Aging Building Audit

Stellarton Memorial Rink - Final Report

Town of Stellarton

Infrastructure Engineering

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Executive Summary

In 2018 SNC-Lavalin was awarded a contract to carry out an Aging Building Audit at the Stellarton Memorial Rink. Site visits were made in July and September. All building systems and components were examined. This report details both the findings and recommendations for this facility.

The building was constructed in the late 1940s. Since then it has seen several additions and renovations, including an ice surface replacement, new change rooms, upgrades to the heating system, the installation of a reflective ceiling above the ice, and at least two roof membrane replacements.

The building is serviceable as is but does need significant expenditure in the near term to ameliorate structural issues and upgrade the electrical & mechanical systems.

Several areas are in need immediate attention:

- Remediate mold issues
- Remove/relocate door from stairs to hospitality room
- Provide guard rail at hospitality room viewing window
- Provide adequate egress infrastructure (Doors and exterior stairs)
- Remove existing speed tile and brick exterior walls and reinstate
- Replace cracked concrete pilaster along back (east) wall supporting wind post
- Repair localized failure, severe cracking, and areas of leakage in perimeter foundation wall
- Replace severely corroded steel columns in basement area
- Replacement of corroded electrical conduits in the ice plant
- Maintain good housekeeping with storage items away from electrical panels
- Replace and relocate the compressor manual transfer switch in a location away from water lines and maintain a minimum 1 meter unobstructed access in front of any electrical equipment
- A summary of many electrical upgrade requirements can be read in the Nova Scotia Power Utility Service Requirements bulletin which can be found at: https://www.nspower.ca/site/media/Parent/Utility%20Service%20Requirements_2017.pdf
- Repair & replacement of various low cost ventilation equipment
- Anchoring of fuel oil tanks & replacement of heating boiler breeching
- Testing existing backflow preventers & installation of new backflow preventer on Zamboni fill hose

In the medium term, upgrades will be necessary such as:

- Provide support to basement beam above cracking in concrete wall and repair cracking (east side of basement)
- Replace light switches and receptacles, replace emergency lighting, and add additional lighting for the spectator/bleacher area. Install Ground Fault Circuit interrupters for devices within 1 meter of water sources
- Replace the fire alarm system and smoke detectors. Replace alarm bells with Horn/Strobe indicators
- Improve barrier free accessibility
- Provide barrier free washroom
- Replacement of Refrigeration Plant equipment
- Replacement of Heating System Equipment such as the boiler, heat exchanger, pumps, & piping

In the long term, major expenditures will likely be:

- Renovate stands to upgrade material durability, increase safety, and provide barrier free use
- Provide lift to hospitality room
- Replacement of existing ice surface and dasher boards to improve ice surface performance
- Replacement of Zamboni Room concrete/asphalt floor
- Repair of medium to severe cracks in perimeter foundation
- Build separate electrical rooms in the ice plant and main electrical area with circuit breaker distribution panels. Observe one meter clearance in front of all electrical equipment and Install one hour rated fire proof walls.
- Major upgrades to the Refrigeration Plant
- Replacement of electrical heating equipment

1. Civil & Architectural

1.1 Site

The Stellarton Memorial Rink is located in a low-density urban environment, on Stellar Street in Stellarton, Nova Scotia. It is the home arena of the Stellarton Royals. To the North are a lawn and a municipal parking lot of approximately 90 spaces. It serves the rink, town hall, public library, Albion Ball Field, and general use. The East of the rink is its rear; it faces the rear of businesses on South Foord Street, the commercial main street of Stellarton. There are houses adjacent to the building on the South and also directly across the street to the West. The Albion baseball field is located close to the rink, on the other side of Stellar Street.

There are paved areas around the outermost perimeter of the rink on all sides except the East. In areas between bump-outs there are patches of grass. At the front of the rink there are two designated barrier-free parking spots to the North of the main entrance door and a small undelineated parking area to the South of the main door with room for approximately five vehicles. The asphalt driveway around the building is in fair condition, with minor to moderate cracking and uneven areas. There are storm water catch basins in the North driveway; other areas do not appear to have designed drainage. The East side of the building has a footpath through large bushes and uncontrolled plant growth, much of which grows immediately adjacent to the building foundation. Weeds and bushes grow unfettered in all areas where soil abuts the building, including the areas surrounding emergency exits.

Recommendations:

1. Paint lines in parking area to the South of main entrance to create barrier free spaces
2. Remove vegetation adjacent to building; create gravel strip beside foundation to discourage future growth
3. Provide drainage at East and South sides of building
4. Repair/patch damaged asphalt as necessary

1.2 Building Overview

The main arena structure is a steel frame on a concrete foundation, with walls of structural clay tile (“speed tile”). Construction of the building was funded by local coal miners in memory of war casualties; the original architectural drawings are dated 1947. Over the years several additions have been constructed along the sides of the structure. The primary dressing rooms have been relocated to an addition, and former dressing room area renovated. The front of the building (forward of the ice surface) has a full basement with access from the exterior and interior. The new dressing rooms are partially below grade; the remaining portions of the ground floor have slab-on-grade construction. The mezzanine stands have been replaced with a hospitality room which affords a more comfortable, heated viewing of the ice surface.

1.3 Roof

The roof is clad in steel. There are horizontal snow guards over doorways on the long sides, and crickets at major roof penetrations. From ground observations the roof appears to be in good condition.

Recommendations:

1. The rink has approximately 1000 square meters of South-facing moderately-sloped roof with little shading and few penetrations. Study structural upgrades and costing required to install solar panels to generate power (and revenue!) while shading roof.

1.4 Exterior

There is major grout cracking on all walls except the front façade, which appears to have been reclad. Several corners exhibit evidence of vehicular impact. There are exterior stairs from several emergency exits. One set of exit stairs has steel stringers and wood treads; the others are concrete. All have steel railings. The steel stair stringers require repainting, but appear sturdy. Railings on all exterior stairs except the Southeast are securely anchored; the Southeast railing is loose. The concrete stairs all exhibit chipped treads. The Southeast stair has exposed reinforcing steel, pits and cracks in its support pillars, and cracking in the nearby masonry.

Of special note is the poor condition of the brickwork at the rear of the building, on the East side. At regular intervals vertical cracking extends from the foundation to the roof, usually following grout lines. In some cases these cracks carry through the speed tiles. The crack locations parallel column locations observed inside the building. (See Structural section)

Some original openings have been infilled with brick. On the East side, windows are broken and blocked from the inside with aging plywood, which appears to be in poor condition. The windows in the addition are transparent and have exterior-mounted security grilles. Those on the front (West) face are translucent glass block.

Above the main entrance is a curved canopy. It was reported that the canopy is supported by a beam which cantilevers into the structure underneath the mezzanine floor. A pair of chains also ties the canopy to the exterior wall. A large two-piece sign is mounted across the windows over the canopy. It is a replacement of an earlier sign, and was donated by the local fire department and installed within the past six years. The sign is mounted on four steel members. Two of the members are tied back to columns.

The main entrance doors are steel and do not appear to be original. They lack interior escape hardware. Some of the remaining doors are painted wood, others are painted steel. The paint on the wood doors is cracked and peeling; some steel doors exhibit dents. Where present, the exterior door hardware is in poor condition. Door frames appear in fair condition, but there is light leakage between some doors and frames. The poor state the exterior stairs and doors present a potential hazard in the event of an emergency evacuation.

