

DATE: November 29, 2019

FILE: -8020-02

TO: Chair and Members
Comox Valley Sports Centre Commission

Supported by Russell Dyson
Chief Administrative Officer

FROM: Russell Dyson
Chief Administrative Officer

R. Dyson

RE: Recreation Facilities Condition Assessments and Lifecycle Report

Purpose

To provide the Comox Valley Sports Centre Commission (CVSCC) with information regarding the 2019 recreation facilities condition assessments and lifecycle initiative.

Recommendation from the Chief Administrative Officer:

This report is for information only

Executive Summary

This presentation is to provide information regarding the 2019 recreation facilities condition assessments and lifecycle initiative provided by the Comox Valley Regional District (CVRD) Recreation Services. The need for a recreation facilities condition assessments and lifecycle report was identified as a priority in the 2018-2022 financial plan.

Highlights include:

- Strategic Goal 1 of the CVSCC is to utilize the Asset Management process to develop the long-term plan for recreation infrastructure and sustainable service delivery.
- The final results of this report will support the CVRD's future decision making of facility capital requirements, from building systems to individual components.
- An increase in the annual requisition may need to be considered in future years in order to address recommendations and priorities coming out of the report.
- The facilities are within their first expenditure spike, due to assets requiring replacements from reaching end of service lives.
- The investment required to maintain the acceptable condition state of the two recreation facilities is approximately \$475,000 per year, on average, or a total of \$9.5 million, over the period of 2019 – 2028.
- The Recreation Service is working in collaboration with all CVRD services to implement a comprehensive Asset Management program. This work is ongoing

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Background/Current Situation

The need for a recreation facilities condition assessments and lifecycle report was identified as a priority in the 2018-2022 financial plan. Costs were allocated within the proposed 2019 budget line item operating expenditures associated with the recreation facilities condition assessments and lifecycle to provide for safety and improvements to assist maximizing asset life expectancy.

At the March 5, 2019 planning session the CVSCC identified Asset Management – focusing on using the Asset Management process to develop the long-term plan for recreation infrastructure and sustainable service delivery, as one of five strategic priorities for the CVRD recreation department.

An asset management plan review for the CVRD Sports and Aquatic Centre facilities has taken place in May 2019. Staff have received the final report at attached Appendix A.

The scope of work included:

1. A facility condition assessment including architectural, materials, structural, building envelope, mechanical, electrical and fire / life safety systems for two facilities.
2. A review of each facility for, interior components and regulatory compliance in addition to age, present value and a general opinion on condition.
3. A building and component life-cycle cost analysis.
4. Recommended best practices, strategies and systems to employ the information provided in the report in ongoing operational manner (i.e. a preventive maintenance activities).
5. Estimated date when the entire facility or major portions thereof would need replacement including associated construction costs

The objectives of this report are to assist in the CVRD's future financial and operational plans for the maintenance, upgrade, repair and replacement of building components and to identify strategies to extend the life of building assets. In order to support the condition assessments, the contractor also engaged with CVRD staff to discuss deficiencies, particularly with respect to current building standards and operational needs.

The final results of this report will support the CVRD's future decision making of facility capital requirements, from building systems to individual components, based on observed condition performances and individual assets' remaining service lives. This knowledge will inform the application of risk management principles in delineating where capital investment is needed most and shifting investment from a reactive to a proactive strategy. Investment alternatives can be compared at various funding levels to further define the amount of acceptable risk in the CVRD's facility infrastructure portfolio

An increase in the annual requisition may need to be considered in future years in order to address recommendations and priorities coming out of the report

Policy Analysis

Bylaw No. 2410, being the "Bylaw to Establish the Comox Valley Recreation Complexes Service" was adopted to establish a service for the purpose of constructing, equipping, enlarging, operating and maintaining ice arena-swimming pool complexes and to contribute towards the cost of existing community use facilities and structures in the service area. Participants in the service include the City of Courtenay, Town of Comox, Village of Cumberland and the residents of Electoral Areas A, B and C.

Options

This report is presented for information only

Financial Factors

The investment required to maintain the acceptable condition state of the two recreation facilities is approximately \$475,000 per year, on average, or a total of \$9.5 million, over the period of 2019 – 2028.

An average annual spending of \$257,000 or a total of \$5.15 million is anticipated for pure asset replacement over the next twenty years. The expenditure profile is generally consistent.

The facilities are within their first expenditure spike, due to assets requiring replacements from reaching end of service lives. The next expenditure spike is forecasted to occur in 2034 and is the largest single year spending in the next twenty years, of which the largest types are Foundations, Exterior Enclosure, Plumbing and HVAC.

The majority of deficiencies listed in the report have already been completed through the 2019 budget for function 645 service.

Given the current status of the CVRD's facility asset management efforts as well as the findings from this 2019 assessment. The primary recommendation is a 20-year reinvestment of approximately \$475,000 per year, on average.

The way forward will be dependent on each respective facility's functionality and capability to support services in their current design, location and condition state and ultimately, the risk posed to the CVRD if we choose not to invest as indicated through this condition assessment.

The life expectancy of a pool facility can be anywhere between 30-60 years and will be dependent on a number of things such as quality of the building envelope, type of filtration systems in place, how well it has been maintained over time and if an active asset management plan is in place. Costs for replacing such a facility will vary depending on the size and features.

Some recent examples:

- UBC (Pool Facility with a 1.3 million gallon water holding tank to replenish evaporating water) 80,000 square feet – 39 million.
- Richmond – Minoru Centre for Active Living (pool/fitness facilities) – 110,000 square feet 80 million.
- POCO recreation complex (three ice sheets and leisure pool) – 205,000 square feet – 132 million

The requisition and financial plan for this service currently remains stable over the next five years. Staff are forecasting that asset management work may be restricted nearing the year 2025 therefore it is recommended that the maximum requisition be increased at that time.

The current \$4,520,250 requisition will continue to assist in funding contributions to the reserve funds. The maximum requisition for this service is \$11,977,147.

Legal Factors

There are no legal concerns generated by this report

Regional Growth Strategy Implications

- i. Infrastructure: Provide affordable, effective and efficient infrastructure that conserves land, water and energy resourced:
 - Objective 5-A: Promote water conservation and efficiency throughout the Comox Valley.
- ii. Public health and safety: Support a high quality of life through the protection and enhancement of community health, safety and well-being:
 - Objective 7A-5: Support the promotion of healthy lifestyles and invigorating community spirit through physical activity.
- iii. Climate change: Minimize regional greenhouse gas (GHG) emissions and plan for adaptation:
 - Objective 8-A: Reduce GHG emissions created by the building sector.
 - Objective 8A-5: Local governments should develop GHG reduction strategies for the operations, maintenance and construction of their buildings in the Comox Valley.

Intergovernmental Factors

Participants in the service include the City of Courtenay, Town of Comox, Village of Cumberland and the residents of Electoral Areas A, B and C.

Interdepartmental Involvement

Although the recreation department has taken the lead on this initiative, the finance department provides input and will continue to do so as implementation of the recreation facilities condition assessments and lifecycle plan occurs.

Citizen/Public Relations

The public will be notified of any impacts to future tax requisitions, facility conditions, operations, schedules, fees and charges through a communications plan that involves stakeholder input and notification to the general public.

Attachments: Appendix A – “Recreation Facility Condition Assessment and Life Cycle Report”



Recreation Facility Condition Assessments and Life Cycle Report

Comox Valley Regional District

Project number: 60565872

November 18, 2019

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Quality information

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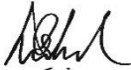

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	September 20, 2019	Draft Report		Chris Lombard	Project Manager
1	November 18, 2019	Final Report		Chris Lombard	Project Manager

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1. Executive Summary

AECOM Canada Ltd. (“AECOM”) prepared this report for the Comox Valley Regional District (“CVRD”) for the Facility Condition Assessment & Life Cycle Report. The project included a facility condition assessment (FCA) including architectural, structural, mechanical, electrical and fire / life safety systems for two facilities, as summarised in [Table E-1](#):

Table E-1 Facilities Assessed

Facility Name	Address	Year of Construction	Area (m ²)	Date of Assessment
Sports Centre	3001 Vanier Drive, Courtenay, BC V8N 5Y2	1973	8,616	May 7-8, 22
Aquatic Centre	377 Lerwick Road, Courtenay, BC V9N 9G4	1998	4,030	May 8-9, 23
TOTAL			12,646	

AECOM collected condition data through visual inspection of these facilities and recorded the condition and asset inventory data, as well as asset photographs using handheld tablet computers equipped with the Fulcrum application. Following the site inspection, the collected data underwent a rigorous quality assurance and quality control (QA/QC) process, after which it was uploaded into a cost estimating database tool. This tool, RSMeans, was used to generate project-related outputs such as the facility deficiency costs and life cycle cost reports, as well as to develop the 20-year work plan.

[Table E-2](#) summarizes results by facility, including:

- Facility Condition, condition rates from good to critical based on the aggregate condition of assets assessed in field;
- Replacement Value, the sum of building component replacement costs;
- Present Value, the sum of replacement value, contractor fees (25%), and architectural fees (7%);
- 20-Year Work Plan, the sum of all potential treatment during the period, comprising preventive maintenance, maintenance & repair, and replacement costs.

Table E-2 Key Attributes of Facilities

Facility Name	Facility Condition	Replacement Value	Present Value (Replacement Value + Contractor Fees + Architectural Fees)	Average Annual Replacement Cost	20-Year Work Plan Total Cost
Sports Centre	Fair	\$20,195,000	\$26,658,000	\$197,000	\$7,244,000
Aquatic Centre	Good	\$9,957,000	\$13,143,000	\$60,000	\$2,251,000
TOTAL		\$30,152,000	\$39,801,000	\$257,000	\$9,495,000

Facility condition index (FCI) is an industry standard asset management tool used to provide a benchmark to compare the relative conditions of facility systems. [Table E-3](#) shows the FCI scale. Please refer to [Section 4.4](#) for a detailed explanation of FCI and its rating scale. [Table E-4](#) shows that most subsystems of the two facilities are in good condition, with some notable exceptions in B30 Roofing, C10 Interior Construction, D20 Plumbing, and D30 HVAC, where the conditions are poor to critical. Please refer to [Section 5.3](#) for a detailed breakdown of backlogged replacements in these four subsystems. Overall, the facilities are generally in an acceptable state of repair, with FCI scores of 7% (“Fair”) and 4% (“Good”) for the Sports Centre and Aquatic Centre, respectively, as shown in [Table E-4](#).

Table E-3 Facility Condition Index Scale

FCI	FCI Description
0% - 5%	GOOD
5% - 10%	FAIR
10% - 30%	POOR
30% - 100%	CRITICAL

Table E-4 FCI Score Breakdown for Each Facility ("ND" = No Data*)

Facility Name	FCI	A10 Foundation	A20 Basement Construction	B10 Superstructure	B20 Exterior Enclosure	B30 Roofing	C10 Interior Construction	C20 Stairs	C30 Interior Finishes	D10 Conveying	D20 Plumbing	D30 HVAC	D40 Fire Protection	D50 Electrical	E10 Equipment	F10 Special Construction	G20 Site Improvements
Sports Centre	7%	0%	0%	0%	5%	39%	14%	0%	2%	0%	20%	55%	0%	3%	0%	0%	0%
Aquatic Centre	4%	0%	0%	0%	1%	15%	21%	0%	1%	ND	35%	15%	ND	1%	0%	0%	0%

AECOM recommends that the CVRD maintains an average spending budget of \$475k per year as this will maintain these two facilities in the condition state of "Fair" over the next 20 years, thereby continuing the high level of service that the CVRD's residents and visitors have become accustomed to. The 20-year work plan by activity (preventive, M&R and replacement, as defined below) is presented in [Figure E-1](#).

- **Preventive Maintenance** represent known costs that occur at planned intervals. An example of preventive maintenance is replacing the filters in an air handling unit every six months to prevent failures of the air handling unit.
- **Maintenance & Repair (M&R)** are based on a best estimate of maintenance due to component use and age and are used for budgeting for unscheduled activities. An example of M&R is the replacement of a circuit breaker in a control panel to repair a panel failure.
- **Replacement** include money set aside for replacement of large components as they reach the end of their useful lives. An example of replacement is replacing a water heater system due to age.

In addition, the work plan by element is presented in [Figure E-2](#). With the average annual expenditure of \$475k per year, the total 20-year requirement is estimated at \$9.5M. Please refer to [Section 6.1](#) for portfolio level views of the 20-year work plans and to [Appendix A](#) for detailed work plans for individual facilities.

Portfolio View - 20 Year Work Plan by Activity

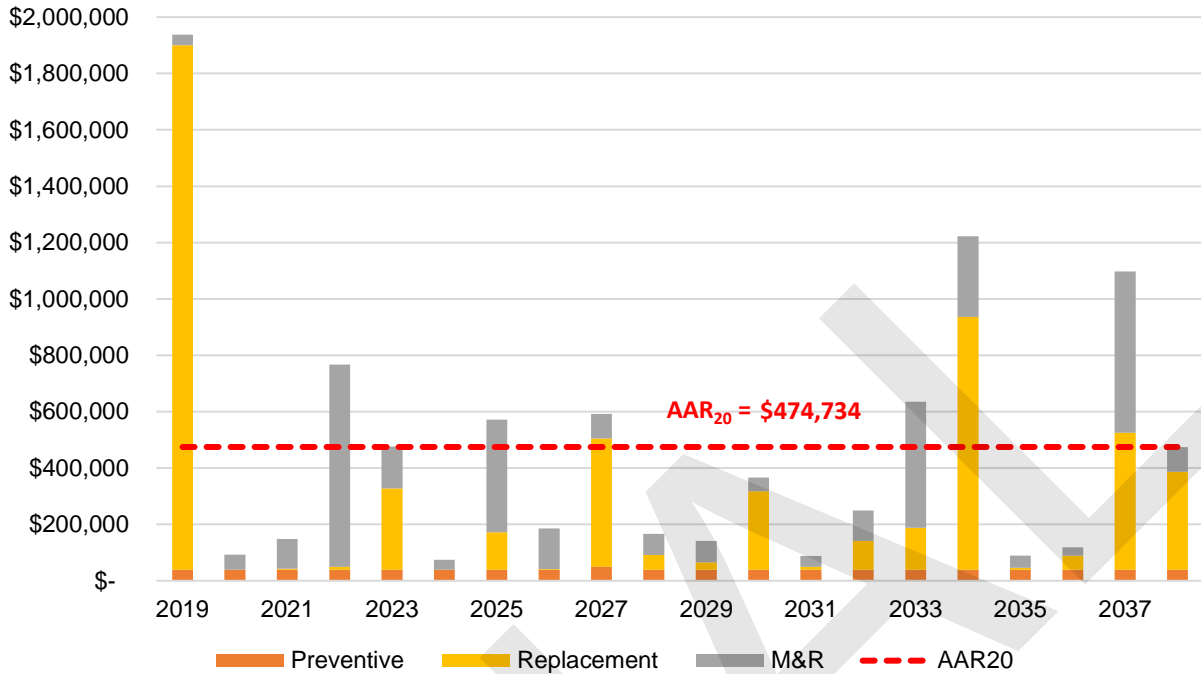


Figure E-1 Portfolio View – 20 Year Work Plan by Activity

Portfolio View - 20 Year Work Plan by Element

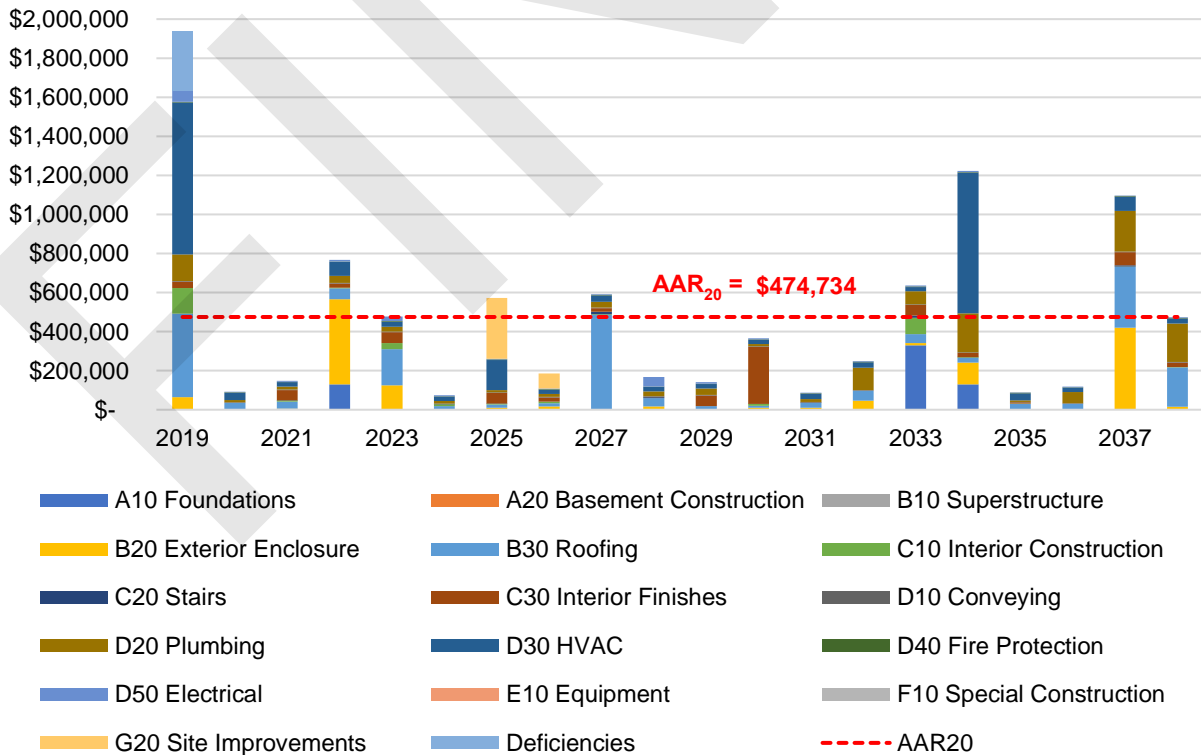


Figure E-2 Portfolio View – 20 Year Work Plan by Element

Table E-5 summarizes the notable deficiencies identified during the facility condition assessment, as follows:

