Associated Engineering
GLOBAL PERSPECTIVE.
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REPORT

Town of Beaverlodge

Arena Condition Assessment

FEBRUARY 2023

EXECUTIVE SUMMARY

Associated Engineering Alberta Ltd. (Associated) along with Solis Architecture Ltd. carried out a visual review and condition assessment of the Beaverlodge Arena at 306-10A Street in Beaverlodge, Alberta on December 12, 2022. The Town of Beaverlodge is considering renovating the arena and wishes to obtain a summary of the condition of the facility and the budget required to perform the upgrades.

The objectives of this report are as follows:

- Review the condition of the building envelope, windows and doors, and architectural finishes.
- Evaluate the condition of the building's structural systems and elements.
- Evaluate the condition of the building mechanical systems and components.
- Evaluate the condition of the electrical systems and components.
- Provide comments and observations regarding National Building Code 2019 – Alberta Edition conformance of the observed building components including accessibility, and CSA B52 2018 for Class T Machine Room for conformance of the ice plant room.
- Provide comments on what is required by the Building Code for upgrades and/or major renovations.
- Provide recommendations and/or requirements for additional investigation or studies.
- Compile site observations and provide a prioritized list of repairs or replacements with probable costs.
- Evaluate and provide recommendations on increasing the rink size to standard North American (NHL) size.

Based on the review, there are a number of recommendations the Town should undertake. The recommendations are noted and ranked in order of priority as follows.

Table ES-1 Recommendation Ranking Chart

Rank	Urgency
Immediate Priority	Considered to be a risk to the public's safety or are considered urgent for the building's integrity
High Priority	Within 1 to 5 years
Medium Priority	Within 6 to 10 years
Low Priority	Within 11 to 20 years

The summary costs presented in this report are based on a Class D opinion of probable cost, which has an accuracy of ±30%. The Class D opinion of probable costs for addressing the deficient items is summarized in the following table and broken down by discipline and ranking priority.

Table ES-2 **Cost Summary** of Recommendations

Item	Estimate
Immediate Priorities	**$4,084,000**
High Priorities	**$1,980,000**
Medium Priorities	**$569,000**
Low Priorities	**$316,000**
Recommendation Sub-total	**$6,949,000**
Professional Consulting (12%)	**$833,880**
Sub-total	**$7,782,880**
Contingency (30%)	**$2,334,864**
Sub-total	**$10,117,744**
GST (5%)	**$505,887**
TOTAL	**$10,623,631**

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1 INTRODUCTION

1.1 Background

The Beaverlodge Arena is located at 306-10a Street, in Beaverlodge, Alberta. It was originally constructed in the 1960s and has had an expansion on the east side of the building, built in 2008. The building houses a single ice surface rink complete with bleachers on both sides. The building's front of house contains a lobby area, dressing rooms for players and officials, washrooms, and a concession. The east addition contains two additional dressing rooms, the Zamboni Room, and Ammonia Ice Plant.

1.2 Scope of Work

Associated Engineering Alberta Ltd. (Associated) along with Solis Architecture Ltd. carried out a visual review and condition assessment of the Beaverlodge Arena on December 12, 2022.

The objectives of this report are as follows:

- Review the condition of the building envelope, windows and doors, and architectural finishes.
- Evaluate the condition of the building's structural systems and elements.
- Evaluate the condition of the building mechanical systems and components, including the ice plant.
- Evaluate the condition of the electrical systems and components.
- Provide comments and observations regarding National Building Code 2019 – Alberta Edition conformance of the observed building components including accessibility, and CSA B52 2018 for Class T Machine Room for conformance of the ice plant room.
- Provide comments on what is required by the Building Code for upgrades and/or major renovations.
- Provide recommendations and/or requirements for additional investigation or studies.
- Compile site observations and provide a prioritized list of repairs or replacements with probable costs.
- Evaluate and provide recommendations on increasing the rink size to standard North American (NHL) size.

Site photos and field notes have been compiled into this assessment report. The report also contains conceptual estimates of probable costs for the repair of deficiencies found within the facility, along with a priority ranking. The summary cost presented in this report are based on a Class D opinion of probable cost, which has an accuracy of ± 30%.

The recommendations are noted and ranked in order of priority as follows.

Table 1-1 Recommendation Ranking Chart

Rank	Urgency
Immediate Priority	Considered to be a risk to the public's safety or are considered urgent for the building's integrity
High Priority	Within 1 to 5 years
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Low Priority	Within 11 to 20 years

2 ARCHITECTURAL

2.1 Code Review

2.1.1 Building Classification

Review of the National Building Code - 2019 Alberta Edition
3.2.2.30 Group A, Division 3, up to 2 Storeys
Building Area: Maximum Allowable Area **5,000m^2**
Ground Floor = 3,003m^2 +/-
No Mezzanine
Non-Sprinklered
Non-combustible construction
Roof assembly over the rink is steel
Fire Rating Requirements (F.R.R.)
loadbearing walls, columns = 1hr
Roof = waived (3.2.2.17)
Streets = Facing 2 street (East + South)
Building Height = 1 Storey

No existing drawings were provided and thus the areas noted as part of this review are based on onsite measurements.

Based upon a review of the *National Building Code - 2019 Alberta Edition*, the building should be classified as 3.2.2.30 and is presently not in conformance with the current code. There are fire rating issues, accessibility issues, and concerns with the building envelope.

It is understood that the Town currently uses the building on occasion for public gatherings. The Town engages the Fire Marshall to review the space prior to the event which addresses the life safety concerns for this building. This current method is acceptable and commonly practiced in other communities. With the proposed modifications and the understood future use of the building, sprinklers will need to be installed as part of the retrofit to meet current building classification and code requirements.

2.1.2 Limiting Distances and Fire Ratings

No site plan or legal survey has been provided; thus, it is impossible to determine the limiting distance and any required exterior wall fire ratings, however, based on Google Maps the distances are as follows:

- South: Face of the building to the center of the road = +/- 75.5m
- North: Distance between Arena addition and the curling rink = +/- 6.2m
- North: Distance between arena and road/end of park = +/- 61m
- East: Face of building to center line of the road= +/- 38.5m
- West: Face of building to end of tennis court = +/-17.4m

Based upon the exterior wall construction, and the number of exterior penetrations facing adjacent buildings, there are no major issues that need to be addressed. It is advisable that a legal survey be created to confirm limiting distances and any required exterior wall fire ratings.

2.1.3 Major Code Violations

The building has the following code violations:

- The wall separating the rink from the public viewing gallery/lobby does not meet the required 1 hour fire ratings.
- The single door on the east side of the lobby to the rink is not installed properly and does not have the required 1 hour fire rating.
- The glazing separating the lobby from the rink is not in a 1 hour rated pressed steel frame with Georgian Wire Glass or fire rated glass.
- The underside of the bleachers is not fire rated.
- The storage room off the lobby does not have adequate fire ratings.
- The ice plant is not properly separated from the remainder of the building via a vestibule as per 6.2.2. of the Mechanical Refrigeration Code.

2.1.4 Other Code Violations

- **3.1.8.3 Continuity of Fire Separations:** The required fire ratings between the lobby and the rink are not continuous to the roof, and the ceilings do not have the proper fire separations to allow the area above the ceiling of the lobby to act as the required fire separation.
- **3.3.4.3 Storage Rooms**: Require a fire separation from the remainder of the building by a F.R.R. of 1 hour. Currently there are penetrations that need to be sealed.
- **3.3.2.2.(3) Fire Separations:** The space under the tiers of seats in arena-type buildings, a fire separation with a fire-resistance rating not less than 45 min shall be provided between the space and the seats or the space shall be sprinklered.
- **3.6.2.1.(1) Service Rooms**: Are required to be separated from the remainder of the building by a F.R.R. of 1 hour.
- **3.1.9.1.(3) Fire Stops**: Penetrations of a fire separation shall be sealed by a fire stop that, when subjected to the fire test method in CAN/ULC-S115 “Fire Test of Firestop Systems” has an FT rating not less than the fire-resistance rating for the fire separation of the assembly.

Fire rated doors have labels on the door and the frame indicating the fire rating. There are several doors that have the ratings removed from the door. It is important to note that once a label is removed, it cannot be reattached by facility personnel. The assembly will have to go through the field labeling process described in NFPA 80. The rating labels must be kept on the door and be visible.

Figure 2-1 Replace Damaged Door and Framing

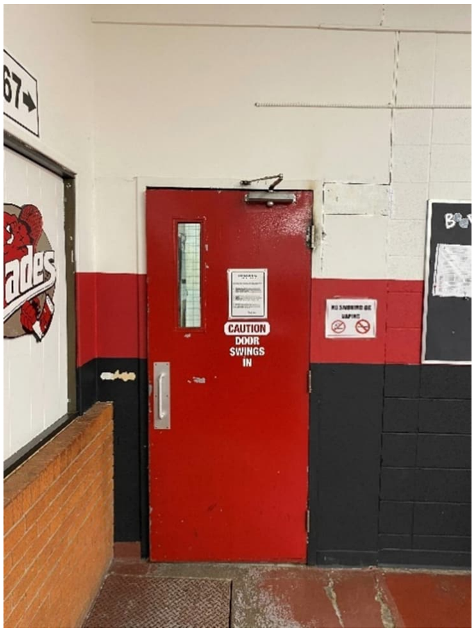


Figure 2-2 Non-Rated Access into Ceiling Area

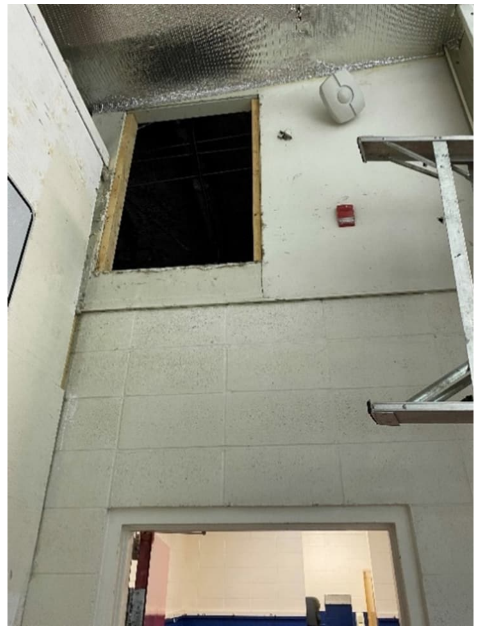
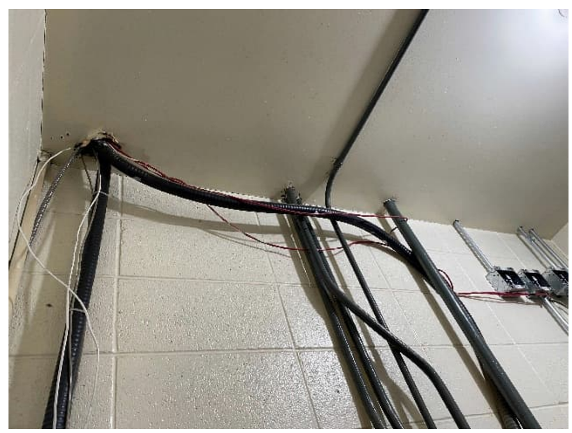


Figure 2-3 Separation Between Rink and Lobby to be Rated

Figure 2-4 Penetrations Through Rated Assembly



Recommendations

- Rebuild and repair the fire separation between the lobby and the rink to meet the 1 hour required F.R.R.
- Patch and repair penetrations through rated wall assemblies.
- Replace doors between the rink and the lobby and rebuild the rough opening.
- Install fire ratings on doors as per NFPA 80.
- Install a vestibule into the ice plant to meet the required separation.

2.1.5 Accessibility

The building is not barrier-free compliant:

- Main entry doors to the lobby and access doors to the rink do not have automatic door operators.
- There is no dedicated viewing area with a ramp for H.C. access.

Figure 2-5 No H.C. Access Button

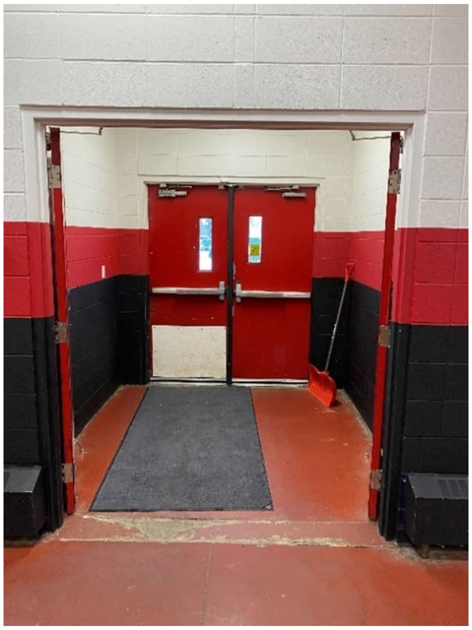
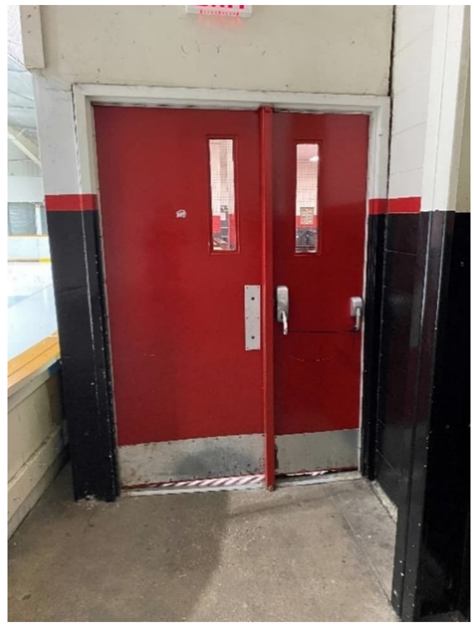


Figure 2-6 No H.C. Access Button



Recommendations

- When renovating the building update non-compliant code issues.

2.2 Building Envelope/Exterior Walls

No existing drawings were provided, however interior liner panels on the north wall and ceiling were removed to allow for an adequate understanding of the building envelope in the arena. The concrete block walls in the addition on the east side with the change rooms are unknown, however based on industry standards and the current frost build-up on the inside surface of the wall we can an informed decision, and access to the ceiling space above the lobby and front of house was accessible for visual inspection.

The exterior wall assembly (based upon visual review) in the Beaverlodge arena are as follows:

Main Arena Walls:

Assembly 1

- Metal liner panel
- Horizontal Metal girts @ 600 mm O.C.
- Spray applied cellulose insulation (25 mm thick) R-value of 3.75
- Exterior metal cladding

<u>**Arena Front of House:**</u>
Split Wall Assembly
Bottom Section
- Concrete block – most likely filled with zonolite or another asbestos-related insulation.

Upper Section (truss space)
- Exterior metal cladding
- Spray applied cellulose insulation (25 mm thick) R-value of 3.75

<u>**Change Room Walls (addition):**</u>
Assembly 2
- 190 mm concrete block (may or may not be filled with zonolite)

<u>**Ceiling – Front of House:**</u>
Assembly 1 - Lobby
- T-bar
- Air space (900 mm +/-)
- 6 mil poly vapour barrier
- Wood structure c/w batt insulation
- Additional Batt insulation

Assembly 2 – Front of House
- Gypsum Board
- 6 mil poly vapour barrier
- Wood structure c/w batt insulation
- Additional Batt insulation

The existing exterior walls are at the end of their lifespan. The following deficiencies are noted:
- Insulation levels in the walls spray-applied cellulose insulated walls are inefficient to current building code standards.
- Insulation levels in the concrete block walls are inefficient to meet current building code standards.
- Exterior metal cladding – discolored and faded with some rust. Section on the east side is damaged. The metal cladding is at the end of its lifespan and should be replaced. This was also indicated in the previous facility assessment.
- No metal flashing over exit doors.

The NECB 2017 and the National Building Code 2019 - Alberta Edition requires the R-value of the walls be R-27, and the ceiling/roof to be R41 as a baseline but can be reduced with trade-offs, and/or energy modeling.

The 25 mm spray-applied cellulose insulation in the walls and roof are inadequate to meet the NECB requirements, and generally has a lifespan of 20 - 30 years. Since the rink has been in operation since 1974 with no modifications to the building envelope it puts the insulation at close to 50 years old and is well beyond its typical lifespan.

The cellulose insulation above the lobby area is starting to flake off the walls and ceiling and is a sign that the insulation has passed its lifespan and is starting to fail. This failure will cause additional moisture issues in the roof and walls due to the reduced capacity for the insulation to deal with migrating moisture through the walls.

The exterior metal cladding is discolored, faded, and has rust in various locations. The rubber washers holding the cladding to the girts are stiff and brittle and need to be replace. Metal cladding has a typical lifespan of 50 years and is also at the end of its lifespan.

The maintenance staff has indicated that the existing exterior concrete block in the 'Blades' dressing room frosts over and their jerseys stick to wall when it is -20° outside and below. Based on this information the concrete blocks were not likely filled with zonolite an asbestos-based insulation typically used in exterior concrete block construction. This in combination with inadequate air flow can against the wall will cause frost to appear on the inside of exterior walls.

Overall, the thermal performance of a zonolite filled lightweight 200 mm concrete block is about R 5.9, which is below the 2019 Alberta Code Standard. The R-value we have noted is derived from product manufacturers for lightweight concrete blocks with zonolite insulation.

Figure 2-7 No Base Flashing

Figure 2-8 North Facade

Figure 2-9 Damaged Exterior Cladding

Figure 2-10 Damaged Exterior Cladding

Figure 2-11 No Flashing Over Exit Door

Figure 2-12 Rust Visible on Southwest Corner

The lobby and front of house has an insulated wood-framed ceiling over the interior masonry walls. The following deficiencies are noted:

- The insulation above the lobby area has a lot of water damage, and the vapour barrier has water stains.
- The vapour barrier is not sealed properly with tape and sealant at joints in the lobby.
- The vapour barrier is punctured, torn, and cut in various locations and has several large holes.
- There is a hole through the gypsum board ceiling that punctures the vapour barrier in the storage room that requires patching.

- The uninsulated space above the insulation is open to the rink and the exterior.

The ceiling has approximately 300 mm of fibreglass insulation in the roof. Which provides an R-value of R26.4. In some locations additional fibreglass insulation has been installed and is very thick. The exact depth was unable to be measured. It is believed that those areas with the additional insulation would meet the R41 required.

When the vapour barrier is not continuous it can cause moisture issues in the building envelope because there is no barrier to stop the water from condensing in and on the insulation. It can also degrade the steel in the wall causing long term maintenance issues. The lack of air tightness in the building envelope has ensured that the exterior wall assembly has remained dry. Having such permeability in the envelope is currently understood as poor building science practice because it increases the operating cost and the wear and tear on the heating system and the building envelope.

Figure 2-13 Cellulose Insulation Visible on Fiberglass Insulation

Figure 2-14 Water Stains on Fiberglass Insulation

Figure 2-15 Additional Insulation Above Storage Room

Figure 2-16 Water Damaged Fiberglass Insulation

Figure 2-17 Cellulose Applied Insulation

Figure 2-18 Exterior of the New Addition

Recommendations

Replace the existing metal cladding and building envelope around the rink. It is recommended to install insulated metal panels or a similar system outbound of the existing girts to reduce the thermal bridging.

The concrete block addition on the east side lacks adequate insulation but is in good condition. To meet the NECB requirements, it is recommended to install exterior bound insulation attached to the concrete block over a liquid applied vapour barrier and tie into the new exterior wall system.

The fibreglass insulation & the vapour barrier in the lobby needs to be replaced and properly tied into the building envelope, which includes the exterior wall and the wall dividing the rink from the lobby to preventing moisture from accumulating in the ceiling space. The wall between the rink and lobby also needs to be insulated and a vapour barrier installed to provide an adequate separation from the interior heated spaces and the exterior.

