



Capital Management
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5531 Cornwallis Street,
Halifax, NS, Canada

Phone: 902 429 4412
Fax: 902 423 4945



CAMPBELL COMEAU
ENGINEERING LIMITED
CONSULTING ENGINEERS

2719 GLADSTONE STREET
SUITE 110 HALIFAX, N.S. B3K 4W6
Tel: 429-5454 Fax: 444-3099
Email: cce@campbellcomeau.ns.ca

HALIFAX



Draft Report

Halifax Forum Redevelopment 2901 Windsor Street Halifax, Nova Scotia

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HRM Contract Number 2070619280

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Prepared for: Mr. Darren Young
Project Manager
Operations Support /
Corporate Facility Design & Construction
Halifax Regional Municipality
PO Box 1749,
Halifax, NS B3J 3A5

Prepared by: Capital Management Engineering Limited
5531 Cornwallis Street
Halifax, NS, B3K 1B3
(902) 429-4412

Executive Summary

Project Description

Capital Management Engineering Limited (CMEL) was retained by Mr. Darren Young, Operations Support / Corporate Facility Design & Construction, Halifax Regional Municipality following Council's decision to investigate further the possibility to redevelop the property known as the Halifax Forum located at 2901 Windsor Street Halifax. The subject of this report is to better define the potential challenges and risks associated with redevelopment and provide a budget level estimate. In addition the project is to identify specific limitations or criteria that may not be achievable.

An assessment of the property was undertaken in 2016 to identify and compare the costs associated with repairing and renovating the current facilities or demolishing them and building new. The 2016 report provided a general overview of the present condition of the building components and provided an opinion of probable costs to remedy any identified physical deficiencies over an evaluation period of 20 years. CMEL completed the architectural assessment, and was also responsible to coordinate and integrate into the report, discipline specific assessments of the structural systems undertaken by Campbell Comeau Engineering Ltd. (Campbell Comeau) and mechanical, electrical, life safety and ice plant assessments which were completed by Eastpoint Engineering Limited (Eastpoint).

This report is an extension of the first study which continues to be used as a baseline with respect to redevelop and renovate the current building to meet the defined program needs.

The propose of the report is to define the costs and risks related to accommodating an additional ice pad at the Halifax Forum site and meet the requirements of a Functional Space Program (Program) as defined by the Halifax Regional Municipality's Charter. The overall project is required in support of HRM's recreation program delivery and HRM's long term asset and overall portfolio management.

Renovation Solution

Current Building Condition

The Halifax Forum was constructed in 1927 and has had multiple additions and renovations since construction. It is currently a four building complex which houses two ice pads and multipurpose event spaces including a bingo hall. The building complex is two storeys with a reported gross area of approximately 123,000 ft² (11,430 m²). The Halifax Forum Complex is within the Municipal recreation portfolio. The current facilities were assessed by a multidisciplinary team to provide a general overview of the present condition of the building components and to provide an opinion of costs to renovate the Complex such that it meets the HRM Project Charter.

The Charter generally defines that the Complex is to be brought up to today's codes, provide an additional ice sheet, have at least two of the ice sheets be brought up to NHL size and maintain the Heritage designation associated with the Forum. The current condition of the complex is generally poor to fair condition with many of the complex elements at or beyond their expected useful life.

In addition, the current complex does not meet many aspects of today's building codes. The roof structures throughout the four buildings do not meet snow, lateral or seismic requirements. There are serious life safety code issues with the Forum. These are not limited to distance of egress, number of egress points lack of full sprinkler coverage, a combustible roof, distances below minimum clearances surrounding the patron seating and the density of seats versus egress pathways. In addition, the slopes associated with the lower concourse exceed allowed slopes for egress.

To have the complex full accessible, which is considered a minimum standard for Municipal infrastructure by today's standards will require significant alteration. Changes in slopes, seating locations and the addition of an elevator are anticipated.

Renovation

To achieve the Charter's objectives CMEL working with HRM staff produced a set of Functional Program Requirements (Program) and categorized each item as either mandatory, preferred and wish list. Working from this list CMEL developed a proposed renovation solution which allowed CMEL to estimate the costs associated with the solution.

The renovation solution is understood to be comprised of several components including demolition, new construction and renovation and repair or recapitalization of end of life components to meet the space requirements of the Program.

In summary the existing Forum Complex if renovated, includes expanding the ice surface of both the Forum and the Civic Centre to NHL size. The Bingo Hall is maintained. The MPC is demolished and an additional ice pad is added along with additional floor space as required to meet the Program requirements. Compliance to current codes is considered mandatory facility wide, which includes revision to the seating of the Forum. It is our opinion that the deterioration of the Forum masonry is beyond repair and that a "replica" of the original Forum is built preserving the architectural attributes associated with its Heritage designation.

The interior renovations anticipated with the forum include extensive renovations to the concourse and the addition of egress points as well as reduction in seating to achieve the correct ratio of egress pathways to seats. Additional points of egress are anticipated to be required.

The Civic arena requires less renovations however structural reinforcing of the roof is anticipated along with extending the building northward to accommodate the new size of ice pad. The addition of a third pad has been considered equivalent to a new building, once the demolition of the MPC has been completed and the debris removed. The Bingo Hall remains mostly unchanged.

The ice plant that is currently serving the two ice sheets is at the end of its life, and a new plant suitable for servicing all three sheets has been included. General upgrades to the site have been considered including pedestrian and vehicle circulation, optimized parking and separation of pedestrians and vehicles at the entrances.

Estimate

The anticipated costs have generally been broken down into three categories:

- Demolition costs
- Renovation costs
- New construction costs

	Demolition Costs	Repairs and Renovation	New Construction	Total Cost
Renovation Solution	\$3,980,218	\$39,740,198	\$16,714,662	\$60,435,078

Conclusion

The Forum Complex proposed renovation and addition of a third ice pad is anticipated to come at a significant premium in comparison to a new build. To maintain the Heritage status of the Forum, increase the pad sizes to NHL size and add a third ice pad on the Forum site will come at an expense beyond building new. A decision will have to be made as to whether the premium associated with renovating the Forum site is deemed reasonable to proceed.

Overall Condition and Limitations

The analyses and development of the proposed renovation solution is based on the communicated requirements as defined by the Halifax Regional Municipality. CMEL has not developed a detailed space adequacy analysis or developed a preliminary design. Building design is beyond the scope of this report.

Estimates are anticipated to be developed to a class D at best and are anticipated to be suitable for comparative use and for budgetary discussions and decision making.

The statements made in the Executive Summary are subject to the same limitations included in the Closure section, and are to be read in conjunction with the remainder of this report.

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1 Introduction

Capital Management Engineering Limited (CMEL) was retained by Mr. Darren Young, Operations Support / Corporate Facility Design & Construction, Halifax Regional Municipality (HRM) to evaluate the possibility to redevelop the property known as the Halifax Forum Complex located at 2901 Windsor Street Halifax to meet the specific defined needs of HRM and specifically the Department of Recreation program delivery. The subject of this report is to estimate the cost of and refine the potential challenges and risks associated with a redevelopment of the site and buildings to accommodate a third ice sheet and update the facilities generally to meet current building standards.

An assessment of the property was undertaken in 2016 to identify and compare the costs associated with repairing and renovating the current facilities or demolishing them and building new. The 2016 report provided a general overview of the present condition of the building components and provided an opinion of probable costs to remedy any identified physical deficiencies over an evaluation period of 20 years. CMEL completed the architectural assessment, and was also responsible to coordinate and integrate into the report, discipline specific assessments of the structural systems undertaken by Campbell Comeau Engineering Ltd. (Campbell Comeau) and mechanical, electrical, life safety and ice plant assessments which were completed by Eastpoint Engineering Limited (Eastpoint).

This report is an extension of the first study which continues to be used as a baseline with respect to redevelop and renovate the current building to meet the defined program needs.

2 Objective

The propose of the report is to better define the costs and risks related to accommodating an additional ice pad at the Halifax Forum site and meet the requirements of a Functional Space Program (Program) as defined by the Halifax Regional Municipality. The overall project is required in support of HRM's recreation program delivery and HRM's long term asset and overall portfolio management.

3 Background

The Halifax Forum Complex (Complex) was constructed in 1927 and has had multiple additions and renovations since construction. It is currently a four building complex which houses two ice pads (that are smaller than the NHL sheet size standard of 200ft x 85ft) and multipurpose event spaces. The common terms used for each individual building are:

- The Forum, which is the original ice pad,
- The Civic Arena which is the second ice pad,
- The Multi Purpose Centre (MPC), and
- The Bingo Hall (which includes the Maritime Hall).
-

The existing Complex is two storeys with a reported gross area of approximately 123,000 ft² (11,430 m²).

The Halifax Forum Complex is within the Municipal recreation portfolio which includes several aging single sheet arenas. CMEL was contracted in 2016 to conduct an options analysis which included complete a detailed condition assessment of the current Complex and the Forum Site. After reviewing the initial report, Halifax Regional Council directed staff on June 20, 2017 to “conduct additional analysis on the Halifax Forum project including further building condition assessment and related renovation feasibility...and report back to Regional Council prior to undertaking the project”. The result of that direction is the subject of this report.

The project at a high level is to provide an additional ice pad on the current Forum site and to renew the Complex. The Program requirement was provided by the Halifax Regional Municipality in 2016 which was subsequently amended by HRM through the Halifax Forum Complex Renovation Draft Project Charter Objectives dated August 18, 2017, a copy of which is located in section 5.1.1 of this report. The charter established the requirement for a total of three ice pads of which two are required to be NHL sized ice pads. These ice pads are required to have supporting facilities, and multipurpose community event spaces with a gross area requirement of be approximately 183,800 ft² (17,100 m²).

3.1 General Methodology

The analysis consisted of the following:

- Interviews with the Municipality, and staff as made available;
- Review of available building drawings;
- On-site assessment that included a building walk-through, data collection, collection of and observation of building, equipment and component conditions;
- Identification of building component and equipment replacement requirements, estimated costs and schedule;
- Development of a gap analysis between the current complex and the Program requirements.
- Estimate the new construction and renovation costs associated with the additional area required to meet the Program objectives
- Responses to a review of the draft report (pending).

3.2 Building Condition Assessment (BCA)

The BCA carried out by Capital Management Engineering Limited on the property was based on the ASTM Standard Guide for Property Condition Assessments: Baseline Property Condition Assessment Process (ASTM E 2018-15)

The assessment of the Site was initially based on a visual assessment of the visible and readily accessible areas of the property, building and related structures. The site components, building exterior, roof membrane(s) and interior finishes of the on-site buildings and related structures were visually reviewed to check their condition and to identify if any obvious physical deficiencies were present. Typically this review would not include an intrusive investigation of wall assemblies, ceiling cavities or any other enclosure spaces. In this case, exceptions were made to investigate potential structural concerns associated to the building. Destructive testing was undertaken under the direction of Campbell Comeau Engineering (a local structural engineering firm) and included removing limited areas of the masonry to expose the imbedded structural

members. These members make up the building frame which supports the roof of the Forum. This also provided the opportunity to confirm and evaluate the construction methodology of the cladding system.

Beyond the described destructive testing, no additional physical tests were conducted and no samples of building materials were collected to confirm or support the findings presented unless otherwise noted in this report. Recommendations and estimates for additional testing or investigations may be presented as part of the report when, in the assessor's opinion, a condition may exist that would substantially alter the findings and cannot be adequately assessed by non-intrusive visual means.

The review of the mechanical and electrical systems at the property included discussions with the site contact(s). A visual review of the mechanical and electrical systems was conducted to confirm the type of systems present, age and aesthetic condition. The baseline information gathered by Eastpoint Engineering supporting the 2016 report was also review and incorporated where appropriate. No physical tests were conducted on the mechanical and electrical operating systems.

A high level code review was completed however a detailed evaluation of the property development's compliance with all National and Provincial Building Codes and/or Fire Codes is not part of the scope of this assessment. However, applicable codes may be used as a reference in determining appropriate recommendations. Although it is assumed that the existing buildings were reviewed and approved by local authorities at the time of construction, part of the Program definition included bringing many aspects of the Complex up to current day codes and standards.

The estimated costs outlined in the initial 2016 report and subsequently used in this report, are based on the conditions observed during the site assessments and the documents provided. The opinions of cost are intended for global budgeting purposes only. Actual costs for work recommended can only be determined after preparation of tender documents and/or soliciting quotations from qualified contractors. Costs associated with scheduling restrictions, and impacts to ongoing operations have not been taken into account in determining the estimate of costs. In many cases various assumptions have been made which have had an impact on the planned redevelopment and or costs associated with the Project.

3.3 Redevelopment Analysis and Costing

Following the detailed assessment it was possible to identify the components that were suitable for continued use and those which were at end of life and in need for replacement. Referring to the Program's objectives, CMEL compared the current Complex space and determined what existing space met or did not meet the Program requirements. This result in a gap analysis which once defined allowed CMEL to propose a renovation solution to meet the Program requirements. Once the gap and possible solution(s) had been determined the cost of the solution was estimated.

Pricing estimates were developed using the same methodology as in the 2016 report, using, when available, known recent past expenditure pricing from similar HRM projects, in the absence of suitable recent HRM pricing local contractor pricing was used and lastly if required, estimates were developed using RS Means estimating guides corrected for currency, geometry and geographical location.

3.4 The Report

The presentation of the findings included in this report generally follows a defined format. The Complex was reviewed system by system and building by building and in keeping with the review we have reported using the same category breakdown. This allows the reader to identify based on each of the systems, their location their condition, and their suitability for re-use and or redevelopment. Following the Description, Observation and Comments we provide a Conclusion and Recommendation. Each section is completed with a table summary of the recommendations by major component. A separate estimate section follows taking into account the overall renovation solution. The report contains an executive summary which highlights the results.

3.5 Supporting Documents

The following supporting documentation was provided by HRM to support the assessment:

Supporting Document	Category	Date Issued	Issuing Party
Photo - GISS Forum	Specifications	Unknown	HRM
D4P - Costing Sheet	Other	Unknown	Unknown
HRM - Bingo Hall Drawings - 12 June 2012 - CAD	Drawings	18/05/2012	IPECC
HRM - Halifax Forum - 12 June 2012 - CAD	Drawings	18/05/2012	IPECC
HRM - Civic Centre - level One - 12 June 2012 - CAD	Drawings	18/05/2012	IPECC
HRM - Civic Centre - level Two - 12 June 2012 - CAD	Drawings	18/05/2012	IPECC
HRM - Multi Purpose Centre - 12 June 2012 - CAD	Drawings	18/05/2012	IPECC
Background Document Request	Correspondence	04/10/2017	CMEL
Dartmouth 4 Pad - Electrical	Drawings	Unknown	Unknown
Dartmouth 4 Pad - Mechanical	Drawings	Unknown	Unknown
Dartmouth 4 Pad - Architectural	Drawings	Unknown	Unknown
Dartmouth 4 Pad - Structural	Drawings	Unknown	Unknown
Dartmouth 4 Pad - Landscape	Drawings	Unknown	Unknown
Dartmouth 4 Pad - Civil	Drawings	Unknown	Unknown
Survey Plan of Lot BX-1A and Lot BX-1B	Drawings	20/12/2000	Alderney Surveys Limited
Dartmouth 4 Pad - EVAC MAPS - 30AUG2017	Drawings	31/08/2017	Smart Spaces

Supporting Document	Category	Date Issued	Issuing Party
Development Objectives	Meeting Minutes	18/08/2017	HRM
Draft Project Charter	Report	18/08/2017	HRM

4 Assumptions

Halifax Regional Municipality operates and maintains the Halifax Forum as part of their Recreation Program and will continue to operate and maintain the facility.

The redevelopment of the site to be in keeping with the Functional Space Program confirmed by HRM

The extent of the site available for redevelopment is limited to the current site as defined by the Site Plan.

The renovations are significant to the extent that the entire Complex will be subject to current day codes and will not be eligible for Grandfathering.

Current zoning will apply to the site.

The Renovation Solution developed in this report is intended as a tool to evaluate operational and financial risk and is not intended to be or limit the eventual design solution.

5 Renovation Solution

5.1 Solution Overview

Without undertaking a design solution, CMEL identified that the majority of the Program requirements could be met, however at a significant premium when compared to developing a new facility with similar functionality. The premium is generally due to the increased costs associated with partial renovation, maintaining the Heritage status, and altering the Complex to meet current accessibility and fire code requirements.

In brief, the site can accommodate a third pad. The demolition and removal of the current MPC makes way for the new pad. The new pad location has been strategically located to provide an additional supporting square footage as required by the Program. The bingo hall generally remains unchanged. Site work improvements are included to improving parking, vehicular access / egress as well as pedestrian access / egress.

5.1.1 Project Charter

The Halifax Regional Municipality Draft Project Charter for the Halifax Forum Complex Renovation and Expansion Solution dated August 18, 2017 are listed below. These form the basis of the requirements of this Project analysis.

HIGH LEVEL

- Renovated Forum Arena
- Renovated Civic Arena
- Addition of third ice pad
- Upgrade Maritime Hall and Bingo Hall
- New mechanical
- New community rooms and lounge
- New foyer and entrance for Civic and third ice pad

DETAILED

- Emphasize historic characteristics of the Forum throughout the facility
- Convert existing pads to NHL size
- Sky boxes in Civic and Forum
- New concessions space and lounge space
- Variety of community use multi-purpose rooms adjacent to rinks
- Glass atrium entrance linking existing Civic to new rink
- Install new elevators and stairways to improve barrier-free access and improve circulation
- Standardized floor levels to increase barrier-free access around complex
- Update to Almon Street and Windsor Street facade
- landscape adjustments to improve vehicle and pedestrian movement
- life safety issues will be addressed throughout project
- LEED Silver targeted

FORUM

- Improvements to exterior envelope;
 - new windows, roofing, drainage, insulation and repointing brick
- Upgrades to entrances, canopies, doors, hardware
- Interior upgrades to change rooms, concessions and public areas
- Upper level walking track
- Removal of columns to increase sightlines
- Improvement to seating, maintaining as much of the 4,610 capacity

CIVIC

- Upgrade to link area including;
 - new structure for lounge, washrooms, kitchen and community and fitness rooms
- lounge added
- Community rooms
- Barrier free upgrades including elevator and stairway

CMEL identified a combination of functional and design criteria with respect to developing the Forum renovation option. Each of the criterion were discussed with HRM staff with the objective of identifying whether the criterion was considered to be Mandatory, Preferred or Wish List, (Those items which if possible would be nice to be included but not necessary.) The table below summarizes the direction provided by HRM following the discussions in a Stakeholders meeting held at HRM offices on October 17, 2017.

Criterion	Mandatory	Preferred	Wish List	Comments
Cost				It was discussed that project cost is a major consideration and cost does not fit with the other criteria below. Greater "financial certainty" is of paramount concern to HRM
Code Compliance : Life Safety	X			
Code: Accessibility	X			
Code: Complete	X			Equivalency as detailed in the code NBCC 2010 is an accepted approach
Heritage Designation	X			Council has provided clear direction that this is mandatory
Remove Forum Columns		X		
3 rd Ice Pad	X			
NHL size 2 (new and "Civic")	X			This is the standard currently used
Halifax Forum Expanded to NHL size		X		
Maritime Hall	X			Note that this requirement was defined as the functional requirement of the maritime hall. Not the physical structure currently called the maritime hall
Bingo Hall		X		As per the Maritime hall, the function of bingo services as currently provided
Parking	NA	NA	NA	HRM requested that the requirements and the estimated service numbers are outlined in the report.
Site Improvement		X		Described as rationalization to the parking on the North side of the site
Pedestrian circulation improvements (internal)	X			
Multi Event Facility-ice	X			Maintain the current capacity which is one surface.
Multi-purpose rooms		X		The requirement will be further developed by HRM recreation
Walking Track			X	Not identified as a specific requirement but nice to have

Criterion	Mandatory	Preferred	Wish List	Comments
Seating Capacity (4,610)			X	A reduction will be expected related to applying current code. As a minimum 25% reduction may be realized and will need to be clarified through detailed design in the future.
Ease of Implementation	X			Phasing will not be considered a viable option. It is anticipated that the building during construction will be closed.
Lounge			X	Not identified as a specific requirement but nice to have
Sky Boxes			X	Not identified as a specific requirement but nice to have

5.1.2 Accrued Deferred Maintenance

Based on the visual assessment and on the information collected the property appears to be in a serious state of disrepair with many components being well beyond their useful life and in need of replacement. This results in extensive accrued deferred maintenance. This means that the existing complex requires significant cost expenditure to catch up, in addition to the new construction described below, to provide a total facility in good condition. These accrued deferred maintenance costs are included in the renovation and contribute significantly to the overall cost of the project.

The most recent assessment estimates the current deferred maintenance as of 2016 to be in excess of \$3.9 million and an anticipated capital renewal cost in excess of an additional \$17 million over the twenty years. The costing assumes that renewal and replacement of building components are as *like as kind* where practically possible. Upgrading and modernization was generally not included in the estimate unless required to meet the Program requirements.

The proposed renovation solution sources information from the baseline building condition assessment of 2016. Included in the renovation costing are requirements identified and recommended for replacement in the immediate to five year time frames. This was included as it was recognized that even with swift approval to commence the renovations; there will be a lag between approval and construction allowing time for design development and project tendering.

The original assessment included costing for the entire complex, however those costs associated to the MPC and the Mechanical area have not been included as the proposed renovation solution includes demolition of those two areas. The costs associated to the north wall of the Civic Center, similarly have been removed as this elevation of the building is proposed to be demolished to allow for extension of the ice surface in the renovation solution.

In brief the items which are to be recapitalized (replaced or repaired depending on needs and type of component) based on the current condition which are included in the renovation cost include:

Site

- Repair retaining wall
- Asphalt repairs

Exterior

- Forum masonry cladding replacement
- Forum exterior door replacement
- Civic Center masonry repair
- Civic Center door replace those not being replaced by new construction
- Civic Center window replacement
- Bingo Hall masonry repairs
- Bingo Hall fiber cement board siding replacement
- Bingo Hall secondary door replacement
- Bingo lower north door replacement

Roof

- Replace connection roof between the Forum and Bingo Hall
- Bingo canopy
- Gutters at Civic and Bingo

Structural reinforcing as required by code compliance assessment

- Forum Roof Reinforcing
- Forum Column Reinforcing
- Forum Concrete Repairs
- Civic Centre Roof Reinforcing
- Bingo Hall Roof Reinforcing

Interior

- Forum new floor finish at forum concourse
- Forum new WC's
- Civic Center low-e ceiling
- Civic Center renovation of the washrooms and change rooms
- Bingo Hall replace floor finishes

5.2 Solution Costing

The resultant solution is a combination of renovation of part of the existing complex, demolition of the MPC and mechanical spaces and new construction of an ice plant and additional ice pad. The estimate of costs for the renovation, demolition and new buildings are developed independently recognising that there are typically increased costs associated with renovation where some but not all components are being replaced, and the space is being reconfigured. These activities brings with it inherently more risk and cost premiums due to unforeseen situations and the limitations associated with maintaining and incorporating existing components.