Table E-5 Asset Deficiencies

Facility Name	System & Subsystem	Description of Deficiency	Corrective Action	Estimated Cost
Aquatic Centre	B1020 Roof Construction	Moss build-up, congested gutters, membrane bubbling	Maintenance & Repair	\$5,200
	B2010 Exterior Walls	Cracking of exterior wall finish	Repair	\$4,300
	B2030 Exterior Doors	Rusted door units (4), missing handles (2), loose door frames (2)	Replace	\$12,600
	C1020 Interior Doors	Broken shower partition doors (2), broken closet door, rusted locks (3)	Replace	\$4,700
	D2090 Other Plumbing Systems	Leaking valves (2), leaking gasket and flange (2) to strainer and ozone contact tank	Repair	\$1,500
	D3020 Heat Generating Systems	Leaking boiler	Repair	\$6,300
	D3040 Distribution Systems	Missing exhaust fan (removed due to failure)	Replace	\$900
	D5010 Electrical Service & Distribution	Unplugged UPS, MDC missing lock out, code violating bypass (see Appendix D for more details)	Repair & Inspect	\$6,000
	D5020 Lighting and Branch Wiring	Burned out recessed pot lights (6) and T8s (4), faulty cabyre cables	Replace	\$3,500
	G2020 Parking Lots	Cracks and holes in parking lot pavement	Repair	\$8,700
Sports Centre	B1010 Floor Construction	Slight deflection (3/4"-1") in Arena #1 rink floor	Repair	\$13,700
	B1020 Roof Construction	Moss built-up, bubbling and uneven surfaces	Maintenance & Repair	\$6,500
	B2010 Exterior Walls	Spray painted vandalism on exterior walls	Repair	\$8,100
	B2020 Exterior Windows	Cracked window viewing Arena #2	Replace	\$6,700
	C1020 Interior Doors	Broken door unit leading to Arena #2 staircase	Repair	\$1,500
	C3020 Floor Finishes	Bumps and uneven vinyl tile flooring	Replace	\$2,500
	C3030 Ceiling Finishes	Missing and broken ceiling tiles	Replace	\$1,900
	D2010 Plumbing Fixtures	Leaking flush valve in the change room	Repair	\$300
	D3040 Distribution Systems	Broken rooftop exhaust fan	Replace	\$700
	D3050 Terminal & Package Units	Exterior housing of the makeup air unit is chalking and corroded	Replace	\$3,100
D4010 Sprinklers	Sprinkler piping was noted as being thinner wall pipe and has developed	Replace	\$123,000	

Facility Name	System & Subsystem	Description of Deficiency	Corrective Action	Estimated Cost
		pin hole leaks throughout the system.		
	D5010 Electrical Service & Distribution	Broken panel, and lack of clearance	Repair	\$500
	D5020 Lighting and Branch Wiring	Unplugged and exposed remote heads and battery packs (2), recessed panel lights not outdoor rated (10), burned out T8s (5)	Repair & Replace	\$7,800
	E2010 Fixed Furnishings	Aged track & fields bleachers, heavily rusted diving board, stained tiling in the hot tub, skates damage benches in the changerooms (6)	Maintenance & Repair	\$52,000
	G2020 Parking Lots	Cracks and holes in parking lot pavement	Repair	\$13,000
	G2040 Site Development	Heavily rusted shot-put cage	Maintenance & Repair	\$6,400

Additional information is provided in the appendices and in MS Excel format as supplements to the findings in this report. Below is a list of all additional information provided:

- **Appendix A:** Facility cost and deficiencies summary report for the facilities, the summary includes building condition, replacement cost, annual servicing cost, observed deficiencies during visual inspection and 20-year expenditure profile.
- **Appendix B:** Facility life cycle cost reports for the facilities, the report includes the 20-year expenditure broken down by activity type (preventive, M&R and replacement) in both current (2019) and inflation indexed dollar values.
- **Appendix C:** Summary of the present value of building components for the facilities. The summary includes the present value of all building components broken down by UNIFORMAT codes. The present value represents the current value of the facilities in 2019 and is not indicative of the replacement costs of the facilities in the future. Please refer to **MS Excel – “CVRD-AECOM-Complete Building Life Cycle Costs.xlsx”** for a detailed breakdown of replacements costs and timings.
- **Appendix D:** Detailed breakdown and recommendations regarding the code violating bypass located in the Aquatic Centre Chlorine Room.
- **MS Excel – “CVRD-AECOM-Complete Building Life Cycle Costs.xlsx”**, this spreadsheet provides a comprehensive overview of all major costs and associated timing for each component of a facility for both facilities. It also includes specific preventive, M&R and replacement actions required and their associated timings and costs.
- **MS Excel – “CVRD-AECOM-Asset Inventory.xlsx”**, this spreadsheet represents the asset inventory compiled during visual inspection from May 7th to 9th and May 22nd to 23rd, 2019. The table includes condition scores for all facility assets and assigned asset IDs.
- **Asset Photos**, 1,761 photos of assets and deficiencies taken during the condition assessment, organized by assigned asset IDs found within the Asset Inventory.

2. Introduction

AECOM Canada Ltd. (AECOM) prepared this report for the Comox Valley Regional District (hereafter referred to as “CVRD”) for the Facility Condition Assessment & Life Cycle Report of 2019. The project comprised a facility condition assessment (FCA) including architectural, mechanical, electrical and fire / life safety systems for two of the CVRD’s recreation facilities, as summarised in **Table 1**.

Table 1 Facility Key Attributes

Facility Name	Address	Year of Construction	Area (m ²)	Date of Assessment
Sports Centre	3001 Vanier Drive, Courtenay, BC V8N 5Y2	1973	8,616	May 7-8 and May 22, 2019
Aquatic Centre	377 Lerwick Road, Courtenay, BC V9N 9G4	1998	4,030	May 8-9 and May 23, 2019

The objectives of this project were to assist in the CVRD’s future financial and operational plans for the maintenance, upgrade, repair and replacement of building components and to identify strategies to extend the life of building assets. In order to support the condition assessments, AECOM also engaged with CVRD staff to discuss deficiencies, particularly with respect to current building standards and operational needs.

The results of this project will support the CVRD’s future decision making of facility capital requirements, from building systems to individual components, based on observed condition performances and individual assets’ remaining service lives. This knowledge will inform the application of risk management principles in delineating where capital investment is needed most and shifting investment from a reactive to a proactive strategy. Investment alternatives can be compared at various funding levels to further define the amount of acceptable risk in the CVRD’s facility infrastructure portfolio.

3. Scope of Work

The project scope of work is summarized as follows:

1. A review of existing building condition assessments for two recreation facilities in the CVRD.
2. The identified facility elements were classified according to their UNIFORMAT II Level 2 classification:
 - A10 Foundation.
 - A20 Basement Construction.
 - B10 Superstructure.
 - B20 Exterior Enclosure.
 - B30 Roofing.
 - C10 Interior Construction.
 - C20 Stairs.
 - C30 Interior Finishes.
 - D10 Conveying.
 - D20 Plumbing.
 - D30 HVAC.
 - D40 Fire Protection.
 - D50 Electrical.
 - E10 Equipment.
 - F10 Special Construction.
 - G20 Site Improvements.

The building elements were defined in the UNIFORMAT II Elemental Classification for Building Specifications, Cost Estimating and Cost Analysis - 1999. The assessments were based on visual inspections performed from May 7th to 9th and May 22nd to 23rd, 2019.

3. A review of each facility for materials, structure, building envelop, mechanical & electrical systems, interior components and regulatory compliance in addition to age, present value and a general opinion on condition.
4. Meeting with staff to review anecdotal information from staff regarding areas of concern, prior knowledge of existing infrastructure and equipment, and known problematic issues.
5. A building and component life-cycle cost analysis.
6. Recommended best practices, strategies and systems to employ the information provided in the report in ongoing operational manner (i.e., a preventive maintenance activities).
7. Estimated date when the entire facility or major portions thereof would need replacement including associated construction costs.

4. Facility Condition Assessment Methodology

4.1 Classification of Building Elements

The field team that performed the facility condition assessment consisted of four inspectors that performed visual assessments of the accessible building systems within the facilities, on the exteriors and on the roofs. Inspectors collected field data using the Fulcrum app, where building systems and system components were organized in the Fulcrum dataset (see [Section 4.2](#)) according to the UNIFORMAT II classification ([Table 2](#)) governed by ASTM E1557-09. This ensured a standardized hierarchy and nomenclature for all component sections that could be tied to the RS Means unit costs (see [Section 4.6](#)).

Table 2 UNIFORMAT II Classification of Building Elements

LEVEL 1 MAJOR GROUP ELEMENTS	LEVEL 2 GROUP ELEMENTS	LEVEL 3 INDIVIDUAL ELEMENTS	
A SUBSTRUCTURE	A10 Foundations	A1010 Standard Foundations	
		A1020 Special Foundations	
		A1030 Slab on Grade	
	A20 Basement Construction	A2010 Basement Excavation	
		A2020 Basement Walls	
B SHELL	B10 Superstructure	B1010 Floor Construction	
		B1020 Roof Construction	
	B20 Exterior Enclosure	B2010 Exterior Walls	
		B2020 Exterior Windows	
		B2030 Exterior Doors	
	B30 Roofing	B3010 Roof Coverings	
		B3020 Roof Openings	
	C INTERIORS	C10 Interior Construction	C1010 Partitions
			C1020 Interior Doors
			C1030 Fittings
C20 Stairs		C2010 Stair Construction	
		C2020 Stair Finishes	
C30 Interior Finishes		C3010 Wall Finishes	
		C3020 Floor Finishes	
		C3030 Ceiling Finishes	
D SERVICES	D10 Conveying	D1010 Elevators & Lifts	
		D1020 Escalators & Moving Walks	
		D1090 Other Conveying Systems	
	D20 Plumbing	D2010 Plumbing Fixtures	
		D2020 Domestic Water Distribution	
		D2030 Sanitary Waste	
		D2040 Rain Water Drainage	
		D2090 Other Plumbing Systems	

**LEVEL 1
MAJOR GROUP ELEMENTS**

**LEVEL 2
GROUP ELEMENTS**

**LEVEL 3
INDIVIDUAL ELEMENTS**

	D30 HVAC	D3010 Energy Supply D3020 Heat Generating Systems D3030 Cooling Generating Systems D3040 Distribution Systems D3050 Terminal & Package Units D3060 Controls & Instrumentation D3070 Systems Testing & Balancing D3090 Other HVAC Systems & Equipment
	D40 Fire Protection	D4010 Sprinklers D4020 Standpipes D4030 Fire Protection Specialties D4090 Other Fire Protection Systems
	D50 Electrical	D5010 Electrical Service & Distribution D5020 Lighting and Branch Wiring D5030 Communications & Security D5090 Other Electrical Systems
E EQUIPMENT & FURNISHINGS	E10 Equipment	E1010 Commercial Equipment E1020 Institutional Equipment E1030 Vehicular Equipment E1090 Other Equipment
	E20 Furnishings	E2010 Fixed Furnishings E2020 Movable Furnishings
F SPECIAL CONSTRUCTION & DEMOLITION	F10 Special Construction	F1010 Special Structures F1020 Integrated Construction F1030 Special Construction Systems F1040 Special Facilities F1050 Special Controls and Instrumentation
	F20 Selective Building Demolition	F2010 Building Elements Demolition F2020 Hazardous Components Abatement
G SITEWORK	G10 Site Preparation	G1010 Site Clearing G1020 Site Demolition and Relocation G1030 Earthwork G1040 Hazardous Earth Remediation
	G20 Site Improvements	G2010 Roads G2020 Parking Lots G2030 Pedestrian Paving G2040 Site Development G2050 Landscaping

The visual assessments were non-destructive in nature and aimed to quantify the current condition of each component according to performance. The inspectors also incorporated knowledge of the building system histories from conversations with the facility staff and from other documentation provided by the CVRD. The assessment information generated by the inspectors were then inputted in the cost estimating database tool called RSMMeans to create model facilities. RSMMeans then calculate the life cycle cost of each component. These calculated life-cycle costs were then used to forecast future expenditures by activity type (preventive maintenance, repair or replacement), and by building component.

During the data collection, the group was divided into two two-person teams. The teams typically divided the assessment workload into disciplines, with two inspectors handling mechanical, electrical and plumbing, which included visible and accessible conveying, plumbing, HVAC, fire protection, and electrical components both inside the building and outside close to the building perimeter. Where visible, condition for piping and fittings were also collected. The other two inspectors were responsible for the structural and architectural elements which consisted of visible superstructure, exterior enclosure, stairs and interior construction including walls and finishes. Due to favourable weather conditions, visible roofing elements were within scope and collected during the assessment of the exterior enclosure, to the extent possible.

Digital photos of each component, along with any nameplate or distress photos where applicable, were taken and attached at the component section recorded in the Fulcrum inventory via handheld tablet computers. Hardcopy floorplans were also utilized in the field for orientation and notation purposes. Quality assurance and quality control (QA / QC) activities occurred both in the field and back in the office to ensure that components were correctly classified according to ASTM standards. Photos are particularly useful during QA / QC as they provide a visual check of observed distresses in the case of building systems, nameplate information, plumbing, conveying, and fire protection as well. Asset capacity, where applicable, is important for assigning cost while asset age works in conjunction with the current condition in predicting the future life-cycle curve.

4.2 Fulcrum App

Fulcrum is a mobile software application (see <https://www.fulcrumapp.com/>) that is used by AECOM for a variety of facility condition assessment (FCA) and asset inventory projects. FCA projects require field assessors to capture a multitude of data quickly, accurately, and consistently, often under strict schedule constraints. Fulcrum's streamlined customizable user interface, camera functionality and automated quality controls optimize the mass-data collection process, allowing field teams to cover larger areas more efficiently and capture data with increased accuracy. Building systems and system components were organized in the Fulcrum dataset according to the UNIFORMAT II classification (**Table 2**) governed by ASTM E1557-09, ensuring a standardized hierarchy. Inspectors collected crucial asset information such as location, asset type, asset description, quantity, year installed, manufacturer, model number, serial number, overall condition, and any noted deficiencies. Photos were also captured to note the relative location of the asset, asset overview and noted deficiencies. Please refer to **MS Excel – "CVRD-AECOM-Asset Inventory.xlsx"** for the detailed field-collected asset inventory.

4.3 Physical Condition Assessment Ratings

The field inspectors utilized a five-point rating scale which categorized the overall condition and functionality of identified facility assets. The scale ranked assets between "Excellent" and "Fail", with "Excellent" denoting assets that are new and in proper functioning order, while "Fail" denoted assets that have failed or were presenting a life safety concern. Please see **Table 3** for explanation of the condition assessment ratings.

Table 3 Physical Condition Assessment Ratings

Rating Criteria	Description
Excellent	Item is new and in full functioning condition.
Good	Item is in good working order and no work should be necessary.
Fair	Item is functional but may be outdated or have some minor deficiencies. Cleaning, patching, or other minor repairs may be required.
Poor	Item is only partially functional or is degraded substantially. Significant finish damage may be evident. This item should be planned for a major repair or replacement.
Fail	Item is non-functional and / or broken. The item should be planned for replacement.

4.4 Facility Condition Index (FCI)

The Facility Condition Index (FCI) serves as the basis of strategic facilities capital planning by ranking a facility’s need for capital investment. The true condition of a facility becomes clear with the gathering of accurate asset and facility data. The result is a benchmark to analyze the effect of investing in facility improvements. The FCI is the ratio of deferred maintenance and capital expenditure to the facility replacement value. The FCI values for the CVRD facilities were calculated using the following formula:

$$FCI = \text{Cost to Correct Identified Deficiencies} / \text{Current Facility Replacement Value (CRV)}^*$$

**Note: The CRV is based on RSMeans Square Foot Estimator values which were adjusted for location and specific building components. Additionally, the CRV is not intended to be a “replacement cost” for the existing building and thus does not include site costs, demolition or land acquisition. The CRV is developed to create a base line cost for FCI development only.*

The lower the FCI, the lower the need for remedial or renewal funding relative to the facilities value; for example, an FCI of 5% signifies a five percent deficiency rate, which is generally considered low. Whereas, an FCI of 70% would indicate that the facility has a seventy percent deficiency rate, which would indicate the building needs very extensive repairs or replacement. The table below shows how FCI values are categorized.

Table 4 Facility Condition Index Scale

FCI	FCI Description
0% - 5%	GOOD
5% - 10%	FAIR
10% - 30%	POOR
30% - 100%	CRITICAL

The respective facility FCIs were calculated using the data gathered during the facility condition assessments. Metrics such as the FCI provides the CVRD facilities team with the ability to compare similar buildings to each other, as well as to establish target condition ratings. Comparing buildings using the FCI metric also highlights the buildings that are in the greatest need for updates, repairs, or replacements. The FCI analysis provides the true cause and effect of investment decisions.

