical drawings for proposed device location and quantities.

3.8.6 Exterior Lighting

The existing facility's exterior luminaires will be replaced. The existing exterior lighting control system will also be replaced. The existing branch wiring will be retained.

New energy efficient LED luminaires will be provided. A new central lighting control system will also be provided to control both exterior and interior luminaires.

Refer to the electrical drawings for proposed device location and quantities.

3.8.7 Interior Lighting

The existing facility's interior lighting system will be replaced with new energy efficient LED luminaires. Existing light levels have been verified by using a digital light meter. New lighting levels will be designed in accordance with BC Guidelines for Pool Design (Version 2 June 2014) and IESNA Recommended Practice RP-6-01 "Sports and Recreational Area Lighting".

All existing line-voltage switches will be replaced. The entire facility will be provided with occupancy and daylight sensor devices as a means to localized control.

The existing pool lighting system will be replaced with new energy efficient LED luminaires. There are 2 options being investigated regarding the lighting layout, which will be finalized during detailed design.

A new central lighting control system will also be provided to control both exterior and interior luminaires.

Refer to the electrical drawings for proposed luminaire locations and quantities.

3.8.8 Public Announce System

The existing Public Announce (PA) System will be extended and modified to suite the new layouts of the renovated spaces. The system will be tested, re-commissioned and re-programmed in accordance with the facility's programs and policies.

3.8.9 Security

No changes are anticipated to the existing facility's security system.

3.8.10 Communications

No changes are anticipated to the existing facility's communication system.

3.9 CIVIL

This section will present the required civil components for the life cycle upgrade at the Crystal Pool, specifically the required site servicing upgrades.

3.9.1 DESIGN CRITERIA

The design has been based on the scope of work provided by the City of Victoria, and proposed architectural plans and reviews of the existing as-built drawings provided by the City of Victoria.

The Civil systems will be designed in accordance with the intent of all applicable codes and regulations.

3.9.2 PLUMBING SYSTEMS

3.9.2.1 Site Plumbing Services

There are existing domestic water, sanitary sewer and storm drain services that, based on available record information, are well located for the new lifespan upgrades. However, the storm and sanitary may require replacing depending on their condition which at the present time is unknown. A new fire protection service will be required as well as a new fire hydrant within 45m of the proposed fire department connection.

3.9.2.2 Sanitary Sewer Service

Waste water from the Crystal Pool facility is currently discharged into a 200mm pipe running westward to Quadra Street. There, the lateral pipe intersects with the existing 250mm municipal sanitary pipe.

The current condition and material of the 200mm pipe is unknown. Both the service age of the pipe and the water quality discharged from the facility may have contributed to pipe wall decay and corrosion throughout depending on the pipe material. This pipe may need to be replaced with a new PVC pipe. We recommend that the existing sanitary service condition and remaining lifespan be confirmed prior to detailed design and replacement.

3.9.2.3 Storm Sewer Service

The existing 250mm storm service may also require complete replacement. Similar to the sanitary pipe it may be corroded and no longer serviceable depending on the pipe material.

The replacement would be a new 250mm PVC pipe installed along the same alignment as the existing service. This pipe would run northwards from the Crystal pool and tie into the existing 900mm reinforced concrete municipal storm drain running southeast on Queens Avenue. We

recommend that the existing pipe condition and material be investigated prior to detailed design and replacement.

3.9.2.4 Fire Protection Service

To service the proposed sprinkler system, a new 150mm ductile iron fire service connection will be required. The pipe will run southwards to the facility from the existing 150mm cast iron supply on Queens Avenue. Backflow prevention and a detector check valve will be provided either at the property line or inside the water entry room. A new fire hydrant will be required within 45m of the new fire department connection to be located by the mechanical consultant.

4.0 OPTION 3: EXPANDED FITNESS SPACE, UNIVERSAL CHANGE ROOMS AND UNIVERSAL WASHROOM

Option 3 includes all of the scope as identified in the option 2 above.