Whereas the new construction can be priced with less risk and is based on a green field construction where the construction is new and activities can be optimized and all components are new. A description of the two types of costs follows:

5.2.1 Renovation Costs

The renovation costs are associated to two components as described above. The first part is associated to addressing the accrued deferred maintenance of the facility. The second part identifies items required by the project charter which will require renovation of the existing space.

Renovations undertaken include increasing the ice pad sizes of the two existing rinks. It has been assumed based on the recommendations of Eastpoint, the mechanical consultant that complete removal and replacement of the two slabs existing concrete slabs will be required. In addition to the new concrete pads complete with brine piping, infrastructure below the ice sheets to prevent permafrost will be required to align with current design practices. New dasher boards will be required at both rinks to accommodate the size change.

The interior spaces will be renovated and will be brought up to current codes Complex wide. The interior seating and access to the stands will be brought up to current code requiring significant renovations to the Forum building, including partial demolition of the seating and the addition of exits from the stands to meet current life safety requirements.

The cost to renovate was produced based on a combination of unit cost and square foot pricing. The pricing is based on known Municipal development pricing in combination, local contractor pricing and accepted estimating guides such as RS Means corrected for currency, geometry and location. The renovation estimate also includes a 30% contingency. This level of contingency reflects the current level of design information and the inherent risk associated to the type of project.

The renovation costs have not included any costs associated with disruption of activities, premiums associated with scheduling and or temporary facilities to house ongoing programs and services.

5.2.2 New Construction

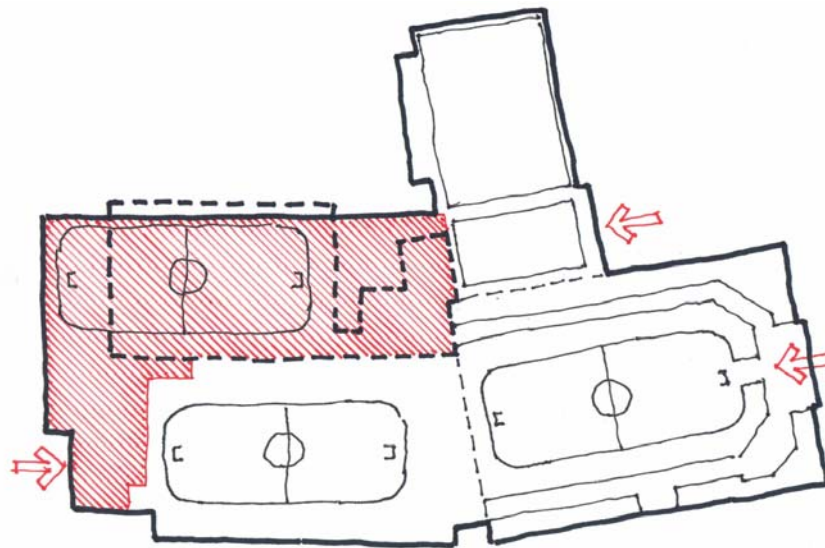
There is not sufficient floor area for the program requirements within the current Complex to meet all of the objectives of the Municipality as identified in the Charter which guided the creation of a limited space plan in Appendix A without major renovation and the construction of a significant addition. The solution assumes constructing a new arena, and entrance to the Civic Center as well as new community and support spaces. In addition a new ice plant and mechanical areas are anticipated to be required.

In order to have space on site and related to the existing condition of the arenas, the proposed renovation solution includes demolition of the MPC, mechanical equipment area and the north wall of the Civic Center. In its place a new NHL sized ice pad, a combined ice plant and additional community and event spaces are provided. The demolition of the north wall of the Civic Center allows for increasing the size of the existing ice pad to NHL size.

The new construction cost was developed using known recent unit costs from the HRM, contractor and consultant quotes and square foot pricing. When required, estimating guides such as RS Means corrected for currency, location and geometry were used. The new construction estimate also includes a 20% contingency, which differs from the renovation contingency of 30%. This 20% new construction contingency is typical for new construction projects prior to definition of a design.

The following sketch of the Renovation solution shows the proposed solution which was used for analysis and costing.

5.2.3 Renovated Complex Sketch



- The thick dashed line denotes the former building outline that is proposed to be demolished
- ////// The red hatch denotes the area of new construction
- ➡ The red arrows show the main entrances to the complex from the parking areas.

6 Detailed Findings and Recommendations

6.1 General Property Overview

Property Name	Halifax Forum
Street Address	2901 Windsor Street
City, Province	Halifax, Nova Scotia
Primary Use	Arenas, Multipurpose Centre and Bingo Hall
Number of Buildings on Site	Four
Foundation	Concrete
Superstructure	Structural Steel and Concrete
Cladding	Metal Siding and Brick Masonry
Roof Membrane	Standing Seam Metal and Modified Bitumen
Reported Year Built	Halifax Forum: 1927 Multipurpose Centre: 1988 Civic Centre: 1995 Bingo/Maritime Hall: 1961/2003
Building Area	123,000 ft ²

The property development consists of four buildings; two arenas (Halifax Forum and Civic Centre), the Multi-Purpose Centre (MPC) and the Bingo Hall (Bingo and Maritime Halls).

The Halifax Forum was constructed in 1927, which has a concrete and steel superstructure, a sloped timber roof deck with modified bitumen roof covering. The building is clad with brick. The building houses a single pad rink with tiered seating. The Forum is identified as a Historic Place registered under The Heritage Property Act of Nova Scotia. The building's heritage value has been defined as both social and architectural. The character defining features are primarily the remaining exterior features; the pillars beside the front entrance and the roof form and the remaining cladding material and placement.

The MPC is a pre-engineered steel structure built in 1988 that is assumed to be founded on standard concrete footings and concrete foundation walls. The building consists of a sloped metal roof, vertical metal siding.

The Civic Centre is a pre-engineered steel structure built in 1995 that is assumed to be founded on standard concrete footings and concrete foundation walls. The building has a sloped metal roof covering, and a combination of vertical metal siding concrete and brick masonry cladding.

The Bingo/Maritime Hall was originally constructed in 1961 renovated in 2003. The building has a steel structure, assumed to be founded on standard concrete footings and

frost wall. It has a sloped metal roof with a portion of flat modified bitumen roof, vertical and horizontal metal siding, with an addition clad in fiber cement board siding.

There is a central mechanical area housing boiler, ice plant and service spaces. The date of construction is not known and is anticipated to include several construction periods. The area has concrete block, metal walls with wood roof structure. The floor is a combination of concrete and asphalt.

The total building complex comprised of the four attached buildings has an approximately area of 123,000 ft². The buildings are located civic address of 2901 Windsor Street, Halifax, Nova Scotia. The property is bordered by Windsor St. to the west, Young St. to the north and Almon St. to the south. Neighbouring commercial properties are located on the east side of the property. Asphalt parking for all four buildings is located to the north and south of the property and accessed off Almon, Young and Windsor streets.

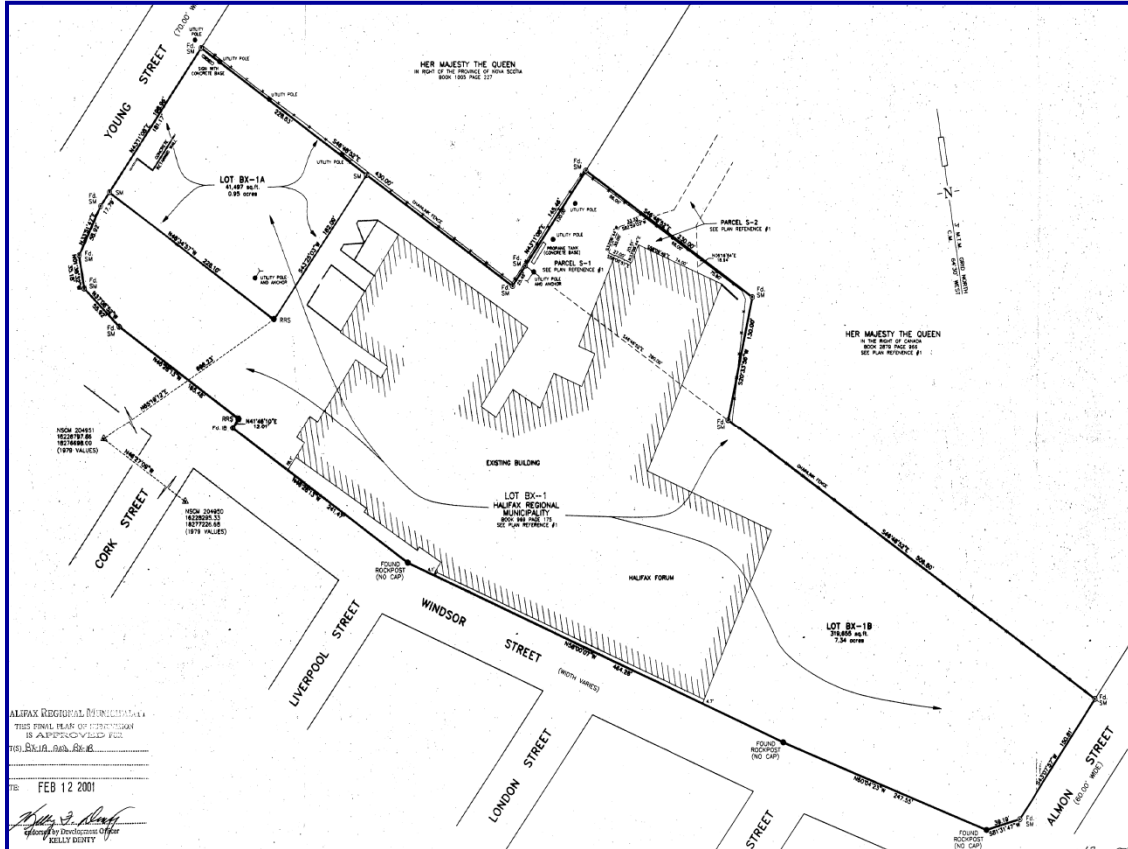
The due to the size of the complex and the varying ages of the structures the sections have been broken down into buildings based on construction or major renovation ages beginning with the oldest.

The following includes, where appropriate information from the 2016 Building Condition Assessment.

6.2 Site Work and Site Development

Introduction

The Halifax Forum site is comprised of two land parcels with a total area of 8.29 acres which slopes down to the north with an overall grade differential of approximately 26 ft. The site extends from Almon Street northward to Young Street and is bordered by Windsor Street to the west and neighbouring commercial properties to the east.



Excerpt from a plan produced by Alderney Surveys Ltd. approved by HRM on February 12, 2001 for the lots BX-1A and BX-1B referred to as PID's 41035924 & 00004010 respectively.

Vehicular access is provided from all bordering roads by six separate entry points. Asphalt paved parking is located at the north and south of the property. From the Young Street parking area, an asphalt paved road provides access to the east side of the MPC and the core building mechanical areas. It has been reported that this back area is used by bingo clients for parking. It is estimated that the site currently has 400 stalls and an additional 31 marked barrier free stalls. The quantities by location are as follows:

- North parking area, 201 stalls and 2 barrier free stalls**
- Bingo area, 20 stalls**
- South parking area: 179 stalls and 29 marked barrier free stalls**

Concrete sidewalk borders the property outside the site boundary along all roadways. There is a minimal amount of concrete pedestrian paving associated with the property located at the entrances to the Civic Center off of Windsor Street, the main entrance of the MPC off of the north parking area and at the entrance off the bingo hall of the south parking area. Pedestrian traffic at the site is generally collocated with the vehicular traffic.

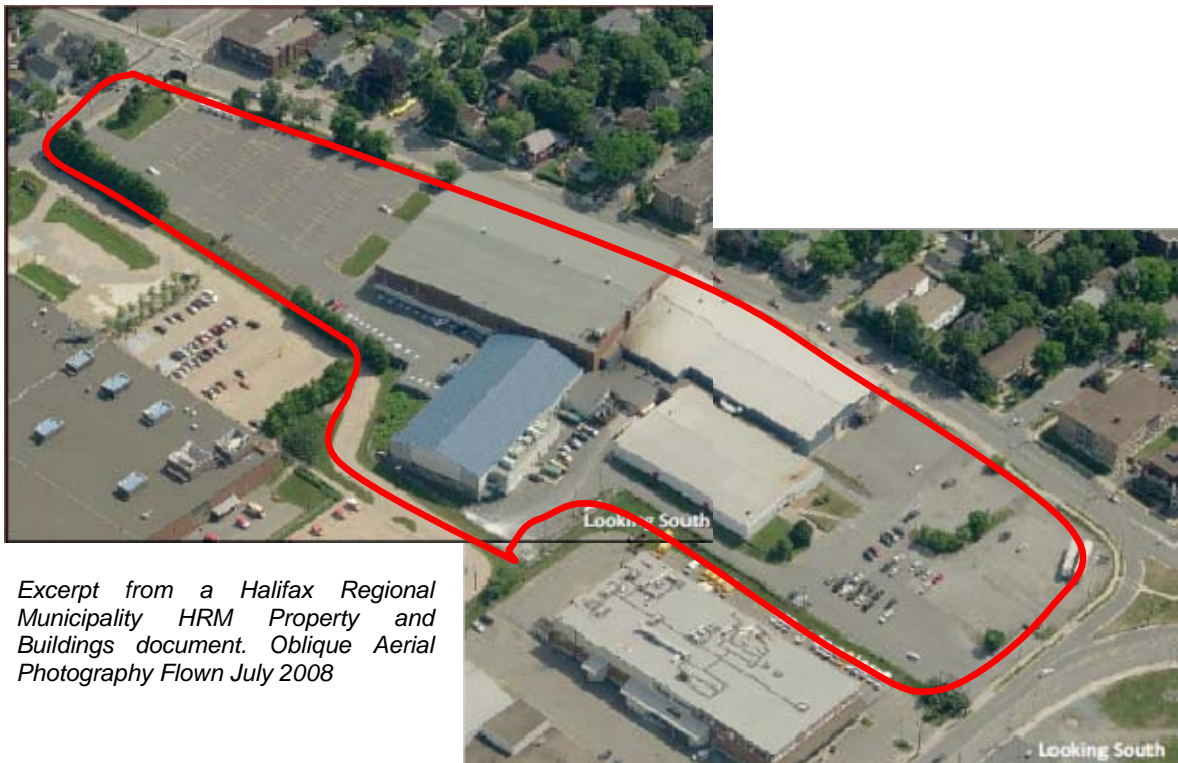
Due to the grade changes across the site there are multiple retaining walls. There is a timber retaining wall on the north side of the MPC and a gabion retaining wall separating the Almon street parking area and the neighboring property to the east. There is a cast

in place concrete wall forming the east edge of a set of stairs on the east of the Bingo Hall.

There are painted metal stairs located on the north side of the MPC that provide egress from the building. There are galvanized steel stairs that are located on the east side of the Bingo/Maritime Hall that also facilitates egress from the building.

There are minimal landscaped areas associated with the property; they are located in front of the MPC building, surrounding the east parking area and around the north side of the property. The landscaping consists of trees, shrubs and grass areas.

A significant portion of the site is currently occupied by the Forum Complex, a grouping of four major attached structures of differing materiality and age. The below aerial images provide an overview of the site and buildings with the red line indicating the approximate site perimeter:



Excerpt from a Halifax Regional Municipality HRM Property and Buildings document. Oblique Aerial Photography Flown July 2008

Servicing Assessment

Within the scope of this report was the assessment of potential risks to obtain improved cost certainty. With that mandate a high level assessment of the incoming services has been undertaken to determine if the existing infrastructure can support an expanded facility which is anticipated to have a greater draw on services. Of particular interest was the potential increase domestic water requirements associated to supplying additional sprinkler converge of the Complex. Where possible, existing civil infrastructure service capacity was evaluated against the service requirements of a similar facility recently constructed by the Municipality, specifically the Dartmouth 4 pad. The below

infrastructure information has been obtained via Halifax water from an output of GIS system in December 2017.

Water

There are currently two incoming water locations into the Complex one at the MPC and a second at the Civic Center. The water line which enters MPC crosses the north side of the site and connects to a 15" ductile iron supply line along Young Street. It is assumed to date from the construction of the MPC in 1988. As observed in the MPC sprinkler room, there is one 8" ductile incoming line which reduces to 6" to support building fire protection and an additional 2" copper domestic water line also enters the area separately at the floor slab. There is a hydrant on this line just beyond the building on the site.

Entering the Civic Center Sprinkler room are two lines; one 6" ductile iron line which supports building fire protection needs and a separate 4" ductile iron line providing domestic water. These are supplied from a 9" cast iron supply line running along Windsor Street. The Civic Centre services appear to have been installed in 1995.

With the proposed renovation solution, MPC is to be demolished a new structure which has a larger footprint constructed in the area. Due to the location of the incoming water line at the north side of the MPC, it is anticipated that there will be costs associated to altering this incoming water service.

When compared to a similar new facility the required domestic water line was 4" with an 8" line providing water for fire protection. Based on the current pipe diameter entering the building, it is estimated that there is sufficient water is available at the site perimeter to accommodate the proposed renovation.

Sanitary

A combined sanitary and storm line has been identified running along and Windsor Street constructed of vitrified clay with a diameter of 12" and increasing to 15". The building sanitary waste is shown leaving the building on the west elevation of the Forum Building it is noted as having a diameter of 8" and is constructed of concrete. A secondary line is shown leaving the center of the site to the east from a privately owned waste water manhole is identified as having a 12" diameter line. The age of this infrastructure is not known.

The requirement for a similar building was for an 8" sanitary line. As the storm and sanitary services are combined just beyond the building, there is the potential that an increase in sanitary and storm lines from the building will be required. An allowance for the work has been included however due to lack of detail these costs are considered a risk.

Storm

A storm line is identified running along both sides of Windsor, Almon and Young Streets. A locating service plan has identified the building storm water leaving the building on the west elevation of the Forum building. However this appears to connect to the adjacent sanitary line output line from the building with an 8" diameter constructed of concrete which connects to a combined outfall. The age of this infrastructure is not known.

There are three existing storm drains located at the south of the building complex. The line which connects to the municipal main is noted as being 10". There is a combined manhole with cast iron a pipe noted as 4" in the north parking lot. This pipe feeds into the combined (sanitary and storm) outfall described above.

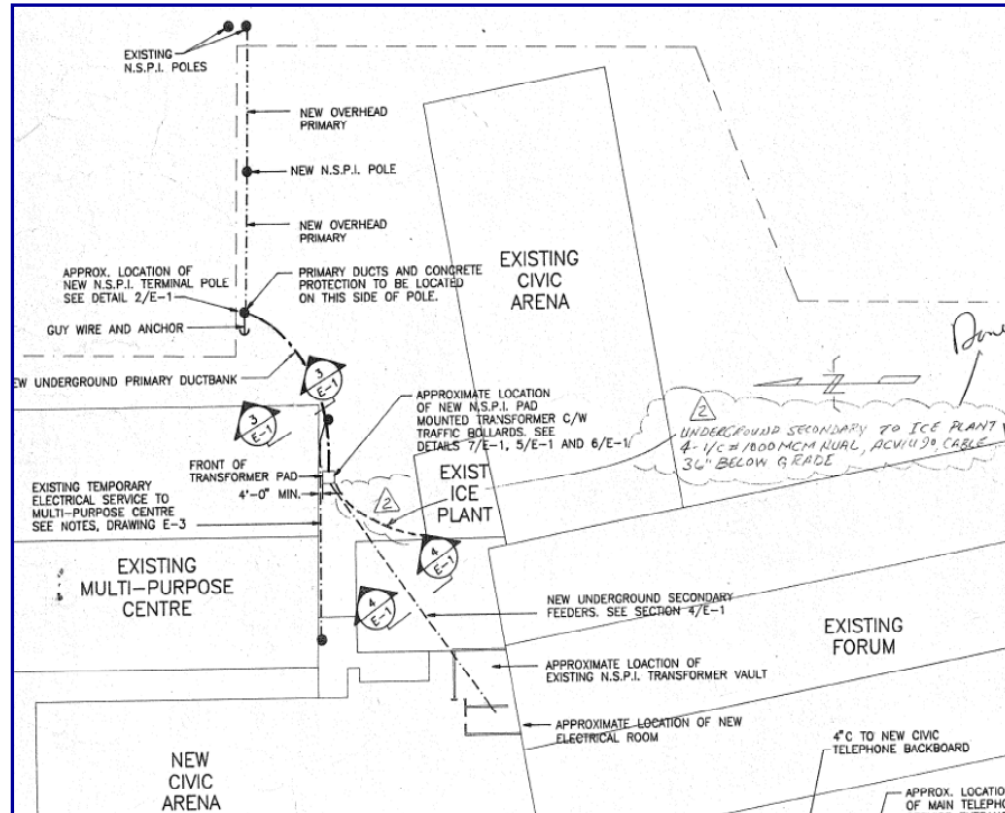
Redesign of the parking levels is anticipated to affect the current design of storm water management on the site. Due to the minimal existing storm services leaving the building, it is anticipated that additional storm lines will be required. An allowance for the work has been included however due to lack of detail these costs are considered a risk.

Municipal Water, Sanitary and Storm Services

As part of the future Forum development process the engineering consultant/applicant, must submit a development proposal for approval. Pending detailed design and receipt of this approval, major Municipal infrastructure upgrading is not anticipated to be required as a result of the renovation project.

Power

The site is provided with power by the local utility Nova Scotia Power. The current incoming power is provided to site at approximately the center and from the east via overhead poles on the perimeter of the site at the Bingo hall area with the last pole located approximately at the apex of the jog on the north east of the site. Power then transfers from above grade to a buried service supplying a concrete encased primary duct bank which is shown on the drawings to be 11" high by 17" wide. The concrete duct bank crosses the access road and feeds a utility owned Federal Pioneer 750KVA pad mount transformer that is located to the south of the current MPC. The incoming power is rated at 24,000V. From the transformer two underground secondary power trenches run across the site; one into the current electrical room located central to the Forum Complex in the Civic Center and the second to the north-west corner of the ice plant area of the building. The provided drawings from the time of the construction of the Civic Center indicated that each feed has its own meter. A 600V, 1200A fed to the main complex electrical room used for general electrical distribution throughout the complex and a 600V, 600A feed to the upper mechanical room to provide power for this room's requirements. The electrical services and main complex electrical room were constructed in 1995.