The FCI of each building formed the basis for the facility condition assessment, which is presented in [Appendix A](#).

4.5 Description of Current, Necessary and Recommended Spending

During the on-site inspections, field inspectors ranked the facility deficiencies into the following three categories:

- **Current & Potentially Critical:** The asset or system has completely degraded to the point of requiring full replacement to continue normal facility operation.
- **Necessary:** The asset or system has significantly degraded to the point where major repairs would be required to continue normal facility operation.
- **Recommended & Long Term:** The asset or system has minor degradation or is showing signs of normal wear and tear and will require routine maintenance to continue normal facility operation. Additionally, assets that have been identified as long-term also include equipment that is obsolete as a whole or has obsolete components or systems.

The rankings feed into the deficiency costs presented in the following section.

4.6 RSMeans Tools

RSMeans is an online database of up-to-date construction cost information adjusted to geographical and market conditions within the U.S and Canada. RSMeans is a division of Reed Business Information that provides cost information to the construction industry so contractors in the industry can provide accurate estimates and projections for their project costs. It has become a data standard for government work in terms of pricing and is widely used by the industry. RS Means is accessible online, and it also integrated in a variety of cost estimating software packages to allow for fast and reliable estimating. Cost information is updated annually and is available online, via CD-ROM, or in book form.

Once the on-site condition assessments were completed, the RSMeans Square Foot Estimator (see [Section 4.6.1](#)) and Life Cycle Cost Tool (see [Section 4.6.2](#)) were used to model and calculate the life cycle costs of each facility. The outputs were then exported from RSMeans to MS Excel to create a summary 20-year work plans on both the individual facility and the portfolio level. Please refer to [Appendix B](#) and [Appendix C](#) for outputs from the RSMeans tools.

4.6.1 RSMeans Square Foot Estimator

The RSMeans Square Foot Cost Estimator is a compilation of typical building types that utilize program-based mapping to link to assemblies within the RSMeans commercial new construction database. Each model uses standard building metrics to develop a complete inventory of building system that are 100% customizable, which allowed AECOM to create model buildings that mirrored the facilities inspected in the field. The program also allowed AECOM to set a geographical location which normalized the component costs to the region where the facility is located. Additionally, the square foot models created by AECOM were the base data that was required for the creation of a capital plan within the RSMeans Life Cycle Cost Tool.

The RSMeans Square Foot Cost Estimator calculated the replacement value of a facility, which refers to the true replacement cost of all systems and assets in the facility. It is important to know that the value is based on in-kind replacements and not based on potential upgrade options. This is different from the present value, which is the sum of replacement costs, contractor fees (25%) and architectural fees (7%). Replacement value was used for the life cycle cost analysis as it represented the true cost of replacing systems and assets within a given facility.

4.6.2 RSMeans Life Cycle Cost Tool

To make the most informed decisions regarding capital investments, and to justify ongoing facility budgets, the asset and system data collected in the field condition assessment process was compiled and entered into the RSMeans Square Foot Estimator. Using these model facilities, normalized to the

region, AECOM then loaded the data into the online RSMMeans Life Cycle Cost Tool which utilized direct mapping to assemblies and model-based construction data within RSMMeans extensive Facilities Maintenance and Repair Database. The flexibility of the program allowed AECOM to project out and develop the 20-year work plans on both the individual facility and the portfolio level.

Given that the models were set up with a specific location (Victoria, BC, used as proxy for the CVRD), the life cycle costs were specific to the location. The generated values from RSMMeans reflect an approximated cost associated with each activity (outlined in “[CVRD-AECOM-Complete Building Life Cycle Costs.xlsx](#)”), with all the associated costs in 2019 dollars.

The RSMMeans life cycle cost tool breaks down the annual cost into three categories of treatment activities, as described below:

- **Preventive Maintenance** represent known costs that occur at planned intervals. An example of preventive maintenance is replacing the filters in an air handling unit every six months to prevent failures of the air handling unit.
- **Maintenance & Repair (M&R)** are based on a best estimate of maintenance due to component use and age and are used for budgeting for unscheduled activities. An example of M&R is the replacement of a circuit breaker in a control panel to repair a panel failure.
- **Replacement** include money set aside for replacement of large components as they reach the end of their useful lives. An example of replacement is replacing a water heater system due to age.

4.7 Quality Control / Quality Assurance (QA / QC)

The project team employed the following QA / QC procedures to ensure accuracy and consistency of the facility data collected in the field:

- Field inspectors completed office and field preparation to identify all data requirements for the project.
- Two two-person teams were utilized to ensure safety and provide a first level of quality control for field data.
- The team had access to experienced subject matter experts to increase accuracy and cross-checking ability.
- Data passing field QA / QC was sent for peer review. Multiple analytical tools were used to identify data gaps, statistical anomalies, or potential inconsistencies.
- The final QA / QC step was a discipline lead data review to identify data trends and outliers that might require further analysis.

4.8 Digital Photos

Digital photos of each component, along with any nameplate or and distress photos, where applicable, were taken via handheld tablets. Photos are particularly useful during the QA / QC process as they provide a visual check of observed distresses, and in the case of facility system assets, provide a recording of nameplate information that is key to verifying the capacity and relative age of a piece of equipment. Asset capacity, where applicable, is important for assigning cost while asset age works in conjunction with the current condition in predicting the future life-cycle curve.

A set of digital photos was stored on Fulcrum’s cloud-based storage site. All the photographs were downloaded from the storage site and transferred to the CVRD. Digital photos can be found in the photos folder using an asset’s unique photo ID available in the asset inventory. The types of photo options included either of the asset, a general photo, its nameplate or a deficiency.

4.9 Best Management Practices

This section details some best asset management practices as they relate to facility assets. RSMeans' Square Foot Estimator and Life Cycle Cost Tool were used to model and calculate the life cycle costs of each facility assessed for this assignment. RSMeans is an online database of up-to-date construction cost information adjusted to geographical and market conditions within the U.S and Canada. The outputs from RSMeans were then exported to MS Excel to create a summary 20-year work plan. The file "**CVRD-AECOM-Complete Building Life Cycle Costs.xlsx**" provided together with this report is intended to serve as a best-practice guide on rehabilitation alternatives, as RSMeans provides best practice guidance on rehabilitation activities, costs and associated timings for all assets for the facilities surveyed. Please refer to **Section 4.6** for more information on RSMeans.

For a more general overview of asset management best practices and supporting guidelines on how to maximize asset expected life, please refer to the following documents:

- Asset Management BC (2015): Asset Management for Sustainable Service Delivery.
- International Organization for Standardization (2014): ISO 55000:2014 Asset Management - Overview, principles and terminology.
- Institute of Public Works (2014): Level of Service and Community Engagement: Practice Note 8. Sydney, Australia.
- International Organization for Standardization (2014): ISO 55001:2014 Asset Management - Management systems - Requirements.
- International Organization for Standardization (2014): ISO 55002:2014 Asset Management - Management systems - Guidelines for the application of ISO 55001.
- NAMS Group (2015): International Infrastructure Management Manual (IIMM). Wellington, NZ.

5. Facility Condition Assessment Summary Findings

5.1 Facility Condition and Deficiency Costs

The inspectors quantified the type and severity of each distress in the field, using the five-point rating scale described in [Section 4.3](#). Asset age and visual ratings were combined to form the condition index basis for each system component. All system components condition indices were aggregated to arrive at a condition index value for a building system. Likewise, the combination of each building system condition is used to determine an overall building condition. A summary of each facility’s deficiencies and overall building condition is presented in [Table 5](#). The total deficiency costs are the sum of currently and potentially critical, necessary, and recommended and long-term spending.

For more information on the specific deficiencies, as well as high level summaries of condition-related observations for the facilities, please refer to [Appendix A](#).

Table 5 Facility Deficiency Costs and Building Condition

Facility Name	Currently and Potentially Critical Spending	Necessary Spending	Recommended and Long-Term Spending	Total Backlog Deficiency Spending	Building Condition
Sports Centre	\$1,500	\$175,300	\$70,900	\$247,700	Fair
Aquatic Centre	\$8,700	\$40,300	\$4,700	\$53,700	Good
Total	\$10,200	\$215,600	\$75,600	\$301,400	

[Table 6](#) shows that most subsystems of the two facilities are in good condition, with some notable exceptions in B30 Roofing, C10 Interior Construction, D20 Plumbing, and D30 HVAC, where the conditions are poor to critical. Please refer to [Section 5.3](#) for a detailed breakdown of backlogged replacements in these four subsystems. Overall, the facilities are generally in an acceptable state of repair, with FCI scores of 7% (“Fair”) and 4% (“Good”) for the Sports Centre and Aquatic Centre, respectively, as shown in [Table 6](#).

Table 6 FCI Score Breakdown for Each Facility (“ND” = No Data*)

Facility Name	FCI	A10 Foundation	A20 Basement Construction	B10 Superstructure	B20 Exterior Enclosure	B30 Roofing	C10 Interior Construction	C20 Stairs	C30 Interior Finishes	D10 Conveying	D20 Plumbing	D30 HVAC	D40 Fire Protection	D50 Electrical	E10 Equipment	F10 Special Construction	G20 Site Improvements
Sports Centre	7%	0%	0%	0%	5%	39%	14%	0%	2%	0%	20%	55%	0%	3%	0%	0%	0%
Aquatic Centre	4%	0%	0%	0%	1%	15%	21%	0%	1%	ND	35%	15%	ND	1%	0%	0%	0%

5.2 Asset Deficiencies

The asset deficiencies identified on-site are presented in **Table 77**. The table includes facility name, system and subsystem where the issues are found, description of the issues and corresponding corrective actions.

Table 7 Asset Deficiencies

Facility Name	System & Subsystem	Description of Deficiency	Corrective Action
Aquatic Centre	B1020 Roof Construction	Moss built-up, congested gutters, membrane bubbling	Maintenance & Repair
	B2010 Exterior Walls	Cracking of exterior wall finish	Repair
	B2030 Exterior Doors	Rusted door units (4), missing handles (2), loose door frames (2)	Replace
	C1020 Interior Doors	Broken shower partition doors (2), broken closet door, rusted locks (3)	Replace
	D2090 Other Plumbing Systems	Leaking valves (2), leaking gasket and flange (2) to strainer and ozone contact tank	Repair
	D3020 Heat Generating Systems	Leaking boiler	Repair
	D3040 Distribution Systems	Missing exhaust fan (removed due to failure)	Replace
	D5010 Electrical Service & Distribution	Unplugged UPS, MDC missing lock out, code violating by-pass	Repair & Inspect
	D5020 Lighting and Branch Wiring	Burned out recessed pot lights (6) and T8s (4), faulty cabtyre cables	Replace
	G2020 Parking Lots	Cracks and holes in parking lot pavement	Repair
Sports Centre	B1010 Floor Construction	Slight deflection (3/4"-1") in Arena #1 rink floor	Repair
	B1020 Roof Construction	Moss built-up, bubbling and uneven surfaces	Maintenance & Repair
	B2010 Exterior Walls	Spray painted vandalism on exterior walls	Repair
	B2020 Exterior Windows	Cracked window viewing Arena #2	Replace
	C1020 Interior Doors	Broken door unit leading to Arena #2 staircase	Repair
	C3020 Floor Finishes	Bumps and uneven vinyl tile flooring	Replace
	C3030 Ceiling Finishes	Missing and broken ceiling tiles	Replace
	D2010 Plumbing Fixtures	Leaking flush valve in the change room	Repair
	D3040 Distribution Systems	Broken rooftop exhaust fan	Replace
	D3050 Terminal & Package Units	Exterior housing of the makeup air unit is chalking and corroded	Replace

Facility Name	System & Subsystem	Description of Deficiency	Corrective Action
	D4010 Sprinklers	Sprinkler piping was noted as being thinner wall pipe and has developed pin hole leaks throughout the system.	Replace
	D5010 Electrical Service & Distribution	Broken panel, and lack of clearance	Repair
	D5020 Lighting and Branch Wiring	Unplugged and exposed remote heads and battery packs (2), recessed panel lights not outdoor rated (10), burned out T8s (5)	Repair & Replace
	E2010 Fixed Furnishings	Aged track & fields bleachers, heavily rusted diving board, stained tiling in the hot tub, skates damage benches in the changerooms (6)	Maintenance & Repair
	G2020 Parking Lots	Cracks and holes in parking lot pavement	Repair
	G2040 Site Development	Heavily rusted shot-put cage	Maintenance & Repair

5.3 End of Service Life Replacements

There are a number of assets that have reached their end of expected service lives (ESL), presented in [Table 8](#). The table includes facility name, system and subsystem where the assets are found, description of the asset, year the asset was installed, the industry average ESL for the asset, and recommended corresponding actions. Systems with the greatest number of assets reaching end of ESL are B30 Roofing, C10 Interior Construction, D20 Plumbing, and D30 HVAC. Please refer to [MS Excel – “CVRD-AECOM-Complete Building Life Cycle Costs.xlsx”](#) for a detailed breakdown of all asset replacement costs and timings.

Table 8 End of Service Life Replacements

Facility Name	System & Subsystem	Description of Asset Reached End of ESL	Year Installed	ESL	Recommended Action
Aquatic Centre	B3010 Roof Coverings	Membrane replacement (~25% of roof area), modified bitum / thermoplastic	1998	20	Assess
	C1030 Fittings	Replacement of toilet partitions, painted metal-overhead braced, per stall	1998	20	Assess
	C1030 Fittings	Replacement of toilet partitions, laminate clad-overhead braced, per stall	1998	20	Assess
	C3020 Floor Finishes	Replacement of carpet, tufted, nylon	1998	8	Assess
	D3040 Distribution Systems	Replacement of central station A.H.U., 16,000 CFM	1998	15	Assess
	D5010 Electrical Service / Distribution	Replacement of switchgear, including switchboard, panels & circuit breakers	1998	10	Assess
	D5020 Lighting & Branch Wiring	Replacement of receptacle, plug receptacles and plugs	1998	20	Assess
	Sports Centre	B2030 Exterior Doors	Replacement of 3'-0" x 7'-0" steel, painted, doors	1973	45
B2030 Exterior Doors		Replacement of 12' x 12' steel roll-up doors	1973	35	Assess
B3010 Roofing Coverings		Replacement of BUR roof	1973	30	Replace
B3010 Roofing Coverings		Minor replacement of metal roof panel (~2.5% of roof area)	1973/1997	20	Replace/Assess
B3010 Roofing Coverings		Replacement of metal roof panel	1973	30	Replace
C1020 Interior Doors		Replacement of interior 3'-0" x 7'-0" hollow core wood doors	1973	30	Replace
C1030 Fittings		Replacement of toilet partitions, painted metal-overhead braced, per stall	1973	20	Assess
C1030 Fittings		Replacement of metal lockers	1973	20	Assess
C3020 Floor Finishes		Replacement of plywood flooring	1973	40	Assess

Facility Name	System & Subsystem	Description of Asset Reached End of ESL	Year Installed	ESL	Recommended Action
	D2010 Plumbing Fixtures	Replacement of wall-hung urinals	1973	35	Assess
	D2010 Plumbing Fixtures	Replacement of laundry sinks	1997	20	Replace
	D2010 Plumbing Fixtures	Replacement of drinking fountain	1993	10	Replace
	D3020 Heat Generating Systems	Replacement of boiler, gas, 2000 MBH	1988	30	Replace
	D3020 Heat Generating Systems	Replacement of pump / motor assembly for circulation pump, 3 HP	1997	20	Assess
	D3040 Distribution Systems	Replacement of central station A.H.U.s, 1900 CFM / 5400 CFM	1997	15	Assess
	D3040 Distribution Systems	Replacement of roof mounted exhaust fan, 800 CFM	1997	20	Assess
	D3050 Terminal & Packing Units	Replacement of fan coil of condensing unit	1997	20	Assess
	D3050 Terminal & Packing Units	Replacement of single zone rooftop unit, 10 ton / 15 ton	1991/1997	15	Replace
	D5020 Lighting & Branch Wiring	Replacement of receptacles, plug receptacles, and plugs	1973	20	Assess
	D5030 Communications & Security	Replacement of speakers	1997	20	Assess
	D5030 Communications & Security	Replacement of monitor panels, volume control, and amplifiers	1997	15	Assess

6. Key Findings

Based on the analysis within RS Means, the total replacement value for the facilities is \$30.2 M. The present value, which includes contractor fees and architectural fees, for all buildings is approximately \$39.8 M. **Table 9** provides a summary of these costs by facility as well as the 20-year work plan expenditure, including all three types of treatments defined in the previous section, preventive maintenance, maintenance & repair, and replacement.

Table 9 Facility Replacement Value, Present Value, Servicing Cost, and Work Plans

Facility Name	Replacement Value	Present Value (Replacement Value + Contractor Fees + Architectural Fees)	Average Annual Replacement Cost	20-Year Work Plan
Sports Centre	\$20,195,000	\$26,658,000	\$197,000	\$7,244,000
Aquatic Centre	\$9,957,000	\$13,143,000	\$60,000	\$2,251,000
	\$30,152,000	\$39,801,000	\$257,000	\$9,495,000

6.1 Portfolio Overview

Table 10 present the total 20 year expenditure profile by year, for both facilities assessed.