In addition to the improvements outlined in the original RFP work noted above, the City of Victoria has requested a program planning study of the existing building in order to align the facility's functional program layout with known limitation in the facility. Improvements desired include a family change room facility to best serve parents with children with privacy, the addition of universal barrier free washrooms in accordance with the current British Columbia Building Code, and a consolidated fitness facility environmentally separated from the pool space. The family change room and universal washrooms will entail an interior renovation within the existing building enclosure, whereas the fitness facility scope will involve a building addition.

4.1 FAMILY CHANGE ROOM, UNIVERSAL WASHROOM AND ENTRANCE LOBBY

4.1.1 Architectural

The new family change room facility was initially considered at the north end of Level-1, to replace two existing offices and to shorten the existing female change area. However, the existing electrical vault below this location restricted the possibility of new shower and toilet drainage from a new change facility above. Therefore, it is here proposed to provide the new family change room at the south end of the building instead, necessitating the removal of the existing child-minding space as well as a shortening of the existing men's locker area. The existing men's and women's change rooms will then trade location to make best use of the revised layout.

Figure 12: Sample family change room stall

A new door access will be provided to the family change area from the public corridor leading to the relocated women's facility. The family change area will consist of a row of six private rooms fitted with a wood or phenolic bench, shelf with hooks, and a shower enclosure, and be secured with an outward swinging phenolic partition door. Two barrier free accessible washrooms will be installed, one of which will be oversized to accommodate a barrier free shower unit in conformance to the current building code. A locker area will be installed across from the change rooms, as will be a mirrored plastic laminate counter top fitted with a sink. It is recommended to provide a solid surface edge trim to the countertop for durability. In conformance to the BC Health Act, visitors will pass through a communal shower area prior to a door-less entry to the pool, briefly crossing the corridor shared by female patrons.

Privacy partitions in the new change room area will consist of structurally reinforced concrete masonry unit construction, edges rounded with a glossy paint finish. The door to the corridor will be glazed with a translucent film, and consist of an aluminum door leaf in aluminum frame. Flooring will consist of an epoxy non-slip membrane extended up the wall as a 200mm cove base, terminated with a prefinished metal trim. Lockers will be stacked, of phenolic construction, and benches will be provided.

The existing perimeter wall finish will be removed and replaced with a suitable underlay material and fluid applied waterproof membrane for a ceramic tile finish.

The addition of the new family change area will require modifications to the adjacent locker room. A new painted concrete masonry unit partition will demise the women's from the family facilities, and a new glazed aluminum door will be provided from the entry corridor. A new locker and bench arrangement will be provided to optimize the shape of the reduced space. The floor and ceiling finishes will be repaired as required.

The building code requires at least one "universal washroom" that may serve either gender, and which may accommodate a person with a mobility disability and their personal assistant. At Crystal Pool, a new universal washroom is proposed to be installed. The new washroom with in-

swinging door will provide a toilet, sink, grab bar, and mirror to meet functional and dimensional requirements for barrier free access as outlined in the British Columbia Building Code. The new washroom will be installed within clear view of the reception staff, available to offer assistance if required.

The existing child-minding will be relocated to the north-west corner of the building, as a result of the new family change room development. The two existing offices at this location will require removal, as will a portion of the existing adjacent locker room. These existing offices will be relocated within the reconfigured level 2 layout. The new child-minding room will be provided with a glazed solid core wood door in an aluminum frame from the corridor. New plastic laminate countertops and cabinetry millwork will be provided at the west and east ends of the room, accommodating a new sink, refrigerator, and dishwasher. Painted gypsum wall board will finish the perimeter walls and partitions, and a new rubber base trim and sheet vinyl will provide a floor finish. A new exterior door will be required to the exterior from this room, which will be accommodated by an insulated glazed aluminum door and sidelight mounted in an aluminum curtain wall system. A new concrete staircase with prefinished metal guard and rail system will provide access to the lowered grade, containing a new yard for play. Security will be provided with a new chain link fence enclosure with two swing gates for safe emergency egress.