This renovation would increase the amount of insulation in the walls and provide a proper vapour barrier aligning with current building envelope standards. It is advised that an energy optimization analysis be completed as part of the upgrades to determine the optimal thickness of insulation in relation to the required upgrades to the mechanical system and the incorporation of any renewables. The goal is to have the correct ratio of insulation vs renewables which will save money over the lifespan of the building.

2.3 Roof

The metal roof was not reviewed as part of this report.

The area over the lobby and front of house was reviewed from the inside and consists of sprayed applied cellulose insulation to the structure and metal roof. The thickness was not confirmed however it is believed to be 25 mm to match the walls. The insulation has started to fall off onto the fibreglass insulation and is well past its lifespan.

Recommendations

- It is recommended to replace the roof. This, in conjunction with the upgrades noted in the building envelope, will provide a proper integrated building envelope.

2.4 Floors

2.4.1 Rink Slab (Cold) – Architectural Comment

In discussion with the maintenance staff, the rink has been patched several times, with 21 times in the last year and nine times on a single line. The pipes were described as hard and brittle. The staff also indicated that when patches were performed there was no visible insulation under the slab and the slab was directly on top of the grade. With this information, the rink slab is understood to consist of the following:

- Ice surface
- 150 mm concrete c/w glycol cooling lines
- Compacted ground

The concrete rink was in use, so it was impossible to visually review the condition of the ice slab. The maintenance staff indicated that there are large cracks in the slab, and patches where repairs have been done and lines replaced. The staff also indicated that the slab is not level and water ponds on the lobby side causing uneven freezing of the ice surface due to the different thicknesses of ice. This uneven freezing creates a poor-quality ice surface.

The functional life span of the rink slab is 40 years and based on the age of the facility, the current maintenance required, and discussions with the maintenance staff, the rink is operating beyond its life expectancy.

The current size of the rink slab is approximately 188’-8” by 79’-7” (57.5m by 24.3m) which is smaller than a standard 200’-0” x 85’-0” (61.0m by 25.6m) NHL ice surface. The client has indicated that they wish to increase the size of the ice surface to the standard NHL size.
A new rink slab uses high-density piping and a fusion-welded system eliminating the need for mechanical connections and the need for trenches. This eliminates maintenance issues, frost build-up, and risk management for accessing the

trenches. The new rink slab is also more efficient and can provide energy savings over the lifespan of the project. It is estimated that the lifespan for new ice rink slabs is around 60 – 80 years.

Figure 2-19 Ice Rink Covered with Ice

Figure 2-20 Frosted Pipes in Header Trench

2.4.2 Rink Slab (Cold) – Structural Comment

It was explained that when rough measurements and slab preparations are being done, the midpoint of the rink is a high point with water pooling towards the south end of the ice surface. Regular maintenance on the brine lines within the slab is sometimes required and there is ongoing chipping and repair work on the slab to accommodate this work. Chipping, re-work and re-instatement of concrete along cold joints, even when the interfaces are properly prepared before a concrete pour, will still negatively impact the slab's durability over time. This effect is intensified with repeated repairs in the same location. The client explained that in the past 2 years, there have been as many as twenty concrete repairs on the rink slab, many in the same location.

Further, when re-icing the rink surface, the client explained that they need to "plug" the cracks with frozen paper towel before they can begin flooding the surface. This was the only way to keep water on top of the rink and without having it leak directly through the slab cracks.

A new rink slab is required. The client has also expressed the desire to expand the rink in width and length to meet NHL regulation sized rink requirements.

Recommendations

Due to the age of the rink, and information provided by the maintenance staff and the desire to increase the size of the rink, a new concrete slab is recommended with a high-density piping and a fusion-welded system. It is not recommended to try to extend the lifespan of the current system.

2.4.3 Rink Slab (Warm)

The ice rink floor assembly is assumed as follows:

- 5” concrete slab
- 6 mil Poly Vapour Barrier
- 6” compacted granular fill
- Existing soil

In general, the visible flooring in the rink is in poor condition. There are some cracks between the cold and warm slab, and some patches. The area around the overhead door on the north is starting to fall apart and there is a visible separation between the grade beam and the floor slab. Most of the slab was covered by the bleachers and skate flooring and thus impossible to review.

Figure 2-21 Concrete at Overhead Door Requires Patching

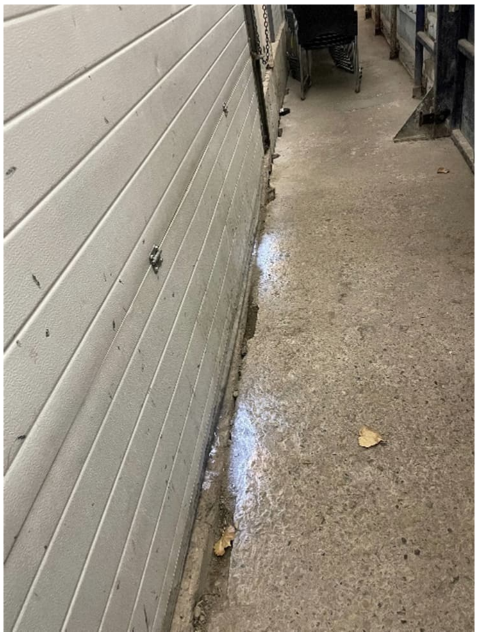


Figure 2-22 Patches in Concrete

Recommendations

It is recommended that the warm slab be replaced because of the need to extend the rink to NHL standards requires the removal of some of the concrete and the bleachers. This will also allow for the area to be leveled out eliminating the need to steps at the exit doors.

2.5 Dasher Boards

The existing dasher boards steel and wood. The existing boards are in poor condition and are very stiff. A stiff board at high caliber levels is dangerous because there is no give within the boards leading to more severe injuries. The following issues are noted:

- Metal posts and brackets are rusted.
- Wood bases are rotting with a lot of the wood damaged.
- Bleachers extend into and above the base of the dasher boards creating added rigidity to the boards.

Figure 2-23 Ice Build-Up Outside of Dasher Boards

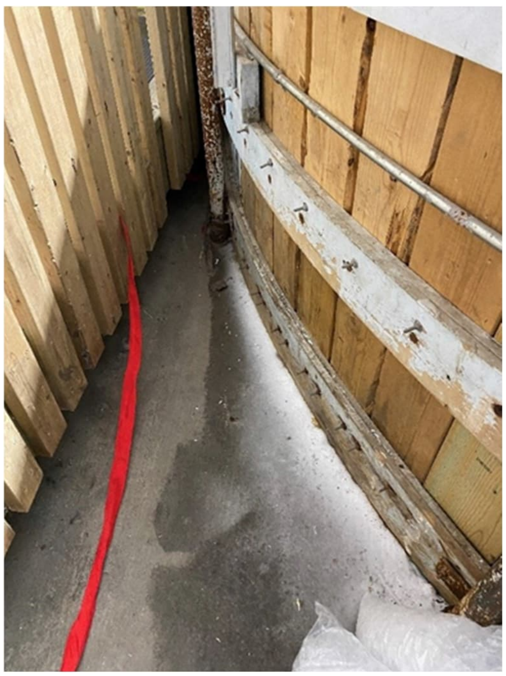


Figure 2-24 Damage to Rink Board in Players Bench Area

Figure 2-25 Rusting on Metal Support for Dasher Board

Recommendations

It is recommended that new dasher boards be installed with the installation of a new concrete rink slab. It is not advisable to reuse the existing boards with a new slab especially if the rink is intended to be expanded to accommodate an NHL sized ice surface.

2.6 Bleachers

The bleachers are painted wooden planks with wood steps. They are kept in good condition and appear to have many layers of paint. The bleachers do not have a dedicated area for H.C seats and the underside is clad with painted chipboard. According to the code the underside of the bleachers that are used for storage need to be fire rated.

Figure 2-26 Underside of Bleacher

Figure 2-27 Bleacher Access

Figure 2-28 Bleachers Against Dasher Boards

Figure 2-29 Access Gate to Storage Under Bleachers

Recommendations

Since the rink surface and boards need to be replaced and the rink expanded, this will require major modifications to the bleachers. It is recommended to replace the bleachers on the east side, while the west side be either eliminated completely or reduced to accommodate the increased rink area footprint.

2.7 Doors

2.7.1 Overhead Doors

The overhead door on the north side is damaged. Frost has built up on the inside surface of the frame and the door because the seals are broken.

The overhead door on the east into the Zamboni Room was in fair condition.

Figure 2-30 Frosting on Overhead Door

Figure 2-31 Damaged Seals on Overhead Door

2.7.2 Exterior Doors

In general, the exterior doors are insulated metal doors and are in poor condition. The following deficiencies are noted:

- Most exit doors have frosting on the inside surface around the edges and at the door handles.
- The seals around most of the doors has failed.
- The exit doors in the arena are elevated from the floor creating a tripping hazard and are higher than a step thus causing issues with exiting.

Figure 2-32 Boxes Piled in Front of Exit Path

Figure 2-33 Frost Build-Up on Door Frame

Figure 2-34 Exit Door Elevated off Ground

Figure 2-35 Existing Hardware

Figure 2-36 Frosting on Exit Door

Figure 2-37 Unpainted Exit Door & Threshold Damaged

Recommendations

It is recommended to replace the existing seals on all doors, add steps to doors that are too high or, when renovating the space, revise the elevation of the floor slab allowing the doors to be closer to the floor level and replace the exterior doors and relocate the overhead door.

2.8 Interiors

2.8.1 Interior Partitions

The interior partitions are painted concrete block walls, or gypsum board. The interior concrete block walls are in good condition and the gypsum board is good in most locations except the separation between the rink and the lobby area. This area needs to be repaired to provide the proper fire ratings.

2.8.2 Interior Doors

All interior doors are painted hollow metal doors and are generally in fair condition. The interior doors between the rink and the lobby are damaged and should be replaced.

Interior fire rated doors are supposed to have labels on the door and the frame indicating the fire rating. There are several doors that have the ratings removed from the door. It is important to note that once a label is removed, it cannot be reattached by facility personnel. The assembly will have to go though the field labeling process described in NFPA 80. The ratings labels must be kept on the door and be visible.

2.8.3 Interior Windows

The interior windows between the lobby and the rink do not meet code and need to be replaced with Pressed Steel Frames with Georgian Wire Glass, or Fire Rated Glass.

Figure 2-38 Windows Are Not Code Compliant

2.8.4 Floor Finishes

__Original Structure:__

- The main lobby floor has a red epoxy coating on the concrete floor. It is in poor condition around the edges, at the entry door threshold, and around the seats facing the rink. The main open areas are in good condition.
- The epoxy floors in the mechanical room, storage, and janitors' room are all in poor condition with the finish starting to peel off. They should all be refinished.
- The concession area and washrooms have old, outdated laminate flooring. It is in fair condition and should be replaced as part of any interior renovation.
- The tiled skate flooring is in fair condition.
- Mechanical room floor is epoxy that is starting to peel away from the concrete. It needs to be refinished.

__New Addition:__
The concrete floor is covered with skate flooring which is in good condition.

Figure 2-39 Skate Flooring in Corridor

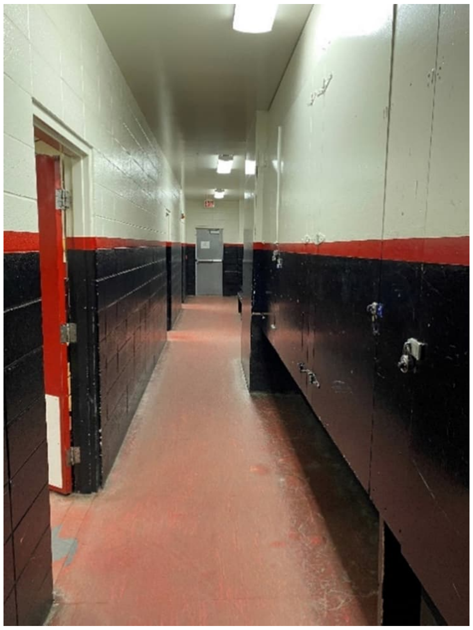


Figure 2-40 Typical Dressing Room Flooring

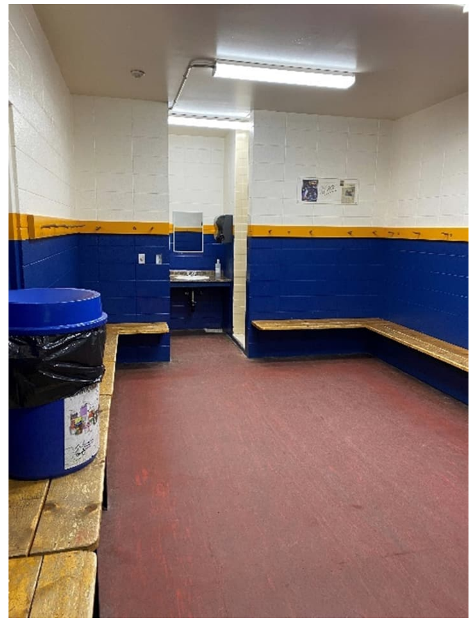


Figure 2-41 Epoxy Flooring Damaged

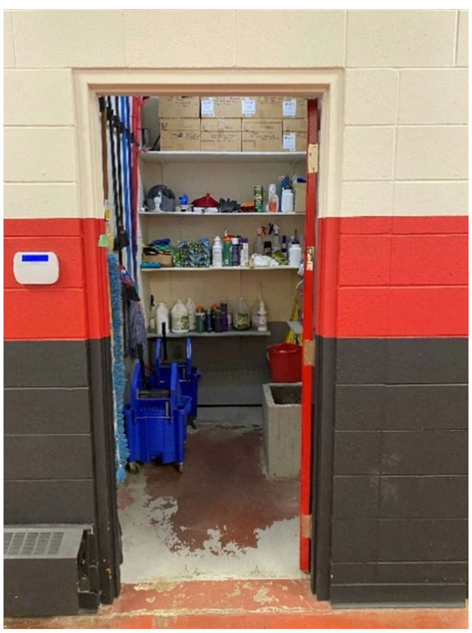


Figure 2-42 Damaged Epoxy Flooring

Figure 2-43 Vinyl Tile in Washroom

2.8.5 Millwork

Original Structure:

- The millwork/cabinets in the concession area are old and beyond their functional lifespan.
- The P.Lam counters are chipped and starting to peel.
- There are no closers on any of the millwork doors, and the front cabinets have had all the doors removed.
- The rolling concession doors are in fair condition, while the original wood concession window is wood and closed. The concession area needs to be separated from the remainder of the space with a 1 hour F.R.R. and thus the existing wood opening needs to be infilled with a rated assembly to match the walls.

Figure 2-44 Millwork Without Doors

Figure 2-45 Old & Damaged Millwork

Figure 2-46 Cracked P.Lam Counters & Old Cabinets

2.8.6 Ceilings

The ceilings consist of T-bar in the lobby, Gypsum board in the remainder of the front of house, and reflective insulation in rink.

The T-bar and gypsum board ceiling appear to be in good condition.

The rink area has recently added a new layer of reflective insulation. This is installed over the existing reflective insulation and supported by aircraft cable. The ability to determine the condition of the existing reflective insulation was limited because only one panel was removed with limited views into the ceiling space.

Figure 2-47 Hole in Ceiling Storage Room

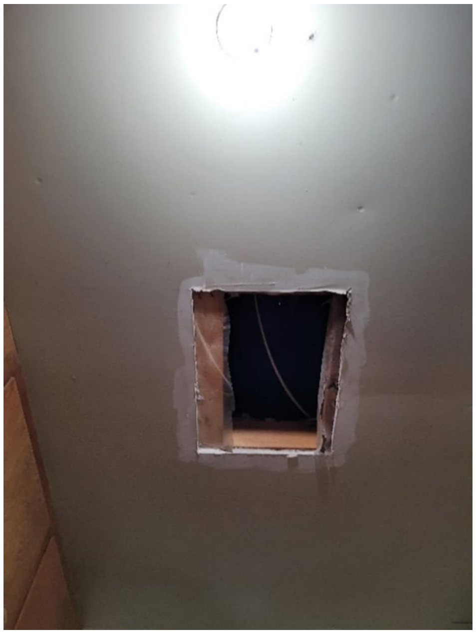


Figure 2-48 Reflective Ceiling in Rink

Figure 2-49 Space Between Reflective Ceilings

2.8.7 Washrooms

Overall, the washrooms are in fair condition. The toilet partitions, and counters are in good condition.

2.8.8 Dressing Rooms

The dressing rooms are in good condition and the washrooms partitions in dressing rooms 1-5 all appear to have been recently upgraded. The benches are in good condition and have standard coat hooks above. The following deficiencies are noted:

- The skate flooring is old and past its lifespan and requires replacement in dressing rooms 1-5.
- Shower tiles in dressing room 4 and 5 are missing tiles on the back side of the recessed drain area.

- Shower tiles in dressing room 1 is missing a row of tiles along the back edge.
- Dressing room 3 has the radiant heater extended into the shower area.
- Shower door in 'Blades' dressing room does not latch.
- Toilet partitions in visitors dressing room has several dints from either pucks or sticks.

Figure 2-50 Dressing Room 1

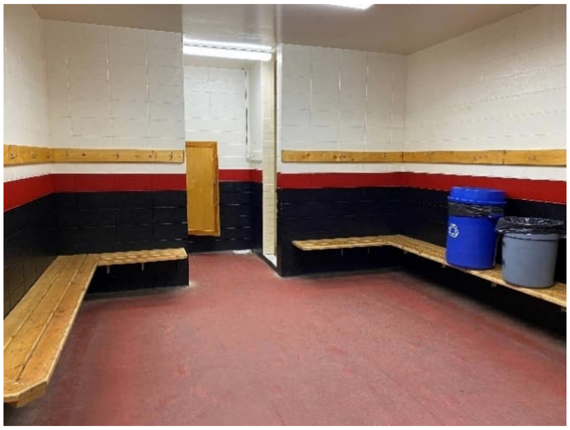
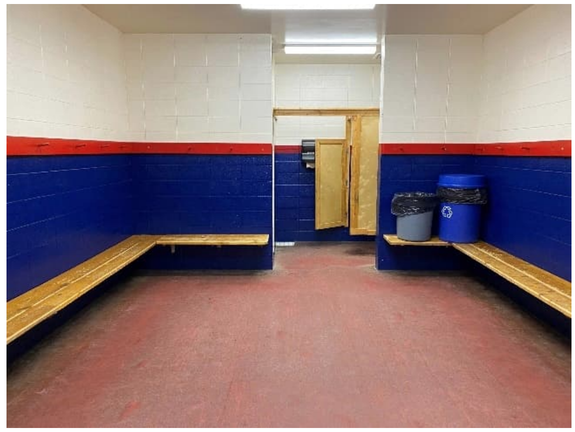


Figure 2-51 Dressing Room 2



Recommendations

- Repair wall between the rink and the lobby area to meet the required code requirements.
- Replace damaged interior doors between the rink and the lobby area.
- Replace skate flooring in dressing rooms 1-5.
- Remove and repair epoxy flooring in lobby, janitors, mechanical, storage, and office.
- Replace existing concession and washroom flooring.
- Replace all the millwork in the concession area.
- Patch original concession door with rated wall.
- Replace the vapour barrier and fibreglass insulation above the lobby. Ensure proper tie-in to the existing ceilings and exterior walls.

2.9 Site

The site is in satisfactory condition. The maintenance staff indicated that the 2nd fence post along the edge of the tennis court is heaving out of the ground. Based on the location of the RWL the probable cause is water freezing and thawing that is coming off the roof.