Recommendations:

1. Replace all exterior doors, include emergency egress hardware
2. Infill windows on East façade with brick to match other infilled windows
3. Repair damaged corners; install bollards to prevent future collisions

1.5 Interior

All basement-access doors are locked from the exterior; no fire escape is provided. One portion of the basement has had a fire, reportedly arson perpetrated by children burning leaves after breaking into the building. In some places the ground floor is suspended concrete, in others it is a solid plane of dimensional lumber installed on edge (as in a built-up beam) for the entire floor. As a result of the fire a portion of the lumber floor system charred, but did not collapse and was not replaced. In the basement a large number of paint cans are stored with Christmas decorations on open shelving in the electrical room. No mold was observed in the basement, but ventilation and air circulation is poor.

With the exception of the ice surface, which is exposed concrete, vinyl tile is the predominant flooring in the building's above-ground spaces. Some areas of flooring are uneven, particularly at access hatches to a mechanical trench in the main corridor between the entrance and ice and in the corridors between the stands (which run along the long sides of the ice surface) and the exterior walls. Uneven surfaces and some spongy spots are also common in the stands. The stands are maintained on a phased schedule; it was reported that their wood construction is not well suited to the temperature changes experienced over the course of building operations. As wood weakens it is sometimes replaced, sometimes overlaid with plywood. The stands are painted; paint appears to be in good condition. There are railings between the top of the stands and the elevated corridors along their perimeter, but no railings on the mid-stand travel path. These paths also lack intermediate steps between seating platforms.

Life safety information is posted throughout the arena, including emergency escape maps and procedures for power failures. The wording on various no-smoking signs is somewhat vague (For example, "No smoking during sporting events") and does not indicate the legislative impetus of the ban. An AED is located prominently between the main entrance and ice surface. The doors to Rooms 1, 2, 3, 4, the canteen, the main washrooms, and the hospitality room have deadbolts and (sometimes multiple) padlocks on the outside, preventing emergency egress.

The rink boards were custom made and are not removable. They are in good condition. Netting is provided above the boards; it appears to be in good condition. There is no advertising on the boards or the walls; above the score clock at the back end of the ice is a custom made illuminated mural displaying names of local soldiers who died in the World Wars. There is a canteen and cuts in the walls near the main entrance to serve as ticket booths, but the building is clearly a community space rather than a commercial endeavour.

Washroom facilities throughout the building are clean and well-maintained, albeit not spacious. A washroom off Room #4 has grab bars surrounding the toilet and may have met barrier free requirements when it was built; it does not meet current clearance requirements. No other washrooms are barrier free, and most have substandard clearance in front of toilets and counters (even by non-barrier-free standards). A new (non barrier-free) washroom is currently under construction on the upper floor near the hospitality room. There is a non-gendered single user washroom near the main entrance.

There is a ramp at the main entrance, but the building is not barrier free. All access routes to the stands are either via stairs or through narrow passages; there is no designated area for wheelchair-based viewing of the ice surface. The ice surface itself can be accessed via a barrier free route directly from the foyer. None of the change rooms have grab bars, and the counters for the ticket boxes and canteen are too high for barrier free use. There is no lift from the ground floor to the hospitality room – were it accessible, the hospitality room would offer an excellent barrier free vantage point for viewing the ice surface. No accommodations appear to have been made for building users with reduced visual acuity.

At the back of the ice surface is a Zamboni room, accessed from the exterior via a garage door and from the ice via a custom made lift gate. The lift gate has emergency stops to prevent it from dropping if its winch-wire should break. It was reported that the location of the room in the corner of the building is awkward for the vehicular manoeuvring. Accessed off this room is storage garage which has been fitted with chillers for temporary cold storage of food and drink during catered events. A narrow door from the garage leads to a storage room (also accessed via the ice surface from immediately behind the hockey net) in which tables, chairs, and hockey nets are stored. During the site visit the room was largely empty; a stage and table and chairs were set up on the ice surface for bingo.

Originally, there were stands on a mezzanine overlooking the ice surface, in the area above the foyer and original dressing rooms. This area has been insulated and renovated to become the hospitality room and some ancillary space. The hospitality room is enclosed and has large nearly floor-to-ceiling glass windows overlooking the ice surface. There is no guard rail or other structure to prevent falling if the glass fails. The door to the hospitality room is located partway up the stairs leading to it (The door is located on a standard step) and is locked from the outside. There is no other exit from the room, except a hatch into the attic. Off the hospitality room are storage rooms. Accessed from these storage rooms are a pair of unfinished and unventilated spaces where the curve of the roof slopes down toward the main floor. The insulation on the inside walls appears to be completely covered in black mold (Samples of the substance were not collected during the site visit; further testing may be required).

Above the storage room at the rear of the ice surface (behind the score clock and mural) is an access corridor. There is a reflective fabric covering suspended over the ice surface on cables. They are anchored to a structural frame, itself welded to the building columns along the back (east) wall of the building, which are accessed via this corridor. On the other side of the rink, the cables anchor to a structural frame bolted to the building columns (these are accessed via the attic above the hospitality room). From the rear access corridor the underside of the roof is visible; its paint is peeling.

Recommendations:

1. Replace door hardware to allow for emergency egress from all rooms
2. Study replacing wood stands with a more appropriate material (Composite or metal)
3. In stands, provide railings and steps to code, and provide barrier-free ice viewing area
4. In hospitality room, provide guard rail at window
5. Update “no smoking” signs and signage for gender-neutral washroom
6. Provide barrier free washroom, optimally with dual use as a barrier free change room
7. Provide lift from foyer to hospitality room
8. Renovate ticket booth and concession counter to improve accessibility
9. Provide high-contrast paint strips/bump strips for ease of access for building users with reduced visual acuity
10. Remove or relocate door to hospitality room away from stairs
11. Remediate mold on second floor; provide adequate ventilation to all access spaces
12. Remove peeling paint from ceiling, repaint or otherwise treat
13. Relocate items that are now stored in utility rooms

1.6 Cultural Significance

The Stellarton Memorial Rink is a testament to the local community spirit. At seventy+ years old, it has some significant building issues and requires upgrades to be more accessible. The people who built it were not given to luxury, but it presents a fine place for a game of hockey, a few cards of bingo, a market, or a community dance. The current cultural and historical context of the building and what significance it may hold for the coming generations should be an important factor in considerations of its future.

2. Structural

2.1 General

Main Structure: The structure is a rigid steel frame building with exterior masonry walls. The main steel structural frames appear to be in good condition and are approximately 30' on center, with steel truss purlins running longitudinally. The steel frames are 95' wide. The end and side exterior walls (north, east and south) are structural clay tile ("speed tile"), and the front (west) exterior wall is brick and concrete block. At the time of the site visit, SNCL could not confirm if the exterior speed tile, brick and concrete block walls were reinforced, and would have to perform an intrusive investigation to confirm. The speed tile did not appear to be reinforced. There are wind posts along the front and back walls of building at approximately 11'10'' on center. Two end bays at the back of building consist of cross bracing.

Roof: The original roofing consists of wood tongue and groove boarding, supported on 2'' x 8'' wood rafters approximately 20'' on center, which is supported on the steel truss purlins running longitudinally. Previous roofing of asphalt and asphalt shingles was covered with steel decking within the last 10 years, as reported by arena maintenance staff. The underside of roof structure section over the ice surface is not insulated.

North-side addition (Dressing rooms): The addition building was constructed for new dressing rooms. It consists of a steel frame structure with interior and exterior concrete block walls. The exterior walls have a layer of brick on the outside face. Where the addition building connects to the main building, the steel beams from addition building are supported on brick pilasters located along north wall of main building and are approximately 30' on center.