Figure 13: Existing Child Minding to be replaced

The adjacent locker room will be reduced in size to suit the new child-minding relocation, and therefore new lockers and benches will be provided in an arrangement that best suits the revised shape and flow of the room. The new demising partition with the new child-minding space may be comprised of metal studs with painted gypsum wallboard finishes. New translucent glazed aluminum door and frame will be provided to the men's space, similar to the new door at the relocated women's locker room.

Further to the addition of a universal washroom, the building entrance and reception lobby will benefit from the reconfiguration of partitioning in order to maintain monitored control over building entrance locations. Currently the view to the set of doors adjacent the south-west stairwell is impeded by a bank of vending machines and partition wall. It is here proposed to demolish the partition and relocate the vending machines across the corridor and adjacent the universal washroom. The coved ceiling from the pool grandstand floor structure above will limit the useable area at this niche, and therefore a new partition and door will be installed from the new vending area, to a new partial height enclosed storage room for staff use. In addition, a new glazed partition and door will be provided at each of the south-west and north-west stairwells at the reception desk level, allowing greater visual access to visitors accessing the second floor level above. The new partitions will additionally permit direct access to the exterior

from each stairwell, improving the code compliance of the building exit functions with the current British Columbia Building Code, and as such will require a fire resistance rating.

4.1.2 Structural

New mechanical and electrical systems will require seismic restraint provisions.

4.1.3 Mechanical

For the family change room and universal washroom upgrades, the additional mechanical work would essentially consist of:

- Connecting the new plumbing fixtures (showers, toilet, sink) to the existing 6" diameter sanitary service within the building which connects to the City Main at Quadra St.
- The domestic hot water recirculation system may need to be up-sized to accommodate the new fixture count, and domestic hot water (DHW) tank volume and recovery rate will need to be reviewed and likely increased (i.e., add another DHW tank in series). Domestic cold water system capacity will be reviewed in a similar manner.
- For the men's and women's change rooms re-locations, revisions to washroom fixtures will occur (toilets, urinals, etc.) to meet required occupant load compliant fixture counts. With layout changes, fixtures will be relocated as well as coring locations for plumbing pipe services through the slab.
- The existing HVAC system will require modifications to accommodate the changing uses of the family change room and the new location of the child minding room. The ducting system and hydronic reheat coils will need to be rerouted and resized from the NW and SW fan rooms. Fan and motor sizes will be reviewed for adequate size and capacity for the additional demand.
- For the relocated child minding room on the NW side of the building, a new packaged rooftop unit is proposed to provide healthful and comfortable conditions within the room during all seasons. The ductwork for the change room on this side of the facility would also require modification.
- The new sink and dishwasher in the child minding room would require connection to sanitary and DHW and DCW systems.
- For the new universal washroom, existing sanitary connections are shown on the original drawings in close proximity to the proposed lobby location. This may minimize the extent of demolition required for connection. Exhaust air, DCW, DHW connections to existing systems would also need to be provided.

4.1.4 Electrical

The existing facility's electrical utility service appears to have capacity capable of supporting the proposed scope of work. No changes to the service are anticipated. Please refer to Section 2.8.1.

Existing distribution panel boards servicing the existing offices, Women's Change Room and Men's Change Room areas will be replaced with new to service the proposed renovations. Existing circuits will be removed and new branch wiring, circuit breakers and wiring devices will be provided.

The proposed layout impacts the existing receptacle layout. As a result, all existing receptacles will be replaced with new receptacles. Receptacles will be commercial grade and will be complete with stainless cover plates. Receptacles will be CSA Type 15/20A 5-20R.

All branch circuit wiring will be replaced with new wiring and will be provided in conduit. The minimum conduit sizes will be 21 mm. Flexible armoured cabling (BX) shall not be used. Branch circuit wiring for power and lighting systems shall be insulated 98% conductivity copper conductor wiring enclosed in EMT (steel) conduit. The minimum size for branch circuit wiring will be #12 AWG and insulation to be 600 Volt RW90XLPE (X Link). Wiring for low voltage systems, including fire alarm, public address, security and other systems is all to be run in conduit. The wiring shall be PVC over-jacketed twisted pair for these low voltage systems.