Figure 2-52 Heaving Fence Post

It was noted that there are drainage issues on the east side of the Arena structure near the curling rink walkway and exterior condenser unit frame. It is not immediately clear if the water accumulating here is a result of poor drainage path(s) from the roadways and surfaces nearby or from the condenser unit itself. Grading work is needed here to re-establish positive drainage away from the structure. Otherwise, the remainder of the site appears to have adequate drainage away from the building with good access to all facades.

Recommendations

- Reduce the length of the RWL so that the water does not pool around the fence post.
- Provide adequate grading for drainage near the condenser unit.

2.10 Exterior Signage

The exterior signage at the front of the arena is old and past it’s lifespan. It is recommended to replace the exterior signage when updating the exterior cladding

2.11 Recommendations Summary

Recommendations accompanied by ranking priority and an estimated probable cost related to architectural work are presented below in Table 2-1. The following is a Class D estimate of probable costs for the repairs or replacements. “Immediate” is considered risks to the public’s safety, “high” is within 1 to 5 years, “medium” is within the next 6 to 10 years, and “low” is within the next 11 to 20 years. Values are probable costs in 2022 dollars and are assumed to be combined with other scope items.

Table 2-1 Estimated Costs for Architectural Upgrades

Disc.	Asset	Work Description	Priority	Estimated Cost
Arch.	Arena	Replace building envelope - arena	Immediate	$350,000
Arch.	Arena	Replace existing roof	Immediate	$320,000
Arch.	Arena	Replace interior liner panels in arena	Immediate	$60,000
Arch.	Arena	Replace exterior exit doors	Immediate	$22,000
Arch.	Front Lobby	Replace entry doors and add H.C. push buttons	Immediate	$5,000
Arch.	New	Add addition to building	Immediate	$500,000
Arch.	Arena (Rink)	Replace rink slab (cold slab)	Immediate	$600,000
Arch.	Arena (Rink)	Replace dasher boards	Immediate	$250,000
Arch.	Arena	Replace warm concrete slab in arena	Immediate	$110,000
Arch.	Arena / Front Lobby	Repair fire separation between lobby and rink	Immediate	$60,000
Arch.	Arena / Front Lobby	Replace windows between lobby and rink	Immediate	$15,000
Arch.	Arena	Install new bleachers	Immediate	$50,000
Arch.	Arena	Replace rated stickers on rated doors	Immediate	$3,000
Arch.	Arena	Install new skate flooring in arena	Immediate	$8,000
Arch.	Ice Plant	Install new Vestibule into ice plant	Immediate	$10,000
Arch.	Ice Plant	Remove and replace overhead door in existing Zamboni room (new electrical room) with double door	Immediate	$8,000
Arch.	East addition	Upgrade building envelope - concrete block addition	High	$100,000
Arch.	Front Lobby	Replace existing vinyl tile flooring	High	$6,000
Arch.	Front Lobby	Replace millwork in concession	High	$10,000
Arch.	Exterior	Re-grading at exterior condenser unit	High	$3,000
Arch.	Exterior	Exterior signage replacement	Low	$15,000
			TOTAL IMMEDIATE PRIORITY	**$2,371,000**
			TOTAL HIGH PRIORITY	**$ 119,000**
			TOTAL MEDIUM PRIORITY	**$0**
			TOTAL LOW PRIORITY	**$15,000**
			TOTAL	**$2,505,000**

3 STRUCTURAL

3.1 Background

The arena structure consists of two main building systems and a later addition. The arena was originally built in the 1960's with a front lobby, concession, dressing rooms, storage space and mechanical and electrical rooms. Originally, the ice plant and Zamboni rooms were on the east side of the building. Two additional dressing rooms and an expansion to the ice plant and Zamboni Room were completed in 2008 along the east side of the arena.

The front lobby area consists of the following:

- Load bearing concrete masonry unit (CMU) exterior walls, stack bond
- Non-load bearing CMU interior walls, stack bond
- Steel pre-engineered framing above
- Dropped ceiling with a wood-framed high-ceiling
- Concrete base slab

The arena rink structure consists of the following:

- Steel pre-engineered framing
- Steel roof deck and purlins
- Metal corrugated panel siding with steel girts
- Concrete base slab

The dressing room addition consists of the following:

- CMU walls, stack bond
- Steel roof deck, framing below unknown
- Concrete base slab

Additionally, two steel support platforms are provided in the main rink area for large dehumidifier equipment and an exterior steel frame platform is provided to support the condenser unit.

There are no record drawings of the primary building or the addition which limited the reviewer's ability to confirm the main building and addition's foundation systems. Access to the roof of both the primary arena structure and the addition roofs was not available at the time of inspection. A roofing repair report from August 2021 and several inspection reports for the roof repairs were available for the review.

3.2 Lobby

The front lobby's primary structural system is the same steel pre-engineered framing for the arena's overall superstructure. Where pre-engineered framing columns are within the lobby area, they are furred and blocked out within the masonry walls. Detailed information on the primary roof steel structural system above the lobby can be found in Section 3.4.1.

The lobby exterior walls are full-height, load bearing CMU block wall and the lobby interior walls are non-load bearing masonry block. The top 1,000 mm of the interior masonry walls are wood stud. Above the ceiling tile and drywall low-ceiling in the lobby, there is an insulated wood-framed high (false)-ceiling. This wood-framed high-ceiling is approximately 1,600 mm below the underside of the primary steel roof framing and deck roof and has the lobby area framed independently from the primary arena steel structure.

3.2.1 Wood Framing and High (Wood/False) Ceiling

Much of the wall and roof wood sub-framing for the lobby area was not visible during the time of review due to the moisture barrier and insulation. However, the basic wood framing for the tops of the interior masonry walls appears to be 38 x 89 mm studs at 400 on center. The high-ceiling wood framing joists also are 38 x 89 mm at approximately 400 mm on center.

The central concession area is wood-framed, full-height up to the high-ceiling. Four large 3-ply of 38 x 189 mm carrier beams are running east-west across the lobby high-ceiling to reach to each of the four corners of the concession. Each of these four concession corners has a 3-ply of 38 x 89 mm framing cripple studs to form a column support. These provide support for the lobby high-ceiling roof and stability for the concession area wood framing.

The ability to determine the condition of the wood framing was limited by the vapour barrier and insulation present in the wall space. The wood framing appeared to be in generally good condition with no visible signs of discoloration, fracturing, mold, or rot. The topside of the wood-framed high-ceiling was found to be quite dirty at the time of inspection, and leftover garbage in this space was observed from the access port on the west side, above dressing room 1.

Figure 3-1 Wood-Framed Space Between High-Ceiling and Dropped Ceiling

Figure 3-2 3-Ply 38x189mm Beam Across Lobby to Concession Area

Figure 3-3 Garbage in Space Between High-Ceiling and Pre-Engineered Roof Above

3.2.2 Masonry Walls

The lobby is constructed with 190 mm thick stack bonded CMU walls. The south, west and east full-height, load bearing masonry walls are 4600 mm tall. The remaining interior, non-load bearing CMU walls in the front lobby area are 3000 mm tall and only serve to provide fire separation between the various rooms.

The outer structural masonry walls have 400 mm by 400 mm pilasters at the building's Southwest and Southeast corners and 400 mm by 400 mm pilasters are regularly spaced at 4500 mm o./c. along the south face. No CMU pilasters exist on the west and east exterior masonry walls of the lobby. A series of through-bolts is visible from the outside face of the south masonry wall, above the main entrance, however it was not determined at the time of review if they are support for any framing or if they are abandoned.

It was determined by hammer sounding test that the cores around the main doorways and openings are grouted. It was also determined by hammer sounding test that no regular pattern of vertically grouted cores or horizontal wall bond beams exists. The review of masonry walls also did not reveal a pattern of regularly spaced vertical control joints.

The overall condition of the masonry walls is good, with only some minor cracking at the head joints. Cracking was found in some locations between the masonry block head joints at the interface of the exterior structural walls and the interior masonry walls. Cracks at the masonry head joints up to 1.5 mm in size were found at the access door opening near the curling rink walkway indicate masonry debonding. This cracking was apparent at both the interior door opening and on the exterior walkway interface of the building at the curling rink to main arena walkway. Similar cracking of up to 0.60 mm was found at the SE corner of the building near the curling rink walkway in the janitor closet.

Some locations of the CMU walls are blocked or furred out to create runs for some mechanical equipment as can be seen in dressing room 3.

Figure 3-4 400 mm x 400 mm Masonry Pilaster in South wall

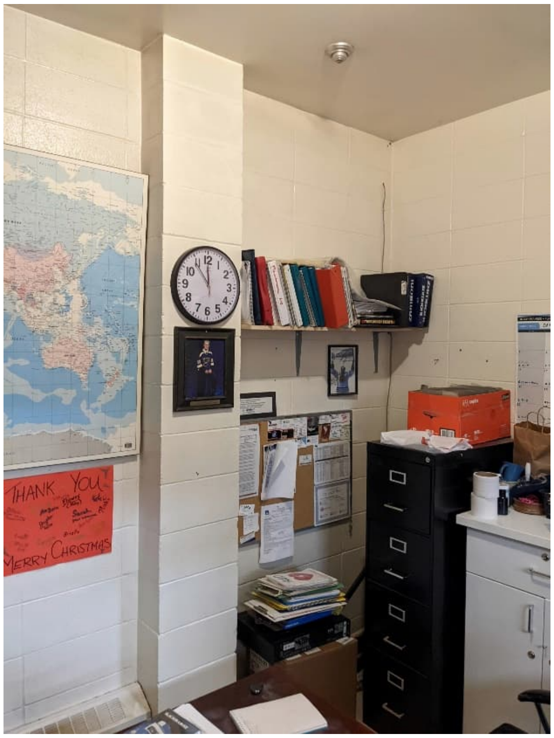
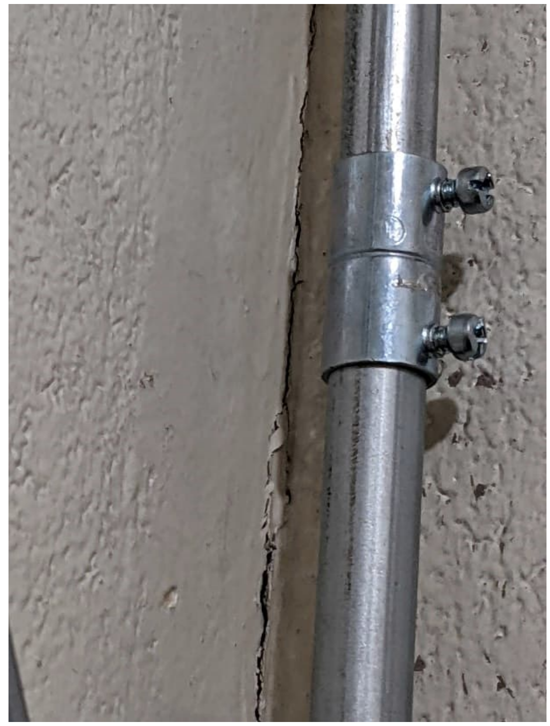


Figure 3-5 Steel Through-Bolts Above Main Entrance

Figure 3-6 Cracking of up to 1.5 mm in Size at Curling Rink Walkway Access Door

Figure 3-7 Cracking of 0.60 mm in Janitor Closet



3.2.3 Base Slab

The main lobby is built on a structural base slab. The outer wall foundations were not determined at the time of review although they appear to be on a system of grade beams with piles or foundation walls with strip footings, however this cannot be confirmed without a further, more intrusive review or record drawings.

The slab is visibly discontinued across doorway thresholds, suggesting that all interior masonry walls are centered on an independent set of grade beams and piles or foundation walls and strip footings as its foundation although the foundation system was not determined as part of the review. The doorway threshold concrete bases are showing signs of wear and deterioration. This is most apparent along the main beam line at the interface between the lobby area and the main arena, where the tops of the concrete walls are chipping and deteriorating, and the bond break has become visibly detached from the wall/slab interface. A network of crack control joints appears to have been incorporated into the slab construction, however the exact layout was only partially visible at the time of review due to the applied floor finish.

Figure 3-8 Typical Doorway Threshold at Interior Masonry Wall

Figure 3-9 Debonding of Bond Break at Beam Line Between Rink and Lobby

The condition of the slab in the boiler room in the south end of the front lobby, was in visibly poor condition with scaling of the concrete and some deterioration visible in some locations. The various equipment drains all funnel to a floor drain in the slab where there is visible discoloration and staining. The improvised drainage system being used in the boiler room will need to be repaired and new concrete reinstated.

The sump pits and header trench for the rink brine system were also reviewed from within the front lobby. Where visible, the general condition of the concrete is showing mild discoloration and only minor cracking. The trench cover shelf angles and their hardware are showing sings or corrosion and discoloration.

Figure 3-10 Deterioration of Concrete in Front Mechanical Room

Figure 3-11 Header Trench Shelf Angle Corrosion

The outer walls appear to be on a system of grade beams with piles or foundation walls with strip footings, however this cannot be confirmed without a further, more intrusive review.

Recommendations

- Patch and repair masonry wall cracking with epoxy and/or re-grouting.
- Provide an expansion joint at the arena and curling rink walkway masonry wall interface.
- Repair and reinstate concrete and bond break at doorways where visibly debonding.
- Chip, clean and reinstate the base concrete around floor drains, particularly in the boiler room.
- Repair and replace the trench cover shelf angles around the sump pit and header trench.
- Clean and re-apply top finish on worn, exposed slab surfaces.
- Clean garbage out of attic space above lobby framing.

3.3 East Locker Room Addition and Ice Plant Expansion

The east locker room addition and ice plant expansion was completed in 2008 and is approximately 10 m by 26.5 m in overall size with the long direction of the addition parallel to the long direction of the main arena structure. The walls are 3,400 mm tall on the outer east side and the addition roof is sloped to join flush with the primary structure roof.

The original 190 mm CMU walls around the ice plant and Zamboni Room were partially preserved, new masonry walls added and dressing room 6 and the 'Blades' dressing room added as well, expanding the overall area footprint. The room order in the addition from southernmost to northernmost is ice plant, Zamboni Room, dressing room 6, mechanical/washrooms, 'Blades' dressing room.

The 2008 addition and expansion geometry can be summarized as follows:

- Dressing room 5 and 'Blades' dressing room are approximately 6 m wide by 7.6 m long.
- Mechanical and shower room space between the two dressing rooms, approximately 3 m wide by 7.6 m long.
- Zamboni Room geometry appears to have been changed to 3.4 m wide by 10 m long.
- Ice plant geometry also appears to have been increased to 6.4 m by 10 mm.

A series of reports and photographs is available for repair work that was completed on the primary rink structure roof and addition roof in 2021. These reports were helpful to the reviewer in determining deck information and provides an idea of the roof framing system.

3.3.1 Roof

Access to the addition ceiling space was not possible as it was sealed with drywall. Any available roof framing information was obtained from the 2021 roofing repair reports.

It is believed the roof system's primary direction of loading is across the addition's short length, between the east and west masonry walls and the roof bearing its ends on the 190 mm CMU, however this was not confirmed as part of the review. This would suggest that the addition roof primary framing is sloped to match the pre-engineered framing from the rink structure.

The roof deck is sized and oriented to match the existing arena rink structure, with flutes roughly 40 mm deep at 200 mm on center and running east-west end. The deck is fastened directly to framing below with the fastening pattern running north-south, suggesting the implementation of north-south oriented purlins here, like the main arena structure's framing arrangement.

3.3.2 Walls

The exterior walls of the addition are all 190 mm CMU, with a new 190 mm CMU wall that appears to have been added flush along the west face of the addition, next to the arena's existing pre-engineered framing. The two walls on either side of the Zamboni Room are also 190 mm CMU. All interior masonry walls around the middle mechanical space, showers, and washrooms as well as the CMU wall on the east side of the hallway are 140 mm thick CMU masonry.

Hammer sounding test revealed that there are vertically grouted CMU cores at 1,200 mm on center for the exterior CMU walls and hammer sounding also revealed that no regular pattern of vertically grouted masonry cores or horizontal bond beams exists in the preserved, original masonry walls. Doorway lintels in dressing rooms are grouted CMU masonry. No observable control joints were provided in the 190 mm or 140 mm CMU walls to allow for flexibility in the walls. A large 1,600 mm wide by 400 mm tall opening in the southernmost CMU wall at the ice plant is visible from outside for condenser unit services. No lintel support was found above or around the opening.

Cracking of roughly 0.40 mm was also visible near the Zamboni Room overhead doors. There is cracking apparent at many head-joint intersections between the interior 140 mm CMU walls in dressing rooms 5 and 'Blades' dressing room and their outer 190 mm CMU walls. At the northeast corner of 'Blades' dressing room, cracking in the masonry walls of about 0.80 mm across both the masonry bed joints and head joints was observed at the time of review. Further, there also appears to have been some differential settlement of 20 mm – 30 mm between the interior 140 mm CMU walls and the outer 190 mm CMU walls prior to the most recent painting of the walls.

Where the addition footprint is extended, the masonry walls are all on top of 200 mm wide by 100 mm tall concrete perimeter curbs. Cracking is visible at the base wall to top of curb interface in the dressing rooms. The 190 mm masonry walls in the Zamboni Room are variable in height from their bases between old concrete curb/slab to the new curbs. The masonry wall to concrete curb interface is stepped and irregular/poorly transitioned, with some reinforcing left exposed. Portions of the old slab are left exposed and reinforcing not properly removed or any cover restored to prevent moisture infiltration into the slab reinforcing.

Figure 3-12 140 mm CMU in Dressing Room 5

Figure 3-13 1,600 mm x 400 mm Opening Near Condensing Unit

Figure 3-14 Cracking, Offset of 20 mm – 30 mm in Masonry in Northeast Dressing Room 5

Figure 3-15 Cracking at Bottom of Masonry Wall and Curb in Dressing Room 5

Figure 3-16 Irregular/Poor Transition in Zamboni Room Wall

Figure 3-17 Irregular/Poor Transition in Zamboni Room Wall

An opening in the masonry wall near the southwest corner of the ice plant room appears to be supported with no lintel or vapour barrier and just broken out to access drainage within the rink space. The masonry block on either side of the opening where there should be vertical cores is not aligned and a clear, support for the wall opening is not established and block alignment is offset by 70 mm. This opening will need to either be fully supported with a dedicated steel or masonry lintel and full masonry block support provided on both sides of the opening. Further, this opening fully exposes the primary superstructure pre-engineered framing which is showing extensive signs of corrosion. This pre-engineered column corrosion issue is further explained in detail in Section 3.4.4.

Figure 3-18 Masonry Opening in Southwest Corner of Ice Plant

Figure 3-19 70 mm Masonry Wall Offset

The Zamboni Room overhead doors units are fastened directly to the CMU walls. The side support frames and door track is fastened back to masonry walls with 6 mm thick clips centered with 8 mm diameter anchors, spaced at 1,000 mm on center.

3.3.3 Base

The addition foundations were not determined at the time of review. The outer walls appear to be on a system of grade beams with piles or foundation walls with strip footings, however this cannot be confirmed without a further, more intrusive review or record drawings.

The base slabs in the dressing rooms area were reviewed in select locations. Areas near doorways and near floor drains appear to be in good condition with only minor cracking. Some cracks of roughly 0.40 mm were found in the mechanical space off the hallway. Some locations in the dressing room are showing visible discoloration of the slab and some corrosion from abandoned bench components or anchorage.

The base slab in the ice plant is in good condition with only minor cracking and discoloration at certain locations. However, the slab areas nearest to the brine tank are very discolored and are accumulating water, with there being some ponding from improperly drained water in the area. There is visible deterioration and scaling of the slab surface in these same locations. These locations are primarily concentrated in the southwest corner near the brine tank.