2.1.1 Interior Structure

Storage area at back of building (East end): Storage rooms were built within main building and behind the ice surface at back of building. They consist of a wood stud wall separating it from main arena, and an upper wood - framed floor with floor joists approximately 18'' on center.

Front end of building (West end): The building layout at the front of ice surface consists of a lobby and corridor area, and four partitions used for dressing rooms, canteen and rest rooms. The floor above the main floor, originally an upper seating area, was reconstructed and is now a mezzanine area. The partitions and upper mezzanine consist of steel framing and concrete block partition walls, and wood framed flooring with plywood decking (not accessible during site visit but reported by arena maintenance staff). The partition walls on the upper floor are wood studded walls.

Foundation: Based on the original drawings, the perimeter foundation consists of a 24'' wide footing with a 12 1/2'' thick foundation wall, and the foundation supporting the steel frame structure consists of 5'4'' x 4'0'' footings at approximately 30' on center. There are also 20'' x 20'' footings with 10'' x 10'' piers spaced at approximately 10' on center and located just inside the 5'4'' x 4'0'' footings on both sides of the building. A steel I-beam rests on top of the 10'' x 10'' footing piers and supports wood framing that spans between the these 10'' x 10'' footing piers and the 5'4'' x 4'0'' footings. This wood framing supports the seating stands on the north and south sides of building. The foundation also includes a concrete foundation wall supporting the rink dasher boards along the ice surface perimeter.

Basement: The front of the building has a full basement with access from the exterior and interior. It consists of the perimeter foundation wall, steel beams at 11'10'' on center (as per original drawings), steel columns, and 6'' thick concrete interior walls. The ceiling of basement (floor of main lobby area) is wood framing (as described under interior structure) with wood 2''x6'' boards laid on edge.

Ice Surface: The original ice surface, approximately 80' wide and 185' long, was a reinforced concrete slab on grade, and based on drawing was 6'' thick. A new reinforced concrete ice surface slab was constructed over the original ice surface in the late 1970's, as reported by arena maintenance staff.

Refer to Appendix D for original construction drawings available at the time of the site review.

2.2 Observations

Site observations are summarized in the following tables:

2.2.1 Foundations

Observation	Photo Ref.	Recommendation	Repl. Date	Opinion on Probable Cost
Medium to severe vertical cracking in exterior foundation wall along building perimeter, particularly at rear of building (east side), and some along sides of building.	S1-5	Repair concrete cracks in foundation.	18 months	$3500
Severe localized failure of south-east corner of perimeter foundation wall (supporting exterior speed tile wall).	S6	Repair foundation corner. Concrete is to be removed to good concrete and repair with new concrete and dowels as required.	Urgent	$3000
Severe cracking in foundation pilaster located along back wall of building (east side) in Zamboni Room. This pilaster supports a wind post.	S7-8	Replace concrete pilaster.	Urgent	$25,000
Leaking through cracks, honeycombing and poorly consolidated concrete in the foundation perimeter wall in the basement area under the front end of building (west side).	S9	Repair concrete foundation (inject and patch).	Urgent	$4000
Severe cracking in concrete foundation wall by south entrance to basement which supports steel beam above. It appears a portion of this wall had previously been removed to allow piping to pass through.	S10-11	Install new support for beam. Repair wall.	Urgent	$8000
Severe diagonal cracking in basement concrete foundation wall (east side of basement) that was observed to extend from ceiling beam at least to floor surface.	S12	Provide support to beam and repair cracking in concrete wall.	1 year	$6000

2.2.2 Masonry & Brick

Observation	Photo Ref.	Recommendation	Repl. Date	Opinion on Probable Cost
Vertical cracking in exterior speed tile wall at rear of building (east side). These vertical cracks appear to be coincident with wind post line locations. Some speed tiles along these cracks appear to have been replaced prior to cracking, which suggest continued cracking since repair (unknown time).	S13(1) -13(2)	Recommend to remove all speed tile and brick making up exterior walls and reinstate (approximately 1,500 sq. metres).	Urgent	$1,050,000 (concrete block and brick wall) OR $500,000 steel cladding with supporting steel secondary structure
Mortar joints in speed tile and brick have deteriorated in various locations along exterior of main building.	S14			
Local cracking in brick layer in addition to main building (north-east corner), potentially due to expansion/contraction of adjacent wall of bricks.	S15			
Zamboni room has an overhead door installed in exterior wall in North-east corner of building. There is cracking observed in brick/speed tile walls and through joints on both sides of door, which appear to have been previously patched.	S16-17			
Sections of concrete block walls in basement have been removed to allow piping to pass through. Some sections have been parged or patched around piping. Some concrete around steel beams supporting floor above have been damaged during the removal of these sections.	S18-20	Repair concrete around steel beams.	2 years	$2000

Observation	Photo Ref.	Recommendation	Repl. Date	Opinion on Probable Cost
Some original openings (i.e. for windows) along the exterior speed tile wall have been filled in with brick. Where any openings still exist, steel angles support the tile from above. Some of these angles have experienced mild corrosion.	S21-22	Replace steel angles above openings in exterior brick or speed tile wall. This would be captured in the replacement of exterior speed tile and brick walls from previous recommendation.	See previous recommen-dation	See previous recommenda-tion.
Concrete spalling and cracking around diagonal bracing through concrete block wall in Zamboni room along back (east) wall of building. The appears to have been patched prior to present cracking.	S23	Repair concrete block wall (This would be captured in the replacement of exterior speed tile and brick walls from previous recommendation).	See previous recommen-dation.	See previous recommenda-tion.

2.2.3 Structural Steel

Observation	Photo Ref.	Recommendation	Repl. Date	Opinion on Probable Cost
Steel beam supporting upper mezzanine area above foyer is supported on steel W-section columns. These columns do not appear to be centered under the beam/structure it is supporting. Each column has a plate welded to the top of it, and 4 holes which are presumably for connection purposes. A number of these columns do not appear to be connected fully at the top of column.	S24-26	Further investigation to confirm structure supported by steel column and to determine the required connection between the structure above and column supporting.	Further investigation required.	Further investigation required.

Observation	Photo Ref.	Recommendation	Repl. Date	Opinion on Probable Cost
Steel column in basement at west end of building has experienced severe corrosion and appears to have almost full section loss a bottom base plate of column. There is a concrete block wedged between the column and concrete wall as a temporary measure to prevent it from kicking out further. A second steel column in basement has also experienced medium to severe corrosion.	S27(1) -(2)	Replace steel columns that have experienced corrosion.	Urgent	$5000/column to replace and install (up to 3 – there are 3 exposed columns as per original drawings).
A steel roof primary truss purlin along the north side of building has a steel plate riveted in its bottom edge with several holes that appear to be for connections. No bracing is shown on the original drawings.	S28(1)	Further investigation would need to be done to confirm whether steel bracing is required.	Further investigation required.	Further investigation required.
Steel beams accessed from basement area and supporting floor above are exposed and have medium corrosion.	S28(2)	Further study would need to be done to determine any loss in structural integrity due to corrosion.	Further investigation required.	Further investigation required.
Steel beam accessed from basement area and supporting floor above has a hole cut through it for wire to pass through.	S28(2)	Conduct mag particle inspection and grind rough surfaces of hole.	2 years	$2000

2.2.4 Slab On Grade / Ice Surface

Observation	Photo Ref.	Recommendation	Repl. Date	Opinion on Probable Cost
Existing ice surface concrete slab has longitudinal and lateral cracking over surface. Of particular note is cracking on the south side of ice surface in the center. This cracking is up to approximately 10 mm wide and has been filled in with a patching compound. A small area of the slab in south-east corner of surface has experienced sagging affecting the performance of ice surface, and was reported by arena maintenance staff to require additional ice to create even ice surface. He also reported that there were no other uneven areas that would suggest frost heave.	S29-35	Replace existing ice surface concrete slab to improve performance of ice surface (optional).	2 years	$1,500,000.00 (includes new dasher boards)
The rink boards are primarily steel structure with “puck board” covering the face on the ice side. They are supported below on original concrete foundation wall. Where the boards meet the ice surface there appears to be gapping which has been filled in with a patching compound.	S36-37	Replace existing ice surface concrete slab to improve performance of ice surface (optional).		
The ice surface in the north-east corner in front of the Zamboni access door has cracked and a section spalled. This appears to have been patched.	S38	Replace existing ice surface concrete slab to improve performance of ice surface (optional).		