Table 10 Total 20-Year Portfolio Expenditure Overview

2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
\$1,937,560	\$92,890	\$147,970	\$766,990	\$476,550	\$74,110	\$571,540	\$186,260	\$592,230	\$166,790
2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
\$141,210	\$366,150	\$87,570	\$249,660	\$635,710	\$1,222,200	\$89,570	\$118,210	\$1,097,170	\$474,340

Figure 1 and **Figure 2** show the breakdown of these expenditure profiles by renewal activity (preventive, M&R and replacement), and building element. The average annual investment requirement from 2019 to 2038 is approximately \$475k or \$9.5 M over the next 20 years. Within the expenditure profile, the preventive maintenance is constant at around \$39k per year and there are three large annual expenditures in the years 2019, 2034 and 2037.

Figure 3 shows just the replacement of assets over the next 20 years. The average annual investment requirement is approximately \$258k or \$5.15 M over the next 20 years.

In 2019, all elements listed in **Table 8** are triggered for replacement due to reaching end of service lives, equalling a total of \$1.86 M in theoretical backlog replacements.

In 2034, all major plumbing and HVAC elements of the Sports Centre are anticipated for replacement, accounting for \$0.78 M of the total \$0.90 M replacement expenditure. In 2037, the concrete block (CMU) wall of the Sports Centre is anticipated for major maintenance, renovations and overhauls are anticipated for at \$0.41 M.

Portfolio View - 20 Year Work Plan by Activity

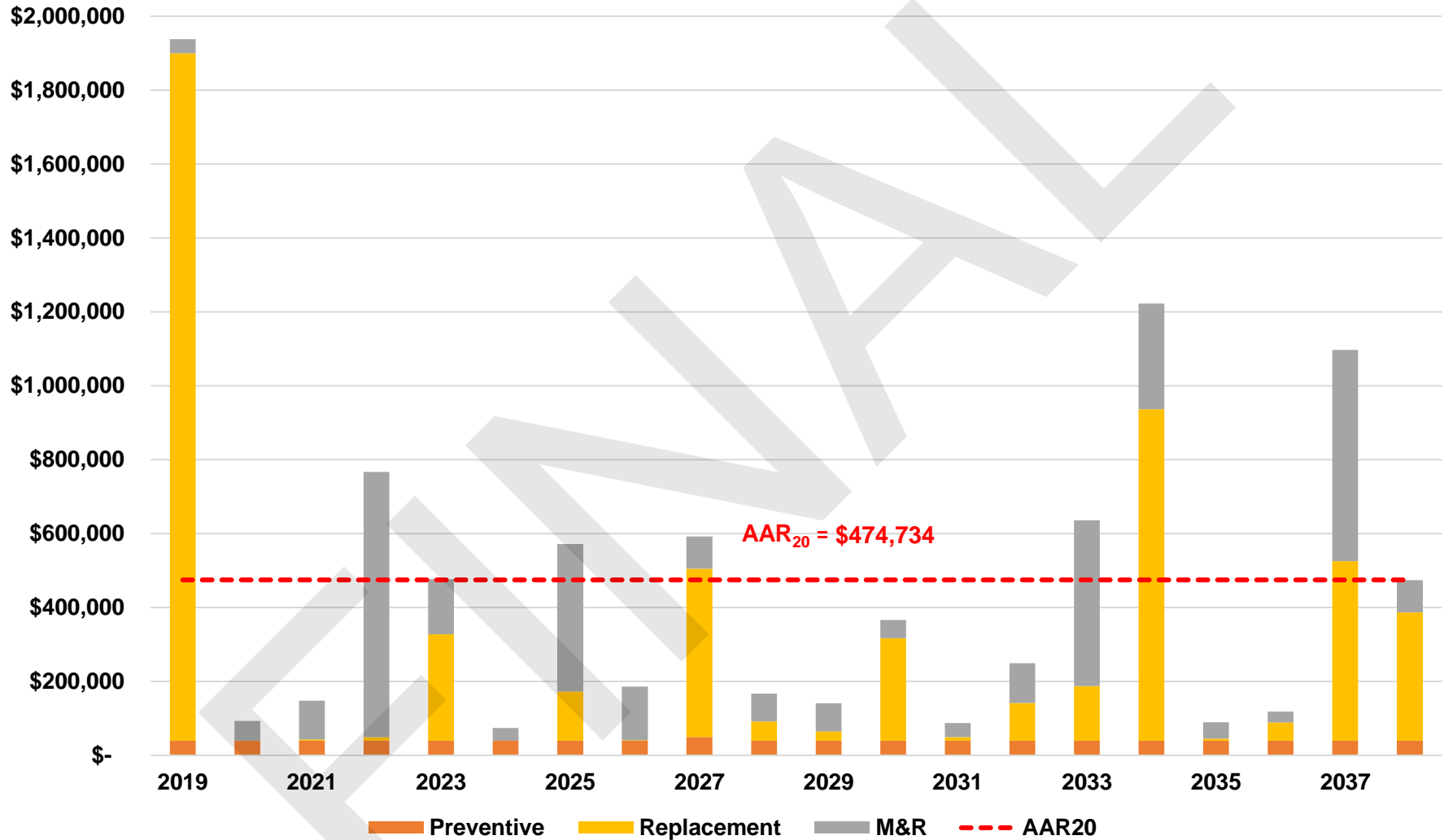


Figure 1 20 Year Work Plan by Activity Type - Portfolio View

Recreation Facilities - 20 Year Work Plan by Element

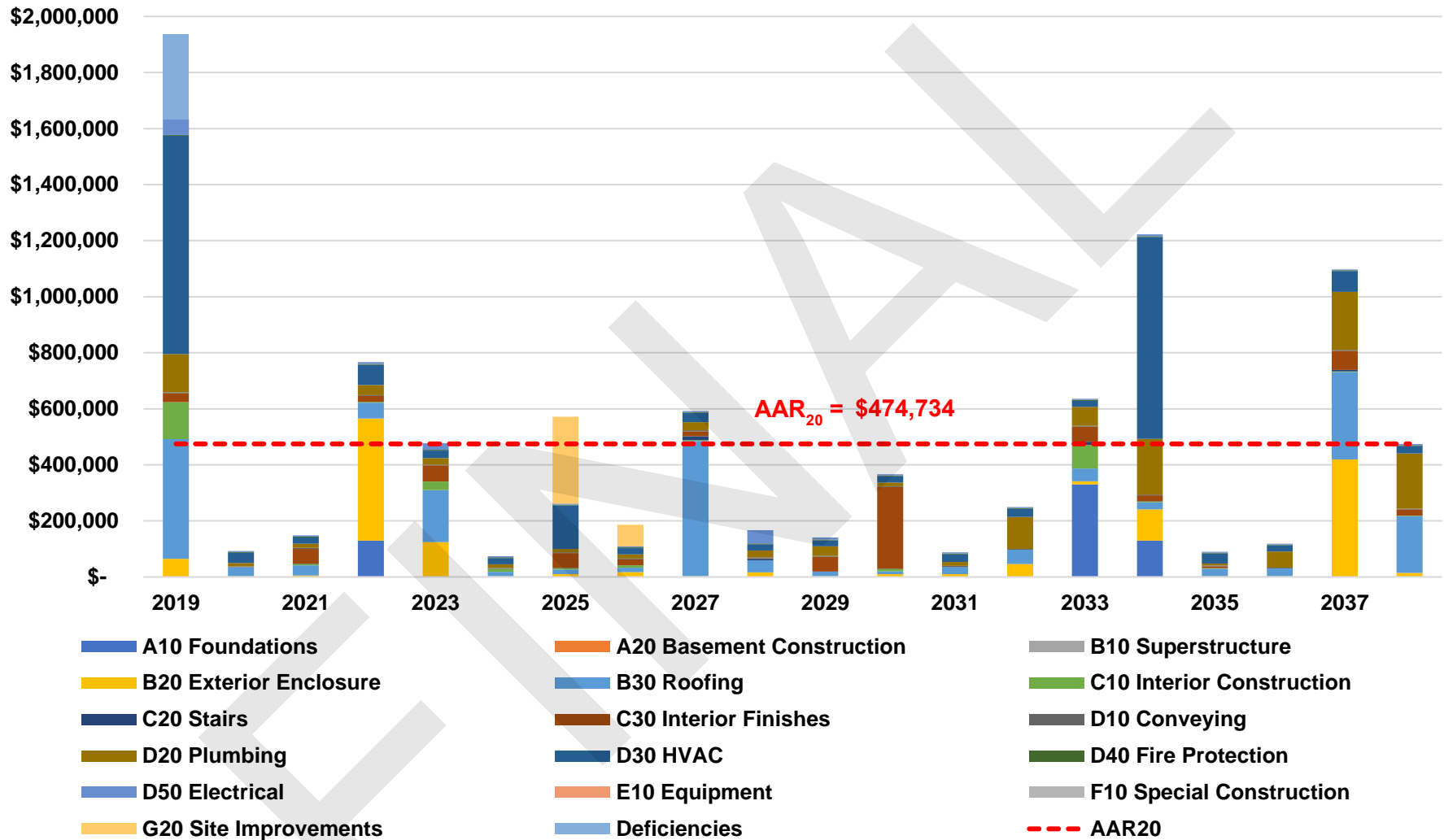


Figure 2 20 Year Work Plan by Building Element - Portfolio View

Recreation Facilities - 20 Year Replacement Timings by Element

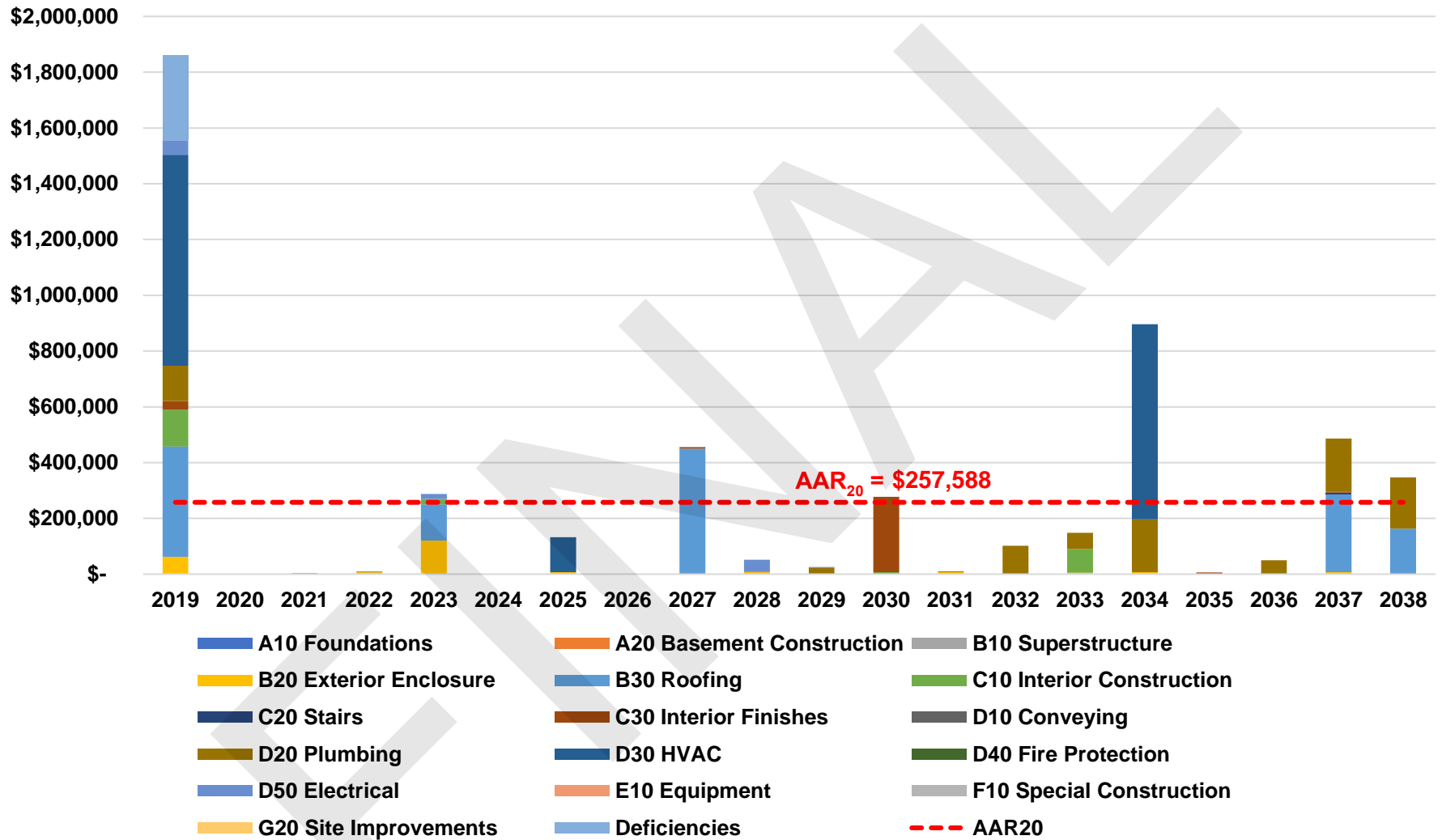


Figure 3 20 Year Replacement Timings by Building Element - Portfolio View

7. Recommendations

As shown in **Figure 1** and **Figure 2**, the investment required to maintain the acceptable condition state of the two recreation facilities is approximately \$475k per year, on average, or a total of \$9.5 M, over the period of 2019 – 2028. An average annual spending of \$257k or a total of \$5.15 M is anticipated for pure asset replacement over the next twenty years, as shown in **Figure 3**. For the next twenty years the expenditure profile is generally consistent. The first expenditure spike occurs in 2019, due to assets requiring replacements due to reaching end of service lives (see **Table 8**). The next expenditure spike occurs in 2034 and is the largest single year spending in the next twenty years, except for 2019, at \$1.2 M, of which the largest types are Foundations, Exterior Enclosure, Plumbing and HVAC.

The Facility Cost & Deficiency Summary (**Appendix A**) presents all the deficiencies, associated costs, conditions and expenditure profiles for both facilities. Overall, the facilities are generally in an acceptable state of repair, with FCI scores of 7% (“Fair”) and 4% (“Good”) for the Sports Centre and Aquatic Centre, respectively, as shown in **Table 6**.

AECOM has considered the current status of the CVRD’s facility asset management efforts as well as the findings from this 2019 assessment and provides herein recommendations on next steps. AECOM’s primary recommendation is the 20-year reinvestment of approximately \$475k per year, on average, as presented in **Table 11**.

Table 11 Facility Cost Summary

Facility Name	Deficiency Cost	End of Service Life Replacements	Average Annual Replacement Cost	Average Annual Total Investment	20-Year Work Plan
Sports Centre	\$250,000	\$1,225,000	\$197,000	\$362,000	\$7,244,000
Aquatic Centre	\$54,000	\$332,000	\$60,000	\$113,000	\$2,251,000
	\$304,000	\$1,557,000	\$257,000	\$475,000	\$9,495,000

The dollar figures presented in **Table 11** are potentially much higher than the CVRD’s current maintenance and capital expenditures on these two facilities. However, the way forward selected by the CVRD depends on each respective facility’s functionality and its capability to support CVRD services in its current design, location and condition state and ultimately, the risk posed to the CVRD if it chooses not to invest as indicated through this condition assessment. Additional recommendations are as follows:

- The Aquatic Centre was originally constructed in 1998 and has just passed its 20-year anniversary. In the next ten years, many assets will reach their expected service lives, requiring a total of \$1.16 M of reinvestment during that same time span to continue its current good facility condition index (FCI). An estimate of \$54k of deficiencies were observed during the condition assessment, with \$10k being “Current and Potential Critical”. These deficiencies include leakage in valves, strainers, the ozone contact tank and boiler. AECOM recommends that these deficiencies be addressed immediately, as delays in repairs or replacement may affect facility operations.
- The Sports Centre is the older facility of the two, with a much greater backlog in deficiencies at \$250k total. Being an older facility, many assets have already reached their expected service lives, although they continue to function. These aged assets will result in a higher-than-average maintenance cost to maintain the equipment in a functional state. Thus, AECOM recommends that equipment original to the facility (1973) be assessed for potential replacement or upgrade. Costly deficiencies such as replacing the sprinkler system piping and the deflection in the Arena 1 rink floor should also be further examined by the CVRD.

APPENDIX A

FACILITY COST & DEFICIENCIES SUMMARY

Appendix A - Facility Cost & Deficiencies Summary

All present value, replacement cost, servicing cost and deficiency costs are presented in 2019 dollars.



Appendix A. Facility Cost & Deficiencies Summary

1.1 Aquatic Centre

1.1.1 Building Condition Assessment

Table 1 Aquatic Centre – Assessment Overview

Address	377 Lerwick Road
Building Purpose	Swimming Pool
Original Year of Construction	1998
Building Area (sq. m)	4,030
Assessment Dates	May 8 th – 9 th , 2019 and May 23 rd , 2019



Table 2 Aquatic Centre – Summary Observations

Architectural Summary

Some vegetation, membrane bubbling and congested gutters were observed on the roof.

The exterior walls and windows show no sign of deterioration. Exterior metal doors and some jambs require new paint and some hinges are rusty - replacement is recommended.

Interior walls, floors, and ceilings are mostly in good condition. A couple of cracked ceiling panels need to be replaced.

Interior doors are in generally in a good condition.

The parking lot is in a fair condition, with some cracks forming.