Figure 3-20 Cracking in Mechanical Room

Figure 3-21 Abandoned Base Anchorage in Dressing Room 5

Figure 3-22 Ponding of Water Near Brine Tank in Ice Plant

Figure 3-23 Staining and Scaling of Ice Plant Base Slab

The Zamboni room floor is showing signs of wear, visible discoloration and deterioration and cracking up to 1.5 mm in size. The ice resurfacer wheels are beginning to wear the concrete surface where repeated use has exposed the concrete aggregate. Not addressing this will cause further deterioration that can eventually erode the concrete cover and expose the steel reinforcing, causing further corrosion of the slab steel.

The west drainage pit concrete is in poor condition with the base slab beginning to erode around the drainpipe. This creates a lip around the floor drain, which only intensifies the concrete erosion effects of standing water. The east pit is showing some signs of discoloration and the grating supports are in relatively good condition, however some steel grating sections are showing signs of corrosion. The base of the pit is wet and dirty with extensive discoloration. And some initial signs of concrete deterioration.

Figure 3-24 Cracking in Southwest Corner of Zamboni Room

Figure 3-25 Moisture and Discoloration in Base of Zamboni Room East Pit

Figure 3-26 Extreme Concrete Degradation in Zamboni Room West Pit

Figure 3-27 General Slab Wear from Ice Resurfacer Traffic

3.3.4 Equipment Supports

The steel chiller skid in the ice plant is in generally good condition. However, the condition of all equipment supports are deteriorating significantly and showing signs of extensive corrosion near the brine tank. The condition of the equipment and their supports deteriorates considerably and correlates with proximity of the brine tank.

A clear impact radius of roughly 5 – 10 m can be seen around the brine tank where it is creating a major corroding effect on all steel elements in its proximity. Mechanical equipment, valves, piping and their clamps, hardware and supports are all showing signs of corrosion. The chiller skid unit is heavily corroded nearest the brine tank.

Figure 3-28 Corrosion on Equipment, Supports and Skid

Figure 3-29 Corrosion on Equipment, Supports and Skid

Figure 3-30 Brine Tank in Southwest Corner of Ice Plant

Recommendations

- Reinforce and provide lintel support for the opening in the southwest corner of the ice plant near the steel pre-engineered column where masonry support is irregular, provide vapour barrier.
- Where the pre-engineered column is experiencing major corrosion, provide waterproofing membrane to isolate this portion of the wall.
- Repair and reinstate the transitions between the old concrete slabs/curbs and the new 200 mm wide by 100 mm tall curbs in the Zamboni Room.
- Miscellaneous concrete repairs to curbs, slab and pits in the Zamboni Room and ice plant.
- Wire brush clean and repaint ice plant pipe supports and skid.
- Clean and re-apply top finish on worn slab surface in ice plant.
- Wire brush clean and repaint Zamboni Room gratings and supports.

3.4 Primary Arena Structure

The arena primary structure is approximately 78 m long by 34 m wide and the structure is framed with pre-engineered steel portal frames, steel roof purlins and steel roof deck. Wall girts and corrugated metal siding are provided for cladding support. The walls are approximately 4,600 mm tall at the perimeter and the roof profile matches the frame geometry with a gable peak at the middle.

Portions of the roof were repaired as part of roofing work done in 2021. As requested for the review, an interior wall panel near the northwest corner of the rink was removed to reveal the wall construction and an interior roof panel was removed in the second to northernmost bay on the east side of the arena roof to reveal the roof construction.

Conversations with the client regarding the concrete rink slab suggested it is in poor condition with many repairs being done over the years. The rink surface was covered in ice during the site review and its condition not visible at the time of review.

3.4.1 Pre-Engineered Steel Roof and Wall Framing

The pre-engineered framing bays are spaced at 7,000 mm on center (nine bays in the rink section and two bays in the front lobby section). The roof pre-engineered bays are spanned with 200 mm deep steel roof purlins, spaced at 1,500 mm on center, running north-south. The pre-engineered framing sections flare to a depth of 1,100 mm near their support, at the column face. Diagonal L64 x 64 angle kick braces are provided at the tops of columns.

The two front (lobby) bays of the pre-engineered framing are supported by intermediate steel columns. The first (southernmost) pre-engineered framing line above the lobby is supported at its third spans by steel columns, which were not accessible at the time of the review. The second southernmost (north end of the lobby) is supported by 150 mm wide by 220 mm deep pre-engineered back-to-back steel channel columns spaced at 4,500 mm on center. These steel support columns are fastened at their bases to a concrete foundation wall or grade beam with four 25 mm diameter anchor bolts and rise to the underside of the pre-engineered framing bottom flange. The final (northernmost) pre-engineered framing line is also a series of steel pre-engineered columns, 150 mm wide, depth not determined, spaced at 6,800 mm on center.

Lateral support for the pre-engineered framed structure is provided by 25 mm diameter threaded-rod and turnbuckle diagonal x-braces in select bays. There are visible signs of minor corrosion that can be seen on the cross-braces in some locations. The ends of the braces are fastened directly to the pre-engineered columns webs. This system of threaded rods and turnbuckle x-braces is provided in the roof plane as well to provide rotational stability between the pre-engineered framing bays.

Figure 3-31 Steel Pre-Engineered Framing

Figure 3-32 Pre-Engineered Steel Framing Above Lobby

Figure 3-33 200 mm Deep Steel Roof Purlins

Figure 3-34 Pre-Engineered Steel Framing at North End of Lobby

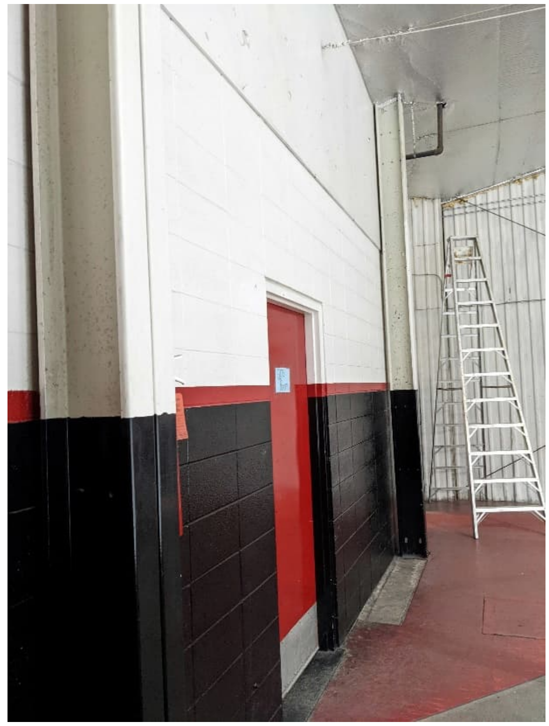


Figure 3-35 Rod and Turnbuckle Pre-Engineered Brace, Minor Corrosion

Figure 3-36 Brace Connection at Northernmost Framing Line

3.4.2 Wall Cladding and Roofing Support

The walls are cladded with corrugated metal siding which span top-to-bottom and are fastened to 200 mm deep wall girts spaced at 1,300 mm on center. At the exposed panel location, there was also some wooden backing provided between the girts, perhaps to allow for a closer fastening support spacing for the corrugated metal siding. Both the interior and exterior wall cladding run top-to-bottom and are fastened to the wall girts. Metal siding rib flutes are approximately 40 mm in depth and spaced at 200 mm on center. The cladding panels are fastened to the wall girts at the tops and bottoms of the panels, with screws at 200 mm on center. The walls sit on 250 mm wide by 400 mm tall concrete upstand walls.

Figure 3-37 Corrugated Siding at Northeast Corner

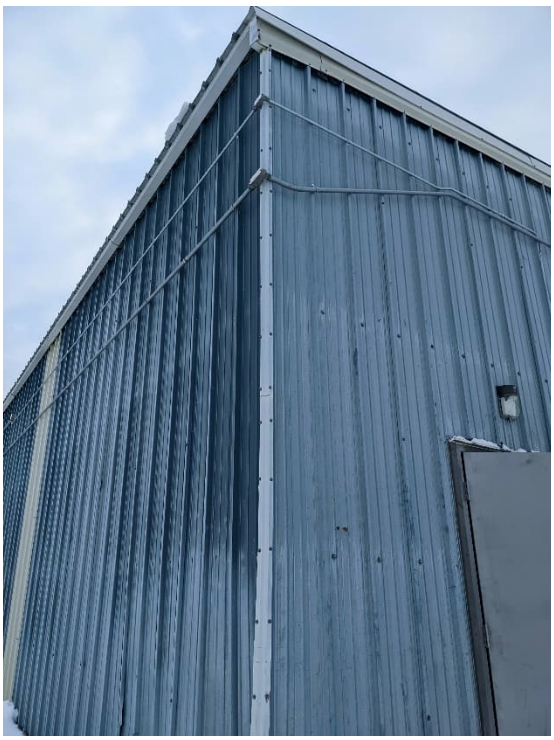


Figure 3-38 Steel Girt at Interior Exposed Panel

The roof deck rib flutes run east-west, are 40 mm deep and spaced at 200 mm on center with a ridge cap at the roof peak and eavestroughs on both the east and west roof edges. The deck is fastened to the purlins and at 200 mm on center between the deck rib flutes. There appears to be a system of flat, steel battens spaced at about 900 mm on center and running east-west that help support the insulation in the upper roof space.

3.4.3 Base Slab and Foundations

The primary structure foundations were not determined at the time of review. The outer walls appear to be on a system of grade beams with piles or foundation walls with strip footings, and pre-engineered columns center don concrete piles or piers. However, this cannot be confirmed without a further, more intrusive review or record drawings.

The primary rink structure pre-engineered steel framing columns are set onto 600 mm diameter concrete extensions which may be pile extensions, pedestals, or piers. There are four 25 mm diameter anchor bolts at the bases of the pre-engineered framing columns. There is variability in the amount of threading projecting from the tops of the nuts, with some bolts threaded too low and having *negative* projection of up to two to three threads.

The main arena spectator area is built on a structural base slab. Where visible, the concrete base slab is in generally good condition with minor cracking in some locations. Around the slab perimeter, where the slab meets the foundation wall/curb, debonding of the slab to curb interface was visible. Some visible efflorescence as well as frost was found along the wall/curb and base slab interface. Some areas of the main level slab are visibly worn and cleaning, reapplication of finish is recommended. The slab was not visible or accessible beneath the bleachers.

For information with structural comment and recommendations on the cold rink slab, refer to Section 2.4.2.

Figure 3-39 600 mm Diameter Concrete Pilecaps or Piers

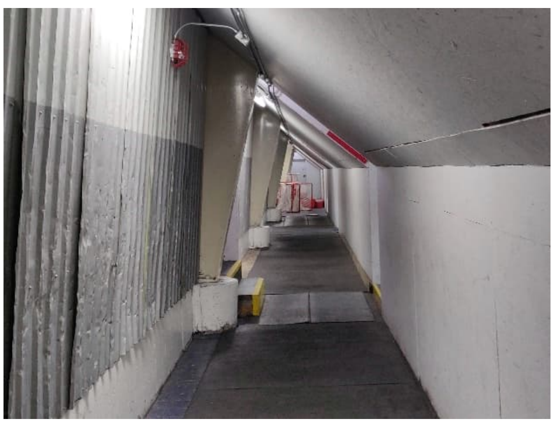


Figure 3-40 Low (Negative) Threading on Anchor Bolt

Figure 3-41 400 mm Tall Curb and Slab Interface Debonding

The foundation system was not determined as part of the review.

3.4.4 Corrosion at Pre-Engineered Column in Ice Plant

As mentioned in Section 3.3.2, the pre-engineered framing column nearest the ice plant room is experiencing extensive corrosion and even moderate section loss in some parts. The corrosion experienced here occurs along the bottom 1,000 mm -1,200 mm of the column base and, where visible, around the baseplate and anchorage.

This will need to be addressed as an immediate concern. The column will need to be properly exposed, cleaned and a more comprehensive review of the extent of the corrosion will be required. Investigation here is an item requiring immediate attention. Otherwise, the visual inspection of the pre-engineered portal frames in the arena, along with their bases and anchorage are in good condition with only minor corrosion found at some locations.

Figure 3-42 Corroding Pre-Engineered Steel Column Near Brine Tank

Figure 3-43 Corroding Pre-Engineered Steel Column Near Brine Tank

3.4.5 Miscellaneous Arena Structural and Wood Bleachers

There are two black steel platform frames to support dehumidifiers inside the rink. The frames are standard HSS 102 x 102 structural steel moment-frames. All connections are designed as moment resisting and the southeast frame is fastened back to the masonry wall with small clips and screws, presumably to have it mounted flush. The southwest frame has a small 600 mm cantilevered portion to the platform. With the frames being entirely moment resisting, the frame bases are free-standing and not bolted to the base slab.

Figure 3-44 Southeast Dehumidifier Steel Frame

Figure 3-45 Northwest Dehumidifier Steel Frame

There is a large steel frame supporting the condenser unit outside between the curling rink and the 2008 addition. The braced frame is entirely made up of small steel angle elements, including the main horizontal platform members, columns, diagonal braces, and kick braces. The condenser unit is set directly onto the framing with a small perimeter cantilevered grating walkway with guardrail around the east side of the unit.

The overall condition of the steel frame varies from element to element, where there is some visible corrosion found on many of the platform elements and some of the diagonal bracing. The bases and their anchorage are showing signs of corrosion where they are beginning to bleed, stain and discolor the tops of the concrete foundation piles. Substantial amounts of frozen water coming from the underside of the unit was visible at the time of the review. This suggests a high-moisture atmosphere for some of the frame elements and there was no indication of any of the steel elements having been galvanized. Only a standard primer finish was provided to this framing, no galvanizing.

Figure 3-46 Exterior Condensing Unit Steel Frame

Figure 3-47 Condensing Unit Steel Frame Corrosion and Ice

Access below the bleachers was not available at the time of inspection, however their condition from the topside appeared to be generally good. Their general build is a series of wooden stair stringers, posts, and continuous boards to create the stepped seating area on both sides. No structural concerns are found with the wooden bleachers and wooden supports/retrofitting within the arena.

Figure 3-48 Wood Bleachers

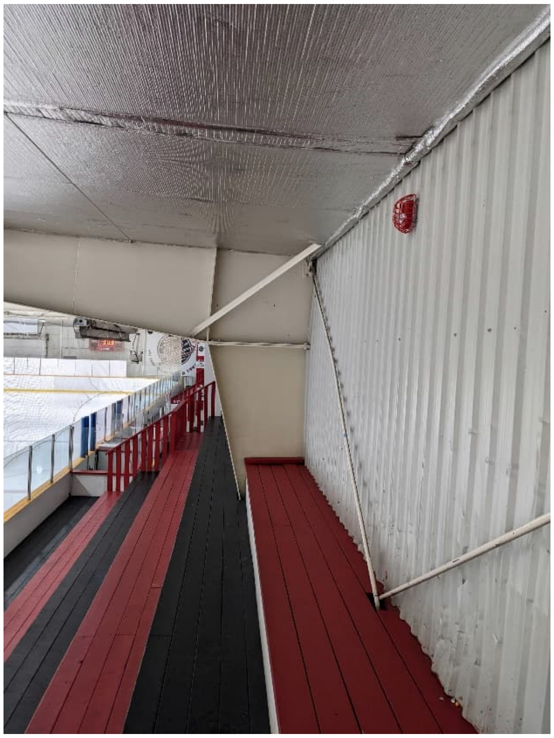


Figure 3-49 Arena Wood Beam Retrofit

Recommendations

- Repair and or replace the pre-engineered framing column segment nearest to the ice plant where the brine tank is causing a major corrosion concern.
- Where anchor bolts are not projecting sufficiently, splicing or cleaning and puddle welding of the anchor bolts to the nuts is required.
- Structural Roof inspection of Main building and east addition.
- Replace the condenser unit steel support frame with galvanized steel framing.
- Repair concrete slab where debonding from wall curb.
- Clean and re-apply top finish on worn slab surface.
- Wire brush clean and repaint pre-engineered steel.

3.5 Recommendations Summary

Recommendations accompanied by ranking priority and an estimated probable cost related to architectural work are presented below in Table 3-1. The following is a Class D estimate of probable costs for the repairs or replacements. "Immediate" is considered risks to the public's safety, "high" is within 1 to 5 years, "medium" is within the next 6 to 10 years, and "low" is within the next 11 to 20 years. Values are probable costs in 2022 dollars and are assumed to be combined with other scope items.

Table 3-1 Estimated Costs for Structural Upgrades

Disc.	Asset	Work Description	Priority	Estimated Cost
Struc.	Arena	Expansion to allow for NHL size rink, Zamboni room relocation	Immediate	$450,000
Struc.	Arena	Repair anchor bolts at pre-engineered columns to reinstate adequate projection	Immediate	$18,000
Struc.	Arena	Repair the pre-engineered framing column segment near the ice plant brine tank	Immediate	$6,000
Struc.	Arena & Addition (Roof)	Structural roof inspection of main building and east addition.	Immediate	$5,000
Struc.	East addition (Ice Plant)	Provide lintel support for the opening in the southwest corner of the ice plant masonry wall opening near brine tank	Immediate	$2,000
Struc.	Front Lobby Area	Patch and repair masonry wall cracking with epoxy	High	$15,000
Struc.	Front Lobby Area	Provide expansion joint at the arena and curling rink walkway masonry wall interface	High	$4,000
Struc.	Arena	Replace the condenser unit steel support frame with a galvanized steel frame	High	$18,000
Struc.	Arena	Repair concrete slab where debonding from wall curb	Medium	$63,000
Struc.	Arena	Clean and re-apply top finish on worn slab surface	Medium	$5,000
Struc.	Front Lobby Area	Repair and reinstate concrete and bond break at doorways	Medium	$27,000
Struc.	Front Lobby Area	Chip, clean and reinstate the base concrete around floor drains, particularly in the boiler room	Medium	$12,000
Struc.	Front Lobby Area	Repair and replace the trench cover shelf angles around the sump pit and header trench	Medium	$15,000
Struc.	East addition (Zamboni Room)	Repair base of wall concrete curb transitions in the Zamboni Room	Medium	$11,000
Struc.	East addition (Zamboni Room)	Miscellaneous concrete repairs to curbs, slab and pits in the Zamboni Room and ice plant	Medium	$45,000
Struc.	East addition (Zamboni Room)	Wire brush clean and repaint steel ice plant supports and skid	Medium	$3,000
Struc.	Front Lobby Area	Clean and re-apply top finish on worn slab surfaces	Low	$3,000
Struc.	Front Lobby Area	Clean garbage out of attic space above lobby framing	Low	$1,000
Struc.	East addition (Ice Plant)	Clean and re-apply top finish on worn slab surface in ice plant	Low	$3,000
Struc.	East addition	Wire brush clean and repaint Zamboni Room grating	Low	$3,000

Disc.	Asset	Work Description	Priority	Estimated Cost
	(Zamboni Room)			
Struc.	Arena	Wire brush clean and repaint pre-engineered steel	Low	$3,000

TOTAL IMMEDIATE PRIORITY	$481,000
TOTAL HIGH PRIORITY	$37,000
TOTAL MEDIUM PRIORITY	$181,000
TOTAL LOW PRIORITY	$13,000
TOTAL	$712,000

4 MECHANICAL

4.1 Plumbing Systems

4.1.1 Sanitary Drainage

The building has a buried sanitary main which collects drainage from the plumbing fixtures installed in the building and connects to the municipal service on-site. Most of the sanitary system could not be observed, but the original sanitary risers at cleanout access panels were observed to be cast iron. The cast iron risers are showing significant surface corrosion. Drainage from individual plumbing fixtures is a variety of PVC, copper and coated brass materials, generally in fair condition.