2.2.5 Exit Structures

Observation	Photo Ref.	Recommendation	Repl. Date	Opinion on Probable Cost
Brick columns supporting exterior entrance platform (entrance to addition building) on north-west corner of main building appear to have local damage at top.	S39-40	Replace columns and stair landing.	Urgent	$6000
Concrete stair structure for exterior entrance to main building (south-east corner) is in poor condition. There are cracks on concrete columns supporting platform, pits in concrete platform surface, and exposed reinforcement steel that has corroded on underside on platform. Where concrete platform is attached to building, there are some speed tiles that have been forced outward from wall and have been damaged. Railing post has corroded and detached from concrete platform. Stairs are uneven and have varying rise heights which may pose a tripping hazard.	S41-48	Replace entire entrance structure (stairs, platform, railings).	Urgent	$10,000
Concrete stair treads at north side entrance to main building are spalled.	S49	Repair concrete stair treads by replacing spalled concrete.	18 months	$2500
Concrete stairs at main entrance to building (west side) are uneven and may pose tripping hazard.	S50	Repair or replace concrete stair treads so that rise and run are consistent and do not pose tripping hazard.	18 months	$5000 (including railing)

2.2.6 Wood

Observation	Photo Ref.	Recommendation	Repl. Date	Opinion on Probable Cost
There is evidence of a fire in the south area of basement, reportedly caused when leaves were set afire after children broke into basement. There is charring on underside of wood floor system above basement. The structure above the charred wood was concealed at time of site visit, and SNCL was not able to confirm if damage occurred to structure above.	S51(1)	A more intrusive investigation would have to be carried out by SNCL to determine if there was any damage to structure above caused by the fire.	Further investigation required.	Further investigation required.
There is a 6''x6'' wood member that appears to have been installed after the fire to support a strip of floor above. The 6''x6'' is supported on 2 jack posts. The arena maintenance staff reported this was installed after a radiator leak had occurred in the room above and "rotted" the wood framed floor.	S51(2)	A more intrusive investigation would have to be carried out by SNCL to determine the extent of damage due to radiator leak. If structure is damaged, it will have to be replaced.	Further investigation required.	Further investigation required.

2.2.7 Site

Observation	Photo Ref.	Recommendation	Repl. Date	Opinion on Probable Cost
Zamboni room floor consists of a concrete slab that has suffered a severe settlement and has been patched with asphalt, which is in very poor condition and has large pits.	S52	Replace Zamboni room concrete/asphalt floor.	18 months	$10,000

2.2.8 Miscellaneous

Observation	Photo Ref.	Recommendation	Repl. Date	Opinion on Probable Cost
Above the main entrance is a semi-circular canopy that is original but has been re-faced since its original construction. The arena maintenance staff reported that the canopy is supported by a steel beam which cantilevers into the structure from underneath the mezzanine floor in main building, and that the canopy is framed with wood. A pair of chains also ties the canopy to the exterior wall, they appear to be in good condition. SNCL was not able to confirm if the exterior masonry walls were reinforced. A more intrusive investigation would need to be done to confirm this. It appears the chains are anchored into the brick. The arena maintenance staff also reported that the chains are believed to be anchored through the entire wall. Due to obstructions behind this wall and without performing intrusive investigations, SNCL was not able to confirm the canopy support and anchorage at the time of site visit. The arena maintenance staff reported that the canopy does not typically experience “significant” snow build up during the past winter seasons.	S53-54	A more intrusive investigation would have to be carried out to determine if canopy is able to resist applicable loads. Canopy is susceptible to snow accumulation. See “Discussion” section in Structural report. This canopy would be required to resist snow loads in accordance with NBC 2015.	Further investigation required.	Further investigation required.

Observation	Photo Ref.	Recommendation	Repl. Date	Opinion on Probable Cost
Above the storage rooms at the rear of the ice surface is a wooden mural board supported on a steel beam which is supported on jack posts. For visual purposes, the mural board was erected so that it was not plumb, but instead that its top edge was angled towards the ice surface, and therefore towards any spectators occupying the rink. The top edge of the mural board is anchored to a number of pulley systems that are aligned with and welded to the wind posts along the back (east) wall of the building. To prevent the mural board from “kicking out” at the bottom, horizontal steel struts were installed between the board and the back wall of building. These struts are welded to the steel beam under the board, and to the steel wind posts along the back wall. Some of these struts are corroded and are irregular in shape in order to pass obstructions. The mural board is also anchored to the wind posts by steel angles located closer to its top edge.	S55-59	This structure installed to support the wooden mural produces additional loads on the wind posts along the back wall that they were not originally designed for and should be engineered. Further investigation should be done to determine whether this has been engineered, and therefore the structural integrity of the steel frame with additional loads imposed.	Further investigation required.	Further investigation required.

Observation	Photo Ref.	Recommendation	Repl. Date	Opinion on Probable Cost
There is a reflective fabric covering suspended over the ice surface on cables, installed in the late 1980's as reported by arena maintenance staff. It is anchored to two structural frames, one welded to the wind posts along the back (east) wall of the building and the other bolted to the wind posts on the front (west) side of the rink.	S60-62	The steel frames welded to the wind posts at the front and back walls of the main building, which are supporting the weight of the fabric covering over ice surface, are not original. Therefore wind posts were not designed to resist the loads imposed by the weight of this fabric covering. Further investigation should be done to determine the structural integrity of the steel frame with additional loads imposed. This structure should be engineered.	Further investigation required.	Further investigation required.
The Zamboni room is accessed from the ice via a custom made lift gate with electric pulley system. The lift gate has emergency stops to prevent it from dropping if its winch-wire should break. The lift gate pulley is hung from a lifting lug supported on a steel section that has been welded to the existing steel purlins that make up the main steel structure of the building.	S63-65	SNCL understands this lift gate system was engineered, but without engineering drawings of lift gate system, SNCL cannot confirm the adequacy of the roof purlins to support the pulley system, which were not originally designed to support this lift gate. Drawings were not available at time of site visit.	Further investigation required.	Further investigation required.

Observation	Photo Ref.	Recommendation	Repl. Date	Opinion on Probable Cost
A large two-piece sign is mounted across the windows over the canopy on the front exterior of building. The arena maintenance staff reported that it was installed within the past six years. The sign is mounted on four steel members. The top member is anchored through the brick and concrete block wall on either side. The third member was also reported to be anchored through entire wall by arena maintenance staff.	S53-54	This sign should be engineered.	Further investigation required.	Further investigation required.