Mechanical Summary

The air handling units were all functioning free of deficiencies. However, they were nearing their expected service life.

Additionally, the building was not designed to allow for the removal or replacement of the air handling units. Therefore when the time comes to replace the units, the costs will need to account for the modifications to the building as well.

Exhaust fan EF-4 was removed due to failure and (at the time of the inspection), has not yet been replaced.

There were two valves in the chlorine room that were leaking and one 8" in-line strainer that was leaking.

There was a leak at the upper flange of the SP OZ TK-5 ozone contact tank.

Boiler B-3 had an active leak at the time of the assessment.

Electrical Summary

Most of the equipment are original to the construction of the building, with no deficiencies or unsafe conditions observed.

MCCs, disconnects, genset, transformers are all in fair working condition, except MDC-1, as was missing lock out and the UPS was unplugged.

Lighting fixtures within the facility were observed to be in fair working condition. Some bulbs need to be replaced / maintained. Pool lights have faulty cabtire cables and should be replaced.

The bypass in the pump room presents a code violation. AECOM recommends that an electrical inspector be hired to identify fixes. See [Appendix D](#) for details on the bypass.

1.1.2 Building Costs and Deficiencies

Table 3 Aquatic Centre – Building Costing Overview

Present Value	\$ 13,143,000	Replacement Cost	\$ 9,957,000	Building Condition	Good
AAR₂₀	\$ 112,550	Deficiency Costs			
				Total	\$ 53,700
				Currently and Potentially Critical	\$ 8,700
				Necessary	\$ 40,300
				Recommended and Long Term	\$ 4,700

Table 4 Aquatic Centre – Deficiencies and Recommendations Overview

System & Subsystem	Description of Deficiency	Corrective Action	Cost
B1020 Roof Construction	Moss built-up, congested gutters, membrane bubbling	Maintenance & Repair	\$5,200
B2010 Exterior Walls	Cracking of exterior wall finish	Repair	\$4,300
B2030 Exterior Doors	Rusted door units (4), missing handles (2), loose door frames (2)	Replace	\$12,600
C1020 Interior Doors	Broken shower partition doors (2), broken closet door, rusted locks (3)	Replace	\$4,700
D2090 Other Plumbing Systems	Leaking valves (2), leaking gasket and flange (2) to strainer and ozone contact tank	Repair	\$1,500
D3020 Heat Generating Systems	Leaking boiler	Repair	\$6,300
D3040 Distribution Systems	Missing exhaust fan (removed due to failure)	Replace	\$900
D5010 Electrical Service & Distribution	Unplugged UPS, MDC missing lock out, code violating by-pass (See Appendix D for details)	Repair & Inspect	\$6,000
D5020 Lighting and Branch Wiring	Burned out recessed pot lights (6) and T8s (4), faulty cabtire cables	Replace	\$3,500
G2020 Parking Lots	Cracks and holes in parking lot pavement	Repair	\$8,700

1.1.3 Expense Schedules

Table 5 Aquatic Centre – 20-Year Budget

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
	\$399,860	\$13,250	\$13,770	\$271,840	\$178,180	\$15,000	\$20,370	\$132,300	\$20,260	\$99,780
	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
	\$20,660	\$39,400	\$21,300	\$16,950	\$94,060	\$403,300	\$19,470	\$58,440	\$20,430	\$392,330

Aquatic Centre - 20 Year Work Plan by Element

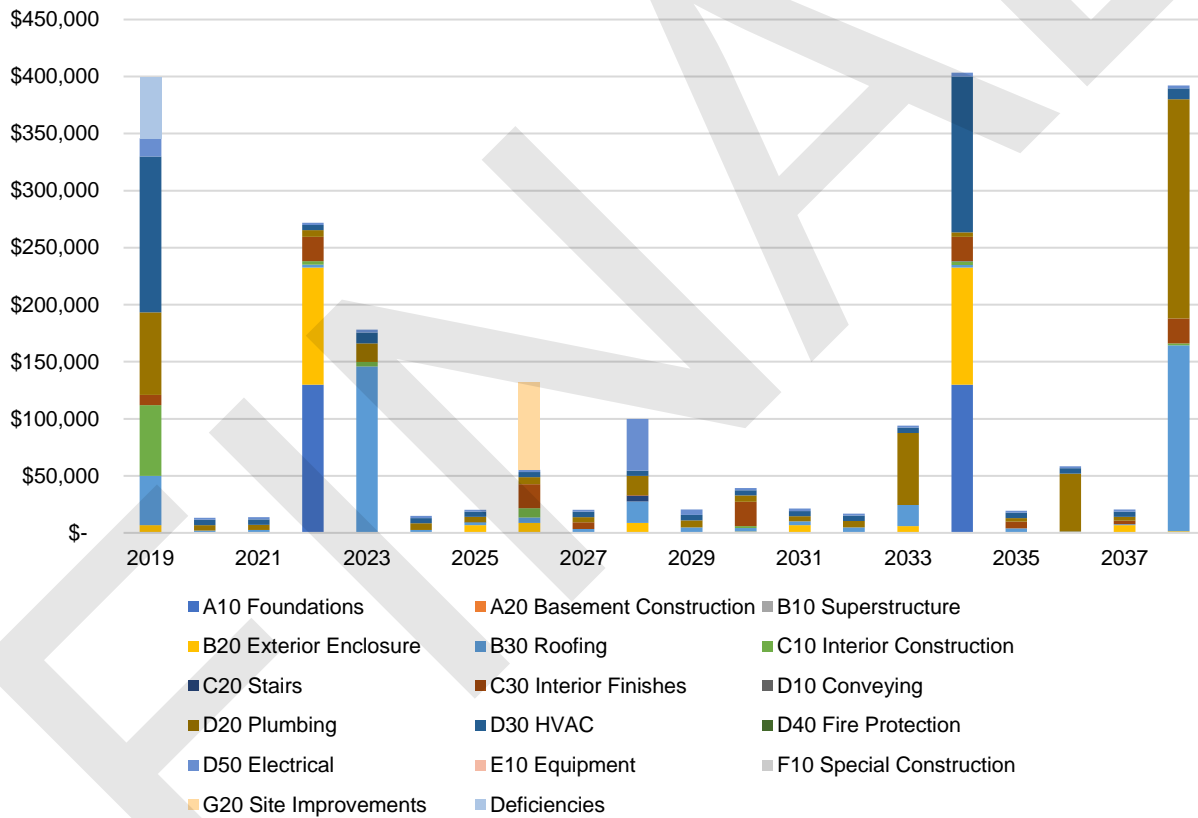


Figure 1 Aquatic Centre – 20-Year Work Plan by Elements

1.2 Sports Centre

1.2.1 Building Condition Assessment

Table 6 Sports Centre – Assessment Overview

Address	3001 Vanier Drive
Building Purpose	Hockey Rink
Original Year of Construction	1973
Building Area (sq. m)	8,616
Assessment Dates	May 7 th – 8 th , 2019 and May 22 nd , 2019



Table 7 Sports Centre – Summary Observations

Architectural Summary	Mechanical Summary	Electrical Summary
<p>The roofing elements for Arena 1 were aged, but still in fair condition. Some vegetation, bubbling and uneven surfaces were observed. The Arena 2 and Wellness Centre roofs were in good working condition.</p> <p>The parking lot is in a fair to poor condition, with significant of crack and hole formation. AECOM recommends that the parking lot be repaved soon.</p> <p>The exterior metal doors and some jambs require new paint and some hinges are rusty- replacement is recommended.</p> <p>A slight deflection (3/4"-1") was observed in Arena 1 rink floor.</p> <p>One cracked window was present in the viewing Arena 2, as well as one broken door handle leading to the Arena 2 staircase.</p>	<p>While the bulk of the HVAC equipment was functioning free of deficiencies the equipment was nearing or had surpassed its expected service life. This will result in higher than average maintenance costs to keep the equipment functional.</p> <p>EF-1 (exhaust fan with down blast shroud) was partially disassembled and was not functional at the time of the assessment.</p> <p>MAU-1 (make-up air unit with a capacity of 5,500 CFM and 533 MBH heating) showed considerable chalking of the enclosure and corrosion forming on its metal surfaces. These issues will reduce the equipment's remaining useful life if not addressed.</p> <p>The domestic water piping that is original to the main building is likely nearing the end of its expected service life and will likely develop leaks and require more frequent maintenance.</p> <p>The water closet in the referee change room in Arena 2 had a leaking flush valve. The urinals in the men's locker room did not have flush valves but instead were on a timed flush cycle. This is not a deficiency but is wasting water when the fixtures are not in use.</p>	<p>The MCCs, disconnects, genset, transformers, fire alarms and smoke detectors were all in fair working condition.</p> <p>The electrical panels were mostly original to the building, and most were in a fair working condition. Panel N appeared to be broken, rusty and creaky. The kitchen / café panel did not have enough clearance for access.</p> <p>The Lighting fixtures within the facility were observed to be in fair working condition with some in need of replacement.</p>

1.2.2 Building Costs and Deficiencies

Table 8 Sports Centre – Building Costing Overview

Present Value	\$ 26,658,000	Replacement Cost	\$ 20,195,000	Building Condition	Fair
AAR₂₀	\$ 362,200	Deficiency Costs			
				Total	\$ 247,700
				Currently and Potentially Critical	\$ 1,500
				Necessary	\$ 175,300
				Recommended and Long Term	\$ 70,900

Table 9 Sports Centre – Deficiencies and Recommendations Overview

System & Subsystem	Deficiency	Recommendation	Cost
B1010 Floor Construction	Slight deflection (3/4"-1") in Arena #1 rink floor	Repair	\$13,700
B1020 Roof Construction	Moss built-up, bubbling and uneven surfaces	Maintenance & Repair	\$6,500
B2010 Exterior Walls	Spray painted vandalism on exterior walls	Repair	\$8,100
B2020 Exterior Windows	Cracked window viewing Arena #2	Replace	\$6,700
C1020 Interior Doors	Broken door unit leading to Arena #2 staircase	Repair	\$1,500
C3020 Floor Finishes	Bumps and uneven vinyl tile flooring	Replace	\$2,500
C3030 Ceiling Finishes	Missing and broken ceiling tiles	Replace	\$1,900
D2010 Plumbing Fixtures	Leaking flush valve in the change room	Repair	\$300
D3040 Distribution Systems	Broken rooftop exhaust fan	Replace	\$700
D3050 Terminal & Package Units	Exterior housing of the makeup air unit is chalking and corroded	Replace	\$3,100
D4010 Sprinklers	Sprinkler piping was noted as being thinner wall pipe and has developed pin hole leaks throughout the system.	Replace	\$123,000
D5010 Electrical Service & Distribution	Broken panel, and lack of clearance	Repair	\$500

System & Subsystem	Deficiency	Recommendation	Cost
D5020 Lighting and Branch Wiring	Unplugged and exposed remote heads and battery packs (2), recessed panel lights not outdoor rated (10), burned out T8s (5)	Repair & Replace	\$7,800
E2010 Fixed Furnishings	Aged track & fields bleachers, heavily rusted diving board, stained tiling in the hot tub, skates damage benches in the changerooms (6)	Maintenance & Repair	\$52,000
G2020 Parking Lots	Cracks and holes in parking lot pavement	Repair	\$13,000
G2040 Site Development	Heavily rusted shot-put cage	Maintenance & Repair	\$6,400

1.2.3 Expense Schedules

Table 10 Sports Centre – 20-Year Budget

2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
\$1,537,700	\$79,640	\$134,200	\$495,150	\$298,370	\$59,110	\$551,170	\$53,960	\$571,970	\$67,010
2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
\$120,550	\$326,750	\$66,270	\$232,710	\$541,650	\$818,900	\$70,100	\$59,770	\$1,076,740	\$82,010

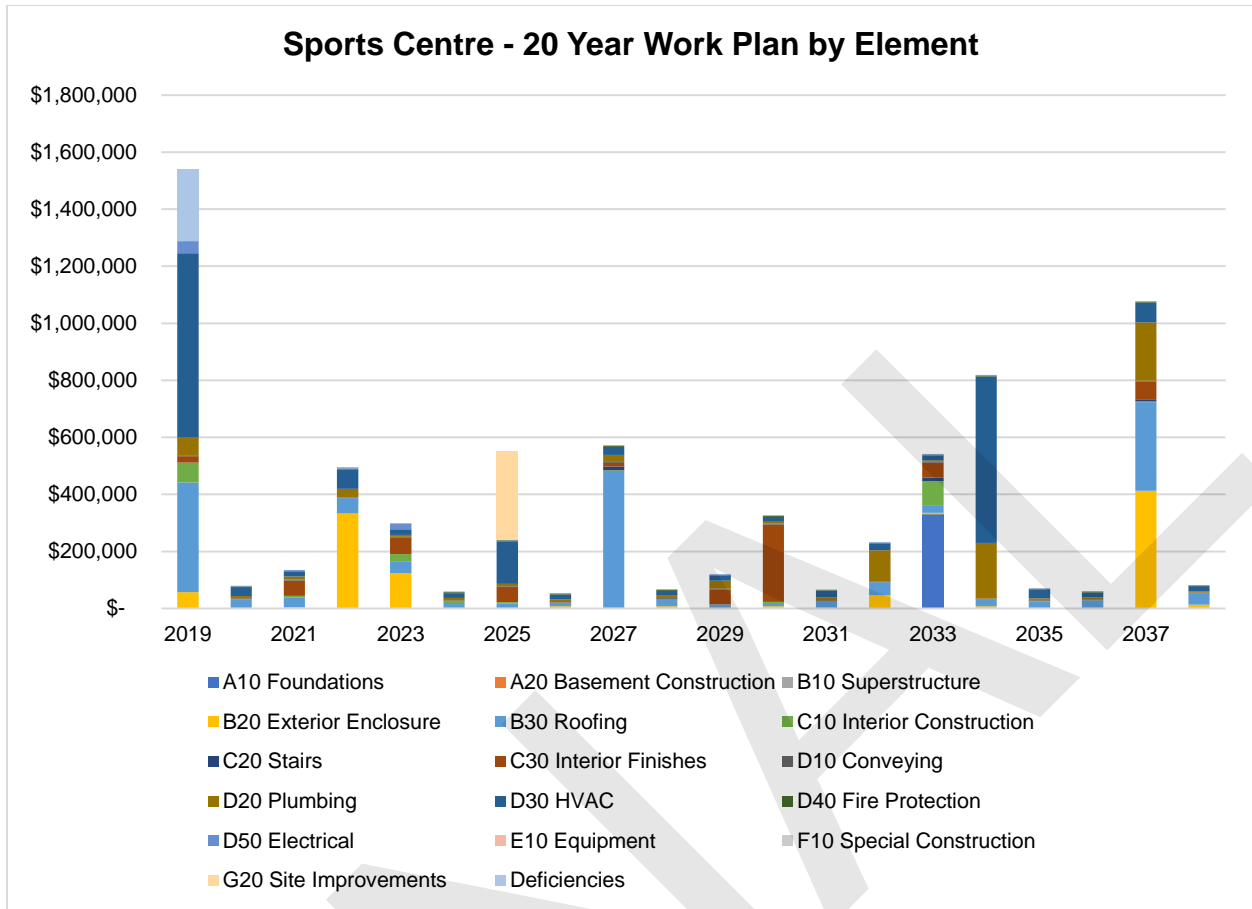


Figure 2 Sports Centre – 20-Year Work Plan by Elements

APPENDIX B

FACILITY LIFE CYCLE COST REPORTS

Appendix B - Facility Life Cycle Cost Reports

Outputs from RSMeans life cycle cost tool for each individual facility. Both 2019 dollar and indexed costs are included with a cost breakdown by activity type (preventive, M&R and replacement). The assumed inflation rates are 2.0% for preventive and M&R activities and 2.0% for replacement activities.