Existing lighting within the office areas will be removed and replaced. New LED luminaires will be provided to match with those being provided as part of the Crystal Pool Life Cycle Renewal Project. Existing light levels will be verified by using a digital light meter during detailed design. New lighting levels will be designed in accordance with BC Guidelines for Pool Design (Version 2 June 2014) and IESNA Recommended Practice RP-6-01 "Sports and Recreational Area Lighting". All existing line-voltage switching within the renovated areas will be replaced with occupancy sensor switches for control.

Changes to the fire alarm system will be minimal as the entire facility's fire alarm system will be replaced as part of Crystal Pool Life Cycle Renewal Program. However, additional fire alarm devices will be added as required to suit the renovated space.

The existing Public Announce (PA) System devices within the renovated area will be modified to suit the new layout.

All electrical and mechanical equipment will be bonded to the source panel board as per CSA 22.1. The building grounding system is in place and does not appear to require alterations as part of this scope of work.

Refer to the electrical drawings for detailed scope of work.

4.2 FITNESS FACILITY BUILDING ADDITION AND RECONFIGURATION

4.2.1 Architectural

A consolidated and updated fitness facility is desired by the City of Victoria, and will be accommodated by an addition to the Crystal Pool building as well as a reconfiguration of the

existing level 2 floor layout. The existing fitness facility is comprised of a series of exercise equipment that ring the pool at the level 2 mezzanine. The machines and occupants share the same environment as the pool, unsuitable for the durability of machinery and comfort of users. The intent of the new facility will be to congregate the fitness program functions in one general area, and to environmentally partition that function from the remainder of the building.

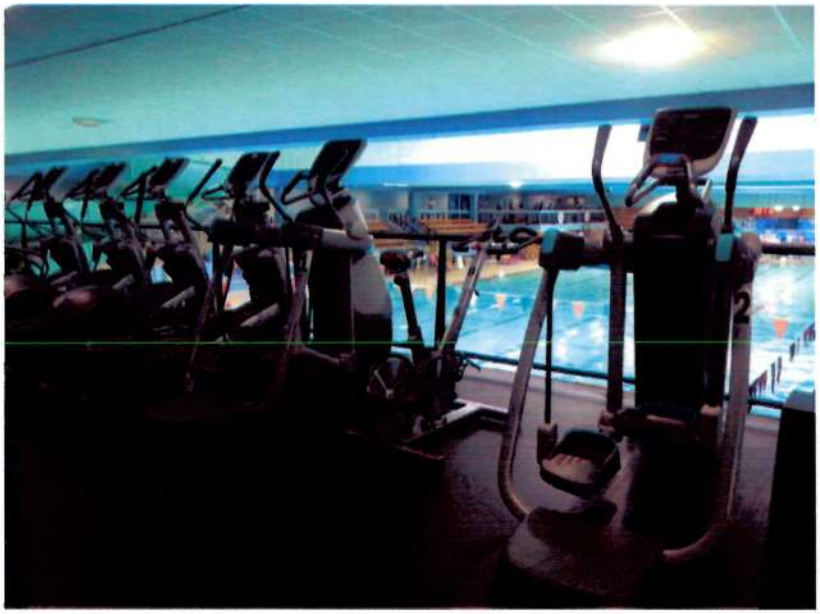

Figure 14: Existing work-out equipment open to pool environment

A level 2 building addition will be provided to the south of the existing building that will include male and female change-rooms, enclosed fitness and storage rooms, and an open weight training room. The addition will be seismically separated from the remainder of the building in order to meet the current requirements of the British Columbia Building Code. The addition will employ a new brick façade compatible with the existing facility exterior, thermally protected with rigid insulation outboard of sheathing, metal stud framing, and painted gypsum wall board interior finishing. Abundant insulated glazing within sections of aluminum curtain wall system will face the park to the south will provide substantial views and natural light to the fitness spaces. An insulated structural metal roof deck will be provided, with a new SBS roof membrane system. A new solar energy system will be located to augment the building power system. The addition will include 2 new storage rooms to support Parks, Recreation & Culture staff and programs. As well, a new corridor and exit door set will be provided to the exterior from the pool deck.