Figure 4-1 Typical Cast Iron Sanitary Riser

Figure 4-2 Exposed Copper and PVC Sanitary Piping Under Concession Sink

4.1.2 Stormwater Drainage

The building does not have a storm drainage system within the building as an exterior gutter system manages stormwater collected from the sloped roof. Refer to the architectural section for more information.

4.1.3 Domestic Cold Water and Domestic Hot Water Piping

Domestic water for the building is supplied by a 40 mm water entry within the mechanical room in the south side of the building. The current water entry is too small to permit future sprinkler system installation. The buried portion of the water service appears to be a larger diameter cast iron piping, which immediately transitions to 40 mm copper after penetrating the mechanical room slab. The entry does not appear to have a backflow preventer installed but is equipped with a water meter and a shutoff valve. It is recommended to install a backflow preventer to protect the municipal water supply against backflow from the building. A backflow preventer is currently installed on the make-up line feeding the ice plant.

Copper distribution piping connecting to plumbing fixtures is used throughout the building for both hot and cold water piping. Portions of the domestic water piping appear to have been replaced, such as near the water heating equipment. Some of the replaced domestic water piping in the south mechanical room is PEX and is run haphazardly and is not properly supported. We recommend adding additional pipe supports to secure this piping. The typical lifespan for copper plumbing piping is approximately 50 years, making the piping in the original areas of the building due for replacement.

The hot and cold domestic water piping are only insulated in a few areas within the original building. The insulation is covered in canvas wrap and has banding for identification. The original piping has been replaced in some areas where equipment replacements have occurred, and where the piping was revised when the change room addition was added to the building. Generally, the newer plumbing piping appears to be in fair condition, but moderate surface corrosion is developing where the piping is original to the building.

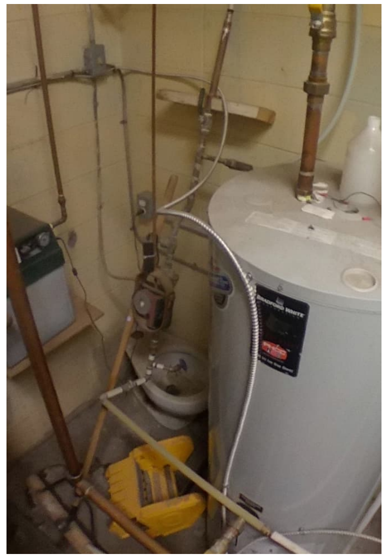
Recommendations

- Install backflow preventer on domestic water entry.
- Add pipe supports in mechanical room.
- Monitor piping in older areas of the building for leaks, consider replacement of older plumbing piping when leaks begin occurring.

Figure 4-3 Domestic Water Service Entry in South Mechanical Room

Figure 4-4 Typical Copper Piping in South Mechanical Room

Figure 4-5 Haphazard Domestic Water Piping in Mechanical Room



4.1.4 Domestic Water Heating Equipment

The building has two independent domestic hot water heating systems.

The south mechanical room contains two matching Bradford White tank style indirect water heaters (46 kW, 215 L, circa 2018) which are heated using hot water from the wall-hung boiler. The south domestic hot water system serves plumbing fixtures throughout the building, except for the new change room addition on the east side of the arena, and includes washrooms, player change room showers, janitor room mop sinks and a concession sink. The system is equipped with a 3-speed Grundfos domestic hot water recirculation pump. The pump was switched off at the time of the review but appears operational when switched on. The recirculation line appears to be run to the shower in the girl's change room. During the review, it was noted that hot water took a long time to become available in the public washroom and player change rooms, which we assume is due to the recirculation pump not running. It is possible, but not confirmed, that the pump was shut off to reduce load on the boiler during past troubleshooting. We recommend running the circulation pump constantly to reduce water use by building occupants or installing an aquastat to operate the pump based on return water temperature. If hot water delivery continues to be a problem, or if it causes problems with boiler operation, the domestic water piping can be insulated to reduce heat loss between the water tanks and the fixtures. We also recommend adding hot water traps or check valves to prevent hot water from migrating to the domestic cold water.

A second domestic hot water system is installed in the east player change room addition to serve the shower rooms for the new change rooms. This system is comprised of a single A.O. Smith gas-fired tank style water heater (52 kW, 306 L, circa 2010). This water heater does not have a recirculation system, but it is physically closer to the plumbing fixtures it serves, so the hot water delay is not expected to be as big an issue. A check valve is located on the domestic cold water connection.

Recommendations

- Run hot water recirculation pump 24/7 or install aquastat control.

- Insulate the domestic water piping if recirculation pump does not fix hot water delivery issue, or if pump operation puts too high a load on the boiler system.
- Install hot water traps or check valves at the south domestic water heaters.

Figure 4-6 Domestic Water Heaters in South Mechanical Room

Figure 4-7 Water Heater in 2010 Expansion Area

4.1.5 Plumbing Fixtures

The public washrooms and player change rooms in the original area of the building are equipped with flush-tank style water closets of various models, lavatories with manual faucets, and manually operated flush-valve urinals in the men's washroom. Floor drains are provided in each washroom. In general, the plumbing fixtures are somewhat dated, but functional. In the men's public washroom, the stops are broken on one faucet (allowing the faucet handle to be rotated a full 360 degrees), and the lid on one of the water closets does not fit the tank. Some of the lavatories are also missing drain stoppers. We recommend replacement of the water closets, urinals and lavatories in the near future to update the aesthetics and to implement automatic lavatory and urinal valves. The water closets likely cannot be replaced with flush valves due to the small size of the existing domestic water pipe size.

The player change rooms in the original areas of the building are also equipped with showers of various models that have manual hot/cold knob adjustment. The showers do not appear to have thermostatic mixing valves or tempering valves. One shower head in change room 5 and the shower controls in the girl's change room do not work well. We recommend installing tempering valves to limit hot water delivery to the showers at 49°C, per NPC 2015, and replacing the faucets with infrared sensors or push-button metering faucets using thermostatic mixing valves to minimize risk of scalding and to restore function. Floor drains are provided in the drainage trench for each shower group and appear to be in fair condition.

The player change rooms in the 2010 expansion have more modern fixtures than the original building areas. The lavatories are manual faucets with thermostatic mixing valves and the water closets are flush-tank type. The showers are individual enclosures with thermostatic mixing valves. Generally, the fixtures are in fair condition, however, it was noted that the floor drain strainers are popping out of the rubberized flooring and should be replaced with a more secure strainer.

There is one water fountain in the main lobby area of the building of unknown install date. We recommend replacing the fountain with a bottle fill station as the washroom lavatories are not ergonomic for filling bottles.

The concession area contains a three-compartment sink with two swing-faucets. The fixture appears to be in working order but is a bit dated. The sink does not currently have a grease interceptor, which we recommend installing so that grease from the range and fryer do not accumulate in the sanitary system over time. The concession also contains two countertop beverage machines which are fed by PEX tubing underneath the counter, which should be better supported to prevent accidental damage.

The mop sink in the janitor closet is a concrete basin with hot/cold hose bibs with hose connections. The mop sink appears to be original to the building, is rather small, and is quite dirty. A second, newer, mop sink is located in the 2010 change room expansion area and appears to be in fair condition but is currently buried under boxes of alcoholic beverages. We recommend replacing the original mop sink with a larger basin and wall-mounted vacuum-breaker faucet, similar to the newer mop sink.

The Zamboni Room h as a small drainage trench, which appears to be draining properly. The trench is quite small and building staff stated that they do not use the trench for melting snow as all snow from the ice resurfacer is deposited outdoors. Hot and cold quick-connect hose ends are provided beside the trench for housekeeping and appear to be in fair condition.

A make-shift hub drain has been created in the mechanical room but makes working in the room cumbersome. We recommend replacing this fixture with a proper hub or funnel floor drain designed for the purpose.

Recommendations

- Replace aging flush-tank water closets in original building area with matching fixtures.
- Replace aging dual-faucet lavatories in original building area with infrared or thermostatic mixing valve manual faucets.
- Replace aging urinals in men’s washroom with infrared flush valves.
- Replace change room showers with new thermostatic metering showers.
- Install tempering valve on shower hot water supply.
- Replace floor drain strainers in change room addition area.
- Replace water fountain with bottle fill station.
- Install grease interceptor for concession sink.
- Secure under-cabinet PEX tubing in concession.
- Replace original mop sink.
- Install new hub or funnel floor drain in the south mechanical room.

Figure 4-8 Typical Lavatory in Original Building Area

Figure 4-9 Typical water closet in Original Building Area

Figure 4-10 Typical Shower in Original Building Area

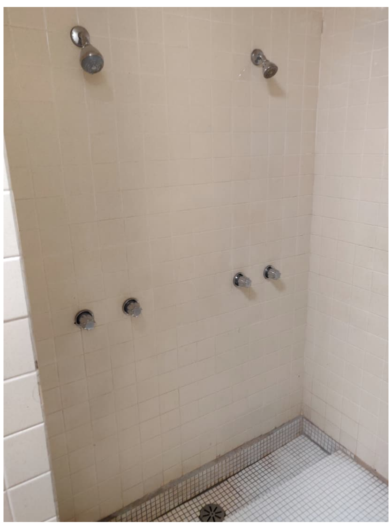


Figure 4-11 Typical Urinal in Original Building Area

Figure 4-12 Typical Floor Drain in Original Building Area

Figure 4-13 Typical Lavatory in 2010 Player Change Rooms

Figure 4-14 Typical Water Closet in 2010 Player Change Rooms

Figure 4-15 Typical Shower in 2010 Player Change Rooms

Figure 4-16 Water Fountain in Lobby Area

Figure 4-17 Three-Compartment Sink in Concession Area

Figure 4-18 PEX Tubing Serving Coffee Equipment in Concession Area

Figure 4-19 Mop Sink in Original Building Area

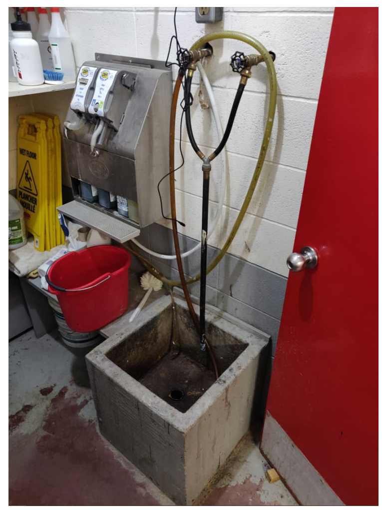


Figure 4-20 Mop Sink in 2010 Change Room Area

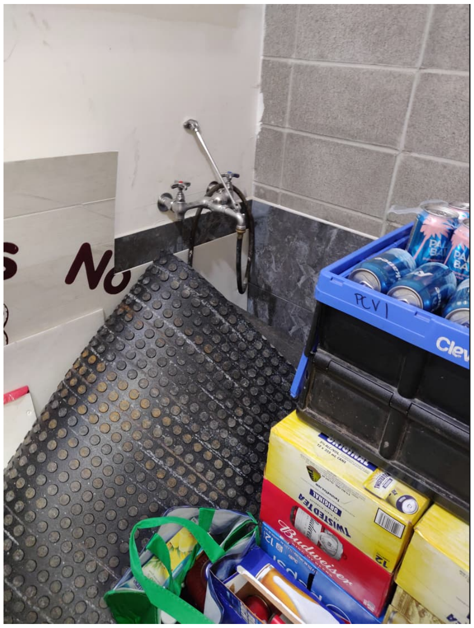


Figure 4-21 Hose Connections in Zamboni Room

Figure 4-22 Zamboni Room Trench Drain

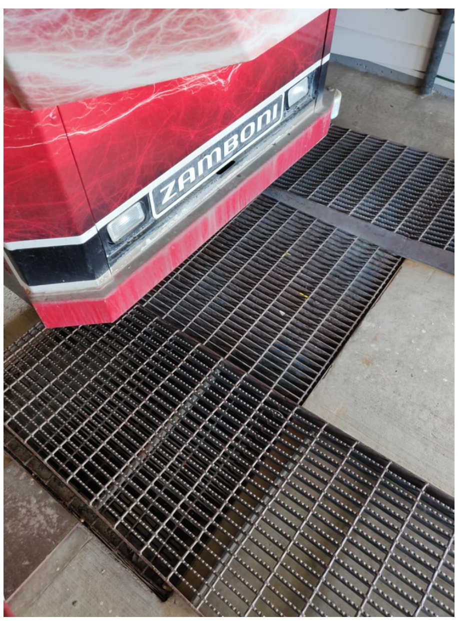


Figure 4-23 South Mechanical Room Floor Drain

4.1.6 Natural Gas

Natural gas is provided to the building from the gas service on the south side of the building, equipped with a regulator set on the outside of the building and gas meter inside the south mechanical room. Additional regulators are located downstream of the main regulator to reduce the pressure for appliances requiring low pressure.

Natural gas piping is threaded steel pipe and is run to the gas-fired appliances within the building including the wall-hung boiler, infrared tube heaters in the arena and commercial cooking equipment in the kitchen. The natural gas piping is partially painted orange in the mechanical room, white in the kitchen, yellow in 2010 change room addition and is unpainted in other areas of the building. Although the gas piping is generally in fair condition, there are a few locations where pipe and fittings, especially where unpainted in the arena, are showing significant surface corrosion. The piping may be susceptible to leaking at corroded joints. We recommend replacing all corroded fittings and sanding and painting the piping within the arena to slow corrosion. Some pipe hangers are also heavily corroded and should be replaced at the same time.

Recommendations

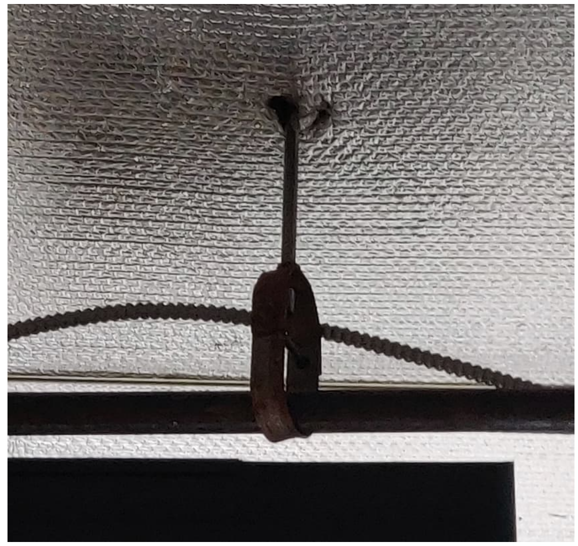
- Replace corroded gas fittings and gas pipe hangers.
- Sand and paint unpainted steel piping in the arena.

Figure 4-24 Building Gas Regulator

Figure 4-25 Building Gas meter

Figure 4-26 Typical Corroded Gas Pipe Fitting in Arena

Figure 4-27 Typical Corroded Gas Pipe Hanger in Arena



4.2 HVAC System

4.2.1 HVAC – Arena

The arena is heated only by four infrared tube heaters located above the stands on the perimeter of the rink, manufactured by Superior Radiant Products and Vantage. A fifth tube heater is located in the Zamboni Room adjacent the arena. All of the tube heaters appear to be quite old and appear to be at end-of-life. We recommend replacing the tube heaters. The galvanized steel tube heater flues are showing moderate corrosion and should be replaced at the same time as the heaters.

The arena has three exhaust fans installed in the envelope, without backdraft dampers, and has a relief grille in the wall to draw air in through the attic above the lobby area of the building. The exhaust fans are not typically used by building operators. This means that there is no ventilation when the propane ice resurface is operating. Lack of ventilation could lead to build-up of hazardous gasses within the arena. Additionally, ASHRAE 62 outdoor air requirements are not met for the arena. Furthermore, the exhaust fans appear to have passed their expected lifespan. We recommend replacing the exhaust fans and installing a gas detection system (CH_3, CO, NOx) within the arena to detect and control hazardous gasses. We also recommend completing a ventilation study to verify ASHRAE 62 compliance for the arena before replacing the fans. Finally, we recommend conducting a review of the building operation procedures to ensure the exhaust fans are operated when the building is occupied by the public and when the ice resurfacer is being used. Alternatively, the fans can be controlled based on a timer synchronized with typical hours of operation.

The arena is also equipped with two Thermoplus Ice Rink dehumidifiers, (circa 2016) to control humidity within the arena. The humidifier drains are heat traced and run through the building envelope to the exterior. No issues were identified regarding the dehumidifiers.

The Zamboni Room has a gas detection system installed which monitors both propane and carbon monoxide levels within the room. However, the Zamboni Room does not have any ventilation equipment to control indoor pollutant levels. While propane cylinders are not filled inside the Zamboni Room, operation of the ice resurfacer can cause exhaust gasses to accumulate in the room unless the exterior overhead door is left open. We recommend adding a ventilation system to clear any hazardous gasses that are in the space.

Recommendations

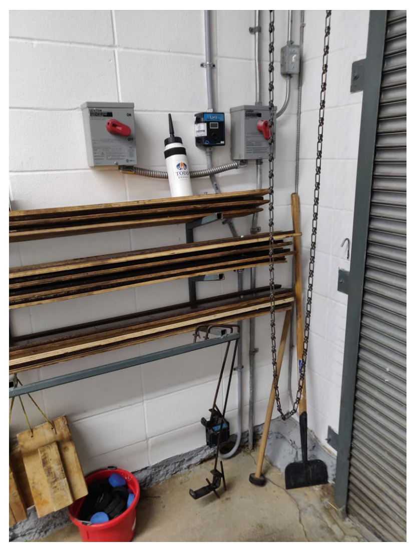
- Replace the arena exhaust fans and install a timer to control fan operation.
- Install a gas detection system for the arena and interlock controls with exhaust fan operation.
- Complete an ASHRAE 62 ventilation study to confirm ventilation rates.
- Install a ventilation system for the Zamboni Room to control hazardous gasses.

Figure 4-28 Typical Tube Heaters in Arena

Figure 4-29 Typical Arena Exhaust Fan

Figure 4-30 Typical Dehumidifier in Arena

Figure 4-31 Gas Detection System in Zamboni Room



4.2.2 HVAC – Original Building Area

The original building areas are heated by a single natural gas-fired NTI wall-hung condensing boiler (116 kW, Circa 2008). The boiler also provides hot water to the building via the indirect domestic water heaters. The boiler drain does not have a condensate neutralizer, and may therefore cause corrosion of the cast iron sanitary drainage system. We recommend installing a condensate neutralizer to extend the life of the sanitary drain. The PVC boiler flue vent appears to be stained from condensate or a roof leak, likely from metal flashing at the roof termination. The escutcheon at the ceiling is also damaged. We recommend replacing the corroding/leaking vent termination components and escutcheon to maintain the fire separation in the mechanical room. While the boiler still has approximately 10 years in its expected service life, building staff indicated that there have been problems with the boiler in the past, although the boiler is currently working properly. The combustion air for the boiler is provided by an opening in the wall. We recommend clearing the debris building up on the combustion air screen and installing an arctic trap to reduce cold air infiltrating the mechanical room.

The heating system has three similar multi-speed Grundfos circulator pumps (Circa 2007, 2010 and 2011). These pumps circulate heating fluid through the boiler, supply heating fluid to the building, and supply heating fluid to the indirect domestic water heaters. The 2011 pump is missing the cover for the wiring enclosure. The expected life for an in-line circulator pump is only 10 years, so these pumps are all at the end of their expected life and should be replaced.

The building is heated by baseboard heaters within each perimeter space, which are controlled by electronic wall-mounted thermostats. We recommend replacing the baseboards in a few locations where they are damaged and missing end-caps (at least three locations). Baseboards in other areas can be sanded and repainted to restore their aesthetic. There is a baseboard located in a shower enclosure in the south-most player changeroom, which is corroded from water splashing on it. We recommend replacing this heater further up on the wall out of the splash-zone for the shower.

An electric Ouellet unit heater (10 kW, Circa 2008) is installed in the lobby, near the main building entrance has reached the end of its expected lifespan and should be replaced.