Aquatic Centre

Source: RSMMeans Online

Model: Aquatic Centre

Year Built: 1998

Stories: 1

Start Year: 2019

Story Height: 25

RPV: \$9,956,780

GSF: 34,250

Labor Inflation 2.00%

Replacement Inflation 2.00%

Year	CURRENT YEAR COSTS						INDEXED COSTS					
	Maintenance & Replacement Costs			Sustainment	Sustainment	Maintenance & Replacement Costs			Sustainment	Sustainment		
	Preventive	M&R	Replacement	Costs	Ratio	Preventive	M&R	Replacement	Costs	Ratio		
		\$2,019	Dollars			Inflation	2.000%	2.000%				
1	2019	\$ 9,390	\$ 4,970	\$ 385,500	\$ 399,860	4.016%	\$ 9,390	\$ 4,970	\$ 385,500	\$ 399,860	4.016%	
2	2020	\$ 9,390	\$ 3,860		\$ 13,250	0.133%	\$ 9,578	\$ 3,937		\$ 13,515	0.133%	
3	2021	\$ 9,390	\$ 4,380		\$ 13,770	0.138%	\$ 9,769	\$ 4,557		\$ 14,326	0.138%	
4	2022	\$ 9,390	\$ 255,750	\$ 6,700	\$ 271,840	2.730%	\$ 9,965	\$ 271,404	\$ 7,110	\$ 288,479	2.730%	
5	2023	\$ 9,390	\$ 38,790	\$ 130,000	\$ 178,180	1.790%	\$ 10,164	\$ 41,988	\$ 140,716	\$ 192,868	1.790%	
6	2024	\$ 9,390	\$ 5,610		\$ 15,000	0.151%	\$ 10,367	\$ 6,194		\$ 16,561	0.151%	
7	2025	\$ 9,390	\$ 4,280	\$ 6,700	\$ 20,370	0.205%	\$ 10,575	\$ 4,820	\$ 7,545	\$ 22,940	0.205%	
8	2026	\$ 9,390	\$ 122,910		\$ 132,300	1.329%	\$ 10,786	\$ 141,185		\$ 151,971	1.329%	
9	2027	\$ 9,390	\$ 4,970	\$ 5,900	\$ 20,260	0.203%	\$ 11,002	\$ 5,823	\$ 6,913	\$ 23,738	0.203%	
10	2028	\$ 9,390	\$ 40,190	\$ 50,200	\$ 99,780	1.002%	\$ 11,222	\$ 48,031	\$ 59,994	\$ 119,246	1.002%	
11	2029	\$ 9,390	\$ 6,570	\$ 4,700	\$ 20,660	0.207%	\$ 11,446	\$ 8,009	\$ 5,729	\$ 25,184	0.207%	
12	2030	\$ 9,390	\$ 30,010		\$ 39,400	0.396%	\$ 11,675	\$ 37,314		\$ 48,989	0.396%	
13	2031	\$ 9,390	\$ 5,210	\$ 6,700	\$ 21,300	0.214%	\$ 11,909	\$ 6,608	\$ 8,497	\$ 27,014	0.214%	
14	2032	\$ 9,390	\$ 7,560		\$ 16,950	0.170%	\$ 12,147	\$ 9,780		\$ 21,927	0.170%	
15	2033	\$ 9,390	\$ 20,570	\$ 64,100	\$ 94,060	0.945%	\$ 12,390	\$ 27,142	\$ 84,579	\$ 124,110	0.945%	
16	2034	\$ 9,390	\$ 253,910	\$ 140,000	\$ 403,300	4.051%	\$ 12,638	\$ 341,729	\$ 188,422	\$ 542,789	4.051%	
17	2035	\$ 9,390	\$ 4,180	\$ 5,900	\$ 19,470	0.196%	\$ 12,890	\$ 5,738	\$ 8,099	\$ 26,728	0.196%	
18	2036	\$ 9,390	\$ 1,050	\$ 48,000	\$ 58,440	0.587%	\$ 13,148	\$ 1,470	\$ 67,212	\$ 81,830	0.587%	
19	2037	\$ 9,390	\$ 1,240	\$ 9,800	\$ 20,430	0.205%	\$ 13,411	\$ 1,771	\$ 13,997	\$ 29,179	0.205%	
20	2038	\$ 9,390	\$ 40,440	\$ 342,500	\$ 392,330	3.940%	\$ 13,679	\$ 58,913	\$ 498,958	\$ 571,551	3.940%	

Sports Centre

Source: RSMMeans Online

Model: Sports Centre

Year Built: 1973

Stories: 2

Start Year: 2019

Story Height: 25

RPV: \$20,195,140

GSF: 90,900

Labor Inflation 2.00%

Replacement Inflation 2.00%

Year	CURRENT YEAR COSTS					INDEXED COSTS					
	Maintenance & Replacement Costs			Sustainment	Sustainment	Maintenance & Replacement Costs			Sustainment	Sustainment	
	Preventive	M&R	Replacement	Costs	Ratio	Preventive	M&R	Replacement	Costs	Ratio	
		2019 Dollars					Inflation 2.000%				
1	2019	\$ 30,250	\$ 32,720	\$ 1,474,730	\$ 1,537,700	7.614%	\$ 30,250	\$ 32,720	\$ 1,474,730	\$ 1,537,700	7.614%
2	2020	\$ 30,250	\$ 49,390		\$ 79,640	0.394%	\$ 30,855	\$ 50,378		\$ 81,233	0.394%
3	2021	\$ 30,250	\$ 100,750	\$ 3,200	\$ 134,200	0.665%	\$ 31,472	\$ 104,820	\$ 3,329	\$ 139,622	0.665%
4	2022	\$ 30,250	\$ 461,780	\$ 3,120	\$ 495,150	2.452%	\$ 32,102	\$ 490,045	\$ 3,311	\$ 525,457	2.452%
5	2023	\$ 30,250	\$ 110,520	\$ 157,600	\$ 298,370	1.477%	\$ 32,744	\$ 119,630	\$ 170,591	\$ 322,965	1.477%
6	2024	\$ 30,250	\$ 28,860		\$ 59,110	0.293%	\$ 33,398	\$ 31,864		\$ 65,262	0.293%
7	2025	\$ 30,250	\$ 394,920	\$ 126,000	\$ 551,170	2.729%	\$ 34,066	\$ 444,744	\$ 141,896	\$ 620,707	2.729%
8	2026	\$ 30,250	\$ 22,110	\$ 1,600	\$ 53,960	0.267%	\$ 34,748	\$ 25,397	\$ 1,838	\$ 61,983	0.267%
9	2027	\$ 39,750	\$ 82,220	\$ 450,000	\$ 571,970	2.832%	\$ 46,573	\$ 96,334	\$ 527,247	\$ 670,154	2.832%
10	2028	\$ 30,250	\$ 34,960	\$ 1,800	\$ 67,010	0.332%	\$ 36,152	\$ 41,780	\$ 2,151	\$ 80,083	0.332%
11	2029	\$ 30,250	\$ 69,700	\$ 20,600	\$ 120,550	0.597%	\$ 36,875	\$ 84,964	\$ 25,111	\$ 146,950	0.597%
12	2030	\$ 30,250	\$ 19,100	\$ 277,400	\$ 326,750	1.618%	\$ 37,612	\$ 23,748	\$ 344,912	\$ 406,273	1.618%
13	2031	\$ 30,250	\$ 32,820	\$ 3,200	\$ 66,270	0.328%	\$ 38,364	\$ 41,624	\$ 4,058	\$ 84,046	0.328%
14	2032	\$ 30,250	\$ 100,360	\$ 102,100	\$ 232,710	1.152%	\$ 39,132	\$ 129,826	\$ 132,077	\$ 301,035	1.152%
15	2033	\$ 30,250	\$ 427,500	\$ 83,900	\$ 541,650	2.682%	\$ 39,914	\$ 564,077	\$ 110,704	\$ 714,696	2.682%
16	2034	\$ 30,250	\$ 31,650	\$ 757,000	\$ 818,900	4.055%	\$ 40,713	\$ 42,597	\$ 1,018,822	\$ 1,102,132	4.055%
17	2035	\$ 30,250	\$ 39,850		\$ 70,100	0.347%	\$ 41,527	\$ 54,706		\$ 96,232	0.347%
18	2036	\$ 30,250	\$ 27,920	\$ 1,600	\$ 59,770	0.296%	\$ 42,357	\$ 39,095	\$ 2,240	\$ 83,692	0.296%
19	2037	\$ 30,250	\$ 570,190	\$ 476,300	\$ 1,076,740	5.332%	\$ 43,204	\$ 814,372	\$ 680,274	\$ 1,537,850	5.332%
20	2038	\$ 30,250	\$ 46,860	\$ 4,900	\$ 82,010	0.406%	\$ 44,069	\$ 68,266	\$ 7,138	\$ 119,473	0.406%

APPENDIX C

PRESENT VALUE OF BUILDING COMPONENTS

Appendix C - Present Value of Building Components


Outputs are taken from RSMeans' building summary report. The report details the present value of all building components broken down according to the UNIFORMAT II Classification.



RSMeans data
from GORDIAN

Square Foot Cost Estimate Report

Date: 8/20/2019

Estimate Name:	CVRD Aquatic Centre	 <p>Costs are derived from a building model with basic components. Scope differences and market conditions can cause costs to vary significantly.</p>
Building Type:	Swimming Pool, Enclosed with Concrete Block / Wood Frame	
Location:	CVRD, BC	
Story Count:	1	
Story Height (L.F.):	24.00	
Floor Area (S.F.):	34250	
Labor Type:	STD	
Basement Included:	No	
Data Release:	Year 2019 Quarter 2	
Cost Per Square Foot:	\$383.74	
PRV:	\$9,956,780	
Total Building Cost:	\$13,142,950	

		% of Total	Cost Per S.F.	Baseline Cost
A	Substructure	4.95%	14.39	\$ 493,000
A1010	Standard Foundations		5.23	\$ 179,000
A10101051600	Foundation wall, CIP, 4' wall height, direct chute, .197 CY/LF, 9.44 PLF, 16" thick		1.17	\$ 40,000
A10101105900	Strip footing, concrete, reinforced, load 33.0 KLF, soil bearing capacity 6 KSF, 20" deep x 72" wide		3.50	\$ 120,000
A10102107200	Spread footings, 3000 PSI concrete, load 50K, soil bearing capacity 6 KSF, 3' - 0" square x 12" deep		0.55	\$ 19,000
A1030	Slab on Grade		6.42	\$ 220,000
A10301202240	Slab on grade, 4" thick, non industrial, reinforced		6.42	\$ 220,000
A2010	Basement Excavation		0.64	\$ 22,000
A20101104560	Excavate and fill, 10,000 SF, 4' deep, sand, gravel, or common earth, on site storage		0.64	\$ 22,000
A2020	Basement Walls		2.10	\$ 72,000
A20201351520	Trench walls 4' high		2.10	\$ 72,000
B	Shell	13.63%	39.64	\$ 1,357,520
B1010	Floor Construction		0.05	\$ 1,600
* B10102661050	Wood deck, 2" thick, douglas fir, 8.0' span/40 PSF, 6.0' span/100 PSF, 4.0' span/250 PSF		0.05	\$ 1,600
B1020	Roof Construction		7.59	\$ 260,020
* B10201203250	Roof, steel joists, joist girder, 1.5" 22 ga metal deck, on columns/bearing wall, 35'x35' bay, 40 PSF superimposed load, 36.5" deep, 60 PSF total load, add for column		0.00	\$ 20
* B10201242900	Roof, steel joists, joist girder, 1.5" 22 ga metal deck, on columns, 35'x35' bay, 20 PSF superimposed load, 36.5" deep, 40 PSF total load		7.59	\$ 260,000
B2010	Exterior Walls		13.67	\$ 468,300
* B20101402300	Exterior wall, glass block, 6" x 6", plain, under 1000 SF		0.24	\$ 8,300
* B20101525270	E.I.F.S., CMU, 8" x 8" x 16", 2" EPS		13.43	\$ 460,000
B2020	Exterior Windows		7.88	\$ 270,000
B20202101100	Aluminum flush tube frame, for 1/4"glass,1-3/4"x4", 5'x6' opening, no intermediate horizontals		4.38	\$ 150,000
B20202201000	Glazing panel, insulating, 1/2" thick, 2 lites 1/8" float glass, clear		3.50	\$ 120,000
B2030	Exterior Doors		2.42	\$ 83,000
* B20301106300	Door, aluminum & glass, without transom, narrow stile, with panic hardware, 3'-0"x 7'-0" opening		0.15	\$ 5,200
* B20301106950	Door, aluminum & glass, with transom, narrow stile, double door, hardware, 6'-0" x 10'-0" opening		0.88	\$ 30,000
* B20302203450	Door, steel 18 gauge, hollow metal, 1 door with frame, no label, 3'-0" x 7'-0" opening		0.88	\$ 30,000
* B20302203700	Door, steel 18 gauge, hollow metal, 2 doors with frame, no label, 6'-0" x 7'-0" opening		0.24	\$ 8,200
* B20302306100	Door, aluminum, overhead, rolling grill, manual operation, 12'-0" x 12'-0" opening		0.28	\$ 9,600
B3010	Roof Coverings		5.94	\$ 203,400
* B30101204500	Roofing, single ply membrane, mb, app modified, granule surf cap sheet, torched, 180 mils		1.17	\$ 40,000
* B30101401100	Asphalt roofing, strip shingles, inorganic, Class A, 4" slope, 210-235 lbs/SQ		1.96	\$ 67,000
B30103203090	Insulation, rigid, roof deck, composite with 2" EPS, 1" perlite		2.54	\$ 87,000
* B30106100050	Gutters, box, aluminum, .027" thick, 5", enameled finish		0.17	\$ 5,900
* B30106200100	Downspout, aluminum, rectangular, 2" x 3", embossed mill finish, .020" thick		0.10	\$ 3,500

B3020	Roof Openings		2.08 \$	71,200
* B30201106200	Skylight, fiberglass sandwich panels, 2-3/4" thick, 25 SF to 40 SF		1.90 \$	65,000
* B30202100900	Roof hatch, with curb, 1" fiberglass insulation, 2'x6" x 8'-0", galvanized steel, 360 lbs		0.18 \$	6,200
C	Interiors	13.75%	39.99 \$	1,369,500
C1010	Partitions		4.61 \$	157,800
* C10101045500	Concrete block (CMU) partition, light weight, hollow, 6" thick, no finish		3.50 \$	120,000
* C10101241200	Wood partition, 5/8" fire rated gypsum board face, none base, 2 x 4, @ 16" OC framing, same opposite face, 0 insul		0.14 \$	4,800
* C10107101120	Interior glazed opening, aluminum flush tube frame, 1/4" float glass, 8' x 5', 1 intermediate mullion		0.44 \$	15,000
* C10107101160	Interior glazed opening, aluminum flush tube frame, 1/4" float glass, 12' x 5', 2 intermediate mullions		0.53 \$	18,000
C1020	Interior Doors		2.64 \$	90,400
* C10201022600	Door, single leaf, kd steel frame, hollow metal, commercial quality, flush, 3'-0" x 7'-0" x 1-3/8"		0.38 \$	13,000
* C10201023300	Door, double leaf, kd steel frame, hollow metal, commercial quality, B label, 2 - 3'-0" x 7'-0" x 1-3/8"		0.25 \$	8,400
* C10201023500	Doors, double swing aluminum and glass, 12'-0" x 7'-0", mill finish		1.55 \$	53,000
* C10201141360	Metal door/metal frame, flush-hollow core, 20 ga half glass, 6'-0" x 7'-0", KD drywall frame, 4-7/8"		0.47 \$	16,000
C1030	Fittings		1.46 \$	50,000
* C10301100680	Toilet partitions, cubicles, floor mounted, painted metal		0.44 \$	15,000
* C10301100860	Toilet partitions, cubicleless, floor mounted, headrail braced, plastic laminate		1.02 \$	35,000
C2010	Stair Construction		0.55 \$	18,700
* C20101100470	Stairs, CIP concrete, w/o landing, 12 risers, w/o nosing		0.06 \$	1,900
* C20101100470	Stairs, CIP concrete, w/o landing, 12 risers, w/o nosing		0.11 \$	3,800
* C20101100660	Stairs, steel, grate type w/nosing & rails, 16 risers, with landing		0.38 \$	13,000
C3010	Wall Finishes		3.92 \$	134,400
C30102202000	2 coats paint on masonry with block filler		1.55 \$	53,000
* C30102300140	Painting, interior on plaster and drywall, walls & ceilings, roller work, primer & 2 coats		0.05 \$	1,700
* C30102301670	Wood board, knotty pine, finished		0.11 \$	3,700
* C30102301940	Ceramic tile, thin set, 4-1/4" x 4-1/4"		2.22 \$	76,000
C3020	Floor Finishes		24.27 \$	831,200
* C30204100140	Carpet, tufted, nylon, roll goods, 12' wide, 26 oz		0.08 \$	2,900
C30204101120	Terrazzo, maximum		19.85 \$	680,000
* C30204101520	Rubber, tile, maximum		0.12 \$	4,200
* C30204101680	Vinyl sheet goods, intricate pattern/colors		0.06 \$	2,200
C30204101720	Tile, ceramic natural clay		3.50 \$	120,000
* C30204109200	Vinyl, composition tile, 12" x 12" x 1/8" thick, recycled content		0.11 \$	3,900
* C30206000055	Resilient base, 1/8" vinyl, 4" H, straight or cove, std. colors		0.53 \$	18,000
C3030	Ceiling Finishes		2.54 \$	87,000
* C30302107200	Acoustic ceilings, 5/8" plastic coated mineral fiber, 12" x 12" tile, 25 ga channel grid, adhesive back support		2.54 \$	87,000
D	Services	20.48%	59.53 \$	2,038,760
D2010	Plumbing Fixtures		4.11 \$	140,700
* D20101102120	Water closet, vitreous china, bowl only with flush valve, floor mount		1.20 \$	41,000
* D20102102000	Urinal, vitreous china, wall hung		0.22 \$	7,500
* D20103102240	Lavatory w/trim, wall hung, vitreous china, 24" x 20"		0.88 \$	30,000
* D20104101960	Kitchen sink w/trim, countertop, stainless steel, 33" x 22" double bowl		0.14 \$	4,900
* D20104202080	Laundry sink w/trim, plastic, on wall or legs, 20" x 24" single compartment		0.04 \$	1,400
* D20104404260	Service sink w/trim, PE on CI, corner floor, 28" x 28", w/rim guard		0.11 \$	3,600
* D20107101800	Shower, stall, fiberglass 1 piece, three walls, 32" square		0.10 \$	3,300
* D20107101960	Shower, built-in head, arm, bypass, stops and handles		0.35 \$	12,000
* D20107102100	Shower, handicap with fixed and handheld heat, control valves, grab bar & seat		1.02 \$	35,000
* D20108201840	Water cooler, electric, wall hung, 8.2 GPH		0.06 \$	2,000
D2020	Domestic Water Distribution		0.55 \$	19,000
* D20202502100	Gas fired water heater, commercial, 100< F rise, 240 MBH input, 230 GPH		0.55 \$	19,000