The above is an excerpt from the as built electrical drawing from construction of the Civic Centre. December 2017

A similar new facility shows that power arrives at site rated at 25KV the main breaker is rated at 2000A the main electrical room switchboard is rated at 600/347V 3 phase 4 wire with 2000A mains and 28KA short circuit rating. The preliminary assessment indicates that there is sufficient power supply to the site and a major upgrade to the electrical service leading to the site is not anticipated.

However, the presence of multiple feeds at locations anticipated to be renovated will disrupt the existing power distribution to the main electrical room. This may be minimized at the time of detailed design however until that time, the renovation solution has allowed for relocation of the NSPI transformer, grounding system and both the primary and secondary feeds below ground. In addition as the main switch dates from 1996, an allowance for replacement has been added to the cost estimate.

Summary of Municipal Zoning

The below information is taken from the Halifax Land Use By-Law Halifax Peninsula, (edition 224) with amendments to August 12, 2017. With consideration given to the planning documents available at the time of writing which included the Halifax Municipal Planning Strategy with amendments to May 6, 2017 and Halifax Center Plan 2017 located at <https://www.shapeyourcityhalifax.ca/centre-plan>.

Based on the Halifax Peninsula LUB ZM1 Zoning 06 May 2017, the site is located in the **Peninsula North Area within the Sub Section 2**. The site is zoned **C-2 General**

Business Zone (*which is not within the view plane*), and the entire block is zoned similarly.

Based on Map ZM-20 the entire site is an **area of elevated archaeological potential**. This is defined as follows: 26BC ZM-20 - Areas of Elevated Archaeological Potential (RC-Jun 25/14; E-Oct 18/14) Where excavation is required for a development on any area identified on ZM- 20 attached to this by-law, a development permit may be issued and the application may be referred to the Nova Scotia Department of Communities, Culture and Heritage, Heritage Division for any action it deems necessary with respect to the preservation.

Information associated Peninsula North Area, Sub Section 2, C-2 General Business Zone are as follows:

57(1) No front, side or rear yards are required for C-2 uses in C-2 Zones.

58 The height of a building in a C-2 Zone shall not exceed a height of eighty (80) feet, but for each foot that the building or that portion of the building which would exceed eighty (80) feet in height is set back from the property line, two (2) feet may be added to the height of the building.

HEIGHT/SETBACK RATIO 5 Where setbacks are required under the provisions of this by-law in respect to a building, such setbacks shall be at the rate of one foot for each two feet that the building exceeds the permissible basic height and shall be applied to all the outer walls of the building.

6A BICYCLE PARKING FACILITIES (RC-Jun 25/14; E-Oct 18/14)

For the whole of every building or structure to be erected or for the portion of a building or structure which is to be enlarged, on-site bicycle parking shall be provided in accordance with the table:

Recreation Facilities, Community Centres, Libraries. Bicycle parking requirement is 1 space per 200m² GFA (aggregate of the area of all floors as defined)

20% Class A – Means a facility which secures the entire bicycle and protects it from inclement weather, and includes any key secured areas such as lockers, bicycle rooms and bicycle cages

80% Class B – Means bicycle racks (including wall mounted varieties which permit the locking of a bicycle by the frame and the front wheel and support the bicycle in a stable position with two points of contact.

The Halifax Forum estimated future requirement is based on 180,000ft² is approximately 84 spots of which 17 are required to be class A and 67 class B. As a starting assumption, type B spots could be accommodated in 870 sq ft. Type A parking is intended to be lockers or in the building and could require 220 sq ft. Areas for bicycle parking will be required in the proposed redevelopment to comply with the above requirement and costs have been included in the cost estimate.

Observations/Comments

The overall condition of the site is poor as maintenance and capital expenditure have not kept pace with the property's needs. This affects asphalt, concrete, retaining walls, metal railings and landscaping. The net result is a site which has several existing issues which should be addresses in a major redevelopment. The scope of site work defined in the initial options analysis was limited to the items identified in the exterior condition assessment. The proposal did not include costing for significant improvements to address the site deficiencies beyond the current condition issues.

The Draft Project Charter dated August 18, 2017 identified landscape adjustments to improve vehicle and pedestrian movement as one of the development objectives. Assessing the site qualitatively with the desire to improve vehicle and pedestrian movement, several issues are apparent.

The pedestrian access to the building from the exterior is fragmented and relies on dual usage of the asphalt paved areas as pedestrian access posing a risk to pedestrians. Examples of this are the main access to the Forum on the south elevation which opens directly onto an entrance from Windsor Street. The multiple building entrances do not appear to have been designed to allow movement between the buildings externally. Travel from the entrance of the Forum to the entrance of the Bingo Hall is via the asphalt parking area as there is no defined pedestrian area. This is also evident at the north of the site where the connection between the existing MPC and the Civic Center requires walking through parking areas and through recessed loading areas or over grassy berms. It is clear that pedestrian access has not been a priority in site planning. Improvement to the pedestrian access to the building is anticipated to be required in a redevelopment and aligns with a Center Plan Core Concept, pedestrians first.

The changing grade, which affects the entire site, is not fully integrated into the parking layout or pedestrian access routes. Generally the site has a grade drop of 26 ft over the 1,230 ft length of the site. Issues currently observed include but are not limited to, large berms cutting off the access between the parking area and the main entrance at the Forum off the south parking area, rain water which enters the building at the same entrance. There is currently a large grade difference at the centre of the site on the eastern side between the site and the adjacent property. This has been addressed through a combination of a cast concrete and gabion wall retaining systems as well as fencing. At this location cracking and deterioration of the paving was observed as well as a drop off to the asphalt. There are berms dividing areas of parking on the north side of the building preventing access to parking areas and causing difficulties for pedestrians. It is anticipated that improvements will include the requirement to undertake rock removal and reconstruction of retaining walls to meet the redevelopment objective.

To align with the Center Plan Land use and design objective to “encourage new development to provide adequate room for parking and servicing needs” maximizing parking at the Forum site is considered a priority. The creation of additional parking through extraordinary means such as an above ground structure or underground parking was not included in the cost estimate. Within the cost estimate are costs associated to realigning and maximising the “at grade” parking while providing clear and separate areas for pedestrians.

Lighting of the site is accomplished by minimal building mounted and pole mounted fixtures within the parking area and it is anticipated that there is some coverage from street lighting. To align with parking area lighting standards, increasing the illumination of the parking areas is anticipated to be required. This working standard can be superseded by security standards specified by the client which typically increase light levels for public safety or by LEED requirements which seek to light areas only as required for safety and comfort while seeking to reduce light pollution as well as overall energy use reduction by limiting power density and increasing controllability of systems. Redesign of the exterior site lighting is anticipated during redevelopment to meet the LEED Silver target project objective.

There is a good buffer of trees between the parking area on the south of the site and Windsor Street which is consistent with the Halifax Municipal Planning Strategy noted under section 6 Environment sub section 6.2 the city shall continue its tree planting program to ensure that all streets benefit. This also aligns with the Center Plan Land Use priority to “Encourage new development that integrates vegetation and green infrastructure such as trees, green spaces, green roofs, gardens, green walls, and vegetated storm water management systems.” Beyond the tree line at Windsor, landscaping on site is extremely limited and is a combination of shrub trees and grassy areas. Beyond the fencing on the eastern boundary of the site is a 3,660 square foot area of overgrown shrubs.

Conclusion and Recommendations

Renovation scope included in the cost estimate associated to site and civil works can be divided into four types; existing condition issues, anticipated short term capital costs, improvements to meet current standards or the direction of the project charter, and work which will be required associated to new construction by extension as a result of the project charter.

Renovation issues addressed by the redevelopment project include repairs to the current asphalt with replacement as required. Repairs to current concrete entrances and the concrete retaining wall on the east elevation have been included in the cost estimate.

Issues addressed resultant from the project charter include; the addition of interior concrete sidewalks along the north and south perimeter of the building to connect the existing entrances. To improve the current parking situation, an allowance for re-grading, removals and asphalt replacement at the north side of the site have been included. In addition to this, a realignment of the south parking area to maximize parking has been included. It is anticipated that parking redesign will include adjustments to the storm water management on site, and although difficult to estimate without detailed design, an allowance has also been included in the cost estimate. With renovated parking areas it is anticipated that site lighting will be redesigned and an allowance for an additional six light standards has been included as well as building mounted lighting.

Items which are required, related to the renovation, include an allowance for service adjustments (relocation) for sanitarily, storm and incoming water as well as main power supply. The process of construction is anticipated to disrupt the site and cause site work damage resulting in replacement of all of the asphalt. Current municipal planning priorities for bicycles and tree streets will be integrated.

Site Service & Development Summary**Site Services and Site Development**

Item	Status	Comments
Domestic Water Service	Size suitable for new Complex	Potential relocation will be required
Sanitary / Sanitary Combined Service	Adequacy was unable to be determined	An allowance for upgrade has been included to allow for increased building size and storm collection.
Strom Collection	Minimal storm collection will need to be redesigned with additional collection	New site plan will require redesign of storm system
Power Service	Utility transformer on site suitable for new Complex	Distribution from transfer may require relocating due to new building location
Excavation	Elevated Archaeological Potential	Added risk to cost of excavation and schedule
Building Height	Planned developed is within zoning regulations	
Bicycle Parking	Zoning requires additional bicycle parking	Additional bicycle parking has been included
Pedestrian Access	Currently collocated with vehicular traffic.	Will be significantly improved as part of the site redesign
Vehicle Parking	Insufficient parking at grade to accommodate planned activities however numbers meets code requirements	No of spaces will be increased through optimization of the site redevelopment
Asphalt	Fair condition but suitable for re-use	Due to planned construction activities a complete replacement has been included
Site Safety & Security	Exterior lighting is anticipated to be replaced	Site lighting will be increased to achieve safe lighting levels for operations.
Landscaping	Fair condition suitable for re-use upgrades to align with development priorities in the Center Plan	Due to planned construction activities and HRM Center Plan local replacement and upgrading has been included

6.3 Building Envelope

6.3.1 Halifax Forum

6.3.1.1 Forum - Exterior Walls

Introduction

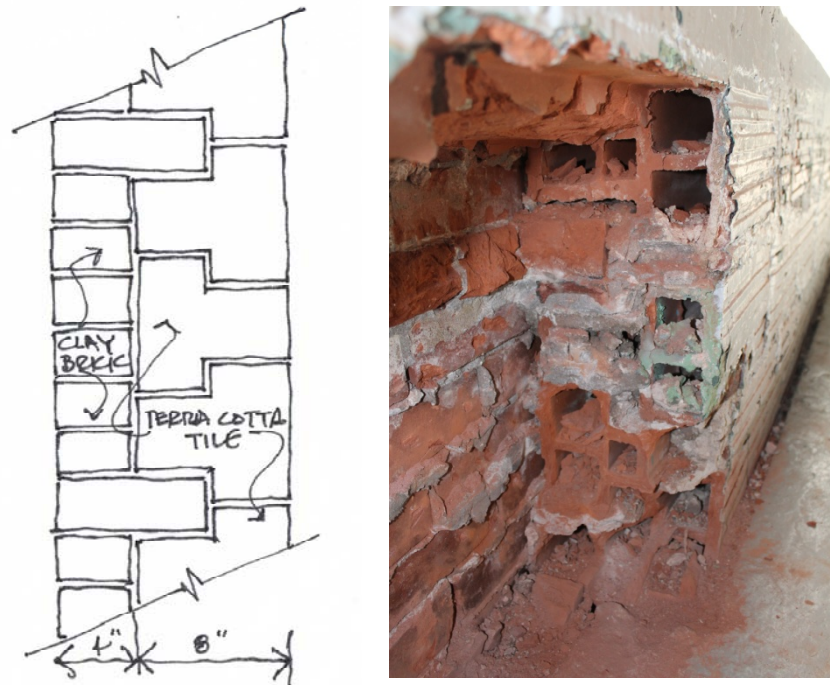
The exterior cladding on the Halifax Forum consists of masonry with infill at former arches. A minimum of 50% of the brick was identified in 2003 as replacement brick at the time of Heritage registry. The main entrance to the Halifax Forum faces Almon Street and consists of four sets of painted double leaf steel doors with a glazed upper. Secondary or exit doors facing Windsor and Almon Streets are aluminum. The glazing on the Forum is a combination of glass masonry units (cross rib glass blocks with a minimum of three different block types observed) located around the top of the north and south elevations, and a minimal amount of vinyl framed operable glazing around the north and east elevations of the building.

The Halifax Forum was formal recognized on November 17, 2003 as a Historic Place. It was listed on the Canadian Register on June 30, 2005. The registration is under the jurisdiction of the Province of Nova Scotia under the Heritage Property Act.

Further to CMEL's September 2016 Halifax Forum Assessment we have completed an additional evaluation of the exterior wall construction. This was necessary due to the Halifax Regional Municipality's (HRM) request that all aspects of Building Code compliance be mandatory as part of a renovation. This includes Life Safety, Accessibility and National Energy Code issues. Due to the magnitude of renovations and additions it is anticipated that the facility would no longer allow for "grandfathering" of items which did not meet current day code.

Observations/Comments

The exterior wall system of the forum consists primarily of 2 wythes of masonry – one 4" deep exterior clay brick and one layer of 8" deep terra cotta tiles (which are locally known as "speed tiles") with a total depth of approximately 12 inches. The terra cotta tiles are T shaped to allow a brick header courses every 7 courses, which ties the brick and terra cotta tiles together. This is a non-load bearing, unreinforced, face sealed system, without any insulation, and was constructed as part of the original 1927 construction. The below sketch and image taken during destructive testing of the wall system illustrate the wall construction. This construction is consistent from above the foundation wall to the roof.



Drawing of wall construction left and image of open wall above the upper concourse right

Recent additional destructive testing has revealed that there is no physical connection, such as reinforcing steel or steel brackets connecting the exterior wall construction to the main structure. The concrete columns (discussed in the structure section in more detail) appear to be sound below the level of the upper stands, but the 8"x8" steel columns between the upper stands and underside of the roof are badly deteriorated due to moisture penetration. Several columns have rusted through.

There were no expansion joints included in the original construction which has caused excessive movement and cracking of the exterior walls, particularly at all corners. The cracking is typically caused by expansion and contraction of the exterior walls due to freeze thaw cycles and moisture penetration. The structural elements have remained at a steadier and generally cool temperature causing differential movement between the masonry walls and the structural elements which has resulted in extensive cracking and deterioration visible to a greater and lesser degree on all building elevations.

The deterioration has resulted in bowing of the exterior walls, causing them to pull away from the structure in many locations. In most locations, the only thing holding the wall in place is friction. CMEL working with Campbell Comeau has recommended that at the very least, the exterior walls need to be pinned to the structure as a temporary safety measure.

Due to the observed masonry and mortar deterioration, cracking, bowing etc., as described above, Forum Management have repointed and replaced spalling brick over extensive areas on all elevations. The brick wall was originally constructed with lime based mortars which was the norm 90 years ago. This is a softer material than the current Portland cement based mortars that appear to have been used for re-pointing and brick replacement. This has been confirmed by a local experienced Mason as well

as Campbell Comeau Engineering. As can be seen from the pattern of deterioration in the attached photo, hard materials have been inserted into the softer outer wall. The new harder mortar and bricks resist the expansion and contraction of the wall. This is having the effect of acceleration deterioration, spalling and allowing more moisture and water penetration into the wall assembly, which in turn is causing accelerated deterioration of the wall assembly including the imbedded structural Steel.

It was reported to the August 27, 2003 Heritage Advisory Committee Meeting that “about 50% of the bricks are repointed”. There have been envelope repairs completed since the 2003 registration with Heritage including selective repointing and brick replacement. This has result in less than 50% of the bricks being original to the building.



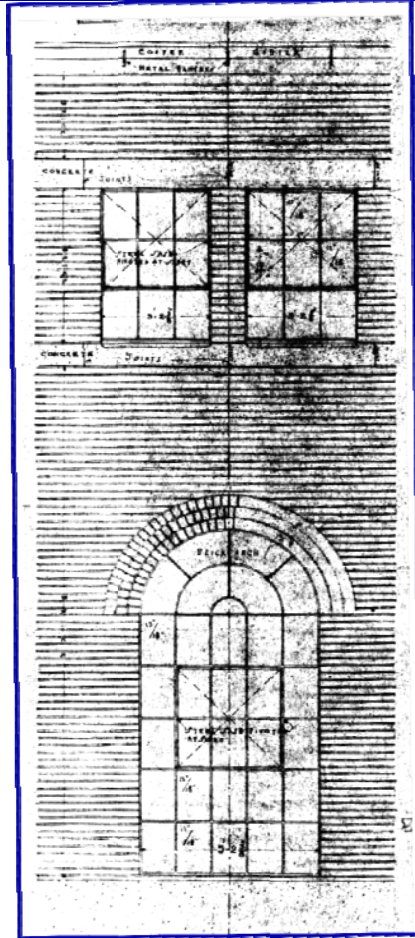
Image from the south elevation of the Forum taken October 2017

This photo also illustrates the continuous poured concrete bands that surround the building below the upper glass block windows. Because no expansion joints were poured into these bands, they have been subject to cracking and exacerbated the differential thermal expansion and contraction between the exterior wall assembly and interior structural components.

The main doors to the buildings were in good condition with no reported or observed problems. The doors were installed in 2010. The secondary entrance doors to the buildings were in fair condition however the steel frames were in poor condition. Although some of the doors have remaining service life, in the event of cladding replacement, new entrance systems would be anticipated and have been allowed for in the cost estimate.

The glass block masonry (glazing) in the Forum was in fair to poor condition with signs of cracked or absent mortar and broken glass units. Replacement of between 10 and 50% of the glass units is, anticipated when the entire building cladding system of which they are a part, is replaced. It is possible that a percentage of the units could be reinstalled however a percentage of breakage should be assumed. An allowance cost has been included. Two sources of similar glass block have been sourced however they are manufactured in Europe and will come at a premium.

As can be seen from the adjacent excerpt from the original Architects Working Drawings, the upper level clearstory windows were originally glass lights in metal frame matching the design of the arched windows below. These windows appear to have been replaced with glass block, probably due to deterioration of the metal frames. Based on the direction of the municipality an allowance for replica windows has been included in the cost estimate instead of the glass block.



Excerpt from original building drawings

The vinyl glazing in the Forum was in good condition. The age of the units was not reported however it is assumed that they are between five and ten years in age. Leaking at the perimeter of the windows on the interior was observed however it is assumed that this is a result of the poor condition of the masonry. Vinyl windows have an expected useful life of thirty five years. The vinyl windows are not in keeping with the original design of the building and in the event of a cladding replacement are anticipated to be removed, and replaced with components in keeping with the Heritage requirements.

Conclusions and Recommendations

This type of exterior wall assembly, although common 90 years ago, would never be employed for this type of building today. It is no coincidence that there are very few, if any, examples of this type of assembly still standing after 90 years.

If not for the Forum's Heritage Designation and the HRM desire to save the building, we would be recommending that, at the very least, the exterior wall assembly be removed and replaced with a more appropriate insulated system.

However, the masonry character of the building, including the original arches, windows and detailing, designed by Architect Andrew Randall Cobb in the mid-1920s, could be reproduced using modern technology. The Minutes of the August 27, 2003 Halifax Heritage Advisory Committee in approving a recommendation that the Forum be registered under the HRM Heritage Property Program encouraged the proponents

(Halifax Forum Community Association) “to give consideration to restoring some of the Cobb features in future renovations”

The brick could be installed using the “rain screen principal” which allows any water or moisture penetration to drain away in the pressure neutral airspace behind the brick, versus the original face seal approach which tends to draw water and moisture into the wall assembly through capillary action and the lower interior pressure.

The structure, following repair and reinforcing, would be protected from continuing deterioration and the insulation requirements of the National Energy Code of Canada for Buildings 2015 (NECB 2015) would be complied with. The most likely assembly would be reinforced 8” lightweight concrete block physically tied to the existing structure, behind a 1” airspace and new 4” clay masonry on the exterior, which would incorporate required vertical and horizontal expansion joints. The interior would be insulated with 4 to 5” inches of rigid insulation and vapor barrier, protected with 4” concrete block or cement board.

There are several appropriate wall assemblies available which should be evaluated at a later date to determine the most cost effective approach. For the purposes of this report we have allowed for a typical block back up with brick and insulation as the basis of the cost estimate.

6.3.1.2 Heritage Designation - Original Halifax Forum

Introduction

The Halifax Forum was formally recognized on November 17, 2003. It was listed on the Canadian Register on June 30, 2005. This registration is under the jurisdiction of the Province of Nova Scotia under the Heritage Property Act. On the Canadian Historic Places web site, the Halifax Forum’s heritage significance is identified as both social (valued for its use as a public space in Halifax and its association with the game of hockey) and architectural (related to the association with the Architect Andrew Randall Cobb). The below historic image was attached to the September 2003 application for registration. The image shows the original building design prior to the brick infill.



Image from the heritage application not dated

The Character Defining Elements as found in the HRM Heritage Property File 2901 Windsor Street, Halifax Forum, found at HRM Planning and Development Services, Heritage Property Program, 6960 Mumford Road, Halifax, Nova Scotia are:

- Georgian architectural elements such as low pitched roof, balanced proportions, central doors on each wall and white granite string course (incorrect description, we believe they are referring to the concrete band) which wraps around the entire building;
- String course above and below third storey windows;
- remaining features of small windows above and below (now filled in with brick) on the Windsor Street side
- remaining features of arched windows in both the front and rear facades with fanlight style windows above reminiscent of clerestory windows found in churches (both filled in with brick);
- remaining features of front central arched window over the entrance (now filled in with brick);
- exterior red brick with two large brick pilasters forming the entrance on the front of the façade and the rear;
- wood construction and concrete foundation of contrasting colour.

The Minutes of the August 27, 2003 Halifax Heritage Advisory Committee in approving a recommendation that the Forum be registered under the HRM Heritage Property Program encouraged the proponents (Halifax Forum Community Association) “to give consideration to restoring come of the Cobb features in future renovations”

Observations and Comments

As documented in Section 6.3 Building Envelope Evaluation, the exterior walls are no longer considered viable to be repaired and are contributing to the serious structural deterioration. The walls are bowing, have pulled away from the supporting structure and are in danger of collapse. The existing walls do not comply with several sections of the National Building Code of Canada (NBC) and the National Energy Code of Canada (NECB 2015).