The original building area is not ventilated, except for individual cabinet exhaust fans located in each of the public washrooms, player change rooms change rooms, and small perimeter spaces including the janitor room, storage room and office. Most of the exhaust fans were not running at the time of the review, and the controls to activate the fans was not located. Building staff indicated that they did not know where the fan controls were located and are uncertain if the fans are working. Exhaust fans in the janitor room, office and storage room were missing intake grilles, and the exhaust fan in the public women's washroom was making an audible buzzing noise. We recommend replacing all the cabinet exhaust fans in the original building areas as they all appear to be past their expected lifespan.

Currently, the building does not have adequate outdoor air to meet ASHRAE 62 requirements, and the building is negatively pressurized due to the exhaust fans installed throughout the building. We recommend installing a new air handling unit with distribution ductwork to deliver outdoor air to meet ASHRAE 62 requirements. A study should be conducted to verify the amount of outdoor air required in each room. Pressurizing the main building areas with the new air handling unit should also help to keep humidity from the arena out of the building and may extend the life of existing building systems by reducing corrosion due to humidity and condensation on cold surfaces.

Recommendations

- Install a condensate neutralizer on the boiler condensate drain.
- Repair corroded/leaking termination for boiler flue vent and replace damaged escutcheon.
- Install arctic trap on combustion air duct and clear debris from screen.
- Replace damaged baseboard heaters and heater in shower enclosure (approximately five heaters).
- Replace all cabinet exhaust fans in original building area.
- Replace electric unit heater in lobby.
- Complete an ASHRAE 62 ventilation study.
- Install a new air handling unit and distribution ductwork to ventilate the building, following ASHRAE 62 study.

Figure 4-32 Heating System Boiler

Figure 4-33 Boiler Flue Vent and Damaged Escutcheon

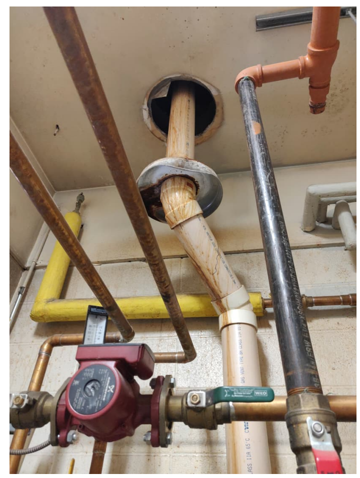


Figure 4-34 Combustion Air Opening in South Mechanical Room

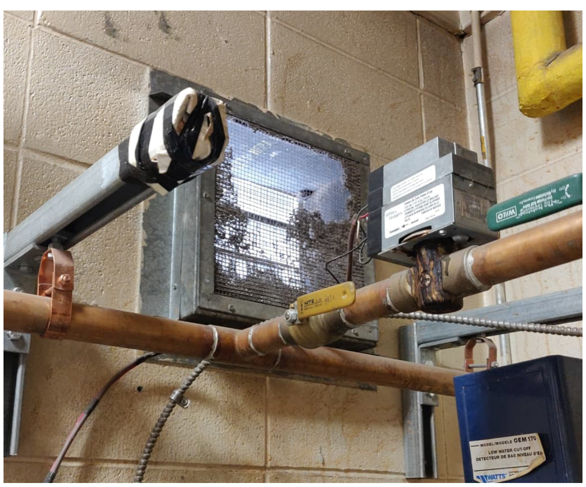


Figure 4-35 Typical Circulator Pump in South Mechanical Room

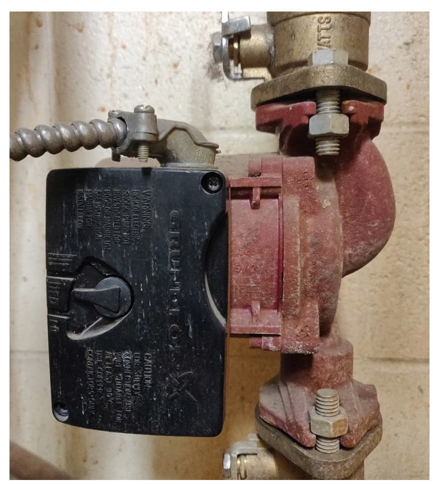


Figure 4-36 Typical Baseboard Heater Missing End-Cap

Figure 4-37 Baseboard Heater in Shower Enclosure

Figure 4-38 Electric Unit Heater in Lobby

Figure 4-39 Typical Cabinet Exhaust Fan Missing Grille

4.2.3 HVAC – Kitchen

The commercial kitchen in the center of the Lobby area equipped with a centrifugal roof-mounted exhaust fan to extract air from the commercial range hood. This fan was not observed due to the safety concerns of accessing the sloped roof during the winter, but is believed to be past its expected lifespan. Currently, there is no make-up air for the kitchen and air is drawn into the kitchen from the main lobby area. We recommend installing a new make-up air unit for the kitchen to prevent the building from becoming negatively pressurized when the exhaust fan is in use.

Recommendations

- Install a make-up air unit for the kitchen.

4.2.4 HVAC –Change Room Addition

The change room addition is heated and ventilated by a single Frigidaire gas-fired furnace (42 kW, Circa 2005). The furnace has just reached the end of its expected service life this year and should be replaced. The galvanized steel furnace ductwork and venting generally appear to be in fair condition and are relatively free of corrosion. The furnace air filter appeared to be relatively clean. A humidistat is provided for the furnace system, but the furnace does not appear to have a steam grid, so it is unclear if there is a duct-mounted humidification grid above the ceiling, or if the humidistat controls the exhaust system. Building staff have noted that player jerseys left to dry in the north player changeroom freeze overnight. This is likely, in part, due to the furnace thermostat being located in the interior furnace room where it does not perceive building heating demand. We recommend relocating the furnace thermostat to the north changeroom where the freezing is occurring. A locking cover can be installed over the thermostat to prevent tampering. If this solution does not resolve the freezing issue, corrections involving the building envelope may be required. It was also noted that the furnace fan is set to automatic mode, meaning that there is no outdoor air delivery to the change room addition spaces unless the furnace is actively heating. We recommend adjusting the controls so that the furnace fans run continuously while the building is occupied, and recommend completing a ventilation study to confirm that outdoor air rates comply with the ASHRAE 62 standard.

Each of the change rooms in the addition has a cabinet exhaust fan located in the shower area. These fans appear to be original to the addition and have approximately 5 years of service life remaining.

Recommendations

- Replace the furnace serving the change room addition.
- Relocate furnace thermostat to north-most player change room, option to add lockable cover.
- Adjust furnace fans to run while building is occupied.
- Complete an ASHRAE 62 ventilation study.
- Replace addition washroom exhaust fans in approximately 5 years.

Figure 4-40 Furnace Serving Change Room Addition

4.2.5 HVAC – Class T Machine Room (Ice Plant Room)

The ice plant machine room is heated with an electric unit heater with thermostatic control. Wall-mounted propeller supply and exhaust fans with a set of dampers comprise the ventilation system, neither of which were operating at the time of review. A gas detection system is in place with PPM readouts for ammonia located outside the man-door access from the arena, and within the machine room itself. Strobe alarms are located at each of the doors to enter the machine room.

The following code deficiencies were noted for the room, based on the requirements for Class T Machine rooms in CSA B52:

- Vestibules are required at the doorways from the arena and Zamboni Room.
- Fire rated walls must be sealed around pipes and other penetrations.
- Ventilation system activation-only switches and ammonia plant emergency shutdown switches must be located outside the interior entrances to remotely activate the ventilation system and disable the ammonia plant.
- The ventilation system does not provide the minimum airflow rate while the plant is operating. Rupture ventilation airflow rate was not confirmed.

Additionally, although not a strict code requirement, we recommend providing additional PPM readouts at the other entrances to the machine room.

A sign in the arena directs to the machine room for an eyewash station, which is a single plastic bottle located inside an unmarked cabinet in the machine room and has passed the expiry date printed on the bottle. We recommend installing a new conspicuous wall-mounted eyewash meeting the ANSI Z358.1 standard.

Recommendations

- Build vestibules for the interior entrances to the machine room.
- Seal all openings to restore the integrity of the fire rated walls.
- Install remote ventilation activation switches and emergency shutdown switches outside entrances to the machine room.
- Revise ventilation system controls to provide the minimum airflow rate while the ice plant is in operation.
- Install additional PPM readouts (two) so that there is one at each entrance to the machine room.
- Install an eyewash station to ANSI Z358.1.

Figure 4-41 Unit Heater and Propeller Fan in Machine Room

Figure 4-42 Second Propeller Fan Serving Machine Room

Figure 4-43 Gas Detection System and Eyewash Sign Outside Machine Room

4.3 Ammonia Ice Plant

The skid-mounted Ammonia Ice Plant is installed in a Class T machine adjacent the arena and is comprised of two reciprocating Mycom compressors, a shell-and-tube chiller and outdoor evaporative condensing unit. Chilled brine is circulated to both the hockey arena slab, as well as to a curling rink adjacent to the arena. Based on discussion with building operators, the original ice plant was built to serve just the hockey rink, and was retrofitted around the time when the curling rink was built at a later date. The hockey rink does not have a heated slab beneath the chilled slab, but the ice plant currently has heating piping to a heated slab for the curling rink using waste heat from the ice plant.

The ice plant is configured such that compressor #1 can provide chilled brine to both the hockey rink and the curling club, and compressor #2 can only supply cooling to the curling club. The compressors are approximately 20 years old, but have undergone major service about 3 years ago. Currently, compressor #2 is shut down due to a low-voltage fault, presumed to be a suction line issue. Additionally, it is known that the chiller is failing due to corroded heat exchanger tubes and requires immediate replacement. From a visual review of the ice plant equipment, it is apparent that most of the equipment, including compressors and pumps serving the hockey arena have reached (or are close to) the end of their expected service life. The majority of equipment and piping is heavily corroded where uninsulated, a fitting on the brine piping appears to be leaking brine on the floor of the ice plant, and there is evidence of past oil leaks. Only a few components, such as one of the brine pumps serving the curling club, appear to have any service life left.

Due to the failing condition of the chiller, we recommend immediate replacement of the chiller. A full replacement of the ice plant should also occur in the near future to restore the service of life of the ice plant. This replacement should also include the outdoor piping and condensing unit. Continuing replacement of individual failed components into the future likely require more downtime and a higher overall cost.

The owner has expressed interest in increasing the size of the ice surface, which should be done concurrently with the ice plant replacement as this may affect the sizing of the plant. In addition, modifications are likely required to the header trench to suit the increased capacity. Although the header trench condition was not observed due to ice buildup on the piping surface, we recommend including an allowance for replacement of the header trench when the ice plant is replaced.

Recommendations

- Replace the chiller immediately.
- Full replacement of ammonia plant in near future.
- Replacement of brine header within header trench.

Figure 4-44 Ice Plant Compressors

Figure 4-45 Ice Plant Chiller

Figure 4-46 Ice Plant Brine Pumps

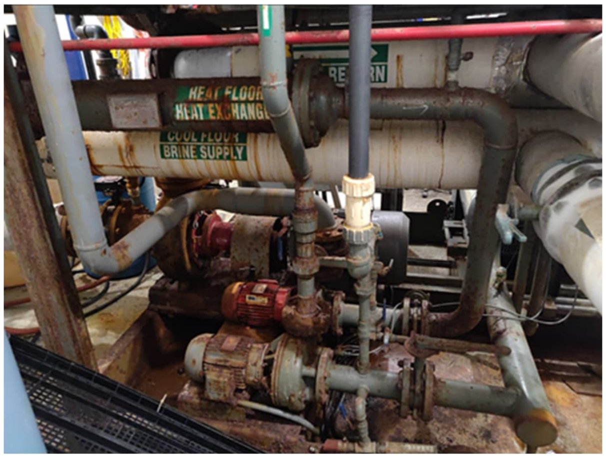
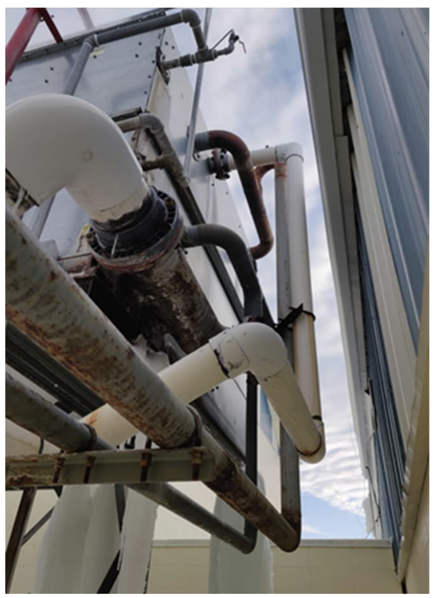


Figure 4-47 Ice Plant Condensing Unit

Figure 4-48 Ice Plant Condensing Unit Piping



4.4 Controls

The building does not have a central control system and makes use of a combination of packaged equipment controls and individual thermostats to control heating equipment. Installed thermostats are a variety of models, but the typical thermostat within the building is digital, non-programmable, and does not have night setback capability. We recommend replacing thermostats with programmable thermostats so that an unoccupied setback temperature can be set for the building as a minor energy saving measure.

Recommendations

- Replace thermostats with programmable thermostats with night-setback capability.

4.5 Fire Protection

The building does not contain a sprinkler system. Although a sprinkler is not currently required, completing future building layout changes will likely trigger the requirement to add a sprinkler system. We recommend carrying an allowance for installation of a new sprinkler system, including a dry zone for the arena. Note that a water service upgrade would be required for installation of a sprinkler system.

General purpose ABC fire extinguishers appeared to be installed at appropriate locations along egress paths and were found to be charged and complete with inspection tags with the most recent inspection having been completed for February 2022. The fire extinguishers were mounted with appropriate hardware, although the fire extinguisher near the player change rooms in the arena has chipping paint and should be replaced soon as the steel vessel may begin to corrode and weaken.

A fire suppression system which appears to be designed to NFPA 96 is installed within the kitchen hood, with inspection tag visible, but NFPA 96 compliance was not verified as part of this review. A Class K fire extinguisher was not observed in the commercial kitchen. We recommend installing a Class K extinguisher for management of grease fires.

Fire separations are required in rooms where gas-burning equipment is installed. The south mechanical room, furnace room for the addition, and the ice plant machine room have pipes penetrating fire rated walls without adequate fire caulking. We recommend sealing all penetrations through fire rated walls to restore their integrity. Refer to the architectural section of this report for additional comments on fire separations.

Recommendations

- Carry a cost allowance for sprinkler system for future floorplan changes.
- Replace ABC fire extinguisher in arena.
- Install a Class K fire extinguisher in the commercial kitchen.
- Seal and fire caulk mechanical penetrations through fire rated walls.

Figure 4-49 ABC Fire Extinguisher in Arena with Chipped Paint

Figure 4-50 Gap in Fire Separation at Natural Gas Piping Through South Mech Room Ceiling (Typical)

Figure 4-51 Gap in Fire Separation at Piping Through Furnace Room Wall (Typical)

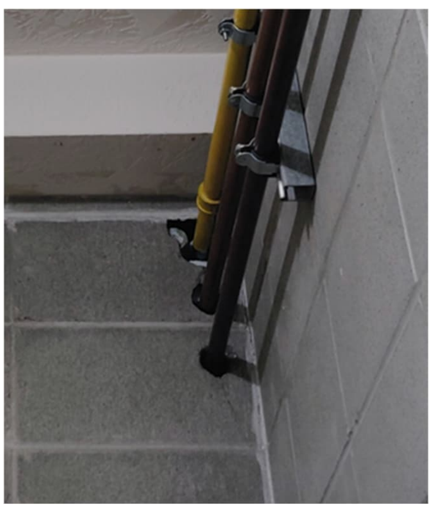


Figure 4-52 Gap in Fire Separation at Piping Through Ice Plant Machine Room Wall (Typical)

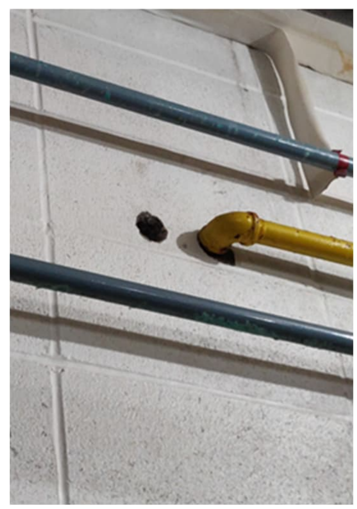


Figure 4-53 Range Hood with Fire Suppression System

4.6 Recommendations Summary

Recommendations accompanied by ranking priority and an estimated probable cost related to mechanical work are presented below in **Table 4-1**. The following is a Class D opinion of probable costs for the repairs or replacements. “Immediate” are considered risks to the public’s safety, “high” is within 1 to 5 years, “medium” is within the next 6 to 10 years, and “low” is within the next 11 to 20 years. Values are probable costs in 2022 dollars and are assumed to be combined with other scope items.