2.3 Discussion: Codes And Standards

Applicable building code at the time of design would have been the National Building Code (NBC) edition 1941.The 2015 edition of the National Building Code of Canada (NBCC 2010) allows buildings designed and built in accordance with previous codes to be considered acceptable provided “the building or its use is not altered in such a way to affect its structural behavior or to increase the loadings on the structure”, and also that “no significant damage, distress or deterioration” has occurred. The Stellarton Memorial Rink has undergone a number of changes, some of which have imposed loads on the structure that were not originally designed for. It has also had a number of additions made to original building and has experienced deterioration and damage to various structural parts (see Section 2.2 and table below).

Structural Component	Changes to original structure?	Damage, distress or deterioration observed?
Primary Steel Truss Frames	No	No
Speed Tile	No	Yes
Steel Wind Posts	Yes	No

With these changes and various deteriorations experienced, the previous code to which it had been designed and built to cannot be considered acceptable for the current building. The Stellarton Memorial Rink must therefore satisfy the current edition of the National Building Code of Canada (2015).

2.4 Conclusions

The Stellarton Memorial Rink building structure has undergone a number of changes and has experienced deterioration and distress in a number of areas since originally built in the late 1940s. Its main structural steel truss framing and roofing appears to be in good condition. Deterioration of the exterior speed tile and brick

walls, cracking and failures in perimeter foundation wall and interior foundation walls in basement area, severe corrosion in some structural steel members (basement area) are of particular note and may detrimentally impact performance of structure as a whole. We therefore recommended these should be repaired to their original design intent, as captured in the observations tables (section 2.2). The entrance and exit structures are also in poor condition and should be replaced or repaired, as noted in the observations tables (section 2.2). The ice surface slab on grade was observed to have several cracks, and a small area that has experienced settlement, both impacting the performance of the ice surface if not replaced. All recommendations (provided in section2.2, Observations and in Appendix D, Priority List) are based on the visual observations and the presumption that the buildings were aptly designed in accordance with applicable building at time of design and construction.

3. Mechanical

3.1 Refrigeration Plant

The refrigeration plant is located in a mechanical room near the Northwest corner of the arena. The room contains the refrigeration plant equipment, hot water storage tanks (abandoned), brine pumps, and related components. The system consists of two compressors, a chiller (shell & tube), condenser pump, evaporator (on roof), two brine pumps, PVC headers, and slab tubing. The compressors are driven by 50hp motors, the brine pumps are driven by 20hp motors. The main header trench is under the main lobby / entrance and it was not able to be inspected.

Overall the refrigeration plant equipment is in mediocre condition. Many components are original equipment, dating back approximately 40 years. Equipment has been serviced throughout the years; however the equipment is near its useful life. The control panel is a Cimco design. Compressor #1 is 40 years old, but was rebuilt eight years ago. Compressor #2 is 38 years old. The evaporator is manufactured by Evapco, but no information is available on its model or manufacture date. The condenser pump is 15 years old, but is in poor condition. The condenser tank was field fabricated, and the lower half is showing visible corrosion. Brine pump #1 was replaced in 2015 and is in good condition. Brine pump #2 is 33 years old and in poor condition. The pump discharge flange and steel adapters are severally corroded. The evaporator was serviced late last year. The majority of the brine system is PVC and valves / fittings appeared in fair condition. The header piping fittings were replaced approximately 8 years ago. The chiller and accumulator are 24 years old and have new safety valves installed in 2017. No problems were reported with these components. Both the refrigerant monitor and gas detector were installed in 2018 and are in excellent condition.

The general housekeeping of the room is poor with limited floor space used to store staging, ladders, light fixtures, etc. Corrosion of equipment is evident throughout the plant, and is particularly bad around the brine system and mixing tank. Steel components are corroded and concrete equipment bases are deteriorated. Roof leaks have resulted in deterioration of the ceiling gyproc over the back half of the plant room and it has since been removed exposing the wood roof joists. The roof is being repaired and the gyproc in the plant room is being replaced after repair.

Recommendations:

1. General housekeeping should be completed and remove any items that are temporarily stored in this area allowing access to refrigeration equipment and panels.

2. Replace Brine Pump #2 and associated steel fittings. This is a priority 1 item with a budget cost of about $15,000.

3. Replace Compressor #2 and associated accessories and fittings. This is a priority 2 item with a budget cost of $60,000.

4. A major upgrade including replacement of compressor #1, condenser tank & pump, compressor accessories, oil separators, control panel, and associated piping should be completed in the next 10 years. This is a priority 3 item with a budget of $300,000.

3.2 Ice Resurfacing

The ice resurfacer is a Zamboni that is approximately 15 years old. No significant issues were reported for this equipment. There are two Zamboni water heaters located near visitor room #6. These are newer John Woods 405L electric water heaters. The Pressure / temperature safety valves are not properly installed on the tanks and appear to be undersized. This should be reviewed by a certified plumber. There is no vacuum breaker or backflow preventer on the Zamboni fill hose which is required by code.

Recommendation:

1. The ice-resurfacing machine seems to be serviceable and 10 to 20 addition years of service is practical. The reliability of this machine may degrade over the next few years if servicing is not done during the off-season. An evaluation of the cost of unplanned service versus planned service is good practice.

2. Install the P&T safety valves directly on the water tanks as recommended by the manufacturer. This is a priority 1 item with a budget cost of $2,000.

3. Install a backflow preventer or vacuum breaker on the Zamboni fill hose. This is a priority 1 item with a budget cost of $400.

3.3 Plumbing

The facility receives water from the town water supply system. There are two different feeds to the Arena. The main 2" NPS feed is located in the basement mechanical room. A second 1" NPS line is located near visitor room #6. Both have backflow preventers, but have not been annually tested as required by the plumbing code. Plumbing fixtures appear to be in good condition. Public washrooms fixtures have been replaced in recent years. No major damage was noted but some dressing room fixtures are showing age. Shower drains appear to be in good condition and shower fixtures have been upgraded in most dressing rooms.

Domestic hot water is supplied by a 175L Rheem electric domestic hot water heater located in the basement mechanical room. The domestic hot water piping runs are long and the system does not have a recirculation loop to maintain water temperature at the fixtures.

The original sanitary drainage system is cast iron in the basement area. It has been replaced in sections with PVC which is in fair condition. The brine system drain line located in the basement is severely corroded with a large hole in the side of the pipe. The condition of this piping may be indicative of the underground piping to the municipal connection. Many of the floor drains in the washrooms have been painted over and should be replaced.

Recommendations:

1. Current codes require annual testing of the backflow preventers. This is a Priority 1 item with a cost of about $500.

2. The remaining cast iron sanitary draining piping in the basement should be replaced and the lateral to the municipal connection should be inspected. This is a Priority 2 item with a cost of about $4000.

3. Replace painted over floor drains in washrooms. This is a priority 1 item with a cost of $500.

3.4 Space Heating

The ice surface area is supplied with in-floor heating during the non-ice months. An oil fired boiler located in the basement mechanical room supplies boiler water to the shell side of a shell & tube heat exchanger (circa 1980). Water is heated on the tube side and pumped through the in-floor piping to provide space heat for the ice surface. This system has never worked sufficiently to provide heat to the ice surface area. In 2017 two new propane fired Modine force air heaters were installed to provide additional space heat in the ice surface area. The boiler has two 6 year old 250 gallon fuel tanks located in the mechanical room. The tanks and piping are in good condition, but are not fixed to the floor as required by code.