It is our opinion that the exterior walls cannot be repaired and should be demolished and replaced. In the interim temporary reinforcing / stabilizing of the exterior walls should be considered. As part of our recommendations for replacement we are taking into account the Standards and Guidelines for Conservation of Historic Places.

Standard Number 10, *Standards and Guidelines for the Conservation of Historic Places in Canada 2nd Edition* published by Parks Canada in 2010 states “Where character defining elements are too severely deteriorated to repair, and where sufficient physical evidence exists, replace them with new elements that match the forms, materials and detailing of sound versions of the same elements. Standard 14 states “Replace missing features from the restoration period with new features whose forms, materials and detailing are based on sufficient physical documentary and/or oral evidence.

Conclusions and Recommendations

Rich in Interest and Charm – The Architecture of Andrew Randall Cobb, 1867 – 1943, published by the Art Gallery of Nova Scotia in 1990, describes the Forum as “a handsome structure of orange-toned brick with large arched windows all around and a severe though impressive entrance set in a blind arch enclosing two small arched windows. Most of the windows were bricked up later giving the building the appearance of an undistinguished warehouse. When new, however, it must have been imposing. Since the exterior walls are too deteriorated to repair, HRM has a unique opportunity to return the Forum to its original “imposing” state.

HRM has also decided that any restoration and renovation of the Complex must meet current code requirements including accessibility requirements of the NBC and energy requirements of NECB 2015. This will ensure that that the renovated Forum will be accessible, comfortable and safe as well as true to its Heritage Designation.



Image from the Halifax Forum Website <http://www.halifaxforum.ca/>

The above illustration, taken from the Halifax Forum Community Association web site, illustrates what the renovated Forum could look like. Preliminary research indicates that most of the original materials clay brick are still available. At the time of registration the upper windows were constructed of glass block. A similar product can be sourced through local suppliers although they are manufactured in Europe. It is likely that the block was not the original glazing material in the building and there for may not be required in the building reconstruction.

6.3.1.3 Forum - Roofing

Introduction

The Forum roof consists of a sloped modified bitumen roof membrane installed in 2001. Drainage is via gutters and downspouts and to a system below grade. The original architectural drawing indicate the 4” C.I. down spouts are to connect to a perimeter 6” C.I.S.

The membrane is supported by a 1 ¼" wood deck supported on 3" wide by 2" deep wood battens 22" c/c, spanning 47" between 10" deep open web steel joists (OWSJ). The original structural drawings call for the OWSJ to be 32" c/c. The structural analysis which formed part of the CMEL September 2016 Study, confirmed that the wood decking and wood battens have sufficient capacity to support current NBCC snow load requirements, however, the OWSJ are significantly below current NBCC snow load requirements. Also, the steel trusses supporting the OWSJ do not meet current NBCC snow load requirements. The complete information and recommendations were contained in Section 4.1 Structure on pages 28 to 30 of our September 2016 Study and have been included in this report.

NBCC 2015 requires assembly occupancies such as this to be of non-combustible construction and fully sprinklered. The wood roof decking and wood batten supports do not meet this requirement and have presumably been allowed to remain due to grandfathering. This situation is made more critical by the fact that the Forum is only sprinklered below the stands, and the actual combustible roof structure is unprotected. The National Energy Code of Canada for Buildings 2015 (NECB 2015) as well as the NBCC requires that the buildings meet minimum energy requirements. Although this can be achieved in many ways, it is generally accepted that a building such as the Forum should have at least an R-Value of at least 40 (RSI-7.04). The Forum roof and walls are not insulated.

Observations/Comments

Premature replacement of the roof membrane and rainwater drainage system is anticipated to be required associated to the requirement to reinforce the roof structure.

In order to meet current NBCC snow load requirements, additional beams or OWSJ could be installed to reinforce the structure. This would reduce the loading on the existing OWSJ in order to meet current design loads. Roof trusses would also need to be reinforced to increase load capacity. This work was included in the structural cost estimate included in the prior Study.

The combustible roof construction issue was not addressed in the earlier study as the requirement to bring the facility up to code was not considered at that point. Assuming that this code violation will no longer be able to be grandfathered due to the extent of anticipated renovation and addition, the 1 ¼" wood deck should be removed and replaced with 3 or 4" metal decking. This would also facilitate the installation of additional beams or OWSJ, as proposed in the above paragraph and allow for the addition of 8 to 10" of rigid insulation to meet NBCC and NECB Code requirements which will increase dead load and possibly snow load due to snow not melting off the roof as quickly.

Additionally, the Forum will need to be fully sprinklered. The addition of a complete sprinkler system will also add the roof loading structural requirements.

Conclusions and Recommendations

Although the roof membrane itself is not in need of replacement, due to the requirement to remove the wood decking, install a sprinkler system and reinforce the roof structure a completed replacement of the roof and its membrane is anticipated. Allowances for the new roof complete with insulation and reinforcing have been included in the estimate.

6.3.2 Multi-Purpose Centre

Introduction

The exterior cladding for the MPC consists of prefinished vertical metal siding assumed to be original to the construction of the building in 1988. There is a main entrance which includes sidelights as well as secondary entrance to the building from the service parking area in the middle of the development. There are exit doors off the east elevation. Secondary and exit doors consist of steel doors in steel frames. The building has two insulated sectional overhead doors. Roofing consists of an original galvanized metal roof installed in 1988. Rain water is drained from the roof by gutters and downspouts or to adjacent roof areas.

Observations/Comments

The vertical metal siding on the MPC was in fair to poor condition with evidence of corrosion and multiple areas of damaged panels around the building. The main entrance doors to the buildings were in fair condition. The secondary and exit doors to the buildings were in poor condition. The overhead doors associated with the facility were in poor to fair condition. The roof was observed to be in fair condition for its age. Based on the current condition of the Multi Purpose Center there is significant Capital investment required to address the current deferred maintenance of the building. The current building condition supports the proposal to demolish this structure to obtain space to construct the additional ice surface and community support space required by Forum redevelopment project objectives.

Conclusions and Recommendations

With demolition of the MPC, the exterior building condition and any necessary upgrading are no longer a concern. The costs associated to maintaining the MPC have been eliminated from the cost estimate.

6.3.3 Civic Centre

Introduction

The exterior cladding for the Civic Centre consists of prefinished vertical metal siding with portions of the front and south elevations which are clad with a block and brick veneer (a rain screen system similar to the one proposed for the new cladding of the Forum). The main entrance to the Civic Centre is at the Young Street end of the complex and consists of steel framed store front style doors providing access to a vestibule and a secondary set of doors providing access to the rink. Secondary entrances to the building include one from the service parking area in the middle of the development and an entrance off Windsor Street where the Forum and the Civic arenas join. Secondary doors consist of steel doors in steel frames. There are three sectional insulated overhead doors on the north elevation. There is minor glazing on the west elevation and consists of fixed steel framed windows. The roofing consists of original a galvanized standing seam installed in 1995 and a section of modified bitumen reported to have been installed in 2011. Rain water is drained via eaves troughs and down spouts to grade level on the west elevation and on the east elevation into the building to the storm water system.

Observations/Comments

The split face concrete block cladding on the Civic Centre is in fair to poor condition with localized cracked absent mortar and damaged concrete masonry units observed. It is assumed that the cladding was installed with the construction of the building in 1995. This is localized to the north elevation. In the Renovation solution, the north elevation is removed to enable extension to the building as required to increase the ice surface to NHL size.

The exposed poured in place foundation wall appears to be in fair to good condition with localized exposed reinforcing on the west elevation. This typically occurs where reinforcing does not have sufficient concrete cover. Based on the observed condition, repair to the concrete wall is required in the short term to prevent further corrosion to the reinforcing and subsequent wall deterioration. An allowance for concrete repair is included in the short term.

The vertical metal siding on the Civic Centre was in fair condition. Corrosion to the siding at the base, the fasteners and at areas subjected to increased moisture (at downspouts and scuppers) was observed. At the second level on the east side there appears to have been multiple repairs and reinstallation of fasteners in the siding. It is recommended that the area be regularly monitored under operations and maintenance budgets to insure that the siding remains affixed. Multiple reinstallations may have degraded the z girts or studs below. There was localized damage at the loading dock. It is assumed that the siding was installed as part of the original construction in 1995. As a result of the observed condition and age off the siding, it is anticipated that a full replacement will be required in the long term of the evaluation period.

The brick cladding on the Civic Centre is in good condition with localized evidence of cracking bricks. The mortar at the concrete cap was observed to be in poor condition and repaired with sealant, also in poor condition. It is assumed that the cladding was installed with the construction of the building in 1995. As a result of the age and the observed condition of the brick, a replacement is not anticipated during the evaluation period but re-pointing is anticipated in the short term of the evaluation period. An allowance for twenty-five percent of the total brick area to be re-pointed has been included.

The building sealants were observed to be in poor condition with de-bonding to the substrate observed. It is assumed that the sealants are original to the construction in 1995. Based on the observed condition and useful life the building sealants are beyond their useful life and require replacement in the short term.

The steel framed glazing was in fair to poor condition with corrosion to the frames observed. It is assumed that the windows were installed with the construction of the building in 1995. As a result of the age and observed condition of the windows, it is anticipated that replacement of the windows will be required in the short term of the evaluation.

The metal roof appeared to be in fair to good condition with no reported leaks. It was reported to have been installed in 1995. Based on the observed condition and remaining useful life anticipate it will require replacement during the extended term of the evaluation period.

The connection between the MPC and the Civic Centre and the west maintenance room were in fair condition. There was significant damage to the ceiling of the east vestibule, however it was not reported if this damage predates the roof replacement, or is a result of interior water leaks. It was reported that the roof was replaced in 2011. There was extensive debris on the roof which could lead to premature replacement. It is recommended that the flat roofs be cleaned of the fasteners and organic material. It is anticipated that the roof areas will experience premature failure and replacement is anticipated at the fifteen year mark in the extended term of the evaluation. As the area is anticipated to be replaced by new construction in the renovation solution, no costs associated to this roof have been included in the cost estimate.

Conclusions and Recommendations

As documented in the CMEL September 2016 Building Condition Assessment, the various components of the Civic Centre vary from fair to poor condition. Due to the fact that the building is a pre-engineered steel structure, now close to 25 years old, it is to be expected that many components would need to be replaced in the near future.

Generally, the above referenced components recommend replacement of the metal siding, windows and entrances. Replacement of components has been included in the cost estimate associated to the renovation. Brick and concrete masonry are more durable materials with longer life expectancy and can be retained with relatively minor maintenance and repair work. Proposed renovations and additions to the Forum Complex including restoration of the exterior of the main arena will allow for an economical upgrade of identified deficiencies to take place at the same time. Generally the deficiencies would be eliminated by the proposed premature replacement of the west elevation and complete replacement removal and replacement of the north and east elevations. These would include concrete repair, repointing, sealant replacement.

Reconfiguring interior circulation systems and the expansion of the ice surface size to NHL size are anticipated to require additional building length to be added to the current Civic Center building. With a new building elevation required to be constructed beyond the current entrance to accommodate the increased building length, new entrance locations will result and the requirement for new entrance systems.

The Windsor Street facade, although deemed to be in relatively good condition, will not relate well visually to a restored Halifax Forum. The architectural style will not be compatible with the adjacent Forum elevation. It is recommended that the Windsor Street (west) and Young Street (north) elevations are redesigned to better fit in with the overall character of the Forum. This would result in premature replacement of the cladding on the west elevation. Costs have not been included for the premature replacement of the Civic cladding, although it should be considered if the renovation option is pursued.

There are many ways to build next to heritage structures in a complimentary manner and without competing with them. The Forum was originally a stand-alone building, suggesting that modern additions to it be light and transparent in contrast to the more heavy and massive nature of the Forum.

6.3.4 Maintenance and Mechanical Areas

Introduction

The exterior cladding for the maintenance/ mechanical areas consists of a combination of concrete block, brick and metal wall systems. The area has steel doors and frames and an insulated sectional overhead door. The roofing consists of modified bitumen roof covering. Drainage from the roof areas is by a system of roof drains and internal rain water leaders.

Conclusions and Recommendations

The exterior cladding for the maintenance area was observed to be in poor condition. There were cracking to the block and mortar at the masonry walls, and holes in the metal siding. The metal doors to the buildings were in poor condition. There was rust observed at the base of the frames and damage to door panels. The overhead door associated with the facility was in fair to poor condition. The building entrances and overhead door were in fair to poor condition. In addition to the area not supporting the functional needs of the renovated complex, the condition of the area generally supports demolition.

Conclusions and Recommendations

Since most of these areas will be demolished and replaced as part of the Forum Complex Renovation and Addition, most of the recommendations in the 2016 Report are irrelevant. New exterior finishes should be complimentary to the restored Halifax Forum and updated and new facilities. However, due to the nature of these uses, sturdy, heavy duty materials should be chosen. Our square foot costing is based on the RSMeans M550 Rink, Hockey which uses a ridged steel structure and metal sandwich panel cladding system. This unit cost includes concrete block at lower building elevations.

These recommendations have been included in the current Cost Estimates.

6.3.5 Bingo Hall/ Maritime Hall

Introduction

The exterior cladding for the Bingo/Maritime Hall consists of a combination of fiber cement board at the south entrance with prefinished metal siding, brick and exposed poured in place concrete wall. It is assumed that the cladding was all installed with the renovation of the building in 2003. The poured in place concrete is assumed to date from the original construction in 1961. The main entrance is aluminum store front doors in aluminum frames and the secondary entrances consist of steel framed insulated steel doors. There is one overhead door on the north elevation. There are vinyl framed glazing units on the south side of the building. Roofing on the Bingo/Maritime Hall consists of a pre-finished standing seam metal. Drainage from the sloped roof is to gutters and downspouts and to grade. There is a modified bitumen area on the north side of the building and on an addition to the south of the main building there is a prefinished metal roof.

Observations/Comments

The exposed painted poured in place foundation wall appears to be in fair condition with cracking observed on the east elevation and at the north east corner. The paint coating was observed to be in poor condition and flaking. Based on the observed condition removal of the flaking paint and repainting is recommended in the short term however it

is anticipated that this work would be undertaken through operations and maintenance budgets.

The fiber cement board siding was in fair condition with the initial signs of deterioration in the form of expanding and chipping planks. These conditions are at the door frames and lowest siding levels. It is assumed that the siding is original to the renovation of the building, in 2003. The expected useful life of fiber cement board siding is reported to be fifty years however this varies greatly due to climatic conditions, the quality of the installation and the location that the product is installed. In the Maritimes the expected useful life is typically reduced to thirty years with ongoing maintenance to reach its expected useful life. Both a repair allowance in the short term and a complete replacement in the extended term are anticipated.

The metal siding appeared to be in fair to good condition. There was a small area of damaged siding. It was reported that the siding was installed at the time the building was renovated in 2003. Localized repair is recommended however due to the limited quantity it is anticipated that the work would be undertaken through operations budgets. Based on the expected useful life and the observed condition, a complete replacement anticipated beyond the term.

The limited brick cladding on the Bingo Hall is in fair condition with localized evidence of cracking mortar and the potential for damage to the wall system. It is assumed that the cladding was installed with the renovation of the building in 2003. Based on the observed condition of the brick, re-pointing and localized repair is anticipated in the short term of the evaluation period. Major replacement is not anticipated.

The building main entrance was observed to be in fair condition. The hardware appears to require adjustment and the weather stripping is not functioning. Based on the observed condition the aluminum doors are not anticipated to require renewal during the evaluation period.

The metal access and secondary doors to the buildings were in poor condition. There was rust observed at the base of the frames and damage to door panels. The weather stripping was not in good condition. There was evidence of moisture ingress at the doors and corresponding interior finish damage. It is assumed that the doors were installed with the renovation of the building in 2003. Based on the observed condition replacement is anticipated in the short term of the evaluation.

The overhead door associated with the facility was in fair condition. The age of the door was not reported. Based on the observed condition of the door, it is anticipated that replacement in the short term of the evaluation can be expected.

The fixed framed vinyl glazing was in fair condition. It is assumed that the windows were installed with the construction of the building in 2003. Based on the observed condition, and the remaining useful life, it is anticipated that replacement of the windows will be required in the extended term of the evaluation.

The primary metal roof of the Bingo/Maritime Hall appeared to be in fair to good condition with no reported of leaks. It was reported that this roof was replaced during the

major renovation undertaken in 2003. Based on the observed condition replacement of the roof area is beyond the evaluation.

The canopy metal roof is in poor condition with sheets of roofing no longer attached to the deck and large openings in the roofing. The canopy roof requires replacement in the short term. Repainting the canopy structure is recommended at the time of roof replacement.

The Modified Bitumen roof at the connection of the Forum and the Bingo Hall was in fair to poor condition. It was reported that the roof was installed in 1995. The roof was reported to have active leaks. At the time of the site visit extensive debris including bricks, mortar, fasteners and organic matter were observed on the roof. There was evidence of long term ponding at the roof drains in the form of staining and organic growth. The roof area has a higher than average rain water load as approximately 20% of the runoff from the Forum roof is directed to the flat roof area. Regular maintenance and inspection of the roof including removal of debris and clearing of the roof drains to prevent damage to critical building components is recommended. Below this roof area are the mechanical and electrical rooms for the Bingo Hall. Based in the current condition, replacement of the roof is anticipated in the short term.

The Modified bitumen membrane on the addition on the north of the building was not accessible to the time of the site visit and was not able to be reviewed. It is assumed that the roof was installed in 2003. Typically, a modified bitumen roof has an expected useful life of twenty to twenty-five years. Based on the estimated remaining useful life, it is anticipated that the membrane will require replacement in the extended term of the evaluation period.

Conclusions and Recommendations

C MEL generally found exterior components associated with the Bingo / Maritime Hall to be in fair condition but requiring regular maintenance.

The current deferred maintenance associated to the building that has been addressed in the renovations are the section of modified bitumen roof between the Forum building and the Bingo Hall building ,the overhead door north elevation, metal doors on the south elevation, and an allowance for minor brick repointing. The fiber cement board siding repair costs have been superseded by the recommendation to replace the south Bingo Hall addition cladding described below.

The fiber cement board siding area although in fair condition shows initial signs of deterioration. Due to the limited area of siding and anticipated long term maintenance issues associated to the material, premature replacement is recommended. The vinyl windows although based on condition are anticipated to require replacement outside of the renovation, are not in keeping with the facility and it is recommended that if the structure is to be maintained a complete replacement of the cladding would be beneficial.

Associated with the Charter requirements repairs are anticipated to the entrances to meet barrier free requirements which are described in the accessibility section.

Building Envelope Summary

Building Envelope

Item	Status	Comments
Forum Masonry	Failed, repairs not considered viable.	Replace with modern rain screen system replicating the architectural requirements in keeping with Heritage designation
Forum Envelope	Walls do not meet energy code requirement, need a significant amount of insulation.	New wall system to include insulation
Forum Glass Block	Mix of three differing type of block in fair to poor condition	Not in keeping with the original design. 50% to be salvaged but can be sourced for replacement
Forum Main Doors	Good Condition	Anticipated to be replaced as part of the new envelope system
Forum Secondary Doors	Fair Condition	Anticipated to be replaced as part of new envelope system, and new doors added to meet egress requirements.
Forum Windows	Originally were glazing set in metal frames	Consideration may include reinstating the glazing to the original design. This has not been included in the estimate.
Forum Vinyl Windows	Do not meet the Heritage requirements	Replacement is anticipated with metal or wood framed windows.
Heritage Designation	Can be maintained	Heritage has an allowance for replacement for severely deteriorated elements.
Forum Roofing	2001 install nearing end of life	To be replaced due to structural and life safety requirements
Forum roof decking	Does not meet codes, fire code and insulation requirement	To be replaced with a non-combustible material with added insulation
MPC	Generally in fair to poor condition	Demolition is anticipated
Civic Metal Siding	Fair Condition, suitable for re-use but nearing end of life	Replacement has been included
Civic Concrete Block	Fair to good condition but will require replacement	Replacement anticipated to accommodate larger ice surface
Civic Foundation Wall	Fair condition, minor areas of exposed reinforcing	Repair allowance has been included
Civic Masonry	Good Condition – suitable for continued service	Repointing and general maintenance anticipated
Civic Glazing	Poor Condition, corroded frames but re-sue is anticipated	Replacement at end of life in 6-10 years anticipated
Civic Metal Roof	Fair Condition, suitable for continued service	End of life replacement anticipated in approximately 10 years
Civic Entrance	Poor Condition	To be replaced as part of extending the building
Maintenance Area	Poor to Failed Condition	Demolishing anticipated to make room for new pad
Bingo Hall Foundation	Good Condition – Suitable for continued service	
Bingo Hall Cement Board Siding	Fair Condition – Suitable for continued use	Repair allowance have been considered for short term and long term.
Bingo Hall Metal Siding	Fair to Good Condition – Suitable for continued use	
Bingo Hall Main Entrance	Fair Condition – Suitable for continued use.	
Bingo Hall secondary	Fair to Poor Condition	Replacement has been anticipated

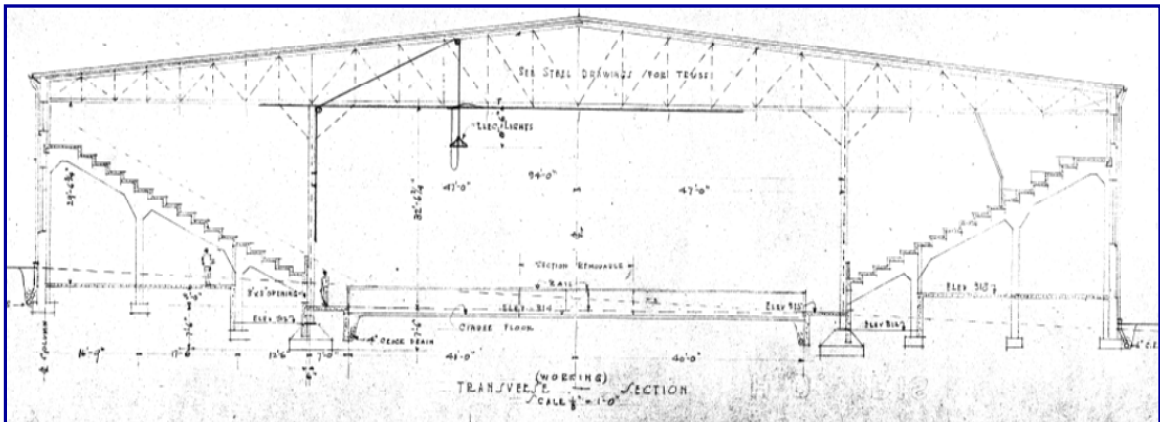
6.4 Structure

6.4.1 Halifax Forum

Introduction

The Halifax Forum was reported to be originally constructed in 1927. The roof structure consists of wood and steel framing. Tongue and groove wood decking is supported by wood battens. The wood battens are supported by open web steel joists (OWSJ). The OWSJ are supported by shallow side steel trusses and deeper central steel trusses. The steel trusses are supported by two lines of steel girder trusses and steel columns at the exterior walls. The girder trusses, which run parallel to the length of the ice sheet, are supported by built-up steel columns. The steel trusses are braced by perpendicular steel bridging trusses in line with the wind columns at the ends of the building. There are also four lines of horizontal diagonal steel angle bracing at the bottom chord of the steel trusses.