D2040	Rain Water Drainage	1.06 \$	36,400	
* D20402104120	Roof drain, CI, soil, single hub, 3" diam, 10' high	0.79 \$	27,000	
* D20402104160	Roof drain, CI, soil, single hub, 3" diam, for each additional foot add	0.27 \$	9,400	
D3020	Heat Generating Systems	16.91 \$	579,000	
* D30203301010	Pump, base mounted with motor, end-suction, 2-1/2" size, 3 HP, to 150 GPM	3.21 \$	110,000	
* D30203301020	Pump, base mounted with motor, end-suction, 3" size, 5 HP, to 225 GPM	1.40 \$	48,000	
* D30203301040	Pump, base mounted with motor, end-suction, 5" size, 15 HP, to 1000 GPM	4.96 \$	170,000	
* D30203301050	Pump, base mounted with motor, end-suction, 6" size, 25 HP, to 1550 GPM	4.96 \$	170,000	
* D30203301050	Pump, base mounted with motor, end-suction, 6" size, 25 HP, to 1550 GPM	2.36 \$	81,000	
D3040	Distribution Systems	5.49 \$	188,000	
* D30401101020	AHU, central station, cool/heat coils, constant volume, filters, 5,000 CFM	2.28 \$	78,000	
* D30401121030	AHU, central station, cool/heat coils, VAV, filters, 15,000 CFM	3.21 \$	110,000	
D3050	Terminal & Package Units	2.63 \$	90,000	
* D30502451010	Heat pump, rooftop, air/air, curb, economizer, supplemental electric heat, 10 ton	2.63 \$	90,000	
D5010	Electrical Service/Distribution	4.86 \$	166,300	
* D50101301200	Underground service installation, includes excavation, backfill, and compaction, 100' length, 4' depth, 3 phase, 4 wire, 277/480 volts, 1200 A	1.05 \$	36,000	
* D50102300440	Feeder installation 600 V, including RGS conduit and XHHW wire, 1000 A	0.73 \$	25,000	
* D50102400320	Switchgear installation, incl switchboard, panels & circuit breaker, 120/208 V, 3 phase, 1200 A	0.82 \$	28,000	
* D50102400560	Switchgear installation, incl switchboard, panels & circuit breaker, 277/480 V, 1000 A	1.05 \$	36,000	
* D50102501020	Panelboard, 4 wire w/conductor & conduit, NQOD, 120/208 V, 100 A, 1 stories, 25' horizontal	0.14 \$	4,800	
* D50102501020	Panelboard, 4 wire w/conductor & conduit, NQOD, 120/208 V, 100 A, 1 stories, 25' horizontal	0.28 \$	9,500	
* D50102502000	Panelboard, 4 wire w/conductor & conduit, NQOD, 120/208 V, 225 A, 1 stories, 25' horizontal	0.50 \$	17,000	
* D50102505020	Panelboard, 4 wire w/conductor & conduit, NEHB, 277/480 V, 225 A, 1 stories, 25' horizontal	0.29 \$	10,000	
D5020	Lighting and Branch Wiring	21.47 \$	735,360	
* D50201100320	Receptacles incl plate, box, conduit, wire, 4 per 1000 SF, .5 W per SF, with transformer	2.07 \$	71,000	
D50201300200	Wall switches, 1.0 per 1000 SF	0.15 \$	5,000	
D50201350440	Miscellaneous power, 2 watts	0.53 \$	18,000	
D50201400320	Central air conditioning power, 6 watts	0.85 \$	29,000	
* D50201650520	Safety switch, 60 A fused, 3 phase, 30 HP 460 V or 40 HP 575 V	0.02 \$	660	
* D50201650840	Safety switch, 200 A fused, 3 phase, 125 HP 460 V or 150 HP 575 V	0.05 \$	1,700	
D50202100540	Fluorescent fixtures recess mounted in ceiling, 2.4 watt per SF, 60 FC, 15 fixtures @ 32 watt per 1000 SF	17.81 \$	610,000	
D5030	Communications and Security	2.45 \$	84,000	
* D50308100200	Security system, head end equipment	1.17 \$	40,000	
* D50308100280	Security system, door/window contact balanced, box, conduit & cable	0.38 \$	13,000	
D50309100452	Communication and alarm systems, fire detection, addressable, 25 detectors, includes outlets, boxes, conduit and wire	0.47 \$	16,000	
D50309100462	Fire alarm command center, addressable with voice, excl. wire & conduit	0.44 \$	15,000	
E	Equipment & Furnishings	43.39%	126.13 \$	4,320,000
E1010	Commercial Equipment	0.06 \$	2,000	
* E10101100500	Specialties, security gates-scissors type, painted steel, single, 6' high, 5-1/2' wide	0.06 \$	2,000	
E1090	Other Equipment	126.07 \$	4,318,000	
* E10906100810	Architectural equipment, vocational shop equipment, benches, wood	0.76 \$	26,000	
* E10908100120	Architectural equipment, sauna, prefabricated, including heater and controls, 7' high, 10' x 12'	0.61 \$	21,000	

* E10908100780	Special construction, swimming pool equipment, slides, fiberglass with aluminum handrail & ladder, 12' high, straight with platform	2.07	\$	71,000
* E10908200160	Special construction, swimming pools, municipal, gunite shell, tile finish, formed gutters	122.63	\$	4,200,000
F	Special Construction	0.15%		
F1030	Special Construction Systems		0.44	\$ 15,000
* F10301200110	Special construction, acoustical, sound absorbing panels, 2'-6" x 8', painted metal		0.44	\$ 15,000
G	Building Sitework	3.65%		
G2020	Parking Lots		7.88	\$ 270,000
* G20202101560	Parking lot, 90 degree angle parking, 4" bituminous paving, 6" gravel base		7.88	\$ 270,000
G2030	Pedestrian Paving		1.37	\$ 47,000
* G20301201660	Concrete sidewalk, 4" thick, 6" gravel base, 4' wide		1.37	\$ 47,000
G4010	Electrical Distribution		0.79	\$ 27,000
* G40103121200	Electric power feed 1200 Amp, 4' deep, 100', including excavation, backfill, concrete & compaction		0.79	\$ 27,000
G4020	Site Lighting		0.55	\$ 19,000
* G40201102340	Site lighting, high pressure sodium, 400 watt, aluminum pole, 30' high		0.55	\$ 19,000
SubTotal		100%	\$ 290.71	\$ 9,956,780.00
Contractor Fees (General Conditions,Overhead,Profit)		25%	\$ 72.68	\$ 2,489,195
Architectural Fees		7%	\$ 20.35	\$ 696,975
User Fees		0%	\$ -	\$ -
Total Building Cost			\$ 383.74	\$ 13,142,950

* Indicates Assemblies or Components have been customized.

RSMeans data
from GORDIAN

Square Foot Cost Estimate Report

Date: 8/20/2019

Estimate Name:	CVRD Sports Centre
Building Type:	Hockey Rink with Concrete Block / Wood Truss
Location:	CVRD, BC
Story Count:	1
Story Height (L.F.):	24.00
Floor Area (S.F.):	90900
Labor Type:	STD
Basement Included:	No
Data Release:	Year 2019 Quarter 2
Cost Per Square Foot:	\$293.26
PRV:	\$20,195,140
Total Building Cost:	\$26,657,585



Costs are derived from a building model with basic components.
Scope differences and market conditions can cause costs to vary significantly.

		% of Total	Cost Per S.F.	Baseline Cost
A	Substructure	5.38%	11.95	\$ 1,086,000
A1010	Standard Foundations		3.96	\$ 360,000
* A10101051760	Foundation wall, CIP, 4' wall height, pumped, .148 CY/LF, 7.2 PLF, 12" thick		0.40	\$ 36,000
A10101102700	Strip footing, concrete, reinforced, load 11.1 KLF, soil bearing capacity 6 KSF, 12" deep x 24" wide		0.89	\$ 81,000
A10102107300	Spread footings, 3000 PSI concrete, load 75K, soil bearing capacity 6 KSF, 4' - 0" square x 12" deep		0.80	\$ 73,000
A10102107610	Spread footings, 3000 PSI concrete, load 150K, soil bearing capacity 6 KSF, 5' - 6" square x 18" deep		1.87	\$ 170,000
A1030	Slab on Grade		7.81	\$ 710,000
A10301204480	Slab on grade, 6" thick, non industrial, reinforced		7.81	\$ 710,000
A2010	Basement Excavation		0.18	\$ 16,000
A20101105740	Excavate and fill, 30,000 SF, 4' deep, sand, gravel, or common earth, on site storage		0.18	\$ 16,000
B	Shell	22.24%	49.41	\$ 4,491,600
B1020	Roof Construction		26.51	\$ 2,410,000
B10207052001	Laminated arch, radial, 100' clear span, 8' OC		15.29	\$ 1,390,000
B10207703152	Roof deck, douglas fir, 3" thick, 8' span		11.22	\$ 1,020,000
B2010	Exterior Walls		7.07	\$ 643,000
* B20101092250	Concrete block (CMU) wall, regular weight, 75% solid, 8 x 8 x 16, 4500 PSI, perlite core fill		6.93	\$ 630,000
* B20101402300	Exterior wall, glass block, 6" x 6", plain, under 1000 SF		0.14	\$ 13,000
B2020	Exterior Windows		1.45	\$ 132,000
B20202101250	Aluminum flush tube frame, for 1/4" glass, 1-3/4" x 4", 5' x 20' opening, three intermediate horizontals		0.70	\$ 64,000
B20202202200	Glazing panel, plate glass, 3/8" thick, clear		0.75	\$ 68,000
B2030	Exterior Doors		4.43	\$ 403,000
* B20301108200	Door, aluminum & glass, sliding entrance, 5' x 7' door, electric operator, 12'-0" x 7'-6" opening		0.55	\$ 50,000
* B20302203950	Door, steel 18 gauge, hollow metal, 1 door with frame, "A" label, 3'-0" x 7'-0" opening		1.43	\$ 130,000
* B20302204200	Door, steel 18 gauge, hollow metal, 2 doors with frame, "A" label, 6'-0" x 7'-0" opening		2.20	\$ 200,000
* B20302204650	Door, steel 24 gauge, overhead, sectional, electric operator, 12'-0" x 12'-0" opening		0.25	\$ 23,000
B3010	Roof Coverings		9.69	\$ 880,900
* B30101055700	Roofing, asphalt mineral surface, roll, 3 plies glass fiber felt (Type IV), 1 ply mineral surfaced selvage roofing, lap 19", mopped		0.46	\$ 42,000
* B30101055700	Roofing, asphalt mineral surface, roll, 3 plies glass fiber felt (Type IV), 1 ply mineral surfaced selvage roofing, lap 19", mopped		0.59	\$ 54,000
* B30101055700	Roofing, asphalt mineral surface, roll, 3 plies glass fiber felt (Type IV), 1 ply mineral surfaced selvage roofing, lap 19", mopped		1.76	\$ 160,000
* B30101300550	Roofing, corrugated, aluminum, painted, .0320" thick, .569 PSF		1.98	\$ 180,000
* B30101301050	Roofing, corrugated, steel, colored, 26 ga, 1.43 PSF		0.97	\$ 88,000
* B30103203090	Insulation, rigid, roof deck, composite with 2" EPS, 1" perlite		2.75	\$ 250,000
* B30104201100	Roof edges, aluminum, mill finish, .050" thick, 6" face		0.88	\$ 80,000
* B30104300040	Flashing, aluminum, no backing sides, .019"		0.17	\$ 15,000
B30106101000	Gutters, box, steel, galvanized, 28 ga thick, 5", enameled finish		0.08	\$ 7,300
B30106201450	Downspout, steel, rectangular, corrugated, 3" x 4", galvanized, 28 ga thick		0.05	\$ 4,600
B3020	Roof Openings		0.25	\$ 22,700

* B30201105200	Skylight, plastic domes, insulated curbs, nominal size to 10 SF, double glazing	0.07	\$	6,700
* B30201105200	Skylight, plastic domes, insulated curbs, nominal size to 10 SF, double glazing	0.18	\$	16,000
C	Interiors	8.13%	18.07	\$ 1,642,850
C1010	Partitions		2.98	\$ 271,120
C10101022000	Concrete block (CMU) partition, regular weight, hollow, 8" thick, no finish		0.83	\$ 75,000
* C10101045500	Concrete block (CMU) partition, light weight, hollow, 6" thick, no finish	1.65	\$	150,000
* C10101241200	Wood partition, 5/8" fire rated gypsum board face, none base, 2 x 4, @ 16" OC framing, same opposite face, 0 insul	0.00	\$	120
* C10101241250	Wood partition, 5/8" fire rated gypsum board face, no base layer, 2x4, @ 16", 5/8" reg gypsum board opposite face, 0 insul	0.51	\$	46,000
C1020	Interior Doors		2.17	\$ 197,500
* C10201023500	Doors, double swing aluminum and glass, 12'-0" x 7'-0", mill finish	0.15	\$	14,000
* C10201023500	Doors, double swing aluminum and glass, 12'-0" x 7'-0", mill finish	0.44	\$	40,000
* C10201023500	Doors, double swing aluminum and glass, 12'-0" x 7'-0", mill finish	0.15	\$	14,000
* C10201023800	Sliding entrance door and frame, mill finish	0.15	\$	14,000
* C10201141020	Metal door/metal frame, flush-hollow core, 20 ga full panel, 3'-0" x 7'-0", butt weld frame, 8-3/4"	0.61	\$	55,000
* C10201141220	Metal door/metal frame, flush-hollow core, 20 ga half glass, 3'-0" x 7'-0", butt welded frame, 8-3/4"	0.24	\$	22,000
* C10201141380	Metal door/metal frame, flush-hollow core, 20 ga half glass, 6'-0" x 7'-0", butt welded frame, 8-3/4"	0.06	\$	5,400
* C10201221620	Wood door/metal frame, hollow core/flush, lauan face, 3'-0" x 7'-0", butt welded frame, 8-3/4"	0.35	\$	32,000
* C10201221820	Wood door/metal frame, hollow core/flush, birch face, 3'-0" x 7'-0", butt welded frame, 8-3/4"	0.01	\$	1,100
C1030	Fittings		0.48	\$ 43,300
* C10301100840	Toilet partitions, cubicless, floor mounted, headrail braced, painted metal	0.03	\$	2,500
* C10301100840	Toilet partitions, cubicless, floor mounted, headrail braced, painted metal	0.12	\$	11,000
* C10301100860	Toilet partitions, cubicless, floor mounted, headrail braced, plastic laminate	0.01	\$	1,200
* C10301100860	Toilet partitions, cubicless, floor mounted, headrail braced, plastic laminate	0.06	\$	5,600
* C10301100860	Toilet partitions, cubicless, floor mounted, headrail braced, plastic laminate	0.03	\$	2,300
* C10301100960	Toilet partitions, cubicles, wall hung, painted metal	0.03	\$	2,700
* C10303100200	Lockers, steel, 1- tier, std. duty, 5' to 6' high, per opening, 1 wide, knock down constr.	0.20	\$	18,000
C2010	Stair Construction		1.58	\$ 143,900
* C20101100480	Stairs, CIP concrete, w/o landing, 12 risers, with nosing	0.66	\$	60,000
* C20101100620	Stairs, CIP concrete, w/landing, 24 risers, with nosing	0.12	\$	11,000
* C20101100620	Stairs, CIP concrete, w/landing, 24 risers, with nosing	0.12	\$	11,000
* C20101100620	Stairs, CIP concrete, w/landing, 24 risers, with nosing	0.23	\$	21,000
* C20101100660	Stairs, steel, grate type w/nosing & rails, 16 risers, with landing	0.42	\$	38,000
* C20101101120	Stairs, wood, prefab box type, oak treads, wood rails 3'-6" wide, 14 risers	0.03	\$	2,900
C3010	Wall Finishes		2.44	\$ 222,000
C30102202000	2 coats paint on masonry with block filler		1.43	\$ 130,000
* C30102301670	Wood board, knotty pine, finished	0.66	\$	60,000
* C30102301940	Ceramic tile, thin set, 4-1/4" x 4-1/4"	0.35	\$	32,000
C3020	Floor Finishes		6.22	\$ 565,030
C30204100930	Concrete topping, paint		0.19	\$ 17,000
* C30204101520	Rubber, tile, maximum	0.28	\$	25,000
* C30204101520	Rubber, tile, maximum	3.41	\$	310,000
* C30204101600	Vinyl, composition tile, maximum	0.01	\$	530
* C30204101760	Tile, porcelain type, maximum	0.06	\$	5,800
* C30204101760	Tile, porcelain type, maximum	0.39	\$	35,000
* C30204102300	Add for sleepers on concrete, treated, 24" OC, 2"x4"	0.13	\$	12,000
* C30204102370	Underlayment, plywood, 3/4" thick	0.14	\$	13,000
* C30204109200	Vinyl, composition tile, 12" x 12" x 1/8" thick, recycled content	0.07	\$	6,700