Table 4-1 Estimated Costs for Mechanical Upgrades

Disc.	Asset	Work Description	Priority	Estimated Cost
Mech.	Arena	Allowance to install new air handling unit and distribution ductwork to ventilate the building, following the ASHRAE 62 study recommendations	Immediate	$500,000
Mech.	Arena	Chiller replacement (plate and frame)	Immediate	$360,000
Mech.	Arena	Allowance for replacement of brine header	Immediate	$100,000
Mech.	Front Lobby	Install a make-up air unit for the commercial kitchen	Immediate	$50,000
Mech.	Arena	Complete an ASHRAE 62 ventilation study for the building to confirm ventilation rates	Immediate	$25,000
Mech.	Arena	Sand and paint unpainted steel gas piping in the arena	Immediate	$20,000
Mech.	Arena	Replace arena exhaust fans and install timer control over fan operation	Immediate	$20,000
Mech.	Arena	Install a gas detection system in the arena and interlock controls with exhaust fan operation	Immediate	$20,000
Mech.	Zamboni Room	Install a ventilation system for the Zamboni Room to control hazardous gasses	Immediate	$20,000
Mech.	Front Lobby	Replace all cabinet exhaust fans in original building area	Immediate	$20,000
Mech.	Front Lobby	Install grease interceptor for the concession sink	Immediate	$10,000
Mech.	Arena	Replace corroded gas pipe fittings and pipe hangers	Immediate	$10,000
Mech.	General	Seal all openings in fire rated walls	Immediate	$8,000
Mech.	Ice Plant	Install remote ventilation activation switches and emergency shutdown switches outside entrances to the ice plant room	Immediate	$8,000
Mech.	Ice Plant	Install an eyewash station to ANSI Z358.1	Immediate	$8,000
Mech.	Front Lobby	Replace damaged baseboard heaters and relocate heater in shower enclosure	Immediate	$6,000
Mech.	East Addition	Replace the furnace serving the change room addition	Immediate	$6,000
Mech.	General	Install backflow preventer on domestic water entry	Immediate	$5,000
Mech.	Front Lobby	Install new hub or funnel floor drain in south mechanical room	Immediate	$5,000
Mech.	Front Lobby	Replace electric unit heater in lobby	Immediate	$5,000
Mech.	Front Lobby	Install hot water traps or check valves at the south mechanical room domestic water heaters	Immediate	$4,000
Mech.	Arena	Repair boiler flue termination and replace escutcheon	Immediate	$3,000
Mech.	Front Lobby	Add pipe supports in mechanical room	Immediate	$3,000
Mech.	Front Lobby	Install arctic trap on combustion air opening in south mechanical room and clear debris from screen	Immediate	$3,000
Mech.	Ice Plant	Revise ventilation system controls in ice plant room to provide minimum airflow rate when ice plant is in operation	Immediate	$3,000
Mech.	Front Lobby	Install aquastat control for domestic hot water recirculation pump, or run 24/7	Immediate	$2,000
Mech.	General	Install tempering valve(s) for shower hot water supply	Immediate	$2,000

Disc.	Asset	Work Description	Priority	Estimated Cost
Mech.	East Addition	Relocate furnace thermostat to north player changeroom, option to add lockable cover to prevent tampering	Immediate	$2,000
Mech.	East Addition	Replace floor drain strainers in change room addition area	Immediate	$1,000
Mech.	Front Lobby	Secure under-cabinet PEX tubing in concession	Immediate	$1,000
Mech.	Front Lobby	Install a condensate neutralizer on the boiler condensate drain	Immediate	$1,000
Mech.	Front Lobby	Install Class K fire extinguisher in the commercial kitchen	Immediate	$1,000
Mech.	Arena	Full replacement of ice plant, including outdoor condenser	High	$1,200,000
Mech.	General	Allowance for new sprinkler system, including water service upgrade, if proceeding with floorplan changes	High	$285,000
Mech.	General	Monitor plumbing piping in older areas of the building, replace older plumbing piping when leaks begin occurring	High	$125,000
Mech.	Front Lobby/East Addition	Replacement of water closets, lavatories, urinals in original building public washrooms and change rooms	High	$100,000
Mech.	Front Lobby	Insulate domestic hot water piping if running recirculation pump does not fix hot water delivery issue or if pump operation puts too high a load on the boiler system	High	$25,000
Mech.	Ice Plant	Install additional PPM readouts (two) so that there is one at each entrance to the machine room	High	$15,000
Mech.	Front Lobby	Replace water fountain with bottle fill station	High	$10,000
Mech.	Front Lobby	Replace original mop sink	High	$10,000
Mech.	General	Replace thermostats controlling heating devices with programmable thermostats with setback capability	High	$5,000
Mech.	Arena	Replace ABC fire extinguisher in arena with chipped paint	High	$1,000
Mech.	East Addition	Replace cabinet exhaust fans in the change room addition	Medium	$10,000

TOTAL IMMEDIATE PRIORITY	**$1,232,000**
TOTAL HIGH PRIORITY	**$1,776,000**
TOTAL MEDIUM PRIORITY	**$10,000**
TOTAL LOW PRIORITY	**$0**
TOTAL	**$3,018,000**

5 ELECTRICAL

5.1 General

The electrical assessment included reviewing the general electrical distribution and lighting systems for end-of-life, functionality, and general power distribution layout. In general, the existing electrical panels are near end-of-life and not maintained in a clean dry environment and should be replaced. Lighting throughout the interior of the building is presently being replaced with new LED fixtures, including emergency lighting. Exit lights should be replaced with green iconography meeting the latest Alberta Building Code. General observations include:

- The lighting in the arena rink should have mechanical protection. The fire alarm system is under replacement, the drawings for the fire alarm system were not available on-site and were not provided. Fire Alarm Systems are required to be authenticated and the verification completed with a professional engineer, so that engineer will be responsible for the fire alarm system.
- There is no emergency generator serving this building. There is an intrusion security system that was installed 8 years ago.
- Not all the distribution equipment is tagged. Generic tags have been used for electrical equipment in this report.
- The wiring in the Zamboni Room should be designed for a Category 1 wet location because of the splashing and hose down for snow melt. Replace panels and ensure the Bleacher Panel is lockable.
- Relocate electrical panels if there are major changes to meet CSA B52 for Class T machine Rooms.
- Move all obstructions and fire hazards from around electrical equipment.
- Replace junction box in Lobby Electrical Room.
- Grounding for ‘custom’ hangers in the arena area and the natural gas line in the boiler room and the telephone entrance.

5.1.1 Utility Power

The utility is from a 300 kVA pad mounted transformer with pad mounting metering. The feed appears to be two underground conduits to ELS into the Mechanical Room. Likely into the 600 Ampere disconnect.

The rink is fed inside the Class T Machine room. This is not ideal because of the higher ambient temperature and corrosive nature of the refrigerant. Class T machine rooms should only have required equipment, and this room has power distribution for the entire facility. It is recommended to remove the main service and panelboards to a clean dry room.

Any replacement of the existing ice plant must take into consideration the available demand capacity and wiring replacement cost.

There are several ‘old’ electrical services that are in various states of abandon connected to the curling rink and the old hockey rink. Unused systems should be demolished.

Figure 5-1 Utility Riser to Pad Mounted Transformer Beside Curling Rink

Figure 5-2 Incoming Feeders for Two Separate Services to Curling Rink and Beaverlodge Arena

Figure 5-3 Telephone Service (and likey the original route for building electrical service)

5.2 600 V Distribution

There are two 600 V disconnects one 600 Ampere (labeled main disconnect) and one 400 Ampere. The 600 Ampere appears to feed a splitter box underneath with a 103 mm coupling.

A 51 mm coupling feeds the 400 Ampere disconnect from the splitter which then goes to a parallel run of armored cables into the ceiling (not TECK90). The cables drop to the compressor panel rated 197 amperes at 600 V with largest pump as 75 hp.

There are two AC90 feeding the lobby heater disconnect and the ice plant room heaters. A 25 mm EMT feeds the north dehumidifier and another 25 mm EMT feeds the south dehumidifier.

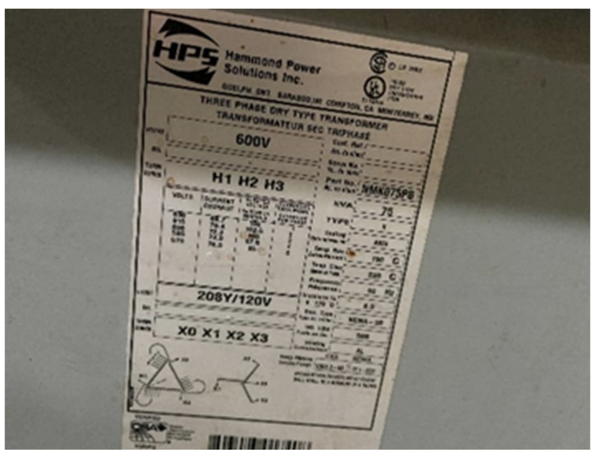
A 51 mm coupling feeds a 200 Ampere disconnect labeled transformer disconnect. A 37 mm EMT from the right goes under the splitter into a transformer which is blocked by a plywood sheet covered in puck board and was covered with a bucket, a battery charger and two old siemens breakers.

The transformer is a Hammond power systems 600V 75 kVA transformer with a 120/208V secondary. It appears to be coupled with a splitter on the west wall behind a work bench.

Figure 5-4 Main Distribution Panel - 600A, 600V 3P, 4W (upgraded for new plant 2009)

Figure 5-5 Mix of New and Old Disconnects

Figure 5-6 75 kVA Transformer for all 120/208V panels



Recommendations

No changes are required to the utility service at this time, if the site increases demand this will need to be examined more closely and the utility will need to provide peak loading information. The 600 V system could be replaced with new panels to replace the gutter and clean up the space. The power distribution should be located in a clean, dry room.

5.3 120V/208V Distribution

The 208 V splitter feeds a 37 mm EMT to the rink lights panel which is a single two pole 100 Ampere breaker. The splitter feeds a 37 mm EMT to the Lobby Electrical Room which is a single two pole 100 Ampere breaker (3/0 AL). Both are federal pioneer panels. The splitter also feeds a 37 mm armored cable to a two pole 100 Ampere breaker in a panel called Bleacher panel. Lastly, there is a 52 mm EMT going to a surface mounted panel board 42 circuit siemens panel with area loads.

The Lobby Electrical Room is believed to feed the Rink Attendant Office Panel, however the routing is not clear.

Class T Machine room does not have an ante chamber and no clear indication of the fan controls inside the room. No gas protection or separation.

Zamboni Room has two manual starters which appear to be for opening the doors and a garage door opener. There is a gas detector for CO and propane.

Existing cabling throughout the facility was installed in conduit or concealed in walls; current condition is not known. Typical life expectancy for wiring insulation is 70 or more years. It is recommended that main cable feeds are megger tested when panels are replaced to ensure there are no issues with the existing cable insulation.

Figure 5-7 Gutter to Breakers (feeds the Bleacher Panel, Lobby Electrical Room and Office (Original))

Figure 5-8 New Panel C - 225A, 120/208V, 3P, 4W (for Dressing Room Expansion and Faire Power)

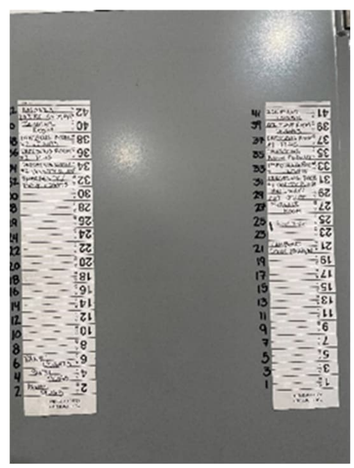


Figure 5-9 Bleacher Power Panel (accessible to public)

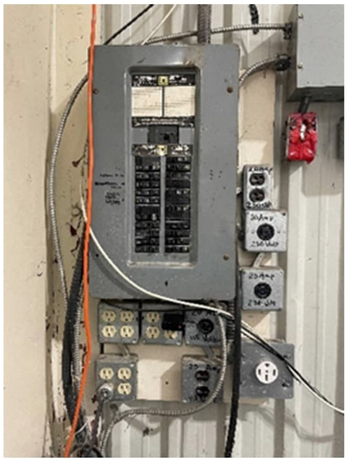
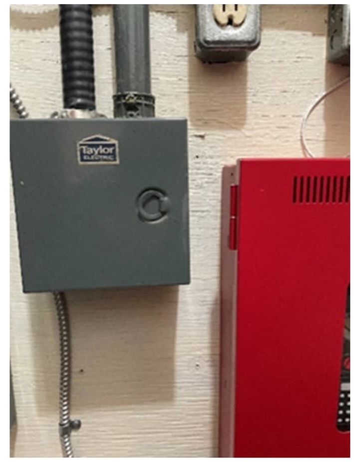


Figure 5-10 High Risk Junction Box (likely replacing the old service connection to the panel in the office)



Recommendations

Because of the age of the panels, we recommend a project to replace remaining original panels, approximately nine panel boards, in the next 1 to 3 years.

5.3.1 Receptacles

Receptacles throughout the facility were not tested for functionality; however, they were observed for code compliance. There are many convenience receptacles throughout the facility. There are no receptacles in the washrooms. The receptacles in the janitor rooms are GFI. The receptacles are original to the facility and appear to be in acceptable condition. No need for any repair in the next 10 - 20 years.

Recommendations

- Replace when they are damaged or fail.

5.3.2 HVAC Power

For any rooftop HVAC equipment that needs to be replaced, it will require a local disconnect, as well as a 20A dedicated receptacle (GFI protected) to be located within 7.5 m of equipment located on rooftops (as per Canadian Electrical Code 26-710 requirements).

Currently, it does not appear that any of the existing HVAC have dedicated 20A receptacles nearby. If the HVAC units are to be replaced, dedicated receptacles are required in the next 1 to 3 years.

5.4 Generator

There is no emergency generator serving this building. No generator is required.

5.5 Security System and Fire Alarm Devices

5.5.1 Security System

The doors have position switches and there is a security call out panel HS2016 with battery back up, likely used for fire alarm call out along with security. There is no CCTV system or monitoring.

Figure 5-11 Security Keypad

Recommendations

- Implement annual testing and maintenance of the security system and fire alarm call out.

5.5.2 Fire Alarm System

The new main fire alarm panel is a AutoCall Fire Control 4007. It is powered down and locked. The existing fire alarm system is in a state of replacement with the new fire alarm system.

The fire alarm system was not reviewed after this was determined. The new fire alarm system should be verified by a professional engineer and the drawings must be authenticated.

Figure 5-12 Main Fire Alarm Control Panel (located in Office, being replaced)

Figure 5-13 New Fire Alarm Panel (located in Lobby Electrical Room)

Figure 5-14 New Equipment is Tamper Resistant

Figure 5-15 New Isolatation Modules

Recommendations

- That fire alarm drawings be created for the building and posted at the front door. A fire alarm annunciator mounted at the front door.

5.5.3 Gas Detection

The Zamboni Room is provided with CO2 and propane gas detectors with local alarm and display. There is a QCC-RDM gas detector display in the attendant's office for ammonia, propane and carbon monoxide. All reading Zero.

No observations were made of the frequency of testing or maintenance program.

Recommendations

- Ensure the gas detectors and remote transmitters are calibrated and confirmed to be working on an annual basis, we recommend this is completed with the fire alarm testing.

5.6 Lighting

5.6.1 Exterior Lighting

The exterior lights are of wall pack type and most of them were replaced with LED type. Exterior lights are controlled with a timer located in the rink attendant office.

The parking lot lights appear to be highway style cobra heads likely high-pressure sodium. They should be replaced with LED for reduced energy consumption during the next maintenance or failure.

Recommendations

- Replace the remaining luminaires with LED complete with timer and photocells.

5.6.2 Interior Lighting

The interior lights were replaced with LED fixtures throughout, they are of mix of linear type strip shape and 1 x 4 shape, lamps, or recessed. Lighting is controlled with local line voltage lighting switches, which are original to the building. Occupancy motion sensors were not observed, they are useful for energy reduction, but not required.

Luminaires in dressing rooms have no Polycarbonate lens and are not rated for a damp environment. It is recommended to replace them with Polycarbonate lens type and be rated for damp location.

Luminaire above the bleachers are pendant style LED matching the rink lighting. The rink lighting is exposed LED and may not be vandal resistant.

Figure 5-16 Concession Lighting

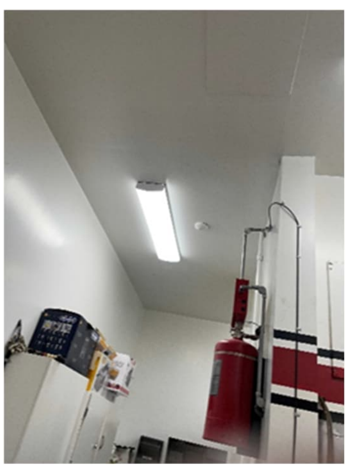


Figure 5-17 Arena Change Room LED Lighting Without Mechanical Protection

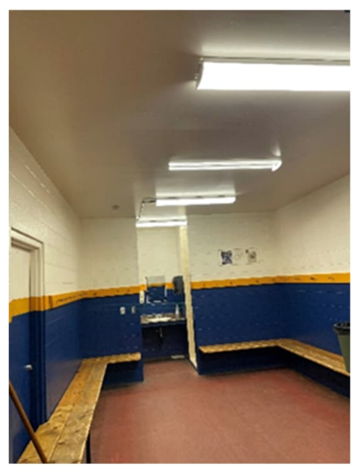


Figure 5-18 Under Bleachers Lighting

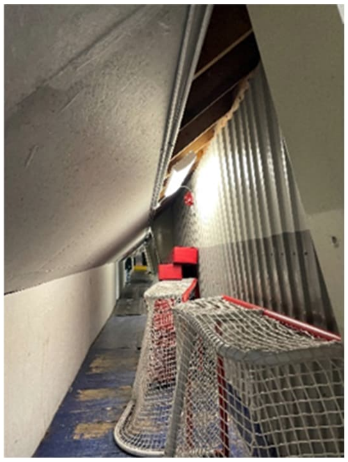


Figure 5-19 Arena LED Lighting Without Mechanical Protection (Def)

Recommendations

- Replace dressing room luminaires with ‘unbreakable’ Polycarbonate lens type and be rated for damp location.
- Consider mechanical protection guards for rink lighting.
- The concession lighting should be food grade/ ‘unbreakable’.

5.6.3 Emergency Lighting and Exit Signs

Emergency lighting is installed throughout the building. The emergency lighting levels throughout the facility were not tested; however, it appears all main egress paths are lit as per National Building Code-2019 Alberta Edition Section 3.2.7.3 “Emergency Lighting”. Most of the emergency lights are battery combo or battery/exit sign combo and were replaced, likely more than 10 years ago. It is recommended to replace the remaining emergency lights and exit lights in the next 3 to 5 years.

The number of emergency lights in the arena is not sufficient to meet code requirements. It is recommended to add new emergency lights in the arena area to meet the current code. Currently all exit signs are older style “exit” signs.

Figure 5-20 Exit Sign

Figure 5-21 Modernized Emergency Light - Battery Combo

Recommendations

- Replace exit signs with the updated green “running man” (pictogram) style signs as required per National Building Code-2019 Alberta Edition Section 3.4.5.
- Add new emergency lights in the arena area to meet 5 lux on stairways and main egress.

5.7 Architectural & Building Mechanical

The architectural changes will include modifying and relocation equipment, this will include meeting CSA Z52 Class T Machine requirements. During the detailed design this will include special controls and alarms. This is a catch-all for the building renovations and expansion.

The building mechanical will include support for demolition, modernization, and power new equipment. Special controls for exhaust fans for cooling and Ammonia will be required for the Class T Machine room. This is a catch-all item to support the mechanical modifications.

5.8 Recommendations Summary

Recommendations accompanied by ranking priority and an estimated probable cost related to electrical work are presented below in Table 5-1. The following is a Class D estimate of probable costs for the repairs or replacements. “Immediate” are considered risks to the public’s safety, “high” is within 1 to 5 years, “medium” is within the next 6 to 10 years, and “low” is within the next 11 to 20 years. Values are probable costs in 2023 dollars and are assumed to be combined with other scope items.

Table 5-1 Estimated Costs for Electrical Upgrades

Disc.	Asset	Work Description	Priority	Estimated Cost
Elec.	Distribution	Move all obstructions and fire hazards from around electrical equipment.	Immediate	0
Elec.	Distribution	Replaced all 120/208V panelboards	High	$36,000
Elec.	Grounding	Grounding the natural gas piping, telephone panel, and metal supports (emergency lighting) in bleachers area	High	$3,000
Elec.	Distribution	Replacing mystery junction box in Lobby Electrical Room and wire tracing to confirm circuiting	High	$3,000
Elec.	Life Safety	Annual Fire Alarm Testing, Gas Detector Calibration and Transmitter operational testing	High	$6,000
Elec.	Life Safety	Exit Signage and emergency lighting	Medium	$11,000
Elec.	Life Safety	Food Grade Lighting in Concession	Medium	$4,000
Elec.	Mechanical Modification	Support of mechanical changes and improvements (10%)	Medium	$238,000
Elec.	Architectural Modifications	Support of architectural changes and improvements (5%)	Medium	$125,000
Elec.	Distribution	Relocate all non-essential electrical equipment from the Class T Mechanical Room	Low	$200,000
Elec.	Life Safety	Update the emergency egress (building layout) and post by fire alarm panel and other key areas)	Low	$2,000
Elec.	Life Safety	Update the single line drawings and post laminated copies in each of the electrical rooms	Low	$4,000
Elec.	Lighting	Replace the remaining luminaires with LED complete with timer and photocells.	Low	$50,000
Elec.	Lighting	Replace dressing room luminaires with 'unbreakable' Polycarbonate lens type and be rated for damp location	Low	$12,000
Elec.	Lighting	Mechanical protection guards for rink lighting.	Low	$20,000

TOTAL IMMEDIATE PRIORITY	$0
TOTAL HIGH PRIORITY	$48,000
TOTAL MEDIUM PRIORITY	$378,000
TOTAL LOW PRIORITY	$288,000
TOTAL	$714,000

6 FUTURE EXPANSION TO NHL SIZE RINK

Beaverlodge has indicated the desire to expand the arena to fit a standard NHL ice sheet that is 200' x 85' (61 m x 26 m). The existing building is not long enough to fit an NHL arena without an addition but has sufficient width to allow for the expansion of the ice surface.