The second floor and bleachers are constructed of concrete slabs, beams and columns. According to the original building drawings, the columns are supported on spread footings.



Observations/Comments

A limited structural assessment was completed by Campbell Comeau Engineering and the findings summarized by CMEL for inclusion into the report. The Forum structure is approximately 89 years old. The steel roof framing displayed signs of minor surface corrosion with bubbled and flaking paint throughout. The thickness of the wood decking was not observed during the site review, but it is noted on the original drawings as 1 ¼" thick. The wood battens are 3" wide by 2" deep at approximately 22" c/c. A structural analysis of the wood decking and wood battens indicate they have sufficient capacity to support the current NBCC 2010 requirements for snow loading.

The OWSJ at the Forum roof are 10" deep, spaced at 3'-11" c/c and span 20'-0". The OWSJ consist of double rod top and bottom chords and a single bent rod forming the diagonal web members. The original building drawings indicate Massillon bar joists at 32" c/c. This is a significant discrepancy in spacing. A structural analysis of the OWSJ top and bottom chords at mid span indicates the OWSJ do not have sufficient capacity to support the current NBCC 2010 requirements for snow loading. The factored loading is approximately 1.4 times the factored resistance for the bottom chords and approximately

2.0 times the resistance for the top chords. The web members, welds and connections to the trusses were not assessed as part of this review.

The steel trusses at the Forum roof vary in depth from approximately 3'-6" deep at the side of the building to approximately 13'-4" deep at the centre of the building. The steel trusses have double angle top and bottom chords and double angle vertical and diagonal web members. The web members are connected to the chords with steel gusset plates and rivets. The trusses are spaced at 20'-0" c/c. The side trusses span approximately 47'-0", and the central trusses span approximately 94'-0". A structural analysis of the side and central truss top and bottom chords at mid span indicates the trusses do not have sufficient capacity to support the current NBCC 2010 requirements for snow loading. The factored loading is approximately 1.05 times the factored resistance for the bottom chords and approximately 1.55 times the resistance for the top chords. The web members, rivets and end connections were not assessed as part of this review.

The girder trusses at the Forum are approximately 7'-5" deep and span approximately 40'-0" and 60'-0". The first two web diagonals at each end appear to have been reinforced with 3 x 3 x 1/4" angles on both sides. These angles are welded to spacer plates that are welded to the original steel gusset plates. The original steel is painted black and the newer steel is painted red. The girder trusses were not analysed as part of this review.

The Forum has diagonal bracing angles in the plane of the truss bottom chords, but no diagonal bracing was noted in the exterior walls during the site review. The original building drawings indicate the presence of temporary diagonal bracing at the side walls. Since this bracing was temporary, it was likely installed for erection purposes and removed after the exterior brick walls were installed. The lack of a defined lateral load resisting system does not meet the current requirements of the NBCC 2010 for seismic design. Diagonal steel bracing could be installed in the exterior walls to resist current wind and seismic loading.

The OWSJ and steel trusses at the Forum do not meet current snow loading requirements. A steel beam or OWSJ could be installed between each existing OWSJ. This would reduce the loading on the existing OWSJ in order to meet current design loads. A complete structural analysis of all truss members would be required, and the capacity of the trusses would be increased through the use of steel reinforcing.

The exterior steel columns at the Forum are experiencing corrosion. The exterior flange and a portion of the column web are encased in speed tile which was removed (and reinstated) in various locations as part of the detailed assessment. The exposure of the in situ steel revealed that the exterior brick wall is allowing water to reach the steel columns. Corroded steel is flaking from the exterior flange of the steel columns and pushing against the brick and speed tile. The speed tile is bulging into the building locally at the steel columns. In some areas, a portion of the speed tile has broken away to expose the exterior column flange. In these areas approximately half of the flange thickness has been lost. The column flanges require reinforcing.

Serious corrosion of the exterior steel columns was observed at the Forum. The column flanges are corroded where they are embedded in the exterior masonry wall. As the

condition of the hidden exterior steel columns could not be ascertained at the time of the initial assessment destructive testing was undertaken and the deterioration confirmed. The exterior columns at the Forum could be reinforced by removing the corroded steel and welding steel plates to the remaining sound steel. The exterior walls would need to be removed around the columns in order to accomplish this reinforcing. The exterior walls should be replaced with an exterior wall assembly that will prevent water from contacting the steel columns to prevent further corrosion. The estimated cost for the column reinforcing only has been included in the structural costs. These are located in the Architectural exterior costs.

The exterior brick walls at the Forum were constructed full height from foundation to roof. The walls were constructed tight to the concrete slab at the top of the bleachers. There is currently a gap of up to 1 ½" between the exterior wall and the concrete slab in some areas. Re cladding has been recommended in the Building Envelope Section along with temporary pinning which is recommended as a priority repair.

The bleacher seating at the Forum is constructed of cast in place concrete columns, beams and slabs. The concrete is reinforced with smooth rods. There are locations with spalling concrete and exposed reinforcing. These damaged areas require repair. The repair would consist of removal of all loose concrete and patching with concrete repair mortar. The estimated cost for concrete repairs has been included in the cost estimate.

Conclusions and Recommendations

Interior Column Removal

HRM staffs have identified the removal of Forum interior columns as "preferred" but not a "mandatory" requirement within their redevelopment project objectives. The 8 - 12" x 12" steel square built up columns obstruct the view of the ice surface from the stands.

An initial review of this request indicates that 65% of the entire roof structure is supported by the 8 12" x 12" interior columns. The remaining 35% of the roof load is supported by 42 - 8" x 8" perimeter columns. Unfortunately, 65% of the roof load cannot be easily transferred to the perimeter columns. In order to remove the 8 interior columns, a heavy truss structure that re-supports the roof and spans the entire width of the building would be required. Alternatively, the entire structure would need to be demolished and rebuilt, including the roof structure.

Another option which has been investigated is the removal of the two interior columns close to centre ice on both sides of the rink. If possible, this would remove the two columns that most interfere with the view. However, removal of these columns would transfer the roof load to the adjacent two columns on each side of the rink, increasing their load requirement by approximately 50% and would increase the span of the existing 7'- 5" deep girder trusses from 60 feet to 120 feet. This truss would have to be replaced by a much deeper truss that would potentially obstruct the view from the upper stands.

Also, although the adjacent columns could be reinforced or replaced to increase their load capacity by 50% each, it is anticipated the existing footings would need to be increased in size. This will involve extensive excavation and underpinning work. A more detailed structural analysis would be required to determine if this option is feasible. Until such a study is completed, CMEL and our structural consultant would not recommend

removal of any of the columns, if even viable, due to extremely high cost and little improvement to the obstructed view from the lower seating and potential increase to the obstructed view from the upper seats.

The obstructed view is not the only structural challenge associated with the Forum. Currently the roof structure does not meet current code from both a structural loading and life safety point of view. It is likely that with the addition of sprinkler piping and potentially roof insulation which will be required to meet current code the roof structure will have to be significantly altered if not replaced. In the event that the changes result in the requirement to replace the roof structure, removal of the columns may be considered as a high priority as it could be efficiently incorporated into the new design solution at an incremental cost.

Additional analysis related to; Upper concourse and lateral bracing, Roof Structure Reinforcing and Concrete Seating and concourse modifications is anticipated however pending receipt of the findings the material as provided from Campbell Comeau Engineering from the initial assessment have been included with a 20% premium applied to move the risk analysis forward in the interim associated to the Project Charter direction. The potential issues are increased load associated to a sprinkler system insulation and replaced decking.

Another undefined risk involves the potential of permafrost building up under the slab. If the ground has frozen to any great extent during renovations there could be significant movement of spread footings and columns footings that could lead to significant additional costs. As the ground thaws during major renovation, if it has frozen, the differential movement may further compromise the structure. Prior to starting renovation, bore hole testing may identify the extent, if any, of the permafrost.

6.4.2 Multi-Purpose Centre

Introduction

The Multi-Purpose Centre was reported to be constructed in 1988 to the northwest of the Forum facing Young Street. The roof structure consists of steel framing. A metal roof is supported by cold formed steel Z-shaped purlins. The purlins are supported by rigid frames. The rigid frames have uniform depth I-shaped beams made up of steel plates. The end columns are tapered. There are two interior HSS columns in each rigid frame. The second bay from each end has diagonal rod cross bracing in the plane of the roof beams and the exterior columns. The foundations are not known but assumed to be concrete spread footings.

Observations/Comments

The Multi-Purpose Centre structure is approximately 28 years old. The steel framing appears to be in good condition with no signs of corrosion. The cold formed steel Z-shaped purlins are 10" deep, spaced at 5'-0" c/c and span approximately 25'-0". The purlins are overlapped at the supporting beams in order to achieve continuity across all of the spans. A structural analysis of the purlins indicates they do not have sufficient capacity to support the current NBCC 2010 requirements for snow loading. The factored loading is approximately 1.65 times the factored resistance at the first interior supporting beam at each end and approximately 1.1 times the resistance at all other supporting beams.

The rigid frames at the Multi-Purpose Centre consist of 22" deep steel beams with rigid connections to two tapered end columns and two interior HSS 6x6 columns. The rigid frames are spaced at approximately 25'-0", the end spans are approximately 38'-0" and the middle span is approximately 40'-0". The rigid frames have a combination of welded and bolted connections. A structural analysis of the rigid frame indicates the middle beams do not have sufficient capacity to support the current NBCC 2010 requirements for snow loading. The factored loading is approximately 1.3 times the factored resistance at the interior columns and approximately 1.0 times the resistance at the end columns. The exterior tapered columns were hidden by drywall finishes and could not be measured. The columns, welds and bolted connections were not assessed as part of this review.

The diagonal cross bracing at the Multi-Purpose Centre consists of two ¾" diameter rod braced bays on each side of the building. A structural analysis of the cross bracing indicates they sufficient capacity to support the current NBCC 2010 requirements for wind loading but not seismic loading. The factored loading is approximately 0.45 times the factored resistance under wind loading and 1.35 under seismic loading. Additional cross bracing could be added at the exterior walls to meet current seismic loading.

The purlins and the rigid frames at the Multi-Purpose Centre (MPC) do not meet current snow loading requirements. A purlin could be installed between each existing purlin in order to meet current design loads. The capacity of the rigid frames would need to be increased through the use of steel reinforcing. As the MPC is proposed to be demolished in the renovation solution, the repair costs have not been included in the renovation solution cost estimate.

6.4.3 Civic Centre

Introduction

The Civic Centre was reported to be constructed in 1995 to the west of the Forum facing Windsor Street and Young Street. The roof structure consists of steel framing. A metal roof is supported by cold formed steel Z-shaped purlins. The purlins are supported by rigid frames. The rigid frames consist of tapered I-shaped beams and columns made up of steel plates. The second bay from each end has diagonal rod cross bracing in the plane of the roof beams and the exterior columns. There is a low roof on the east side of the building between the Civic Centre and the Multi-Purpose Centre. The low roof consists of steel deck, OWSJ and steel beams supported by steel columns. The foundations are not known but assumed to be concrete spread footings.

Observations/Comments

The Civic Centre structure is approximately 21 years old. The steel framing appears to be in good condition with no signs of corrosion. The cold formed steel Z-shaped purlins are 9 1/2" deep, spaced at 5'-1" c/c and span approximately 23'-6". The purlins are overlapped at the supporting beams in order to achieve continuity across all of the spans. A structural analysis of the purlins indicates they do not have sufficient capacity to support the current NBCC 2010 requirements for snow loading. The factored loading is approximately 1.35 times the factored resistance at the first interior supporting beam at each end and approximately 1.6 times the resistance at all other supporting beams.

The rigid frames at the Civic Centre consist of tapered steel beams varying between 4'-1" deep and 2'-4" +/- deep with rigid connections to two tapered end columns. The rigid frames are spaced at approximately 23'-6" c/c and span approximately 120'-0". The rigid

frames have a combination of welded and bolted connections. A structural analysis of the rigid frame indicates the beams do not have sufficient capacity to support the current NBCC 2010 requirements for snow loading. The factored loading is approximately 1.3 times the factored resistance at the columns. The middle beams were partially hidden by foil at the roof soffit and could not be measured. The middle beams, columns, welds and bolted connections were not assessed as part of this review.

The low roof framing to the east of the Civic Centre appears to be part of the Civic Centre construction. The steel deck spans 3'-5", the OWSJ span approximately 23'-6" and the steel beams span approximately 14'-5". A structural analysis of the steel deck, OWSJ top and bottom chords and steel beams indicates the low roof framing has sufficient capacity to support the current NBCC 2010 requirements for snow loading including snow drift from the high roof.

The diagonal cross bracing at the Civic Centre consists of two 13/16" diameter rod braced bays on each side of the building. A structural analysis of the cross bracing indicates they have sufficient capacity to support the current NBCC 2010 requirements for wind loading but not seismic loading. The factored loading is approximately 0.75 times the factored resistance under wind loading and 2.0 times the factored resistance under seismic loading. Additional cross bracing could be added at the exterior walls to meet current seismic loading.

The purlins and the rigid frames at the Civic Centre do not meet current snow loading requirements. A purlin could be installed between each existing purlin in order to meet current design loads. The capacity of the rigid frames would need to be increased through the use of steel reinforcing. The estimated cost for roof structure reinforcing has been included in the Cost Table.

Similar concerns with the Civic Centre as with the Forum renovations should be considered with respect to the potential of permafrost. It is unlikely that either ice sheet has a thermal break under the slab to help prevent frost building up.

6.4.4 Bingo Hall/ Maritime Hall

Introduction

The Bingo Hall and Maritime Hall were reported to be opened in 2003. The Hall replaced a civic arena to the northeast of the Forum facing Almon Street however many of the original building components were left in place and incorporated into the development of the Bingo / Maritime Hall. The original Civic arena was reported to be constructed in 1961 and closed in 1995. The roof structure remains and consists of steel framing. The metal roof is supported by OWSJ. The OWSJ are supported by steel truss rigid frames. The end bays have diagonal rod bracing in the plane of the roof. There is a low roof on the back side of the building. The low roof consists of composite steel deck with no concrete topping and steel beams. The steel beams are anchored to the block walls of the main building and supported by steel beams at the other end. The foundations are not known but assumed to be concrete spread footings.

Observations/Comments

The original Maritime/Bingo Hall structure is approximately 55 years old. The steel roof framing displayed signs of minor surface corrosion with bubbled and flaking paint throughout. According to the architectural renovation drawings from 2003, the existing

roofing was removed and replaced with new metal roofing, which would be approximately 13 years old however the underlying structure is original.

The OWSJ at the Bingo Hall roof are 12" deep, spaced at 3'-6" c/c and span 20'-0". The OWSJ consist of double angle top chords, double rod bottom chords and a single bent rod forming the diagonal web members. A structural analysis of the OWSJ top and bottom chords at mid span indicates the OWSJ do not have sufficient capacity to support the current NBCC 2010 requirements for snow loading. The factored loading is approximately 1.2 times the factored resistance for the bottom chords and approximately 1.15 times the resistance for the top chords. The web members, welds and connections to the trusses were not assessed as part of this review.

The steel truss rigid frames at the Bingo Hall consist of tapered column trusses and 4'-4" deep beam trusses spaced at 20'-0" c/c and spanning approximately 101'-0". The trusses have double angle top and bottom chords and a combination of welded and bolted connections. A structural analysis of the top chords near mid span and the bottom chords at the columns indicates the trusses do not have sufficient capacity to support the current NBCC 2010 requirements for snow loading. The factored loading is approximately 1.8 times the factored resistance for the bottom chords and approximately 2.2 times the resistance for the top chords. The web members, welds and bolted connections were not assessed as part of this review.

The low roof framing at the back of the Bingo Hall appears to have been added after the original building was constructed. The composite steel deck spans 4'-0" and the steel beams span approximately 18'-9". A structural analysis of the steel deck and steel beams indicates the deck and beams have sufficient capacity to support the current NBCC 2010 requirements for snow loading including snow drift from the high roof. The steel beams are supported by C12 steel channels that are anchored to the block wall of the main building. The capacity of the anchors was not assessed as the anchor type is unknown. These block walls do not appear to have been load bearing in the original construction of the building.

The Bingo Hall roof has diagonal rod cross bracing in the plane of the roof at both ends of the building, but no diagonal cross bracing was observed in the exterior walls during the site review. The rigid frames resist lateral loads parallel to the frames. It appears the building may be relying on the exterior block walls to resist lateral loads such as wind and seismic loading perpendicular to the rigid frames. The lack of a defined lateral load resisting system does not meet the current requirements of the NBCC 2010 for seismic design. Diagonal steel bracing could be installed in the exterior walls to resist current wind and seismic loading.

The OWSJ and steel rigid frame trusses at the Bingo Hall do not meet current snow loading requirements. The capacity of the OWSJ and steel trusses could be increased to meet current design loads through the use of steel reinforcing. The estimated cost for roof structure reinforcing has been included in the Probable Cost Table.

Conclusions and Recommendations

With the exception of the MPC which is proposed to be demolished reinforcing of the Bingo Hall and Civic arena has been included in the cost estimate. The reinforcing is required to meet the current NBC design requirements for snow, lateral and seismic

loading. Similar to all renovation work, a contingency of 30% has been applied to the structural renovation costs.

Structure Summary

Item	Status	Comments
Forum Roof Structure	Does not meet current snow loading, seismic or lateral code requirements	Reinforcing possible, replacement is anticipated
Forum Perimeter Steel Columns	Poor to failing condition. Do not meet code for lateral bracing	Major repair and reinforcing requiring removal of surround brick anticipated
Forum Internal Steel Columns	Fair Condition	Reinforcing has been anticipated due to increased roof load requirements
Civic Centre Roof Structure	Does not meet current snow loading code requirement	Reinforcing has been anticipated
Civic Diagonal Bracing	Does not meet current seismic code requirement	Reinforcing has been anticipated
Civic Steel Columns	Fair to Good Condition	Suitable for continued service
Bingo Hall Roof Structure	Does not meet current snow loading, seismic or lateral code requirements	Reinforcing has been anticipated
MPC Roof Structure	Does not meet current snow loading, or seismic code requirements	Building is anticipated to be demolished

6.5 Building Interior

6.5.1 Introduction

The Forum complex interior generally consists of change room, washrooms and ancillary rooms' associated with the ice rink. There is spectator seating associated with the Civic and the Forum buildings. The multipurpose centre is generally an open area with connected washrooms and service rooms and similarly the bingo hall is a predominantly a hall style finished space with connected washrooms and ancillary service rooms.

The interior finishes generally vary in condition however their suitability for re-use and or redevelopment is very limited. Code compliance issues associated with life safety, structural and or accessibility requirements will ultimately result in many of the interior finishes being abandoned as part of a larger redevelopment of the interior spaces. Each of the respective sections, accessibility, structure and life safety discuss the details in more depth, however the resultant impact on many of the interior finishes is that they will be significantly altered and or removed to accommodate required changes. In some cases, limited amounts of interior finishes may be re-used but more often they will be removed and replaced with new as it will be more cost effective than selectively removing, in an attempt to maintain and re-install the finishes as opposed to crude demolition and replacement with new.

A description by building follows describing at a high level the contained finishes, and their current condition. Comment has been made on the anticipated remaining life and the suitability of the components for re-use and or incorporation into a redevelopment. Unfortunately, as outlined below, the major of the finishes are impacted one way or another that ultimately result in replacing with new.

6.5.2 Halifax Forum

Introduction

The interior of the Forum consists of an ice surface atop a concrete slab on grade, change rooms, washrooms, concession area and administrative offices. The interior wall finishes for the Forum generally consists of painted concrete, speed tile and exposed painted metal columns / beams. The floor finishes consist of epoxy resin on top of the concrete slabs and rubber matting around the ice surface and locker rooms. Ceilings are open to the underside of the ceiling deck with painted exposed structural components. The upper section of the arena has a box area that is made out of glass and plywood with wood frames. The box sections are open to the rest of the arena.

The original seating in the Forum consisted of formed concrete seats with timber seat covers in the upper sections of the arena. The lower and middle sections have since been retrofitted with folding painted wooden arena seats with arm rests.

The arena has a variety of dressing rooms and associated washrooms. The dressing rooms are typically finished with painted block walls, a painted ceiling and rubber mats throughout. Wooden bench seating is generally lines the perimeter and wall mounted clothes hooks are mounted on the wall.

	Halifax Forum
Total Number of Changing Rooms	11
Dedicated Changing Rooms	4

The washrooms finishes are a combination of painted block walls, hard tile wall and floor finishes. Typically arena washrooms have sinks, water closets and a limited number of showering facilities. Washroom fixtures are discussed in the plumbing section.

Observations/Comments

The rubber mats were in fair to good condition and did not have signs of excessive wear or missing sections. It was reported that the mats had been completely replace in the Forum in 2010. Based on the observed condition the mats will require replacement during the long term of the evaluation period in keeping with their expected useful life. It is expected that the mats would be retained for use in the updated facility.

The epoxy coating in the Forum appeared to be in fair condition with localized areas of deterioration. The floor coating was reported to be installed in 2010. Based on the observed condition and the expected useful life, a cyclical replacement as been included where every five years 40% of the epoxy will be replaced started in the short term of the evaluation period. Although the floor coating is not at the end of its useful life, many of the elevations will need to be changed to meet accessibility standards and to

accommodate the increased ice surface size. As a result many of the floors will be replaced and therefore a new floor finish applied.

The public washrooms appeared and were observed to vary in condition from good to fair condition. Based on the condition of the majority of the public washroom finishes including floor wall ceiling bathroom partitions and millwork are anticipated to require replacement in the term. In addition, many of the public washrooms are not fully accessible and significant alterations and or replacement which will result in the majority of the finishes being replaced. An allowance for the public washroom replacement has been included in the costing.