* C30204109200	Vinyl, composition tile, 12" x 12" x 1/8" thick, recycled content	1.54	\$	140,000
C3030	Ceiling Finishes	2.20	\$	200,000
* C30302105800	Acoustic ceilings, 5/8" fiberglass board, 24" x 48" tile, tee grid, suspended support	2.20	\$	200,000
D	Services	18.03%	40.05	\$ 3,640,790
D1010	Elevators and Lifts	0.95	\$	86,000
* D10101101900	Hydraulic, passenger elevator, 2500 lb, 2 floors, 100 FPM	0.95	\$	86,000
D2010	Plumbing Fixtures	1.89	\$	172,000
* D20101102120	Water closet, vitreous china, bowl only with flush valve, floor mount	0.88	\$	80,000
* D20102102000	Urinal, vitreous china, wall hung	0.12	\$	11,000
* D20102102000	Urinal, vitreous china, wall hung	0.05	\$	4,500
* D20103101800	Lavatory w/trim, vanity top, stainless, 17" x 22"	0.06	\$	5,600
* D20103101800	Lavatory w/trim, vanity top, stainless, 17" x 22"	0.06	\$	5,600
* D20103101960	Lavatory w/trim, vanity top, vitreous china, 19" x 16"	0.31	\$	28,000
* D20103102200	Lavatory w/trim, wall hung, vitreous china, 19" x 17"	0.07	\$	6,300
* D20104101960	Kitchen sink w/trim, countertop, stainless steel, 33" x 22" double bowl	0.08	\$	7,400
* D20104202080	Laundry sink w/trim, plastic, on wall or legs, 20" x 24" single compartment	0.02	\$	1,400
* D20104202080	Laundry sink w/trim, plastic, on wall or legs, 20" x 24" single compartment	0.02	\$	1,400
* D20104404260	Service sink w/trim, PE on Cl, corner floor, 28" x 28", w/rim guard	0.04	\$	3,600
* D20107101960	Shower, built-in head, arm, bypass, stops and handles	0.10	\$	9,100
* D20108201840	Water cooler, electric, wall hung, 8.2 GPH	0.02	\$	2,000
* D20108201840	Water cooler, electric, wall hung, 8.2 GPH	0.04	\$	4,000
* D20108201920	Water cooler, electric, wall hung, wheelchair type, 7.5 GPH	0.02	\$	2,100
D2020	Domestic Water Distribution	0.81	\$	73,600
* D20202101820	Electric water heater, residential, 100< F rise, 20 gallon tank, 7 GPH	0.03	\$	2,600
* D20202502060	Gas fired water heater, commercial, 100< F rise, 200 MBH input, 192 GPH	0.78	\$	71,000
D2040	Rain Water Drainage	0.52	\$	47,000
* D20402104120	Roof drain, Cl, soil, single hub, 3" diam, 10' high	0.42	\$	38,000
* D20402104160	Roof drain, Cl, soil, single hub, 3" diam, for each additional foot add	0.10	\$	9,000
D3020	Heat Generating Systems	4.19	\$	381,000
* D30201061080	Boiler, gas, cast iron, hot water, 1,088 MBH	0.25	\$	23,000
* D30203301010	Pump, base mounted with motor, end-suction, 2-1/2" size, 3 HP, to 150 GPM	0.89	\$	81,000
* D30203301020	Pump, base mounted with motor, end-suction, 3" size, 5 HP, to 225 GPM	0.79	\$	72,000
* D30203301030	Pump, base mounted with motor, end-suction, 4" size, 7-1/2 HP, to 350 GPM	0.32	\$	29,000
* D30203301040	Pump, base mounted with motor, end-suction, 5" size, 15 HP, to 1000 GPM	0.45	\$	41,000
* D30203301050	Pump, base mounted with motor, end-suction, 6" size, 25 HP, to 1550 GPM	0.59	\$	54,000
* D30203301050	Pump, base mounted with motor, end-suction, 6" size, 25 HP, to 1550 GPM	0.89	\$	81,000
D3030	Cooling Generating Systems	2.11	\$	192,000
* D30303301020	Cooling tower, stainless steel, packaged unit, draw thru, 110 ton	0.79	\$	72,000
* D30303301030	Cooling tower, stainless steel, packaged unit, draw thru, 300 ton	1.32	\$	120,000
D3040	Distribution Systems	3.51	\$	319,000
* D30401141010	AHU, rooftop, cool/heat coils, constant volume, filters, 2,000 CFM	0.48	\$	44,000
* D30401141020	AHU, rooftop, cool/heat coils, constant volume, filters, 5,000 CFM	0.57	\$	52,000
* D30401141020	AHU, rooftop, cool/heat coils, constant volume, filters, 5,000 CFM	0.57	\$	52,000
* D30401181050	Fan coil A/C system, cabinet mounted, controls, 2 pipe, 3 ton	0.20	\$	18,000
* D30402401010	Roof vent. system, power, centrifugal, aluminum, galvanized curb, back draft damper, 500 CFM	0.35	\$	32,000
* D30402401040	Roof vent. system, power, centrifugal, aluminum, galvanized curb, back draft damper, 2750 CFM	0.65	\$	59,000
* D30402401050	Roof vent. system, power, centrifugal, aluminum, galvanized curb, back draft damper, 3500 CFM	0.28	\$	25,000

* D30402601010	Commercial kitchen exhaust/make-up air system, rooftop, gas, 2000 CFM	0.41 \$	37,000
D3050	Terminal & Package Units	2.69 \$	244,300
* D30501201040	Space heater, suspended, gas fired, propeller fan, 160 MBH	0.25 \$	23,000
* D30501301010	Space heater, suspended, horizontal mount, hot water, propeller fan, 20 MBH	0.09 \$	8,300
* D30501301020	Space heater, suspended, horizontal mount, hot water, propeller fan, 60 MBH	0.12 \$	11,000
* D30501703400	Split system, air cooled condensing unit, medical centers, 10,000 SF, 23.33 ton	0.12 \$	11,000
* D30501751010	A/C, rooftop, DX cooling, gas heat, curb, economizer, filters, 5 ton	0.18 \$	16,000
* D30501751030	A/C, rooftop, DX cooling, gas heat, curb, economizer, filters, 12-1/2 ton	0.26 \$	24,000
* D30501751040	A/C, rooftop, DX cooling, gas heat, curb, economizer, filters, 18 ton	0.32 \$	29,000
* D30501751050	A/C, rooftop, DX cooling, gas heat, curb, economizer, filters, 25 ton	0.58 \$	53,000
* D30502301060	Heat pump, central station, water source, constant volume, 50 ton	0.76 \$	69,000
D4010	Sprinklers	5.94 \$	540,000
* D40103101080	Dry pipe sprinkler systems, steel, ordinary hazard, 1 floor, 10,000 SF	3.19 \$	290,000
* D40104101060	Wet pipe sprinkler systems, steel, ordinary hazard, 1 floor, 5000 SF	2.75 \$	250,000
D4020	Standpipes	0.53 \$	48,400
* D40203101540	Wet standpipe risers, class III, steel, black, sch 40, 4" diam pipe, 1 floor	0.23 \$	21,000
* D40203101560	Wet standpipe risers, class III, steel, black, sch 40, 4" diam pipe, additional floors	0.08 \$	6,900
* D40203301540	Dry standpipe risers, class III, steel, black, sch 40, 4" diam pipe, 1 floor	0.15 \$	14,000
* D40203301560	Dry standpipe risers, class III, steel, black, sch 40, 4" diam pipe, additional floors	0.07 \$	6,500
D5010	Electrical Service/Distribution	3.15 \$	286,000
* D50101301400	Underground service installation, includes excavation, backfill, and compaction, 100' length, 4' depth, 3 phase, 4 wire, 277/480 volts, 800 A	0.29 \$	26,000
* D50102300400	Feeder installation 600 V, including RGS conduit and XHHW wire, 800 A	0.66 \$	60,000
* D50102400540	Switchgear installation, incl switchboard, panels & circuit breaker, 277/480 V, 800 A	0.32 \$	29,000
* D50102501020	Panelboard, 4 wire w/conductor & conduit, NQOD, 120/208 V, 100 A, 1 stories, 25' horizontal	0.42 \$	38,000
* D50102501080	Panelboard, 4 wire w/conductor & conduit, NQOD, 120/208 V, 225 A, 0 stories, 0' horizontal	0.14 \$	13,000
* D50102502000	Panelboard, 4 wire w/conductor & conduit, NQOD, 120/208 V, 225 A, 1 stories, 25' horizontal	0.92 \$	84,000
* D50102502020	Panelboard, 4 wire w/conductor & conduit, NQOD, 120/208 V, 225 A, 5 stories, 50' horizontal	0.14 \$	13,000
* D50102506080	Panelboard, 4 wire w/conductor & conduit, NEHB, 277/480 V, 600 A, 1 stories, 25' horizontal	0.25 \$	23,000
D5020	Lighting and Branch Wiring	11.85 \$	1,076,770
D50201100240	Receptacles incl plate, box, conduit, wire, 2.5 per 1000 SF, .3 W per SF, with transformer	0.98 \$	89,000
D50201350520	Miscellaneous power, 3 watts	0.76 \$	69,000
D50201400280	Central air conditioning power, 4 watts	0.59 \$	54,000
* D50201650200	Safety switch, 30 A fused, 1 phase, 2 HP 115 V or 3 HP, 230 V	0.00 \$	310
* D50201650360	Safety switch, 30 A fused, 3 phase, 15 HP, 460 V or 20 HP, 575 V	0.02 \$	2,100
* D50201650520	Safety switch, 60 A fused, 3 phase, 30 HP 460 V or 40 HP 575 V	0.01 \$	660
* D50201650680	Safety switch, 100 A fused, 3 phase, 50 HP 460 V or 60 HP 575 V	0.03 \$	3,100
* D50201651040	Safety switch, 600 A fused, 3 phase, 400 HP 460 V	0.12 \$	11,000
* D50201651040	Safety switch, 600 A fused, 3 phase, 400 HP 460 V	0.08 \$	7,600
* D50202080640	Fluorescent fixtures, type A, 23 fixtures per 1600 SF	3.63 \$	330,000
D50202300680	HID fixture, 20' above work plane, 3 watt/SF, type G, 151 FC, 3 fixtures per 1000 SF	5.61 \$	510,000
D5030	Communications and Security	1.91 \$	174,000
D50309100220	Communication and alarm systems, includes outlets, boxes, conduit and wire, sound systems, 12 outlets	0.74 \$	67,000

D50309100452	Communication and alarm systems, fire detection, addressable, 25 detectors, includes outlets, boxes, conduit and wire	1.01	\$	92,000
D50309100462	Fire alarm command center, addressable with voice, excl. wire & conduit	0.17	\$	15,000
D5090	Other Electrical Systems	0.01	\$	720
* D50905101000	Electric baseboard radiation, low density, 900 SF floor area, 31 MBH, 9 kW	0.01	\$	720
E	Equipment & Furnishings	27.74%	61.63	\$ 5,601,900
E1010	Commercial Equipment	0.02	\$	2,000
* E10101100500	Specialties, security gates-scissors type, painted steel, single, 6' high, 5-1/2' wide	0.02	\$	2,000
E1020	Institutional Equipment	7.58	\$	688,900
* E10201300100	Architectural equipment, church equipment pews, bench type, hardwood, economy	5.83	\$	530,000
* E10201300100	Architectural equipment, church equipment pews, bench type, hardwood, economy	0.04	\$	3,700
* E10201300100	Architectural equipment, church equipment pews, bench type, hardwood, economy	0.04	\$	3,200
* E10201300100	Architectural equipment, church equipment pews, bench type, hardwood, economy	0.14	\$	13,000
* E10201300100	Architectural equipment, church equipment pews, bench type, hardwood, economy	0.14	\$	13,000
* E10201300100	Architectural equipment, church equipment pews, bench type, hardwood, economy	0.35	\$	32,000
* E10201300100	Architectural equipment, church equipment pews, bench type, hardwood, economy	0.77	\$	70,000
* E10201300110	Architectural equipment, church equipment pews, bench type, hardwood, deluxe	0.26	\$	24,000
E1090	Other Equipment	54.03	\$	4,911,000
* E10908100120	Architectural equipment, sauna, prefabricated, including heater and controls, 7' high, 10' x 12'	0.23	\$	21,000
* E10908200160	Special construction, swimming pools, municipal, gunite shell, tile finish, formed gutters	53.80	\$	4,890,000
F	Special Construction	11.24%	24.97	\$ 2,270,000
F1040	Special Facilities	24.97	\$	2,270,000
* F10402100110	Special construction, ice skating rink, 85' x 200', 90 degree system, 12 months, 135 ton	19.47	\$	1,770,000
* F10402100130	Special construction, ice skating rink, dash boards, acryl screens, fiberglass and aluminum construction	5.50	\$	500,000
G	Building Sitework	7.24%	16.08	\$ 1,462,000
G2020	Parking Lots	10.34	\$	940,000
* G20202101580	Parking lot, 90 degree angle parking, 4" bituminous paving, 8" gravel base	10.34	\$	940,000
G2030	Pedestrian Paving	0.13	\$	12,000
* G20301201680	Concrete sidewalk, 4" thick, 6" gravel base, 5' wide	0.13	\$	12,000
G2040	Site Development	5.61	\$	510,000
* G20401251000	Fence, chain link, Security 4" Tpost, 2" rail, 1" mesh, 8' high	5.61	\$	510,000
SubTotal		100%	\$	222.17 \$ 20,195,140
Contractor Fees (General Conditions,Overhead,Profit)		25%	\$	55.54 \$ 5,048,785
Architectural Fees		7%	\$	15.55 \$ 1,413,660
User Fees		0%	\$	- \$ -
Total Building Cost			\$	293.26 \$ 26,657,585

* Indicates Assemblies or Components have been customized.

APPENDIX D

**EIC CODE
VIOLATIONS &
DEFICIENCIES FOR
AOUTIC CENTRE**

Appendix D - EIC Code Violations and Deficiencies for Aquatic Centre

Detailed breakdown and recommendations of the electrical code violations of the bypass located in the Aquatic Centre chlorine room.



Appendix D

EIC Code Violations and Deficiencies for Aquatic Centre

Fig. 1) Depicts a code violation to 2-308(1) (as shown in **Fig 2**); the wall mounted equipment is blocked by the motors. A good/typical design practice suggests that there should be room/clearance for accessibility and maintenance purposes.

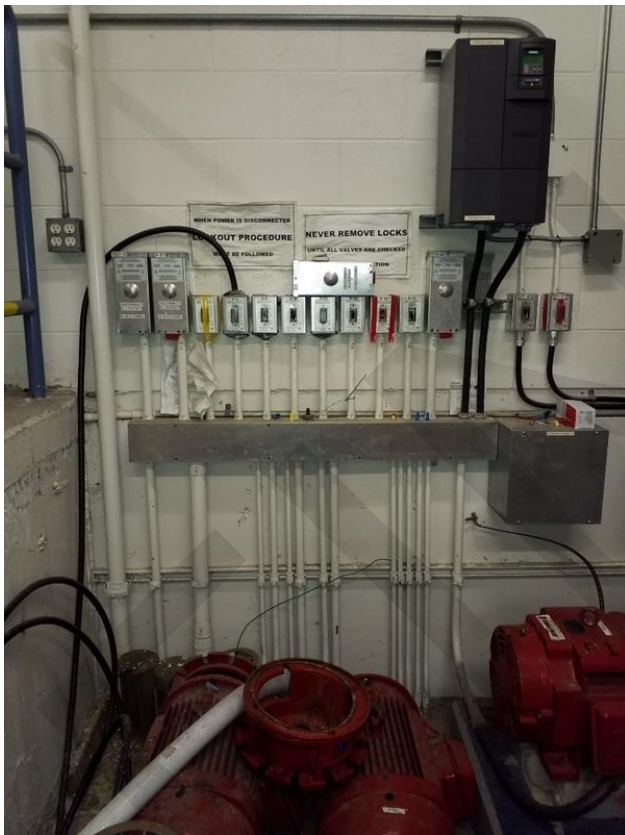


Figure 1. Bypass Overview

2-308 Working space around electrical equipment

- (1) A minimum working space of 1 m with secure footing shall be provided and maintained about electrical equipment such as switchboards, panelboards, control panels, and motor control centres that are enclosed in metal, except that working space is not required behind such equipment where there are no renewable parts such as fuses or switches on the back and where all connections are accessible from locations other than the back.

Figure 2. Canadian Electrical Code 2018 (Section 2-308)

Fig 3) The Teck cable on the left isn't supported. Should be supported with cable supports similar to the other ones on the wall. In addition, there is a spare disconnect just placed on top of the other equipment.



Figure 3. Bypass cables

Fig 4) 600V VFD should be protected with a NEMA enclosure offering waterproof protection due to the location because a pipe could burst and damage the VFD.



Figure 4. VFD with no protection

Fig 5) It appears that the switches aren't lockable which does not provide adequate precautions according to code 2-304(3) (as shown in **Fig 6**). 600V VFD is connected to the splitter box along with all ancillary devices - these devices also appear to not be the appropriate IEC Measurement Category.



Figure 5. Switches

2-304 Disconnection (see Appendix B)

- (1) No repairs or alterations shall be carried out on any live equipment except where complete disconnection of the equipment is not feasible.
- (2) Three-way or four-way switches shall not be considered as disconnecting means.
- (3) Adequate precautions, such as locks on circuit breakers or switches, warning notices, sentries, or other equally effective means, shall be taken to prevent electrical equipment from being electrically charged when work is being done.

Figure 6. Canadian Electrical Code 2018 (Section 2-304)

Recommendations:

Equipment to be located in a more accessible location while complying with the Canadian Electrical Code 2018. CSA C22.1-2018. Contractor to ensure the appropriate equipment is used per service and location Category rating.

Hiring an electrical inspector is also highly recommended. An experienced inspector will be able to provide the District with detailed violations, steps to correct violations, and associated costs.

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