The renovation of the existing building would require the removal and replacement of the bleachers on both sides of the rink to allow for the expansion of the rink surface and upgrades to the building envelope. This renovation would reduce the overall seating capacity. Expanding the width of the building to accommodate additional spectator seating is not feasible with the dressing rooms to the east and the tennis courts to the west. If a seating capacity increase is required, then the current structure would need to be modified increasing the costs to a point that makes the option of building a new arena more desirable.

The current height above the lobby and dressing rooms are not enough to install a mezzanine over the entire area. A mezzanine could be installed over the lobby area but would not extend over the dressing room area, thus limiting the mezzanine size and its ability to function beyond a small gathering space or office area.

This renovation and north Zamboni room addition would solve the immediate problem of having too small an ice surface for the Blades Hockey team but would not improve the quality of the programs provided in the arena.

The costs and recommendations summarized in this report are for the arena renovation and Zamboni room addition to the north. It is our belief that this renovation and addition scenario is only feasible under the condition that the grant is accepted. Without the grant approval, our recommendation is to have funding directed towards building a new facility which will be able to better incorporate additional recreation and support spaces.

7 SUMMARY OF RECOMMENDATIONS

A summary of the prioritized recommendations and probable costs is presented below. “Immediate” are considered risks to the public’s safety, “high” is within 1 to 5 years, “medium” is within the next 6 to 10 years, and “low” is within the next 11 to 20 years. Values are Class D probable costs (plus or minus 30%) in 2022 dollars and are assumed to be combined with other scope items.

The estimates exclude GST. It is recommended the Town budget Consulting Fees and Professional Services to be 12% of the cost of construction, in addition to the Class D estimates.

Table 7-1 Summary of Opinions of Probable Cost

Disc.	Asset	Work Description	Priority	Section	Opinion of Probable Cost
Arch.	Arena	Replace building envelope - arena	Immediate	2.2	$350,000
Arch.	Arena	Replace existing roof	Immediate	2.3	$320,000
Arch.	Arena	Replace interior liner panels in arena	Immediate	2.2	$60,000
Arch.	Arena	Replace exterior exit doors	Immediate	2.7.2	$22,000
Arch.	Front Lobby	Replace entry doors and add H.C. push buttons	Immediate	2.1.5	$5,000
Arch.	New	Add addition to building	Immediate		$500,000
Arch.	Arena (Rink)	Replace rink slab (cold slab)	Immediate	2.4.1	$600,000
Arch.	Arena (Rink)	Replace dasher boards	Immediate	2.5	$250,000
Arch.	Arena	Replace warm concrete slab in arena	Immediate	2.4.3	$110,000
Arch.	Arena/Front Lobby	Repair fire separation between lobby and rink	Immediate	2.1.4	$60,000
Arch.	Arena/Front Lobby	Replace windows between lobby and rink	Immediate	2.8.3	$15,000
Arch.	Arena	Install new bleachers	Immediate	2.6	$50,000
Arch.	Arena	Replace rated stickers on rated doors	Immediate	2.1.4	$3,000
Arch.	Arena	Install new skate flooring in arena	Immediate	2.8	$8,000
Arch.	Ice Plant	Install new Vestibule into ice plant	Immediate	2.1.4	$10,000
Arch.	Ice Plant	Remove and replace overhead door in existing Zamboni room (new electrical room) with double door	Immediate	2.7.1	$8,000
Struc.	Arena	Expansion to allow for NHL size rink, Zamboni room relocation	Immediate		$450,000
Struc.	Arena	Repair anchor bolts at pre-engineered columns to reinstate adequate projection	Immediate	3.4.3	$18,000
Struc.	Arena	Repair the pre-engineered framing column segment near the ice plant brine tank	Immediate	3.4.4	$6,000
Struc.	Arena & Addition (Roof)	Structural roof inspection of main building and east addition.	Immediate	3.4	$5,000

Disc.	Asset	Work Description	Priority	Section	Opinion of Probable Cost
Struc.	East addition (Ice Plant)	Provide lintel support for the opening in the southwest corner of the ice plant masonry wall opening near brine tank	Immediate	3.3.2	$2,000
Mech.	General	Allowance to install new air handling unit and distribution ductwork to ventilate the building, following the ASHRAE 62 study recommendations	Immediate	4.2.2	$500,000
Mech	Arena	Chiller replacement (plate and frame)	Immediate	4.3	$360,000
Mech.	Arena	Allowance for replacement of brine header	Immediate	4.3	$100,000
Mech.	Front Lobby	Install a make-up air unit for the commercial kitchen	Immediate	4.2.3	$50,000
Mech.	Arena	Complete an ASHRAE 62 ventilation study for the building to confirm ventilation rates	Immediate	4.2.1/.2/.4	$25,000
Mech.	Arena	Sand and paint unpainted steel gas piping in the arena	Immediate	4.1.6	$20,000
Mech.	Arena	Replace arena exhaust fans and install timer control over fan operation	Immediate	4.2.1	$20,000
Mech.	Arena	Install a gas detection system in the arena and interlock controls with exhaust fan operation	Immediate	4.2.1	$20,000
Mech.	Zamboni Room	Install a ventilation system for the Zamboni Room to control hazardous gasses	Immediate	4.2.1	$20,000
Mech.	Front Lobby	Replace all cabinet exhaust fans in original building area	Immediate	4.2.2	$20,000
Mech.	Front Lobby	Install grease interceptor at concession sink	Immediate	4.1.5	$10,000
Mech.	Arena	Replace corroded gas pipe fittings and pipe hangers	Immediate	4.1.6	$10,000
Mech.	General	Seal all openings in fire rated walls	Immediate	4.2.5	$8,000
Mech.	Ice Plant	Install remote ventilation activation switches and emergency shutdown switches outside entrances to the ice plant room	Immediate	4.2.5	$8,000
Mech.	Ice Plant	Install an eyewash station to ANSI Z358.1	Immediate	4.2.5	$8,000
Mech.	Front Lobby	Replace damaged baseboard heaters and relocate heater in shower enclosure	Immediate	4.2.2	$6,000
Mech.	East Addition	Replace the furnace serving the change room addition	Immediate	4.2.4	$6,000
Mech.	General	Install backflow preventer on domestic water entry	Immediate	4.1.3	$5,000
Mech.	Front Lobby	Install new hub or funnel floor drain in south mechanical room	Immediate	4.1.5	$5,000
Mech.	Front Lobby	Replace electric unit heater in lobby	Immediate	4..2.2	$5,000
Mech.	Front Lobby	Install hot water traps or check valves at the south mechanical room domestic water heaters	Immediate	4.1.4	$4,000
Mech.	Arena	Repair boiler flue termination and replace escutcheon	Immediate	4.2.2	$3,000

Disc.	Asset	Work Description	Priority	Section	Opinion of Probable Cost
Mech.	Front Lobby	Add pipe supports in mechanical room	Immediate	4.1.3	$3,000
Mech.	Front Lobby	Install arctic trap on combustion air opening in south mechanical room and clear debris from screen	Immediate	4.2.2	$3,000
Mech.	Ice Plant	Revise ventilation system controls in ice plant room to provide minimum airflow rate when ice plant is in operation	Immediate	4.2.5	$3,000
Mech.	Front Lobby	Install aquastat control for domestic hot water recirculation pump, or run 24/7	Immediate	4.1.4	$2,000
Mech.	General	Install tempering valve(s) for shower hot water supply	Immediate	4.1.5	$2,000
Mech.	East Addition	Relocate furnace thermostat to north player changeroom, option to add lockable cover to prevent tampering	Immediate	4.2.4	$2,000
Mech.	East Addition	Replace floor drain strainers in change room addition area	Immediate	4.1.5	$1,000
Mech.	Front Lobby	Secure under-cabinet PEX tubing in concession	Immediate	4.1.5	$1,000
Mech.	Front Lobby	Install a condensate neutralizer on the boiler condensate drain	Immediate	4.2.2	$1,000
Mech.	Front Lobby	Install Class K fire extinguisher in the commercial kitchen	Immediate	4.5	$1,000
Elec.	Distribution	Move all obstructions and fire hazards from around electrical equipment	Immediate	5.1	0
Arch.	East addition	Upgrade building envelope - concrete block addition	High		$100,000
Arch.	Front Lobby	Replace existing vinyl tile flooring	High	2.8.4	$6,000
Arch.	Front Lobby	Replace millwork in concession	High	2.8.5	$10,000
Arch.	Exterior	Re-grading at exterior condenser unit	High	2.9.2	$3,000
Struc.	Front Lobby Area	Patch and repair masonry wall cracking with epoxy	High	3.2.3	$15,000
Struc.	Front Lobby Area	Provide expansion joint at the arena and curling rink walkway masonry wall interface	High	3.2.2	$4,000
Struc.	Arena	Replace the condenser unit steel support frame with a galvanized steel frame	High	3.4.5	$18,000
Mech.	Arena	Full replacement of ice plant, including condenser	High	4.3	$1,200,000
Mech.	General	Allowance for new sprinkler system, including water service upgrade, if floor plan changes are made	High	4.5	$285,000
Mech.	General	Monitor plumbing piping in older areas of the building, replace older plumbing piping when leaks begin occurring	High	4.1.3	$125,000
Mech.	Front Lobby/East Addition	Replacement of water closets, lavatories, urinals in original building public washrooms and change rooms	High	4.1.5	$100,000

Disc.	Asset	Work Description	Priority	Section	Opinion of Probable Cost
Mech.	Front Lobby	Insulate domestic hot water piping if running recirculation pump does not fix hot water delivery issue or if pump operation puts too high a load on the boiler system	High	4.1.4	$25,000
Mech.	Ice Plant	Install additional PPM readouts (two) so that there is one at each entrance to the machine room	High	4.2.5	$15,000
Mech.	Front Lobby	Replace water fountain with bottle fill station	High	4.1.5	$10,000
Mech.	Front Lobby	Replace original mop sink	High	4.1.5	$10,000
Mech.	General	Replace thermostats controlling heating devices with programmable thermostats with setback capability	High	4.4	$5,000
Mech.	Arena	Replace ABC fire extinguisher in arena with chipped paint	High	4.5	$1,000
Elec.	Distribution	Replaced all 120/208V panelboards	High	5.3.1	$36,000
Elec.	Grounding	Grounding the natural gas piping, telephone panel, and metal supports (emergency lighting) in bleachers area	High	5.1	$3,000
Elec.	Distribution	Replacing mystery junction box in Lobby Electrical Room and wire tracing to confirm circuiting	High	5.1	$3,000
Elec.	Life Safety	Annual Fire Alarm Testing, Gas Detector Calibration and Transmitter operational testing	High	5.5.2	$6,000
Struc.	Arena	Repair concrete slab where debonding from wall curb	Medium	3.4.3	$63,000
Struc.	Arena	Clean and re-apply top finish on worn slab surface	Medium	3.4.3	$5,000
Struc.	Front Lobby Area	Repair and reinstate concrete and bond break at doorways	Medium	3.2.3	$27,000
Struc.	Front Lobby Area	Chip, clean and reinstate the base concrete around floor drains, particularly in the boiler room	Medium	3.2.3	$12,000
Struc.	Front Lobby Area	Repair and replace the trench cover shelf angles around the sump pit and header trench	Medium	3.2.3	$15,000
Struc.	East addition (Zamboni Room)	Repair base of wall concrete curb transitions in the Zamboni Room	Medium	3.3.2	$11,000
Struc.	East addition (Zamboni Room)	Miscellaneous concrete repairs to curbs, slab and pits in the Zamboni Room and Ice Plant	Medium	3.3.3	$45,000
Struc.	East Addition (Ice Plant)	Wire brush clean and repaint steel ice plant supports and skid	Medium	3.3.4	$3,000
Mech.	East Addition	Replace cabinet exhaust fans in the change room addition	Medium	4.2.2	$10,000
Elec.	Life Safety	Exit Signage and emergency lighting	Medium	5.6.3	$11,000

Disc.	Asset	Work Description	Priority	Section	Opinion of Probable Cost
Elec.	Life Safety	Food Grade Lighting in Concession	Medium	5.6.2	$4,000
Elec.	Mechanical Modification	Support of mechanical changes and improvements (10%)	Medium	5.7	$238,000
Elec.	Architectural Modifications	Support of architectural changes and improvements (5%)	Medium	5.7	$125,000
Arch.	Exterior	Exterior signage replacement	Low	2.10	$15,000
Struc.	Front Lobby Area	Clean and re-apply top finish on worn slab surfaces	Low	3.2.3	$3,000
Struc.	Front Lobby Area	Clean garbage out of attic space above lobby framing	Low	3.2.2	$1,000
Struc.	East addition (Ice Plant)	Clean and re-apply top finish on worn slab surface in Ice Plant	Low	3.3.3	$3,000
Struc.	East addition (Zamboni Room)	Wire brush clean and repaint Zamboni Room grating	Low	3.3.4	$3,000
Struc.	Arena	Wire brush clean and repaint pre-engineered Steel	Low	3.4.1	$3,000
Elec.	Distribution	Relocate all non-essential electrical equipment from the Class T Mechanical Room	Low	5.1	$200,000
Elec.	Lighting	Replace the remaining luminaires with LED complete with timer and photocells.	Low	5.6.1	$50,000
Elec.	Lighting	Replace dressing room luminaires with 'unbreakable' Polycarbonate lens type and be rated for damp location	Low	5.6.2	$12,000
Elec.	Lighting	Mechanical protection guards for rink lighting.	Low	5.6.2	$20,000
Elec.	Life Safety	Update the emergency egress (building layout) and post by fire alarm panel and other key areas)	Low	5.5.2	$2,000
Elec.	Life Safety	Update the single line drawings and post laminated copies in each of the electrical rooms	Low	5.5.2	$4,000
			TOTAL IMMEDIATE PRIORITY		$4,084,000
			TOTAL HIGH PRIORITY		$ 1,980,000
			TOTAL MEDIUM PRIORITY		$ 569,000
			TOTAL LOW PRIORITY		$ 316,000
			TOTAL		$ 6,949,000

Table 7-2 Cost Summary

Item	Estimate
Immediate Priorities	$4,084,000
High Priorities	$1,980,000
Medium Priorities	$569,000
Low Priorities	$316,000
Recommendation Sub-total	$6,949,000
Professional Consulting (12%)	$833,880
Sub-total	$7,782,880
Contingency (30%)	$2,334,864
Sub-total	$10,117,744
GST (5%)	$505,887
TOTAL	$10,623,631

CLOSURE

This report was prepared for the Town of Beaverlodge to provide recommendations for repairs and modernization of the Beaverlodge Arena.

The services provided by Associated Engineering Alberta Ltd. and Solis Architecture Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,
Associated Engineering Alberta Ltd.

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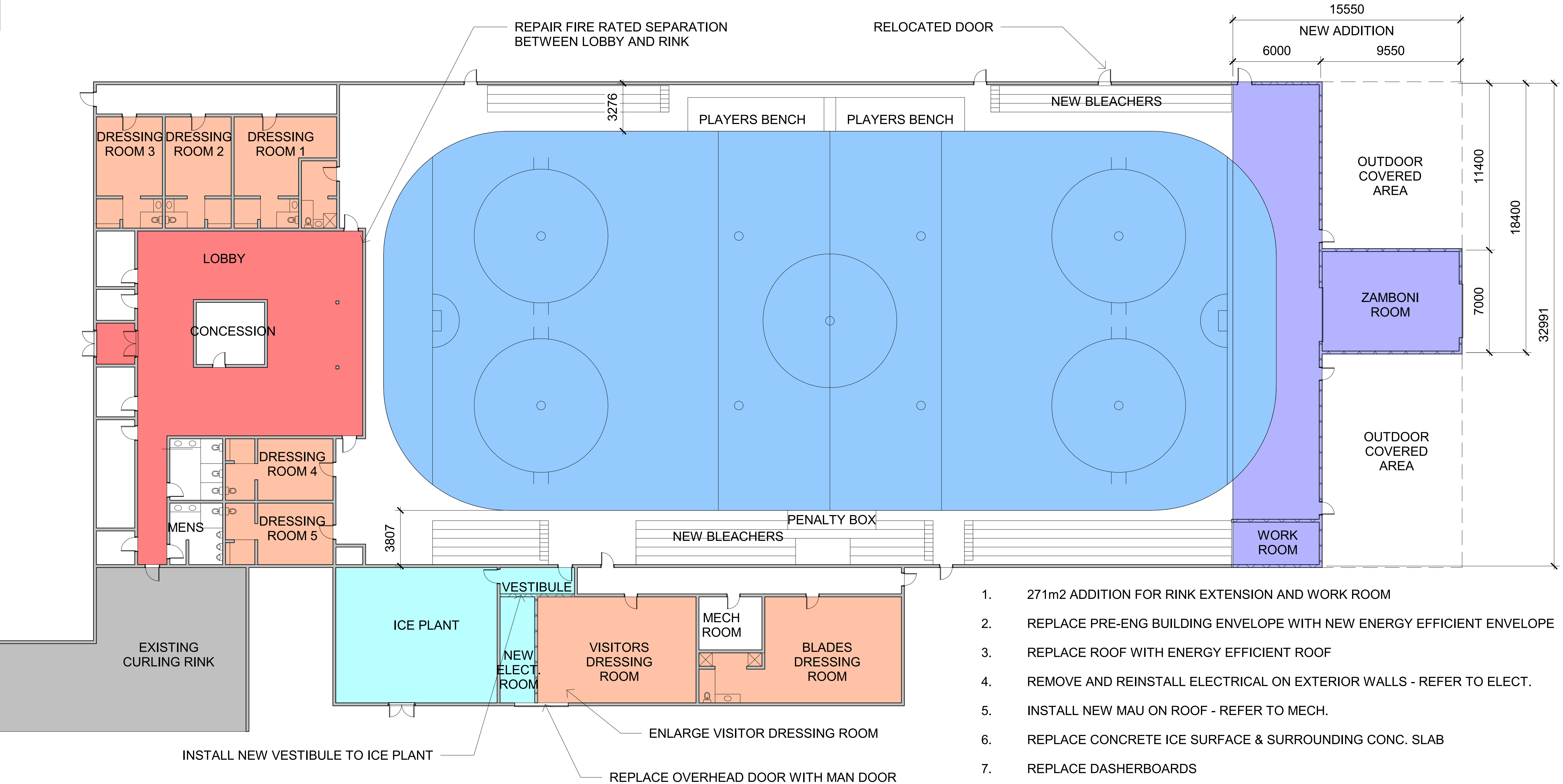
PERMIT TO PRACTICE
ASSOCIATED ENGINEERING ALBERTA LTD.

RM Signature ____________________
Gregory Walker ID 28771 2023 Feb 22

PERMIT NUMBER: P 03979
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

APPENDIX A – BEAVERLODGE ARENA RENOVATION CONCEPT



1. 271m2 ADDITION FOR RINK EXTENSION AND WORK ROOM
2. REPLACE PRE-ENG BUILDING ENVELOPE WITH NEW ENERGY EFFICIENT ENVELOPE
3. REPLACE ROOF WITH ENERGY EFFICIENT ROOF
4. REMOVE AND REINSTALL ELECTRICAL ON EXTERIOR WALLS - REFER TO ELECT.
5. INSTALL NEW MAU ON ROOF - REFER TO MECH.
6. REPLACE CONCRETE ICE SURFACE & SURROUNDING CONC. SLAB
7. REPLACE DASHERBOARDS
8. ENLARGE VISITOR DRESSING ROOM
9. OLD ZAMBONI ROOM CONVERTED INTO NEW ELECTRICAL ROOM

BEAVERLODGE ARENA ASSESSMENT

1 : 250

PROPOSED ADDITION

SOLIS ARCHITECTURE

Solis Architecture Ltd.

02/10/23
2022-18