The seating in the Forum is in good condition for their age and the based on condition, the seats will exceed the evaluation period. However, the current seating arrangement does not meet the clearance requirements based on code with respect to egress. This result in a requirement to replace all of the seating with code compliant seating and disposing of the seating.

The administration area floor finish is a combination of primarily laminate and carpet. The carpet was in poor condition and the laminate appeared to be in fair condition. Based on the observed condition and remaining useful life replacement is anticipated in the long term however due to the limited quantity and estimated cost, replacement of the laminate flooring and Carpet have been included as a single line item.

The suspended ceiling tile finishes appeared to be generally in fair condition with localized staining due to moisture damage throughout the facility. Based on the observed condition an allowance of 4000 square feet of tile replacement has been included in the extended term of the evaluation period.

The speed tile finish was observed to vary in condition from poor to fair. Where the tile is within the exterior wall system, the condition is poor with failing masonry. On the interior of the building if the area has not experienced higher levels of moisture the condition of the speed tiles is fair. Replacement of the speed tile in the exterior wall is assumed to be included in the exterior renovation cost.

Conclusions and Recommendations

The current deferred maintenance associated to the building has been included in the renovation. The items indentified in the short term include epoxy repairs and renovation of the west public washrooms however both of these items will be superseded by the major interior renovation required by the project charter and as a result of the cladding replacement.

Renovations to the Forum include changes resultant from the Project requirements for complete code compliance and the CSA Barrier Free standard. These are noted in the code compliance section and the accessibility sections respectively. The although noted as optional, in the renovation solution are included costs to remove and replace the ice slab, with the assumption of additional work resultant for addressing the sub slab. Dasher boards and matting are included in the cost estimates. The project charter required interior renovations which include the administrative area and the change rooms. It should be noted that with complete cladding removal it is unlikely that should the Project not include the requirement for interior renovation, exposing the interior

rooms to the elements and reconstruction would result in the requirement for a major renovation. An allowance on a per square foot basis has been include in the cost estimate for major interior renovations to the forum.

With the proposed renovations recapitalization of the Forum in years 6-20 is anticipated to be minimal due to the scope Forum renovation anticipated resultant from the requirements of the project requirements.

6.5.3 Multi-Purpose Centre

Introduction

The interior of the MPC consists of concrete slab floor and painted block walls and a minimal area of finished floor wall and ceilings.

MPC washrooms consist of hard tile finishes, washroom partitions and suspended ceiling tiles. (Washroom fixtures are discussed in the plumbing section)

Observations/Comments

The interior finishes to the MPC were generally in fair condition. Replacement of the VCT flooring, the suspended ceiling tile and washroom finishes are anticipated. Minor repairs and repainting will be required during the evaluation period and are anticipated to be funded as part of regular operations and maintenance budgets. Replacement of the ceiling tile the washroom finishes and the vinyl floor tile are anticipated within the term of the evaluation.

Conclusions and Recommendations

In the renovation solution it is proposed that the area is demolished and all costs are associated to demolition with new construction in the area of the former MPC proposed.

6.5.4 Civic Centre

Introduction

The interior of the Civic Centre consists of an ice surface atop a concrete slab on grade, change rooms, washrooms, stepped observation area, on level two a concession room, meeting and team areas as well as a skate sharpening room. The two arenas share a mechanical room, electrical room and ice resurfacers garage.

The interior wall finishes for the Civic Centre consists of painted concrete block and painted structural steel, the exposed interior of the insulation liner. The ceiling finishes consist of the Low E covering, and the floor finish is concrete slab with rubber matting around the ice surface and locker rooms.

The seating for the Civic Centre consists of polymer benches attached to a wooden framed stadium seating structure.

The arena has a variety of dressing rooms and associated washrooms. The dressing rooms are typically finished with painted block walls, painted ceilings and rubber mats throughout.

	Civic Center
Total Number of Changing Rooms	10
Dedicated Changing Rooms	3

The washrooms finishes are a combination of painted block walls, hard tile wall and floor finishes. Typically arena washrooms have sinks, water closets and a limited number of showering facilities.

There is a limited area of office and entrance area which has vinyl floor tile and some gypsum wall board lay in ceiling tile finishes and gypsum wall board at entrance vestibule.

Observations/Comments

The rubber mats were in fair to good condition and did not have signs of excessive wear or missing sections. The mats have been selectively replaced as needed however given the extent of the rubber flooring an established replacement programme should be identified to ensure adequate coverage for the arenas, dressing rooms and washrooms. The Civic arena mats were reported to have been replaced in 2012. Based on the observed condition and reported life expectancy it is anticipated that the mats will require replacement during the evaluation period in keeping with their expected useful life.

The Low-E ceiling cover is in good condition with no observed or reported abrasions to the membrane. The ceiling cover was reported to have been installed within the last three years. Based on the condition replacement is not anticipated until the long term of the evaluation period, however with the planned roof structure reinforcing the Low E ceiling is likely to require replacing. Costs have been included for its replacement.

The public washrooms appeared and were observed to be in good condition. As a result of the condition of the public washroom finishes it is not anticipated that any significant replacement is required during the evaluation.

The seating in the Civic Centre were in good condition and the useful life of the seats will exceed the evaluation period.

The metal stairs at the north of the building were observed to be in poor condition. The risers have corrosion and deterioration. The north set of stairs is heavily used by occupants coming in from the exterior and is subjected to moisture and salt. Based on the observed condition it is anticipated that the metal stairs will require replacement in the short term of the evaluation.

The vinyl tile flooring and lay in tile were generally observed to be in good condition and appear to have been installed in the last ten years. Based on the remaining useful life and the observed condition an allowance for finishes in the Civic Centre has been included in the extended term of the evaluation.

The Gypsum wall board ceiling at the east entrance was observed to be in poor condition with evidence of moisture damage. It was not reported if the damage was current, however it is recommended that the area be repaired in the short term.

Conclusions and Recommendations

The current deferred maintenance associated to the building has been included in the renovation. As finishes in the building are limited, replacement is anticipated to include metal stairs, and gypsum board repairs. Although the condition of the e-ceiling would not dictate replacement in the short term, replacement is anticipated. The destructive work required by the structural roof augmentation will require a new e-ceiling as the material is not durable and is not expected to be resilient enough to withstand the renovation.

Changes to the Civic Center interior dictated by the project charter include increasing the ice surface, meeting code and barrier free standards. Renovation to the interior of the civic center is also identified along with improvements to the interior pedestrian movement within the building. Significant renovation will occur within the proposed renovation solution which will demolish the north and east elevations of the building.

6.5.5 Bingo Hall/ Maritime Hall

Introduction

The interior of the Bingo/Maritime Hall consists of vinyl composite tiling (VCT) flooring with painted gypsum wall finishes and suspended ceiling tiles.

Bingo Hall washrooms consist of hard tile finishes, washroom partitions and suspended ceiling tiles. (Washroom fixtures are discussed in the plumbing section)

Observations/Comments

The VCT flooring in the Bingo/Maritime Hall were in poor condition. It is anticipated that the floor will need to be replaced in the short term of the evaluation period.

The suspended ceiling tiles in the Bingo/Maritime Hall were in fair to good condition and have no observed signs of broken tiles or water damage. It is anticipated that damaged tiles will be replaced as required on an as needed basis with major replacement anticipated in the long term.

Conclusions and Recommendations

The current deferred maintenance associated to the building has been included in the renovation. Due to the 2003 major renovation that is limited to replacement of floor finishes.

In addition related to barrier free standards applied via the project charter and further meeting direction, changes to the hardware, renovations to the door thresholds and washrooms at the Maritime hall are anticipated. An allowance for repairs and washroom renovations has been included.

6.5.6 Mechanical Area

Introduction

The mechanical room and the ice resurface garage have minimal finishes. The floor is exposed concrete or asphalt with unfinished walls and ceilings.

Conclusions and Recommendations

In the renovation solution it is proposed that the area is demolished and all costs are associated to demolition and new construction.

Building Interior Summary

Building Interior

Item	Status	Comments
Forum Seating	Does not meet current code for spacing	Replacement of seating is expected to achieve required clearance. Modification to some of the concrete sub-structure will be required.
Forum Slab	Fair Condition	Replacement is anticipated to achieve new size.
Forum Dressing rooms	Fair condition	Due to the extent of the exterior renovation, new dressing rooms have been anticipated including a possible relocation.
Forum Rubber Mats	Fair to good condition	Suitable for re-use
Forum Public Washrooms	Fair Condition. Do not meet all accessibility standards	Replacement and possible relocation is anticipated
Speed Tile Demising Walls	Poor to Fair Condition	Replacement is anticipated
Administration Area Finishes	Fair to Poor Condition	Replacement of finishes are anticipated
Forum Dasherboards	Good Condition	Replacement anticipated to accommodate new rink size
Civic Rubber Mats	Fair to Good Condition	Suitable for continued service
Civic Seating	Good Condition	Suitable for continued service
Civic Change Rooms	Fair Condition	Renovations to include repartitioning, new washroom facilities and potential relocation of change rooms
Civic Ice Slab	Fair Condition	Replacement anticipated to accommodate new size
Low E Ceiling	Fair Condition	Replacement anticipated due to reinforcing of the roof structure
Bingo Hall Finishes	Generally Good Condition	Majority of interior finishes are suitable for continued service.
MPC Interior Finishes	To be demolished	

6.6 Mechanical Systems

Overview

The Complex has a combination of plant equipment associated with the two arenas as well as HVAC equipment associated with the common and multifunction rooms. Each building is self sufficient with respect to washrooms and ventilation. Heat generation is generally achieved from hot water boilers in combination with radiant tube heating on the Forum and one common ice plant services both ice sheets. A description of each system by building follows.

6.6.1 Rooftop Equipment

Overall there are (3) roof mounted condensers on the Multi-Purpose Centre (MPC), (1) roof mounted dehumidifier serving both rinks, (5) roof mounted Air handling units & (2) Roof exhausters serving the Bingo Hall. Outside the Civic Centre ice resurfacers door are three evaporative condensers that serve the chiller plant; one Frick and two Cimco units. All equipment on the Bingo hall rooftop (built in 2003) and the MPC (Built in 1988) seem to be in fair to Good condition. The Forum (Built in 1927) rooftop dehumidifier however inclusive of the structural frame is in fair to poor condition and with an unknown age appears it is at or over its estimated life expectancy.

6.6.2 Halifax Forum

Introduction

The Halifax Forum was the original building of the four buildings; originally built in 1927 the Forum has undergone multiple renovations with the most recent being in 2010 where the washroom fixtures were replaced. The Forum mechanical systems support of one 81' x 198' ice surface, 10 dressing rooms, two washrooms and the administrative office. Mechanically, the Forum is in good/fair shape. The new addition of radiant tubes for heating, new washrooms fixtures and new ventilation ductwork has extended the mechanical life of the Forum.

Heating

The main heating for the Forum is accomplished by Superior Radiant tube heaters located above the ice surface; these heaters are also responsible for heating the stands and the ice surface. There is an "H" shaped arrangement of the heaters above the ice surface that is fed through a single duct. Another line of heaters are located above the east and west stands; the lengths of these heaters are fed individually by a supply line.

The main corridor is heated by a single run of duct work that is connected to two (2) Reznor Air Handling Units (AHU) located in storage crawl spaces above dressing room 2 and the west side male's washroom. Both units have a heating coil that is heated through a natural gas burner. The heating capacities of the AHUs are 400 mbh. Both units were installed in 2009 so they are in good condition with no sign of wear and tear. The rest of the rooms are heating by unit heaters placed in the dressing rooms as well as undercut doors or no doors.

Three HRV's serve the Dalhousie and Saint Mary's Men's hockey teams dressing rooms. A Fantech and Nu-Air Unit are located in the east crawl space about the Saint Mary's Hockey room. The Nu-air unit has a capacity of 118 cfm while the Fantech unit's capacity is unknown. There is another Nu-air unit in the second west crawl space that

serves the Dalhousie Men’s Hockey Room. This unit has a capacity of 145 cfm. All three HRV’s are still in good shape. There are 14 decommissioned heating fans installed around the stands. These were used before the radiant heaters were installed.

Ventilation

The rink area has air supplied through a duct on the east side of the stands with transfer grills at regular intervals along the duct. The duct on the east side is supplied air through the Munter’s dehumidifier located on the north east corner of the Forum roof. This is the same dehumidifier that supplies air to the Civic Centre. There is also a return line connected to the dehumidifier. The age and size of the dehumidifier is unknown because there is no identifiable tag located on the unit. The supply and return duct is fairly new and still in good shape however the dehumidifier is in fair condition due to the prolonged exposure to the salty environment on the roof of the Forum.

The rink area is exhausted by three exhaust fans located above the ice surface; one directly north of the scoreboard over centre ice and one located at the north and south ends of the ice surface. Although close examination of these exhaust fans was unable to happen due to the location of the fans, the fans show no significant wear or tear. The corridors and all the rooms along the outside of the lower level are supplied air through the main duct running along the outside of the hall. All the doors in Forum have a significant undercut that allows air to be supplied to the space. As stated above, the ducting and AHUs are in good condition having just been installed.

Piping

The water in the Forum is supplied by the metered water line in the Civic Centre and the domestic hot water tank in the Civic Centre boiler room. These two lines supply water to 10 dressing rooms, 8 washrooms and 2 canteen areas. The total fixture count is seen in table 2.

Fixture	Total Number
Sink	25
Urinal	22
Water Closet	26
Shower Head	21

Table 2- Plumbing Fixtures in the Forum

The fixtures in the Forum were replaced in 2010 because the previous fixtures had reached their expected use life. Due to the recent replacement, all fixtures in the Forum are in good shape and don’t need to be monitored for deterioration. However, they should still be monitored due to the potential of vandalism.

6.6.3 Multi-Purpose Centre

General Remarks

The Multi-Purpose Centre was constructed in 1988 as an expansion of the Forum. The mechanical systems support a 15,520 square foot banquet hall that is used for a variety of events. There is also a smaller room that is used as an office area for the multi-purpose room. There is a canteen and a bar located at the far side of the larger room. There are two larger washrooms off the main event space and two located off the smaller room. Two washrooms are located just inside the larger room to the left while

two single stalls are located in the office area. There is a sprinkler room to the left of the MPC entrance and a small mechanical and electrical room located at the rear exit hallway. There are two pumps and an exhaust fan which has been decommissioned in an old boiler room located on the north wall.

Heating and Cooling

The main room is heated by two air handling units located in the attic space above the entrance and sprinkler room. The two units are served by two Trane condensers outside on the roof. It is assumed that there is a third hair air handling unit with a cooling coil in the space above the office area that is served by a York condenser on the roof. The two units that service the main room have both a hot water heating coil and a cooling coil to control the temperature of the room. The heating in the main room is produced by three perforated fabric ducts while the heating in the office space is accomplished by hot water radiant or electric baseboard heaters. The other main heating and cooling components are a 1 ½ ton Frigidaire heat pump located in the bar area and a Blanchard air conditioning unit located in each of the two walk in fridges for the bar.

Ventilation

The main ventilation for the Multi-Purpose Centre is the three fabric ducts. The rooms are exhausted through three exhaust fans. One is located at the north end of the Multi-Purpose Centre on the roof likely serving the group washrooms. One is located on the sidewall of the individual washrooms and the third one is located on the south wall above the canteen area. All fans appear to be fair condition with signs of wear and damage to the outdoor fans.

Plumbing

The main plumbing in the Multi-Purpose Centre is the two washrooms on the north side of the banquet hall. The fixtures in these washrooms are in fair shape however they are reaching their expected service life. The faucets in these washrooms are five (5) years over their expected life. The total number of fixtures in the Multi-Purpose Centre can be found in table 3.

Fixture	Total Number
Sink	16
Urinal	6
Water Closet	14

Table 3- Plumbing Fixtures in Multipurpose Room

The other plumbing equipment in the Multi-Purpose Centre is located in two washrooms off the office area, the bar and two mechanical rooms. Each of the washrooms off the office area has one (1) sink and one toilet; the bar has two sinks. There is a 2" metered water line and a fire protection valve located in the sprinkler room on the north wall. A mechanical room located in the back hallway has a John Wood domestic hot water tank with a size of 40 US gallons. All the general fixtures in the multi-purpose room are in fair shape, the water main and meter are also in fair shape. However the hot water tank located in the janitors closet is in poor condition and options to replace it should be explored if

Overall the Multi-Purpose Centre is in fair condition however a lot of the mechanical equipment is reaching the end of its expected life. If the building were to remain, it is recommended that these fixtures be monitored closely for signs of deterioration. The equipment that should be watched the most is the faucets and sinks; the hot water tank should also be monitored regularly because of signs of deterioration. However given the intent to demolish the MPC the existing mechanical equipment would not be re-purposed.

6.6.4 Civic Centre

Introduction

The Civic Centre was originally built in 1995 with minor renovations to the washroom fixtures in 2010. It consists of one ice rink, 8 dressing rooms, a kitchen and the ice resurfacers area for both the Civic Centre as well as the Forum. The mechanical room is located on the east side of the ice resurfacers area. The Civic Centre does not have any air conditioning equipment.

The Civic Centre mechanical equipment is in relatively good condition with minor maintenance needed on specific items. One recommendation that could be made would be to tag all pieces of equipment as the majority are unlabelled. A lot of equipment tags were worn off and assumptions had to be made about age and size of the unit. Another recommendation would be to ensure all piping and ductwork are labelled properly with both service and direction of flow. More assumptions were made on what certain pieces of equipment were serving. One example of this is P1 which is located in the lower level mechanical room, the service of this pump is unknown without tracing the line. Overall the Civic Centre is in good to fair shape with a few pieces of equipment in poor condition.

Heating

The main heating source for the Civic Centre is a 4185 MPH York Shipley boiler located in a boiler room in the ice resurfacers area. The burner on the boiler is a Weishaupt burner from 2009. The assembly is in good condition having being converted to natural gas in 2009. The boiler is connected to four 3 HP Armstrong centrifugal pumps. The pumps are in fair condition with slight signs of wear. The entire boiler room is relatively new and still in good shape. Throughout the Civic Centre are six horizontal flow unit heaters. Three are located in the ice resurfacers room, one is in the upper floor mechanical room, one in the sprinkler room and the final one is located in the Dalhousie's women dressing room. The majority of these unit heaters are operated with hot water supplied from the York-Shipley boiler. Besides the horizontal flow heaters, there are six downflow unit heaters spread equally throughout the rink area. These heaters are only used during off season events and are operational when there is ice in the arena. The entrances, corridors and perimeter heating use hot water baseboard radiators that are overall in fair to good condition.

Ventilation

The supply air for the Civic Centre rink is supplied through (1) open round duct on the south end. These ducts are supplied by the dehumidifier that supplies air to the Forum. There is another open round duct on the south wall that is a return line to the dehumidifier. The air is then treated by a Cimco-Munters dehumidifier to control the humidity in the two large rink areas. There is an existing large supply duct located in the centre of the east wall which has been made redundant equipment. This ductwork was

used for the Civic Centre dehumidifier which has now been demolished with the wall penetration being sealed. The rest of the rooms are supplied with air by open ductwork. The dressing rooms are exhausted by a system of ductwork with fans near the respective washrooms. The rink area is exhausted through four Greenheck exhaust fans located on the north and west walls of the building. The unit heaters and supply ductwork are in fair shape while the exhaust fans are in good shape.

Plumbing

The Civic Centre consists of 6 dressing rooms and 2 washrooms. The total amounts of fixtures are listed below in Table 5.

Fixture	Total Number
Sink	24
Urinal	21
Water Closet	16
Shower Head	37

Table 5- Plumbing Fixtures in Civic Centre

The overall condition of the fixtures in the Civic Centre is good due to the renovation performed in 2010 where all the fixtures were replaced. The two areas that would have fair fixtures are the referee's room and the second floor canteen. These fixtures show some minor wear and tear. The washrooms are fed from a hot water tank located in the boiler room and a 2" metered water line located in the sprinkler room under the stands. The hot water tank is a Soudure F.M tank that was installed in 1995 with a volume of approximately 1000gal. There are two pumps operating with the tank also located in the boiler room. P18 is a service pump for the entire system while P19 is a recirculation pump for the tank itself. All the water service fixtures are in fair condition showing minor wear and tear.

6.6.5 Bingo Hall/Maritime Hall

Introduction

Constructed in 2003, Bingo Hall/Maritime hall is the newest addition to the Halifax Forum. The mechanical systems support 2,000 ft² of meeting room 6 washrooms, a canteen, mechanical and electrical rooms and storage. The main use for the maritime hall is bingo which has two of the main rooms dedicated to it. The majority of mechanical equipment is located in the mechanical room on the west wall of the addition. The Bingo Hall/Maritime Hall is still relatively new when compared to the rest of the complex. The mechanical equipment in the hall is the original from 2003 and overall still in good condition.

Heating

The major component of the Bingo Hall/Maritime Hall heating system is a natural gas York- Shipley Boiler with a Weishaupt burner. The boiler and burner have been in operation since the addition was built meaning that they are in good condition. The boiler is connected to a 119 USG Superstor Ultra domestic hot water tank. The boiler assembly and tank are serviced by eight (8) Grundfos pumps that supply and recirculate the water. The heated water is then used to heat radiators placed throughout the storage rooms and an in floor hydronic heating system.

The air conditioning for the Bingo Hall/ Maritime hall is provided by energy recovery units (ERV) located on the roof. These units are provided by Annex Air and have capacities of 7200 and 9600 cfm respectively. The canteen area located on the north wall of the Bingo Hall has a Samsung Heat pump. The heat pump is in fair condition while the two ERV's are in good shape.

Ventilation

Ventilation for the Bingo Hall/ Maritime Hall is provided by three (3) Trane Air Handling Units located on the roof. Two of the AHUs have flow rates of 6000 cfm while the largest one has an 11000 cfm flow rate. These AHUs supply fresh air to the Bingo Hall/ Maritime Hall through a series of ducts located throughout the area. The units have been in place since the addition opened in 2003 and therefore are in good condition. The area is exhausted by three exhaust fans located on the north and west roofs of the Bingo Hall/Maritime Hall. Two of these exhaust fans are Penn FX14B with a maximum rotational velocity of 1300 rpm and the third is a Carnes VRBK12 with a velocity of 1500 rpm. The two fans located next to the AHU's on the north side of the roof, 1 Penn and the Carnes, are in good shape while the second Penn fan is in fair shape.

Piping

Water is supplied to the Bingo Hall/ Maritime Hall by the domestic hot water tank in the mechanical room and the metered cold water inlet in the Civic Centre. The water lines serve three (3) washrooms and a canteen. The total fixture count is located in table 6.