The level 2 fitness area will entail a reconfiguration of the existing corridor and replacement of existing grandstand seating with new level 2 floor area to accommodate an open Cardio layout. A new concrete stair and landing will provide access between the Cardio space and the pool deck below. The resultant consolidated floor area will provide an open, pleasant, and functionally as well as aesthetically updated exercise and fitness facility. The fitness rooms

partitions will be solid up to a height of 2135mm in order to accommodate full room width mirrors, but will allow continuous interior transom glazing above. Natural light will penetrate into the full width of the level 2 fitness corridor and Cardio areas. In turn the demising partition between the level 2 fitness area and the pool below will be comprised of full length tempered frameless glazing, completing a sense of transparency not only through the fitness addition, but through to and from the pool interior as well.

Figure 15: Area for possible level 2 expansion at south elevation

The level 2 fitness reconfiguration will include new enclosure for the existing Cardio function at the open west end exercise mezzanine. Adjacent to this space will be developed two private staff offices, fronting an open corridor to the new south fitness addition space. As per the south fitness area, the west Cardio and office demising partitions with the pool will be linked with a continuous ribbon of full height tempered glazing. Ceilings in each of the west and south portions of the fitness area will be comprised of an arrangement of painted gypsum wall board bulkheads, open painted steel roof deck, and suspended acoustic tile ceiling systems.

A service reception/help desk will be provided at the hub of the west and south fitness areas, which will serve as a secure monitoring station for the new change-rooms located in the building addition's level 2 south-west corner. The men's and women's locker rooms will be accessed by solid wood doors with translucent glazing, mounted in aluminum frames. Each room will be finished with painted gypsum wall board, with ceramic tile at the vanities, toilets, and urinals. As per the level 1 locker room areas, the level 2 change-rooms will be equipped with phenolic lockers and integral benches. New benches will either be solid wood or phenolic. Toilet partitions will be phenolic with stainless steel fittings. The new vanity will be plastic laminate with a solid

surface edge trim. Two new prefabricated shower units will be installed each complete with a shelf and hooks. Partitions adjacent the shower units will as well be finished with tile. An epoxy floor finish will be provided with a coved base and trim detail, and ceilings will be finished with painted suspended gypsum wall board.

Lastly, the existing open mezzanine at the building north-east corner will be redeveloped into two enclosed private staff offices, complete with gypsum wall board partitioning, glazed aluminum doors and frames, door sidelights, and as per the fitness area, tempered glazing for the full width of each office overlooking the pool below. Between the new offices will be installed a new tempered glass guard system to replace the existing guard assembly. Offices will receive a new suspended acoustic tile ceiling.

4.2.2 Structural

4.2.2.1 LEVEL 1 FOUNDATIONS

Proposed foundations for the building addition will be dependent on the findings of the existing soils conditions observed and recommendations provided by a geotechnical engineer. Existing foundations shall be tied together with the new addition foundation system to eliminate differential settlement.

New steel columns which support the second floor and upper roof adjacent to the existing building will be offset by 100 mm to provide a seismic separation joint between the existing structure and new building addition.

Interior non-bearing metal stud partition walls will provide typical dividing wall separations between adjoining rooms at each floor level as noted on new wall partition layouts shown within the architectural drawings.

Metal stud infill framing provides the exterior cladding between supporting steel column grid lines to resist exterior wind loads and designed in accordance to BCBC 2012 at each floor level.

4.2.2.2 LEVEL 2 FLOOR FRAMING

A 100 mm thick reinforced concrete topping with metal decking provides the composite floor configuration, supported by intermediate steel beams and perimeter steel support beams and columns. The floor live load is rated for a minimum design load of 4.8kPa (100 psf), and the floor design will need to accommodate vibration effects for the intended gymnasium occupancy use.