The boiler is 35 years old and is showing its age. The breeching is in very poor condition and should be replaced immediately. The boiler piping is in fair condition, but is lacking insulation in many areas. The circulators are in fair condition and are approximately 10 years old. The heat exchanger is an 8' long by 16" diameter shell & tube design and is in poor shape. Leaks are evident around the tube bundle sheet. It should be planned to be replaced in the near future.

Space heat to the refrigeration plant, dressing rooms, office, kitchen, and washrooms is supplied by a mixture of hot water baseboards heaters and electric unit heaters. Electric heaters are in reasonable shape, but will need to be replaced over the next 5-10 years.

Recommendation:

1. Replace existing interior boiler breeching. This is a Priority 1 item with budget cost of $3,000.

2. Anchor existing oil fuel tanks in basement mechanical room to floor. This is a Priority 1 item with budget cost of $1,000.

3. Replace the boiler system, controls, piping, and associated components in the basement mechanical room. This is a Priority 2 item with a budget cost of $80,000.

4. Replace the in-floor heat exchanger. This is a Priority 2 item with a budget cost of $60,000.

5. Replace the electric forced air heaters in the dressing rooms, office, washrooms. This is a Priority 3 item with a budget cost of $20,000.

3.5 Ventilation

General ice surface area ventilation is provided by mechanical ventilation through a main exhaust fan located above the mezzanine lounge. No date information was available for this fan. There is currently no dehumidification in the Arena.

Building ventilation is exhaust only with untempered fresh air being pulled in through windows, doors, and the building envelope as required. Much of the exhaust ventilation does not work. Local exhaust fans are not working in the men's or women's washrooms near the front entrance. There is also no exhaust in the

washroom near the office. No ventilation is provided in kitchen area. There is an existing exhaust hood for a stove / fryer, but upgrades were required in the past and were not completed and the stove / fryer were removed.

The classification for this refrigeration plant is an Indirect Closed System in a Public Assembly occupancy (See B52 Mechanical Refrigeration Code). Refrigeration plant ventilation appears to be inadequate with one wall mounted fan in the room. The installation of this fan is poor, without proper wall framing. There is emergency air exhaust equipment in place as required by the current code.

Recommendations:

1. Inspect & repair exhaust ventilation in the dressing rooms, washrooms. Replace exhaust fans as required. This is Priority 1 and estimated cost is $2500.

2. Install exhaust ventilation in the 'pink' office washroom. This is Priority 1 and estimated cost is $500.

3. Replace the gravity backdraft damper and install a safety guard on wall fan (as per OSHA requirements) in Refrigeration plant. This is Priority 1 and estimated cost is $500.

3.6 Fire Protection System

The Arena does not have a sprinkler system. The fire alarm system is 35 years old. No significant issues were reported with the fire alarm system and it has been tested recently. See electrical section 4.4.1.

3.7 Controls

The control of equipment is local or manual throughout the facility except for the refrigeration plant. There is no central building energy management system but this is not unusual for a facility at this age. From an energy saving standpoint, there are many measures that can be considered. Measures such as variable or multi-speed brine pump, fan controls, energy recovery to preheat water for ice resurfacing, and lighting controls can be implemented to significantly reduce energy costs.

Recommendation:

1. Use existing information (energy audits) and study energy saving options to achieve reduction in operating costs. This is a Priority 3 item with variable costs depending on the scope of study.

4. Electrical

4.1 Electrical Service

The Stellarton Memorial Arena is provided with two 3 phase electrical systems.

1. A 3-phase, 4-wire 600/347VAC pole-mounted Wye configuration transformers from the utility supplying a 400-amp electrical service to the Ice plant room. The electrical service disconnects switch, current transformer (CT) cabinet and meter equipment are located in the arena's refrigeration room (Ice Plant).

2. A 3-phase 4-wire 120/208VAC, 800-amp electrical service located in the basement of the arena below the main entrance of the building. The disconnect switch, current transformer (CT) cabinet and utility meter has a labeled rating of 240VAC. As it has a 3-phase Wye configuration transformer on the utility pole it is assumed to be 120/208VAC 3-phase as per the splitter box rating and the labels on the electrical panels throughout the building.

4.1.1 600 Volt (Ice Plant) Electrical Distribution

The ice plant electrical service is a 3-phase, 4-wire, 600/347-volt, 400-amp, overhead system fed from the terminal pole to the east side of the building. The NSPI terminal service pole is guyed and consists of three distribution transformers (50 kVA bank) complete with fused cut-outs, which protect the primary line before the transformers.

The CT metering cabinet is located adjacent to and fed from the main service switch while the utility meter is mounted on the North wall outside the building. The metering cabinet feeds a 600/347-volt, 400-amp main splitter, which in turn feeds the remaining electrical loads via a Cimco ice plant relay controller panel and panel boxes. For safety reasons the electrical equipment was not opened up to inspect inside. The refrigeration room was built as an add-on to the building in the early 1970's and the electrical service equipment appears to be the original (40+ year old) equipment that has been modified over the length of service.

Distribution of the ice plant electrical system is located on the North wall in the Ice Plant refrigeration room at the North end of the arena. Each load is controlled via the Cimco Ice plant relay control panel, and then connected via cable in EMT conduits or Teck Cable. The ice plant electrical equipment is greater than 250 volts and ideally should be located in a separate electrical room and provided with sufficient clearance (greater than 1m) from the ice plant compressors. The main service disconnect switch and metering cabinet do have sufficient operating and maintenance clearance space.

The main 600-volt loads include the following systems:

1. Mycom Compressor motor starter #1 575VAC (50 Hp). 46-amp,
2. J&E Hall Compressor motor starter #2 575VAC (50 Hp). 47-amp,
3. Armstrong Brine pump #1 575VAC (20Hp) 20-amp
4. Leeson Brine pump #2 575VAC (20Hp) 20-amp
5. Condenser water pump 575VAC (2 Hp) 2.25-amp
6. Electric heater 575VAC with thermostat relay in the refrigeration room.

Each motor has an HOA (hand-off-auto) operator selector switch from within the Cimco Ice plant relay control panel. Compressor power for the Mycom Compressor, marked NO 1, and the J&E Hall Compressor, marked NO 2, is provided through the ice plant panel then to a manual transfer switch. The only disconnect switches for the compressors are the HOA relay switches. Each compressor is turned on alternately via a manual transfer switch which ensures that both compressors are not running at the same time. If maintenance is done on a compressor the HOA is set to “Off” and the transfer switch is switched to the alternate compressor to prevent the alternate compressor from starting. This is not suitable for a lock out, tag out system.

A gas monitoring system is installed which sends a signal to local authorities if a refrigerant gas leak is detected in the room. It has been noted that if the compressor is running during a power failure it will also set the gas monitor into alarm mode. There is one 120VAC exhaust fan that has an HOA disconnect switch that is connected to the gas monitor system. There is also a 575VAC heater with contact relays connected to a thermostat on the wall near the entryway. The thermostat/heater contactor power is sourced from a switch at the entry way. Maintenance and service records of the ice plant have been completed by Trane Atlantic.

The locations of the 600/347VAC main disconnect switch and ice plant panel are mounted at an accessible height. Generally there is sufficient clearance of 1 meter in front of the equipment for servicing, however the area is being used for storage of gas bottles, staging and ladders which are set over top of the main disconnect switch and splitter box access.

The feeder protection for the 3-phase loads is via three line fuses in a main fusible switch. There are no individual circuit breakers or disconnect switches connected to the motors. The failure of any single upstream fuse could cause single phasing to occur. Single-phase power may allow a motor to continue to operate but at a higher than normal current, potentially damaging motors. Phase protection should be considered for critical motors such as ice plant drives.