Fixture	Total Number
Sink	15
Urinal	6
Water Closet	17

Table 6- Plumbing Fixtures in Bingo Hall/ Maritime Hall

The fixtures have been in place since the addition was constructed, although high usage has produced slight wear and tear on the washroom fixtures in the Bingo Hall. The two washrooms on the Maritime Hall side are still in good condition because they are used less.

Conclusions and Recommendations

The mechanical systems throughout the Complex vary significantly in condition from poor to good. Many of the items are suitable for continued service, specifically the majority of the equipment associated with the Bingo Hall. Despite much of the plumbing having been renewed in the Forum and Civic within the last ten years, redevelopment of the space will ultimately lead to the replacement of a vast majority of the plumbing and the fixtures.

The dehumidification is also anticipated to be replaced. The increased pad sizes and the addition of a third pad provides the opportunity to design a more efficient system one that is matched correctly to the size of the rinks. As a result, despite some remaining serviceable life in the HVAC system, much of it will be replaced to meet the requirement of the renovated Complex.

Mechanical Summary**Mechanical**

Item	Status	Comments
Forum Radiant Tube Heating	Good Condition	Suitable for continued service
Forum Hallway Ventilation	Fair to Good Condition	Anticipated that replacement will be required due to extensive changes
Forum Rooftop Dehumidification	Fair Condition	Replacement is anticipated
Forum Exhaust Ventilation	Fair to Good Condition	Replacement is anticipated to meet new design criteria
Forum Unit Heaters	Vary on Condition	Replacement is anticipated as sizing and relocation will be required for new configuration of rooms
Dressing Room HRV's	Good Condition	HRV's are suitable for continued service
Stands: Heating Fans	Currently decommissioned	To be removed
Forum AHU's	Good Condition	May be able to be re-purposed for the new space. Replacement is not anticipated.
Forum Plumbing Fixtures	Good Condition	They are anticipated to be replaced due to the extensive renovations required to the washrooms and change rooms to meet accessibility and Program requirements
Civic Horizontal FCU	Good Condition, Suitable for continued service	
Civic Downflow Heaters	Fair Condition	Suitable for continued service.
Civic Exhaust	Fair to Good Condition	Anticipated to be replaced with updated equipment to meet new design criteria
Civic Central Boiler	Good Condition	Suitable for continued service
Civic Plumbing Fixtures	Good Condition (Washrooms)	Suitable for continued service
Civic Plumbing Fixtures Dressing Rooms	Fair to Good Condition	Replacement is anticipated due to Dressing room changes.
Domestic Hot Water Tank	Good Condition	Suitable for continued service
MPC HVAC Equipment	Fair to Poor Condition	Not suitable for repurposing.
MPC Plumbing Fixtures	Nearing the end of their useful life	Not suitable for repurposing.
Bingo Hall Boiler	Good Condition	Suitable for continued service
Bingo Hall Domestic Water Heater	Good Condition	Suitable for continued service
Bingo Hall ERV	Fair to Good Condition	Suitable for continued service

6.6.6 Vertical Conveyance

Introduction

There is no mechanical vertical conveyance in the current Halifax Forum Complex.

Conclusions and Recommendations

Currently there is no elevator however due to the accessibility requirement we have allowed for an elevator to be installed.

6.7 Electrical System

6.7.1 Site Electrical Distribution

The Halifax Forum Complex, which includes the Civic Centre, Multi-Purpose Centre, Maritime Hall and Forum, is fed by a 750KVA pad mount transformer. The transformer was in good condition visually. From the transformer, two services enter the complex, each with its own meter. A 600V, 1200A fed to the main complex electrical room used for general electrical distribution throughout the complex and a 600V, 600A feed to the upper mechanical room to provide power for this room's requirements.

The electrical services and main complex electrical room was constructed in 1995 and equipment is generally in good to fair condition. The main service switchboard was in good condition, although nearing end of life expectancy. Switchboards and branch circuit panels were observed in the electrical room to be in good condition. Several of these panels are of a type and brand which has been discontinued, and parts are difficult to acquire.

There are 2 transformers within the main complex electrical room, one which is no longer in use. Both are in good condition and are original to the room's construction. Disconnects and starters are in good condition, most are original to the rooms construction, and several are no longer in operation due to the equipment they are feeding no longer exists.

The upper mechanical room is fed directly from the pad mount transformer and into a service entry switch, which then feeds a splitter and distributing to the loads. Electrical equipment varies in age and condition from good to poor and has been updated as needed for expansion of the complex's mechanical systems. This room also has equipment which has been discontinued and finding replacement parts is difficult. Some corrosion is evident on multiple switches and splitters throughout the area. Transformers within the room are in good condition and are smaller wall mounted units.

6.7.2 Halifax Forum

Introduction

The Forum has undergone multiple renovations with the most recent being in 2010. The Forum is in relatively in good shape with minor maintenance needed on certain items. There is a substantial amount of redundant electrical wiring and equipment, especially in the crawl spaces above the dressing rooms, which if removed help with future electrical maintenance and trouble shooting.

Branch Circuit Panels and Transformers

Branch circuit panels are fed from the main complex electrical room, also branch circuit panels and switchboards in the main complex electrical room feed multiple loads in the Forum. Condition and age of these panels vary from good to poor. Electrical equipment is not labelled properly in most instances and panel schedules are unreliable or non-existent. Several panels are well past their expected end of life and should be replaced, while others are a type and brand which are discontinued and parts are unavailable. Panels in public access area do not have locks to prevent tampering. Also wiring and conduit supports throughout the Forum are not adequate as per code.

The 2 Transformers within the Forum are in fair condition and showing their age, there are no tags on the transformers.

Disconnects and Starters

Disconnects and starters throughout the Forum are in good to poor condition and vary in age. There are numerous redundant starters and disconnects related to the steam heating system which no longer is in operation. Also within the crawl spaces above the dressing rooms, untagged disconnects and starters are common. None of these redundant systems are visibly disconnected or identified as not in use. Disconnects in public access areas do not have locks to prevent tampering.

General Lighting

Lighting within the Forum consists of fluorescent type fixtures throughout the corridors, dressing rooms, offices and dressing rooms; these are in good condition in most areas, being recently updated within the past 5 years. Lighting in the rink area upper portion of the seating, is in poor condition and is at end of life expectancy. There are appropriate fixtures within damp and wet locations. Fixtures are energy efficient to today's standards and have appropriate lighting levels. Overhead rink lighting consists of both fluorescent and high press sodium type and are in good condition.

6.7.3 Multi-Purpose Centre

Introduction

The Multi-Purpose Centre (MPC) was constructed in 1988 as an expansion of the Forum. The MPC has an electrical room, which contains a 120/208V, 400A main switch being fed from switchboard DP1 in the main complex electrical room. The switch feeds a splitter to distribute power to the 4 branch circuit panels throughout the MPC. The MPC is in relatively in good shape with minor maintenance needed on certain items. There is a substantial amount of redundant electrical wiring and equipment which if removed help with future electrical maintenance and trouble shooting.

Branch Circuit Panels and Transformers

The branch circuit panels are in fair condition. Panel schedules are not up to date or non-existent, although the panels were tagged. There were no transformers in the MPC.

Disconnects and Starters

Disconnects throughout the MPC are in fair condition, and most are original to building construction. Disconnects were primarily for branch circuit panels not located within the MPC electrical room. There are several redundant disconnects and starters, which once fed mechanical equipment which no longer exists.

General Lighting

Lighting within the MPC consists of fluorescent type fixtures and are in good condition in most areas, being recently updated within the past 5 years. Fixtures are energy efficient to today's standards and have appropriate lighting levels. Flood lights are located in the main floor area for task lighting and are in good condition, although flood lights are not energy efficient due to them having metal halide lamps. Fixtures in the entry way area are in poor condition, having faded lenses and bent frames.

6.7.4 Civic Centre

Introduction

The Civic Centre was originally built in 1995. Electrical renovations have occurred during this time. It consists of one ice rink, 8 dressing rooms, a kitchen and the Ice Re-Surfacers area for both the Civic Centre as well as the Forum. The main electrical room is located on the north side of the rink area. Overall the Civic Centre is in good condition with a few pieces of equipment in fair condition, primarily in the main complex electrical room.

The Civic Centre is in relatively in good shape with minor maintenance needed on certain items. There is a substantial amount of redundant electrical wiring and equipment which if removed help with future electrical maintenance and trouble shooting.

Branch Circuit Panels and Transformers

The electrical distribution is fed from the main complex electrical room, also most of the electrical panels and switches are found here. Only 2 panels are located exterior of the electrical room, both in fair condition. Electrical equipment is labeled in most areas, although panel schedules are not up to date. There are no transformers in the Civic Centre outside of the main complex electrical room.

Disconnects and Starters

Disconnects and starters throughout the Civic Centre are in good to fair condition. These vary in age, although all are a maximum of the buildings age. Most are located within the main complex electrical room and boiler room.

General Lighting

Lighting within the Civic Centre consists of fluorescent type fixtures and are in good condition in most areas, being recently updated within the past 5 years. There are appropriate fixtures within damp and wet locations. Fixtures are energy efficient to today's standards and have appropriate lighting levels. Overhead rink lighting is also fluorescent type and is in good condition.

6.7.5 Bingo Hall/Maritime Hall

Introduction

The Bingo Hall/Maritime Centre was originally built in 2003. Due to the recent construction, electrical systems are in good condition. It consists of a multipurpose room and adjoining bingo hall, adjoining support rooms. The Maritime Hall has an electrical room with a 600V, 600A distribution panel, fed from the main complex electrical room and feeding the bingo hall and maritime hall's 6 branch circuit panels, 1 transformer and 2 motor control centres.

Due to the age of construction, the Bingo Hall and Maritime Hall is in good condition.

Branch Circuit Panels, Transformers and Motor Control Centres

Branch circuit panels are in good condition and the panel schedules are in order. The single transformer in the electrical room is in good condition. Motor control centres are also in good condition and are tagged, with labels for each switch.

Disconnects and Starters

Disconnects and starters are in good condition.

General Lighting

Lighting in both the Bingo Hall and Maritime Hall consists of fluorescent type fixtures and are in good condition. There is task lighting in some spots and these fixtures are also in good condition. Fixtures are energy efficient to today's standards and have appropriate lighting levels.

Conclusions and Recommendations

In general the electrical at the Forum Complex varies in condition generally in relation to its age. The lighting has been recently upgraded and is of current design and type and is suitable for continued service. The primary, secondary panels, starters and disconnects vary significantly in condition. Due to the age of many of the components serviceability is questionable and in some cases the panels do not meet code for their current location.

With the scope of the proposed renovations, it is likely that much of the electrical distribution and panels will be replaced in the Forum and to a lesser extent in the Civic. Since the MPC is slated to be demolished the potential of reusing the lighting, is unlikely to become reality. The Bingo Hall is generally in good condition and the majority of it's electrical component are expected to remain in service

Summary and Recommendations

Electrical

Item	Status	Comments
Primary Switchgear	Fair Condition but nearing end of life	Replace with primary switchgear
Secondary Panels	Fair to Good Condition, varies with age, Some panels are hard to obtain replacement parts.	Replace the secondary panels to align with the new complex and the requirements
Step down transformers	Good Condition	Suitable for continued service if required with the new Complex
Main Disconnects	Fair to Good Condition	Suitable for re-purposing as needed or continued service
Forum Circuit Panels	Fair to Poor Condition	Panels are anticipated to require replacement due to the extensive nature of the renovations
Forum Transformers	At end of life	To be replaced with new as needed by the new design
Forum Disconnects	Fair to Poor Condition	Anticipated to be replaced with new as needed
Forum Lighting	Good Condition	Suitable for continued service
MPC Lighting	Good Condition	Suitable for repurposing but with no material salvage value
MPC Distribution, Panels, and Disconnects	Fair to Poor Condition	Building is to be demolished
Civic Main Electrical	Good Condition	Suitable for continued service
Civic Disconnects & Starters	Fair to Good Condition	Suitable for continued service
Civic Lighting	Good Condition	Suitable for continued service
Bingo Hall Primary Electrical	Good Condition	Suitable for continued service
Bingo Hall Circuit Panels & MCC	Good Condition	Suitable for continued service
Bingo Hall Lighting	Good Condition	Suitable for continued service

6.8 Life Safety

6.8.1 Halifax Forum

Introduction

The Halifax Forum is provided with partial sprinkler coverage supplied by the lines from the Civic Centre corridors. The upper lounge area, ice surface and stands do not have sprinkler coverage. The main complex fire alarm panel is in the Halifax Forum. Emergency and exit lighting is provided by battery powered units and remote heads.

Observations /Comments

There are notable fire code violations associated to the fire protection system currently in place at the Halifax Forum which includes the lack of sprinklers in both the rink area and the wolverine lounge. All other areas were noted to have sprinklers present.

The Forum is currently working under a restricted occupancy with special provisions in places for specific levels of patron loading.

The Forum challenges include a multitude of design elements which do not meet the code. Specifically it has a combustible roof, lack of sprinklering, insufficient number of exit points, pinched exit points, sloped surfaces which exceed allowed grades, and patron seating plans which exceed the seating density per row and have insufficient clearance.

The Forum has the main fire alarm panel for the multi complex, annunciator panels for the Civic Centre, Multi-Purpose Centre and Maritime Hall. The system is a zoned non addressable system and in good condition and is tested annually. Pull stations are in good condition and are located in required locations. Annunciator devices are bells.

Emergency and exit lighting is overall in good condition, some units are showing their age. There is a sufficient amount of emergency lighting.

Conclusion and Recommendations

With the major Forum renovation dictated by the existing condition and the project charter complete sprinkler coverage is considered mandatory. Additionally, the extensive renovations, it is assumed that a significant amount of the existing sprinkler and Fire alarm systems will need to be replaced. The anticipated changes to the building and due to the noted age indicate that replacement of the current emergency and exit lighting should also be anticipated. Costs on a per square foot basis for replacement of all of the systems have been included. Note that due to the height of the roof off ground a premium is anticipated associated to sprinkler coverage of the Forum Ice surface and stand areas.

6.8.2 Multi-Purpose Centre

Introduction

All the rooms in the Multi-Purpose Centre have sprinklers as per code requirements. There is also a 4" Viking fire protection alarm valve that controls the sprinklers in the space. The MPC has a remote annunciator panel at the main entry which is tied into the main fire alarm panel at the Forum's main entry. Annunciator devices are bells. Emergency and exit lighting is obtained via battery packs and remote heads.

Observations /Comments

The sprinkler system appears to be in overall in fair condition. The alarm system is a zoned system and in good condition, devices are original to building construction. Pull stations are in good condition and are located in required locations. Although there is a sufficient amount of emergency lighting, the devices appear to be original to building construction and are showing signs of aging.

Conclusion and Recommendations

In the renovation solution it is proposed that the MPC is demolished and all costs are associated to demolition and new construction.

6.8.3 Civic Centre

Introduction

Located under the seats in the Civic Centre is the main fire protection water entrance. This entrance includes three Viking fire protection valves. Two of the valves serve a 6" line while the third serves a 4" line. Another 4" Viking fire protection valve is located in the lower mechanical room which serves the Forum East Hall/Dressing room/Office. The fire alarm panel in the Civic Centre is a remote annunciator panel at the main entry which is tied into the main fire alarm panel at the Forums main entry. The system is a zoned system, devices are original to building construction. Annunciator devices are bells. Emergency and exit lighting is obtained via battery packs and remote heads

Observations /Comments

The sprinkler system is in good condition with no signs of deterioration however there were anomalies in coverage noted. There are four noted rooms that do not have any fire protection. Those rooms are the boiler room, lower mechanical room, server room and staff lunchroom. As per NFPA 13 which states "Sprinklers shall be installed in all areas except where omissions is permitted by 6.6.2 through 6.6.7" (13, 2010). None of the rooms listed above are permitted omissions, which includes balconies and storage rooms less than 2.02 meters squared in area. The fire alarm in the Civic Centre is in good condition, devices are original to building construction. Pull stations are in good condition and are located in required locations. Emergency lighting is over all in good condition. There is a sufficient amount of emergency lighting.

Conclusion and Recommendations

As dictated by the project charter complete sprinkler coverage is considered mandatory and repairs will be required to ensure all areas are covered. In addition, the major renovation proposes to remove of two walls of the Civic Center and requires significant renovations, it is assumed that approximately 25% of the existing sprinkler and Fire alarm systems will need to be replaced. The anticipated changes to the building and due to the noted age indicate that replacement of the current emergency and exit lighting should also be anticipated. Costs on a per square foot basis for replacement of all of the systems have been included.

6.8.4 Bingo Hall/ Maritime Hall

Introduction

The building is protected by a sprinkler system which is served by the fire protection valve located in the lower mechanical room. The Bingo Hall and Maritime Hall have a remote annunciator panel at the entry to the Bingo Hall which is tied into the main fire alarm panel at the Forums main entry. The system is a zoned system and the annunciator devices are bells. Emergency and exit lighting is obtained via battery packs and remote heads.

Observations/Comments

Two rooms in the Bingo Hall/ Maritime Hall were noted to not have sprinklers; they are the boiler room and the storage room. The other sprinklers are in good condition without obvious signs of deterioration. The Bingo Hall and Maritime Hall have a remote annunciator panel and system is in good condition. Pull stations are in good condition and are located in required locations. The emergency and exit lighting is in good condition. There is a sufficient amount of emergency lighting.

Conclusion and Recommendations

The interior of the Bingo Hall is largely untouched by the Forum Project Charter and as there was a recent major renovation issues and recapitalization of life safety systems associated to the building are anticipated to be limited. The noted code deficiencies if not already addressed would be assumed to be addressed in the renovation.

Summary and Recommendations

Life Safety

Item	Status	Comments
Sprinkler	Does not meet current code	Addition of sprinkler coverage
Forum Roof Deck	Does not meet code	Replace combustible materials or find an approved alternate solution.
Forum Egress	Does not meet code requirements	Significant renovations to include the addition of exits, seating spacing and removal of ramps
Forum Seats	Insufficient clearance between seats	New Seats to be installed.
Forum Sloped Concourse and Slope to exit	Does not meet current code	Lower concourse to be partially demolished and new points of egress established
Forum Annunciator Panel	Good Condition	Anticipated to be replaced to meet the additional requirements of the third pad.
Civic Sprinkler	Good Condition	Additional piping to cover the addition for the enlarged pad
Civic Sprinkler	Four rooms do not meet code	Addition of sprinkler cover for the four rooms
Bingo Hall Sprinkler	Good Condition, with the exception of two rooms	Add sprinkler coverage to the boiler and storage rooms

6.9 Specialty Systems

6.9.1 Chiller Plant

Introduction

The system supporting the cooling capacity of the two existing ice pads is a plant located in the back of the ice resurfacer room of the Civic Centre. The below image is a panoramic view of this room.



The condensers are installed on an elevated concrete platform shown below.



Observations /Comments

The chillers are from 1999 and 2004 respectively and are served by two Tamper pumps and one Armstrong pump acting as a backup. The chillers are in fair shape for their age as a result of ongoing maintenance. The two Tamper pumps are in poor shape as they are from 1995 and are in full time operation. However the Armstrong pump, which is also from 1995, is in good condition due to the minimized use as a backup. Three evaporative condensers serve the plant. The three condensers were installed separately in 1988, 2000 and 2007. They are all in fair to poor condition due to the combination of their age and exposure to the harsh maritime climate. Along with the three condensers there are four Cimco compressors. These compressors are reciprocating compressors that have

been installed in 1988 and 1995. Two of the old compressors are 75 hp while the third older compressor and the newer are both 100 hp. The three older compressors are in fair condition and were expected to be replaced but the addition of the fourth compressor has alleviated the need to replace two of the old compressors. The fourth compressor is in good shape.

A brine tank and three circulation pumps are used to cool the ice surface. The entire system was installed in 2000 and is in relatively good condition when compared to the entire chiller plant.

Another major component of the chiller plant is the ThermaStor heat recovery system. This system uses an Ammonia/ Water de-superheaters to preheat the boiler water. The four tanks, which are each 114 USG, and respective system is in good condition.

Conclusion and Recommendations

Overall the chiller plant is in fair to poor condition. Many of the components have well exceeded their expected useful life. The Building operators have reported that the iceplant is currently having difficulty keeping up with the requirement for cooling. The inconsistent quality of the ice has become a difficulty which is negatively affecting the functionality of the Building. The current condition as provided by the plant operators indicates that component repairs or replacements are needed to provide consistent ice quality.

However, the proposed renovation expands the ice surface from the existing approximately 31,000 sf by an additional 20,000 sf of ice surface. With the ice surface expansion approximately 40% additional capacity is anticipated to be required. The current plant is a traditional chiller plant comprised of components pieces which, at the time of writing, range in age from 29 to 10 years. Due to the current condition and the scope of the increases in cooling capacity required, selective augmentation and replacement are not considered viable over the long run. Complete replacement of the system has been included in the cost estimate.

A limited amount of heat reclaim is being utilized to provide preheated boiler water however there are opportunities for improving efficiency in ice hockey arenas that could be employed in a redesign. Several energy-efficiency measures could be implemented on refrigeration equipment. Heating of the subfloor could be provided by the heat rejection from the condenser. The refrigeration gas superheat available at the outlet of the compressor can be utilized for the heating of domestic hot water. The refrigeration equipment of an arena can also act as a heat pump. All heat removed from the ice could be used for heating spaces and the outside air for ventilation purposes. Through detailed design, opportunities for improved efficiency can be assessed and employed as deemed most beneficial. To enable this process which has long term benefit to reduced energy usage by the municipality; redesign and the replacement of the ice plant is the most viable solution.

6.10 Accessibility

Introduction

The September 2016 Halifax Forum Assessment identified that the minimum requirements for barrier free access outlined in the 2015 National Building Code of Canada (NBCC) are not met. Halifax Regional Municipality has subsequently directed that the minimum standard of compliance for new buildings should consider the most stringent criteria of the code or the CSA B65-12 Accessible Design for the Building Environment. According to the Project Charter, the future renovation to the Halifax Forum Complex of buildings will need to incorporate this standard.

6.10.1 Halifax Forum

Observations /Comments

On the exterior of the complex there are more parking spaces identified as barrier free spots than are required.

The September 2016 Halifax Forum assessment identified that the original Forum Building does not meet the requirements for barrier free access to viewing spaces in assembly areas. The majority of the seating is reached by stairs. Section 6.7.3.2.(c) of the CSA B65-12 requires that seating is dispersed throughout the seating area on all levels. The only way for a person to view the ice sheet is by moving from the main concourse level to the ice level. There is a small area at ice level which can accommodate seating however, the slope of the ramps, which are the only way to access the area of the ice surface, exceed the maximum 1:12 slope for a barrier free path of travel. The area also does not align with the other requirements of section 6.7.3 specifically that the area be an integral part of the seating plan, and be located adjacent to other seating and adjoin accessible circulation routes adjacent to means of egress.