In addition, floor areas anticipated to have heavy equipment may need to be evaluated during the final design phase.

4.2.2.3 ROOF FRAMING

The new roof structure has been designed in accordance to BCBC 2012 snow load requirements, and will accommodate any snow drift from the existing building, including mechanical/electrical roof top equipment and roof mounted solar panels.

The roof system comprises of metal roof decking over pre-engineered and fabricated open web steel joists, bearing on perimeter steel beams, connected to intermediate and corner support columns.

4.2.2.4 RESISTANCE TO SEISMIC AND WIND LOADS

Conventional steel braced frames on the main and second floor level provide the seismic force resisting system for the building addition to resist present code demand seismic forces and are designed for Site Class C per the geotechnical report which is included within the seismic upgrade assessment report.

Steel bracing is located within partition walls as noted on the structural drawings in order not to affect the functionality of the open space. The steel framed building addition is an economical and efficient system which provides lower steel fabrication costs due to simpler connections at beam to column locations, including lateral bracing details. The result of the building frame simplicity is a reduced construction time to erect the structural framing envelope which will reduce the overall construction budget.

The existing building's lateral capacity shall not be affected by the addition due to the provision of a new seismic separation joint. The separation between the buildings will prevent the structures from pounding against each other in a seismic event that could cause significant damage to each building.

4.2.3 Mechanical

With the additional fitness, change room and storage area footprint, new significant opportunities open up for energy reduction and energy recovery. With the new roof over the fitness area, which will be designed to meet current requirements for seismic and structural capacity, additional roof top units and areas to house efficient mechanical equipment are possible. With the fitness facility being located on the south side of the building, the fitness studios and gym will be cooling dominant (heat removal) during the day for a good portion of the year. This "heat removal" be transferred to the pool under close to ideal temperature conditions (high COP). As well, with the ability to provide simultaneous heating and cooling equipment on this option (e.g., Heat recovery chiller or heat pump), additional heat can be recovered from the natatorium exhaust stream (latent heat of vapourization); and also dehumidification can occur in the return air stream (recovering more latent and sensible heat energy); which in turn reduces the need to use tempered outdoor air to dehumidify the natatorium. It is like a triple bonus,

which will reduce the demand on Fortis gas for the boiler plant significantly and bring the current very high (poor) building energy performance index (BEPI) down.

This upgrade would have, by far, the greatest impact on energy use (reduction of gas consumption and GHG output) in this facility. Cost savings on the $250,000 worth of gas and electricity spent annually on heating and ventilation will be demonstrable on the City's Energy Monitoring System.

For the fitness facility building addition upgrades option, the additional mechanical work would essentially consist of:

- Potentially upgrading and re-sizing the boiler plant. Efficiencies could be achieved by providing fully modulating and condensing boiler units. With a high turn down ratio of 10:1 or better, boilers could operate at low fire for most of the heating season. Average efficiencies of approximately 91% could be achieved with condensing units and with a high turn down ratio, heat won't be simply sent up the boiler stack under minimal load.

- With a condensing boiler installation, the exhaust stack would have to be replaced.

- For the HVAC systems, the current cardio AHU would be demolished. The new 2nd floor washrooms/shower rooms would be supplied from the existing SW fan room by newly sized equipment (which needs to be replaced anyway). The new fitness areas will be supplied with conditioned air from three new roof top AHU's that will be connected to the simultaneous heating and cooling chiller / heat pump. This system, along with heat recovery from the 4 main fan rooms, could provide recovered heat for pool heating, as well as outdoor air pre-heating for the natatorium, heat for the change rooms and DHW pre-heat if there is extra capacity available. With the moist warm exhaust air from the natatorium, heat rejection from the cooling dominant south facing fitness area, and the available COP and ideal temperatures of the pool water, a significant reduction in gas consumption is expected. This is a somewhat ideal situation where the facility has several heat sources and several demand points. The strategy is to utilize/transfer all the heat within the facility first to achieve set points, before going to the gas source as a last resort.