There is no 120/208VAC electrical distribution equipment or panel board in the refrigeration room which indicates that any single phase devices are powered through a panel from the Arena‘s 120/208VAC Main distribution.

The equipment bonding should be examined to ensure secure bond to building steel rather than relying on EMT connections, which are heavily deteriorated due to corrosion from the brine mixer nearby. The 600-volt disconnect switch and meter casing equipment is in good shape considering its age but is dated. All covers were found closed and secured. Labeling of devices should be improved. A new circuit breaker based distribution panel would provide more valuable free space and eliminate problems with fuses and phase operation concerns.

<u>Recommendations:</u>
There are a number of Electrical Code violations that exist in the ice plant room. In order to bring this room up to current codes, below is a list of recommendations.

1. Remove all staging, ladders and other stored equipment away from the electrical distribution equipment and maintain general good housekeeping. This is a priority 1 recommendation which can be easily done by maintenance staff as part of routine tasks.

2. Conduits from the Ice plant panel to the motor loads are in EMT conduit and are heavily corroded due to the proximity of the brine mixing tank. These conduits must be replaced as it is believed the bonding cables,

if any, inside are compromised. This is a Priority 1 recommendation and requires immediate replacing with PVC or non-corrosive conduit with an estimated cost of $20,000

3. The HOA switches in the ice plant relay panel are the only disconnect switches for the motor loads in the refrigeration room. All the 3-phase motors in the room should be rewired with disconnect switches, with a one meter clearance in front of each switch mounted at a serviceable height for each load. This is a Priority 1 recommendation at an estimated cost of $20,000.

4. The compressor transfer switch and splitter box is corroded due to the proximity of the brine mixing tanks. This transfer switch does not meet current code standards as it requires a one meter unobstructed clearance in front of the access panel. This transfer switch along with the splitter/junction box beside it requires being moved to a location better accessed without tripping over pipes, the metal casing is not compromised by brine splashing on it and water lines running over top of it. There appears to be a bonding cable connected to the transfer switch casing which is connected to the adjacent splitter box but further bonding is not known or may be through the corroded EMT conduits. This is a Priority 1 recommendation and with an estimated cost of $20,000.

5. Surface mount receptacles, light switch boxes, and cover plates are painted over, are dated, and should be replaced. The receptacles next to the brine mixer must be replaced with a GFCI receptacle. This is a Priority 1 recommendation. Estimated cost $3000.

6. Install a single line diagram on a wall or display board to indicate equipment electrical connections, sizes ratings and locations as well as to assist with future modifications. This is a Priority 1 recommendation. Estimated cost $2500.

7. The grounding and bonding system should be verified and if insufficient a new ground bus should be added to the electrical system with ground cables to be a minimum #6 AWG copper and bonded to building steel to all disconnect switch enclosures and motors. This is a Priority 2 recommendation with estimated cost of $5000.

8. Most distribution loads are identified via Sharpie ink markings on the panel switches. In some cases the load name is identified with a lamacoid naming each load on the ice plant panel but no indication of the voltage, current or power source fuse or breaker rating. Each of these loads should be identified with Lamacoid nameplates along with load rating and fuse protection rating. Fabricate and install lamacoid nameplates on the ice plant HOA switches, electrical panels and motor disconnect switches identifying the voltage, phase, horsepower and current rating of each motor load as well as individual loads and sources. This will provide clarity and safety for any person working on the electrical system in the future. This is a Priority 2 recommendation with an estimated cost of about $1000.

9. The current electrical code requires new equipment to have an arc flash rating calculated and warning labels applied to all 600-volt equipment. Although not a requirement for existing equipment the electrical equipment should have the arc flash warnings on the enclosure doors, the arc flash level should be indicated along with the recommended personal protective equipment. Have an arc flash level calculation plus add warning labels to electrical panel enclosure covers. This is a Priority 2 recommendation with an estimated cost of $5000.

10. Current electrical, building and fire codes require that any electrical service entrances over 250V or 250A must be in a separate electrical room used for no other purpose except electrical distribution, telephone, communications or cable television equipment. The 600/347 volt service switch should be

enclosed along with the other distribution equipment, in the electrical room with a 1-hour fire rating. This may require a complete renovation of the ice plant with all new electrical equipment to bring the room up to current building, fire and electrical codes. The modification of the Ice plant room to accommodate a separate fire rated electrical room is a Priority 3 recommendation with an approximate cost of $100,000.

4.1.2 120/208 Volt 3-Phase 4Wire Main Arena Electrical Distribution

The Arena main electrical distribution is connected to an 800-amp, 4-wire, 120/208VAC 3-phase fusible disconnect switch located in the basement under the main entry way of the rink. A CT cabinet and utility meter is located adjacent to and fed from the main service switch while the utility meter is mounted above the CT cabinet. The metering cabinet feeds a 120/208-volt 3-phase, 800-amp main splitter, which in turn feeds the remaining electrical loads and panels via fusible disconnect switches. For safety reasons the main switch was not opened to inspect inside. The meter, CT cabinet and utility main disconnect switch appears relatively newer construction (circa 1996) and is in good shape.
The low voltage distribution panels are located as follows:

1. “Panel #3” in referee dressing room 120/208V(3phase)
2. “Panel B” or New Panel #6 in the Utility Room 225A 120/208 (3-phase) Sub from Old Panel #6 CCT 2,4,6 100A breaker
3. “Old Panel #6” in the Utility Room 120/208 (3-phase)
4. Panel off hospitality room sub-fed from Panel #3 120/208
5. Panel by Furnace in basement 120/208 (single phase) sub-fed from Panel#3
6. “Panel #7” in Dressing Room 7 Siemens 125A 120/208
7. Penalty Box Panel sub-fed from Panel #7 Siemens 125A 120/208
8. Canteen Fuse box 60A 120/240V Amalgamated Electrical panel
9. Two 3-phase 208 volt water heaters with Amalgamated Electrical fused disconnects switches located in the main electrical room.
10. 120/208 3-phase fused disconnect switch to a 30kVA transformer for canteen kitchen appliances (not used).

The remaining disconnect switches appears to be 50+ year old Square D equipment. It is assumed that this equipment was installed in the early to mid-1960’s thus is past its expected life cycle. Voltage ratings may be confusing, as disconnect switches are labeled and rated for 240 volt, but the distribution voltage is assumed to be 120/208 volt due to the Wye configuration transformers on the utility pole, the 120/208 volt labeling on the distribution panels and water heater tanks. The labeling of the electrical equipment is a voltage rating and not necessarily the voltage of the electrical system. This is a safety concern as someone may assume this is single phase equipment while in fact it is 3 phase equipment.

The presence of moisture and condensation is evident on the electrical cabinets and splitter boxes due to the water pooling on the floor, high humidity and low air flow in the basement.
Though the electrical system is in a separate room and has lots of clearance, it is used for storage of seasonal decorations and it is a main throughway to get to under parts of the arena. The electrical equipment is not enclosed in a dedicated fire rated room.

Recommendations:

1. Install a heated ventilation system to keep moisture from condensing on the electrical equipment. This is a Priority 1 recommendation with an estimated cost of $10,000

2. The distribution loads are identified via Sharpie ink markings on the disconnect switches. Each of these loads should be identified with Lamacoid nameplates along with load rating and fuse protection rating. Fabricate and install lamacoid nameplates on all fused disconnect switches, electrical panels and motor disconnect switches identifying the voltage, phase, horsepower and current rating of each motor load as well as individual loads and sources. This will provide clarity and safety for any person working on the electrical system in the future. This is a Priority 1 recommendation with an estimated cost of $1000.