The lack of access to the ice level also prevents barrier free use of the ice sheet.

A supplemental detailed review of the Forum compared to the CSA standard was not undertaken for this report as the major renovations required to the cladding, seating, interior washrooms, and administrative areas will enable remedy of any issues which currently exist, preventing complete barrier free access.

Conclusions and Recommendations

Providing barrier free access to assembly in accordance with the CSA standard, requires that major renovations to the seating area are undertaken, however this is also required by other sections of the NBCC see the Code Compliance Section. This is also the case with respect to the current floor levels and ramps along the concourse. Based on the requirements to re-clad the building, and to renovate the existing administrative and support spaces, to improve the existing facilities and to improve interior movement throughout the complex, remediation of the existing barrier free non-compliances can be accommodated by the renovation costing.

6.10.2 Multi-purpose Center

Since the proposed renovations and additions to the Halifax Forum Complex propose the demolition of the MPC to make room for an additional ice surface and community

support space, any existing accessibility non-compliances will not be an issue. A detailed assessment of accessibility compliance was not undertaken. No costs associated to remediation of accessibility issues have been integrated into the cost estimate.

6.10.3 Civic Center

Observations /Comments

Access at grade to the Civic Center is provided off of the north parking area. Currently there is sufficient area to accommodate barrier free parking stalls. The renovation solution requires that the North parking area is renovated and barrier free access to the building can be accommodated in the solution without additional cost.

Access to the second floor of the Civic Center is provided from the exterior of the building off Windsor Street. To reach this entrance a client must park at either the north or south parking area and travel over 200 feet to the entrance. There is also convoluted interior path which leads from the south end of the lower level to the second level through the Forum. However this route is not well marked and it is not clear if the doors would meet the requirements of a path of travel or if the ramp slopes exceed the maximum 1:12. With the addition of a third pad and support spaces, access to the second level of the Civic Center is anticipated to be provided by an interior elevator.

The seating area of the Civic Center currently does not comply with CSA standard. There is a walkway above the seating area which can accommodate barrier free seating however it is not an integral part of the seating plan. Minimal alterations to the upper level would enable the area to meet the intention of this requirement.

A supplemental detailed review of the Civic Center compared to the CSA standard was not undertaken for this report as the major renovations required to the interior washrooms and change rooms in addition to the major renovation to add an ice sheet complete with elevator will enable remedy of any issues which currently exist, preventing complete barrier free access.

Conclusions and Recommendations

The proposed renovations and additions to the Complex propose demolition of the existing north elevation of the Civic Center, changing the Windsor street access, and undertaking interior renovations of the Civic Center and the Halifax Forum. This will improve the existing facilities and improve interior movement throughout the complex, remediation of the existing barrier free non compliances has been integrated into the renovation costing and should be able to be accommodated.

6.10.4 Bingo Hall/ Maritime Center

Observations /Comments

On the exterior of the Bingo Hall there are more parking spaces identified as barrier free than are required.

The Interior facilities were renovated under the supervision Fowler Bauld and Mitchell LTD. with drawings produced in 2002. At that time it is assumed that the renovation met the Code requirements of the day. The CSA B651-12 standard is assumed to not have been required at that time.

Access to the Bingo Hall is provided at grade and includes power door operators. Access to the Maritime Hall is not barrier free. The entrance hardware requires that a thumb latch be depressed. This does not meet the CSA B651-12 Section 5.2.7 Door Hardware requirements. Minor adjustments to the doors and hardware are anticipated to be required.

The washrooms dedicated to the Maritime Hall do not appear to meet the requirements outlined by the CSA B651-12 standard. Renovation of the washrooms is anticipated to be required.

Conclusions and Recommendations

The noted issues related to the Bingo Hall and Maritime Hall will require smaller scale repair work to meet accessibility standards. The potential renovation of the remaining complex and the addition of a new ice pad will address the accessibility requirements of the current CSA standard. An allowance to remediate the identified issues has been included. Items anticipated to be included are hardware replacement, signage replacement, renovations to washrooms, and millwork and to building systems control devices. This has been included on a cost per square foot basis.

6.11 Code Compliance

As part of CMEL's September 2016 Halifax Forum Assessment Study, a limited high level code compliance analysis was completed. This study examined the facility with respect to the 2015 National Building Code of Canada (NBCC). The code compliance was based on a walkthrough of the building and was limited to obvious and readily determinable code compliance with respect to barrier free accessibility, and life safety issues. With exception to the structural review for the adherence to the current roof design, detailed calculations, review and destructive testing were beyond the scope.

It appears that the building additions to the Halifax Forum's original structure have been considered separate buildings based on the fact that although significant renovation and additions have occurred, the Halifax Forum has not been required to be updated. As such CMEL has evaluated the areas individually.

As part of this current analysis, we have been asked to evaluate, in more detail, the implications of retaining and renovating the Forum to meet all existing codes including the National Building Code of Canada (NBCC), the National Energy Code of Canada (NECB) and relevant sections of the National Fire Protection Association (NFPA) requirements which are generally referred to in the NBCC. This will focus on life safety and energy conservation issues. Accessibility issues will be reviewed in a separate section of this report.

Evaluation against the current codes will provide benefit to the analysis of the Forum Complex because the status of a building with respect to current code compliance can change when large renovation projects are undertaken although the point when this will be required is not precise. The requirement to bring a building up to the current code is often discussed with the authority having jurisdiction and can be discussed along with the issuance of a building permit. The risk to a large scale renovation project is that if the building is required to be upgraded to meet current code, the costs associated with the modifications can be considerable and can eliminate renovation as a viable option.

Due to this risk as well as life safety concerns, it has been agreed with HRM staff that "grandfathering" will no longer be acceptable to avoid meeting current code requirements, due to the extent of proposed renovations and additions to the Forum Complex.

6.11.1 Halifax Forum

Introduction

The Halifax Forum dates back to 1927 with the stands generally in their original configuration however two elevations have been covered or partially covered with additional structures. CMEL is concerned that the multiple additions to the Forum have collectively affected the functionality of the original design of the Forum. Specifically it is unclear if the original design had greater capacity for the building occupants to exit than currently exists. Analysis of available background documentation and images of the Forum could not definitively discount or confirm this possibility, however, it is clear that the original building was free standing and had exits on all four elevations. These exiting exits have now become defined as access to exits and travel distances have in all likelihood been exceeded. CMEL has been provided with a limiting occupancy requirement by the Halifax Regional Fire and Emergency limiting the total maximum

occupancy of the Forum at 4600 persons dated January 2017. A detailed analysis of the final addition and renovation design will be required to ensure that maximum travel distance and exit width requirements are achieved. However, this is not seen as an insurmountable problem. Often, fire walls are constructed in large footprint facilities such as schools, hospitals and shopping centres, to technically reduce travel distance.

Observations/Comments

Multiple non compliances were identified. Access to the stands is via nine ramps which lead from the lower concourse down to the rink level and then up via stairs to the stands and to the upper concourse. The slope of all but one of the ramps exceeds the maximum allowable slope for ramp in an assembly occupancy building. Further to this all ramps exceed the maximum slope allowable for barrier free access.

The rise to run of the original stepped bench seating was (and is) 1"-3" rise to 2'-6" run. With the original bench type seating, the required minimum distance between seat rows would meet current clear width dimension of 400mm (approx. 16"). However, when fixed seating with backs and folding seats were added, the required width was reduced to 14" (with the seat folded up). The yellow seats however, provide 17" clear when folded.

There are many areas close to the ice surface where the clear width is so small that it is not even possible to sit in the seats without lifting ones knees or sliding them sideways.



Current codes require that travel distance from any seat cannot require passing more than 7 seats to reach an aisle. This means that the maximum number of seats between aisles is 15. Currently in the Forum the standard number of seats between aisles is 22. There are also large sections where the number of seats between aisles is 30.

The maximum travel distance has been exceeded from much of the high seating in the seating sections. The minimum required exit width based on the building type, and by occupant load on both the east and west sides of the stands through the ramps has not been met. On the east side, the closest distance to an exit and the exit that allows compliance to the maximum travel distance is through a single double door which is significantly below the required width of exit however this can be partially alleviated by reducing the maximum occupant load.

Only the spaces below the stands are sprinklered. The code requirement is that the entire building be sprinklered'

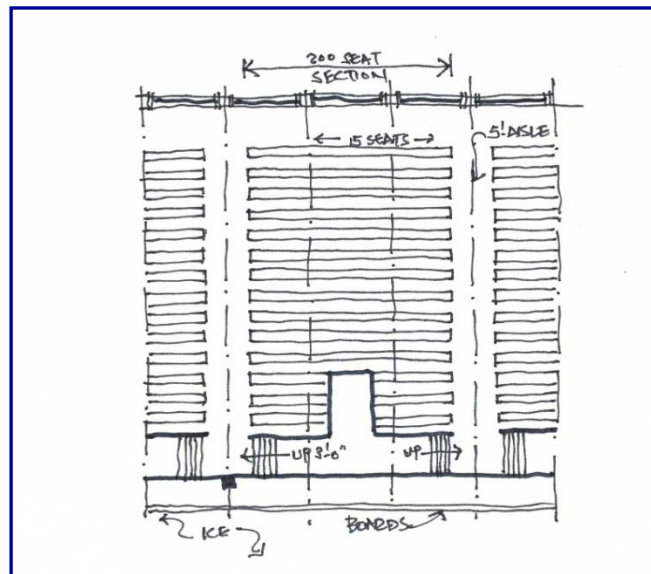
Assembly Occupancies of this scale are required to be of non-combustible construction. The Forum roof is 1 1/4" wood deck supported on 2" x 3" wood battens.

Additionally, many minor and easily rectified code requirements have been identified, such as the quantity of water closets and handrail and guardrail heights and locations.

Conclusions and Recommendations

The rise to run dimensions of the existing stands will enable code compliance if new seats are installed which maintain the required 400mm (16") unobstructed passageway between seat back and folded seat (per NBCC 3.3.2.4-1(a)) However, the maximum number of seats between aisles is not compliant with NBCC 3.3.2.4-3. The lower 15 feet of the stands could be demolished and replaced in such a manner as to allow new passageways from the lower concourse to be created. These passageways will need to be 30' centre to centre to allow for a maximum of 15 seats between aisles and a clear aisle width of at least 1100mm (3'-7"). Coincidentally, the structural columns supporting the stands are 10' centre to centre which facilitate the proposed new passageways and aisles. There would be a total of 17 passageways in lieu of the current 9. These new passageways should be level, eliminating non-compliant ramps and provide stair access to aisles above and level approximately 3 feet below.

Halifax Regional Fire Department has provided a limited occupancy requirement established in January 2017 of 4600 including all staff and patrons. The sketch below illustrates a typical 200 seat section taking into account the allowable density of seating. This approach will result in approximately 3,730 code compliant seats – a reduction of 880 seats, or 19% of the existing seating. However, as outlined above, many of the existing seats are uncomfortably close to guard rails and many are not code compliant.



6.11.2 Multi-Purpose Center

Observations/Comments

The assessment of the compliance of the Multi-Purpose room indicates that based on worse case occupancy loading (non-fixed seating, assembly occupancy), the building does not meet the required exit capacity or the minimum health requirement for the quantity of water closets. However the building appears to meet egress and health requirements of the current code if a reduced maximum occupancy is used.

Conclusions and Recommendations

Since the proposed renovations and additions to the Halifax Forum Complex propose the demolition of the MPC to make room for an additional ice surface and community support space, code compliance will not be an issue.

6.11.3 Civic Centre

Observations/Comments

The assessment of code compliance of the Civic Centre indicates that based on worse case occupancy loading utilizing the numbers obtained from the Forum Marketing Material, if both the ice area and the seating area were fully occupied, the building does not meet the required exit capacity or the minimum health requirement for the quantity of water closets (female access). There are areas within the storage space on the west side of the building which do not appear to comply with the maximum exit distance. However the building appears to meet egress width requirements and health requirements of the current code if a reduced maximum occupancy is used.

Conclusions and Recommendations

Code compliance should be easily achieved with the proposed renovations and additions to the Civic Centre.

6.11.4 Bingo Hall and Maritime Hall

Observations/Comments

The Bingo Hall and Maritime Halls were renovated in 2002. The assessment of the compliance of the bingo hall indicates that based on worse case occupancy loading, the building does not meet the minimum health requirement for the quantity of water closets or required exit widths. However the building appears to meet the barrier free, egress and health requirements of the current code if a reduced maximum occupancy is used.

Conclusions and Recommendations

Code compliance should be easily achieved with the proposed renovations and additions to the Bingo and Maritime Halls.

6.11.5 Structural Compliance Overview

Observations/Comments

In keeping with the detailed assessment identified in the Structural Section, generally, the four buildings do not meet the current design snow loads in the NBCC 2010. Detailed commentary is located in the structural section of CMEL's September 2016 Halifax Forum Assessment.

Additional destructive testing completed as part of this current Study has indicated that 8" x 8" steel wide flange columns between the roof and upper concourse are badly corroded. In at least one location the web is corroded right through and the actual column is twisting. We understand that HRM has contracted a structural consultant to provide a temporary reinforcing detail as an interim measure to ensure that the building is suitable for ongoing use

Conclusions and Recommendations

As discussed under the Building Envelope section, exterior walls although tot load bearing, are badly deteriorated, bowed and coming loose from the structure and cannot be repaired. Exterior walls will need to be replaced.

It is possible to reinforce the buildings to meet the current code. The reinforcing would involve major structural work. Until the buildings have been reinforced, we recommend that the owner prepare with the structural consultant a monitoring and loading mitigation program.

6.11.6 Mechanical Compliance Overview

A number of code violations have been identified throughout the Halifax Forum with the majority of them occurring in the Forum and Civic Centre buildings.

Code violations associated to the buildings ventilation systems include two important code violations concerning exhaust air. The first violation is located in the dressing rooms of the Civic Centre. The rooms are supplied with fresh air through a series of ducts however there are no grilles on the ducts. As stated in the National Building Code of Canada "Supply, return and exhaust air openings located less than 2 m above the floor in rooms or spaces in buildings shall be protected by grilles having openings of a size that will not allow the passage of a 15 mm diameter sphere" (Canada, 2015). The next violation with the exhaust air is in the storage areas below the stadiums; there is no exhaust system in place. This poses a problem because certain storage areas may contain hazardous materials. An additional violation that was observed was primarily noticed in the Forum. Supply air is not provided to all the occupied spaces.

Plumbing violations observed include the presence of decommissioned equipment that has not been removed which is a more prominent concern in plumbing systems. Any plumbing piping with "dead end" piping creates areas of stagnant water which can allow the growth of legionella.

Sprinkler system violations as mentioned within the Life Safety Section of the CMEL September 2016 Report, include a number of rooms including the Main Forum Arena space that do not have sprinklers. This violates NFPA 13.

All these deficiencies can be corrected during the renovation and additions to the Forum Complex. The estimated costs have been included in the renovation cost estimate.

6.11.7 Electrical Compliance Overview

Two areas of concern were observed with respect to compliance. The main complex electrical room is being used for storage and required clearances for electrical

equipment as per code are not in compliance. The Forum rooftop dehumidifier does not have a local disconnect, which is required by code.

Most of the electrical deficiencies can be corrected during the renovation and additions to the Forum Complex. The estimated costs have been included in the renovation cost estimate.

7 Estimate

As discussed above, the works is broken down into three categories, Demolition, Renovation and New Construction. A budget estimate is detailed below:

7.1.1 Demolition

Description	Cost Estimate
Demolition of MPR, Maintenance Area, & Civic Center North Elevation	\$877,406
Demolition of Halifax Forum Seating allowance	\$1,344,000
Demolition of rink areas in the Forum and Civic Center	\$840,300
Contingency on demolition 30%	\$918,512
Demolition Costs	\$3,980,218

7.1.1 Renovation

Description	Cost
Structural costs associated to the complex	
Forum Roof Reinforcing	\$3,400,000
Forum Column Reinforcing	\$500,000
Forum Concrete Repairs	\$20,000
Civic Centre Roof Reinforcing	\$1,228,000
Bingo Hall Roof Reinforcing	\$1,995,500
Three sets of dasher boards	\$750,000
New ice plant for three rinks	\$2,250,000
New ice slabs for three rinks	\$1,350,000
Low e ceilings two rinks	\$50,000
Renovation of Halifax Forum seating area	\$7,298,029
Interior renovations of the Halifax Forum & Civic Center	\$5,836,162
Forum Exterior Envelope	\$3,505,805
Capital years 2-5 undertaken during renovation	\$472,437
Exterior upgrading and replacement	\$1,779,700
Maritime Hall and Bingo Area exterior and interior renovations	\$133,750
Contingency on renovation	\$9,170,815
Renovation Costs	\$39,740,198

7.1.2 New Construction

Description	Cost
Site servicing allowance	\$290,155
Site asphalt and concrete improvements	\$872,387
Site landscaping, lighting & bicycle parking	\$167,780
New construction costs	
Substructure	\$886,014
Superstructure	\$2,601,966
Exterior enclosure	\$919,660
Roofing	\$448,615
Interiors	\$728,999
Conveying	\$153,900
Plumbing	\$919,660
HVAC	\$1,267,337
Fire Protection	\$429,274
Electrical	\$1,009,383
Special construction	\$87,118
<i>Hard cost subtotal</i>	<i>\$9,451,927</i>
<i>soft costs</i>	<i>\$3,119,136</i>
Total New Construction Cost	\$12,571,062
Contingency on new construction 20%	\$2,780,277
New Construction Costs	\$16,681,662

Total Cost	
Demolition Costs	\$3,980,218
Renovation Costs	\$39,740,198
New Construction Costs	\$16,681,662
Total Cost	\$60,402,078

8 Discussion

The Forum Complex requires a significant amount of capital investment to bring it up to today's standards. There would be an added premium associated with maintaining the Heritage nature of the Forum, although at this stage we believe that it is cost prohibitive and of poor design to restore the current Forum. To conserve the Heritage status a reinstatement of the exterior walls is anticipated in a replica like fashion using current day building design and construction techniques. This will allow the Forum to also achieve code compliance with respect to its envelope.

Unfortunately the interior will require significant renovation and alterations to meet building code compliance. Issues with life safety and accessibility are the main drivers which literally results in the majority if not the entire interior being demolished or significantly impacted by the proposed renovations.

The Civic Arena is in better condition however due to code compliance issues with lateral, seismic and snow loading criteria, replacement or reinforcing of the roof structure is anticipated. Combine the structural recommendations with the requirement to extend the ice slab to meet NHL standards result in the majority of the Arena being renovated.

The MPC is slated for demolition to allow for a third pad. The third pad is anticipated to be an efficient building equivalent to a green field project. The addition of a third pad in combination with an aged ice plant results in the recommendation to replace the ice plant in its entirety.

The Bingo Hall arguably the newest of the buildings remains the least changed. Minor reinforcing and repairs to meet code compliance and accessibility is anticipated.

All in all, to redevelop the Forum site comes at a premium. The limitations associated with the site, the aged existing infrastructure and the requirement to renovate rather than replace in its entirety result in the premium in comparisons to a new build.

9 Limitations

This report may not be relied upon by any other person or entity without the expressed written consent of Capital Management Engineering Limited and Halifax Regional Municipality. Any other parties that rely or make decisions based on this report do so solely at their own risk.

Capital Management Engineering makes no warranties, whether written or oral, statutory, expressed or implied, in connection with the services provided, including, without limitation, any warranty of fitness for any particular purpose or use with respect to the property or building components and systems.

Capital Management Engineering's cumulative liability for all claims relating to this report or the services provided shall not exceed the total amount of all fees actually paid for this report.

The opinions of cost are intended for global budgeting purposes only. Actual costs for recommended work can only be determined after preparation of tender documents, detailing the site restrictions, effects and or restrictions on ongoing operations of the building and requirements associated with the construction schedule.

The recommendations made in this report are based on the visual observations made by the assessor during the site assessment and are limited to the areas of the site and building that were observed and accessible during the assessment. Concealed, inaccessible and un-observed areas may be in a different condition than what is reported herein. During the site assessment the assessor will attempt to verify any additional information provided by the site contact. However, in many cases the information will be relied upon and presented without field verification.

10 Conclusion

Capital Management Engineering Limited is pleased to present this Draft report in electronic format for review and comments from Halifax Regional Municipality.

The site assessment findings and report were completed by a multidisciplinary team and coordinated by Ms. Kyla Simpson. The Forum Assessment was reviewed by Mr. Torquil Duncan.



Kyla Simpson, B.A.S.,
Site Assessor
Capital Management Engineering



Torquil Duncan P. Eng
Senior Review
Capital Management Engineering

Appendix A – Limited Space Plan (Program)

Halifax Forum Complex Functional Space Summary					
number	room name	area	quantity	total area	notes
F-1	Ice sheet NHL size		1	0	current 81'x 197' req 200'X 85'
F-2	Dressing rooms to current standard			0	
F-3	Seating for 4610			0	
F-4	Washrooms current standard			0	
C-1	NHL Sized Ice				current is 81'x190' req 200'X 85'
N-1	Services/ M&E area	8000	1	8000	L 1
N-2	New ice pad	27000	1	27000	200'X 85'
N-3	Multi purpose room	8200	1	8200	
N-4	Washrooms	365	4	8200	total 43 fixtures
N-5	Changing areas	225	5	1125	
N-6	MPR	400	1	400	
N-7	MPR	2200	1	2200	
N-8	MPR	600	2	1200	
N-9	Hall of fame	1600	1	1600	
N-10	New entrance	7400	1	7400	
N-11	Elevator	60	2	120	
N-12	Dressing rooms	380	8	3040	
N-13	Dressing rooms washrooms	215	6	1290	18 fixtures min
N-14	Kitchen 1	370	1	370	
N-15	Kitchen 2	560	1	560	
N-16	Bar 1	370	1	370	
N-17	Bar 2	460	1	460	
				71535	
demo					
D-1	MPR	19234	1	19234	
D-2	Spaces between the buildings	5400	1	5400	
D-3	Internal areas at Rinks		NA	0	

total overall added area assume

	area	levels	
new ice pad area	27000	2	54000
new infill area	8000	2	16000
new entrance area	7400	2	14800
			84800
total area new			84800
area demo MPR and MECH			24000
Total building area new			183800