- The new 2nd floor washroom fixtures (showers, toilets, sinks) will be connected to the existing 6" diameter sanitary line which leads out to the city main on Quadra Street. The DHW re-circulation system would likely need to be increased in capacity/size to serve the additional fixture units. The DCW system would also need to be reviewed and likely up-sized.

- The new fitness areas will be fully sprinklered to light hazard design density per the NFPA 13 standard. A fire rated glazing system will likely be needed at the glass between the natatorium and the fitness area on both sides of the glass to maintain the required floor fire rating.

- A solar hot water system is suggested by the energy report and is recommended as part of this scope. It is proposed to offset a portion of the pool or domestic hot water heating demand from natural gas.

4.2.4 Electrical

The existing facility's electrical utility service is capable of supporting the proposed scope of work. No changes to the service are anticipated.

New distribution panel boards will be provided to service the new fitness facility building addition. Existing branch wiring, circuits and devices servicing the existing fitness room will be removed. New branch wiring, circuit breakers and wiring devices will be provided. A new receptacle layout will be required to suit the modifications. Receptacles will be commercial grade and will be complete with stainless cover plates. Receptacles will be CSA Type 15/20A 5-20R. All new branch circuit wiring will be provided in conduit. The minimum conduit sizes will be 21 mm. Flexible armoured cabling (BX) shall not be used. Branch circuit wiring for power and lighting systems shall be insulated 98% conductivity copper conductor wiring enclosed in EMT (steel) conduit. The minimum size for branch circuit wiring will be #12 AWG and insulation to be 600 Volt RW90XLPE (X Link). Wiring for low voltage systems, including fire alarm, public address, security and other systems is all to be run in conduit. The wiring shall be PVC over-jacketed twisted pair for these low voltage systems.

Existing lighting within the existing fitness room and corridor will be removed and replaced. New LED luminaires will be provided to match with those being provided as part of the Crystal Pool Life Cycle Renewal Project. New lighting levels will be designed in accordance with BC Guidelines for Pool Design (Version 2 June 2014) and IESNA Recommended Practice RP-6-01 "Sports and Recreational Area Lighting". All existing line-voltage switching within the renovated areas will be replaced with occupancy sensor switches for control.

Changes to the fire alarm system will be minimal as the entire facility's fire alarm system will be replaced as part of Crystal Pool Life Cycle Renewal Program. However, additional fire alarm devices will added as required to suit the renovated space.

The existing Public Announce (PA) System devices will be extended into the new fitness facility building addition.

All electrical and mechanical equipment will be bonded to the source panel board as per CSA 22.1. The building grounding system is in place and does not appear to require alterations as part of this scope of work.

5.0 OPTION 4: NEW FACILITY

A replacement option is presented to provide a comprehensive range for comparison. The replacement value for the facility is an order of magnitude estimate, falling within a cost range depending on the size of the primary pool, additional pool components and the size and scope of the fitness elements and land-related costs. Current examples of 50-metre (current) and 25-metre primary pools include:

- UBC Aquatic Centre, $38.5M
  Scheduled to open Summer 2015
  Notes: 50-metre competition pool, 25-metre recreation pool, leisure pool, hot tub, wet classroom, multi-purpose spaces and meeting rooms. LEED Gold.
- Iqaluit, Nunavut, $34M
  Scheduled to open 2016
  Notes: 6-lane 25-metre pool, leisure pool, whirlpool, sauna, fitness centre, waterslide.
- Edmonds Community Centre, Burnaby, BC, $32M
  Opened 2013
  Notes: 6-lane 25-metre pool, leisure pool with lazy river and beach entry, water toys, waterslide, 12,000SF twin gymnasiums, fitness centre, community kitchen, multi-purpose rooms, seniors lounge, youth room, preschool play centre with indoor playground. Targeted LEED Silver.