3. Remove combustible decorative material from the electrical room. This is a Priority 1 maintenance recommendation.

4. The grounding and bonding system should be verified and if insufficient a new ground bus should be added to the electrical system with ground cables to be a minimum #6 AWG copper and bonded to building steel to all disconnect switch enclosures. This is a Priority 1 recommendation with estimated cost of $5000.

5. For each switching device and receptacle device cover, a label should be added showing the originating distribution panel and circuit number. This is a Priority 1 recommendation with an estimated cost of $1,500.

6. The current electrical code requires new equipment to have an arc flash rating calculated and warning labels applied to all electrical equipment over 250 amps. Although not a requirement for existing equipment the electrical equipment should have the arc flash warnings on the enclosure doors, the arc flash level should be indicated along with the recommended personal protective equipment. To have an arc flash level calculation plus add warning labels to electrical panel enclosure covers is a Priority 2 recommendation with an estimated cost of $5000.

7. Remove the ticket booth to allow a one meter clearance in front of the electrical panel in the Referee Room. This is code compliance issue and is a Priority 2 recommendation. Estimated cost $10,000.

8. The 120/208VAC electrical distribution sub panel in the Canteen should be replaced from a fused panel to a circuit breaker type. Receptacles and lights appear to be in good condition and can be rewired into the new panel. This is a Priority 2 recommendation. Estimated cost $6000.

9. All deteriorated receptacles and toggle switches in the arena should be replaced. Install cover plates on electrical junction boxes where required and ensure open knockouts are covered. This is a Priority 2 recommendation with an estimated cost of $3500.

10. Begin replacement schedule of distribution panels. Replace the 2-120/208VAC electrical distribution panels below the main office by the visitor dressing room and Referee Room and re-run new branch wiring within the next 10 years. This is a Priority 3 Recommendation. Estimated cost $100,000.

11. Current electrical, building and fire codes require that any electrical service entrances over 250V or 250A must be in a separate electrical room used for no other purpose except electrical distribution, telephone, communications or cable television equipment. The electrical service switch should be enclosed along with the other distribution equipment in the electrical room with a 1-hour fire rating. This is a Priority 3 recommendation with an approximate cost of $100,000.

4.2 Lighting Systems

4.2.1 Indoor Lighting

The lighting system for the arena's ice surface utilizes twenty 120VAC Six-tube lamp T-5 4-foot fluorescent light fixtures. These fixtures are approximately 12-15 years old and were a replacement from the pennant mounted metal halide lights under a rebate program at that time. A replacement should be considered in another 15 years. They are in good working order however the lights are turned on manually via Panel #3 circuit breakers in the Referee Room. There are no light switches for these lights, only the circuit breakers. Circuit breakers are not rated for switching and can cause damage to the breaker panel and to the lights. There are 9 ice light circuits indicating there are approximately 2-3 light fixtures per circuit. There is good uniformity in lighting over the ice due to the large number of fixtures. A periodic (annual) complete cleaning of the reflective surfaces will assist in providing for optimized lighting levels.

The bleacher and spectator walkway area is illuminated by the outer ice surface lights. Even with the outer ice surface lights turned on the spectator walkway area is dimly lit. The spectator walkway close to the ice surface perimeter is illuminated by a few vapor tight incandescent/fluorescent bulb wall pack fixtures mounted inside the Ice boards but the area is still dimly lit.

The main entry foyer and corridor to the canteen area and dressing room #1 are illuminated with 4 foot, 2-tube T5 fluorescent fixtures.

The refrigeration room has suitable 120VAC T-5 fluorescent lighting for access and service of the equipment however in the back of the room the lights have been removed due to the heavily damaged ceiling. A few incandescent and LED lamps are plugged into nearby receptacles to illuminate the back of the refrigeration room area. The wires from these lamps are commercial grade and not rated for this area considering there is heated brine pumped through the pipes while the ice plant is in operation which is a safety concern.

The basement electrical room and boiler room, and canteen office are also illuminated with surface mounted fluorescent fixtures 2 tube, 4-foot long T5 florescent lamps. The electrical room and the ticket office in the Referee Room are illuminated by a single incandescent bulb in each area.

Lighting controls used in the non-ice surface areas of the arena are typically via surface mounted, toggle switch devices with no advanced controls in dressing rooms, public washrooms or utility areas. All switches noted have cover-plates however in many cases the toggle switches and corresponding covers are painted over or are worn and need replacing. Exhaust fans are seen mounted in the washroom ceilings but none of them are working.

Recommendations:

1. Install Lighting Controls for the Ice Surface lights as operations staff should not be accessing circuit breaker panels to turn on lights. This is a Priority 1 recommendation. Estimated cost of $5000.

2. Add a row of lights to the spectator walkway in each bleacher area to increase illumination levels. This is considered Priority 2 tasks and is expected to cost approximately $5000.

3. All the individual incandescent fixtures in the public washrooms, hospitality room, and dressing rooms should be changed to the newer compact LED fixtures to reduce electricity consumption, increase illumination levels and reduce labour replacing lamp bulbs. This is considered Priority 2 tasks and is expected to cost approximately $5000.

4. The fluorescent fixtures and lamps for the main entry foyer, service rooms and corridors should be replaced with vapor tight LED fixtures. In high abuse areas these fixtures should have wire guards installed. This is a Priority 3 recommendation and is expected to cost approximately $5000.

4.2.2 Outdoor Lighting

The outdoor lighting fixtures consist of a mix of HID wall pack fixtures, 100Watt Incandescent and fluorescent bulb fixtures, and a few LED wall packs located over exit doorways and on the side of the building. The lights on the South end of the building appear to have its own individual photocells which turn on at night.

Each of these outdoor fixtures should be controlled with a single photo detector mounted on the North side of the building. There is also HPS outdoor street lighting fixtures above the entry canopy and mounted on the transformer poles in front of the building that are controlled via a photo-detector.
The parking lot area to the North of the building is owned by the Town of Stellarton and the lighting for this area is available from nearby street lighting. All other lighting is from fixtures mounted on the building.

Most of the outdoor lighting fixtures appear to be in need of replacing with one type of fixture for uniformity rather than many different types of fixtures. New or future fixture upgrades should included photo eye or timer controls. These fixtures should be upgraded again every 10 years.

Recommendations:

1. Replace the existing outdoor light fixtures around the building with new photo eye controlled LED fixtures on a timed controller. This is a Priority 1 equipment replacement recommendation. The cost is estimated to be $10,000.

4.3 Electric Heating

The majority of the arena's space heating fixtures are provided by hot water distribution system. There are a series of 575-volt 3 phase electric heaters with integral thermostats for temperature control located in the mezzanine hospitality room, visitor's dressing room and Main office. Heater power is provided from the 120/208 VAC 3 Phase distribution panels throughout the building and are in good shape. There are 2 Propane heaters mounted above the ice surface that appear to have 208VAC 3phase blower fans. These heaters are fairly new and are in good condition.

4.4 Life Safety Systems

4.4.1 Fire Alarm System

The existing fire alarm system is an Edwards model 2280, 8-zone system that is approximately 40+ years old. The system is operational, but it is not known if it is annually inspected and regularly maintained by a fire alarm service company. The fire alarm panel is very old and does not meet current ULC standards. If any devices need replacing they would be hard to find and may not be compatible with this fire alarm panel. It is highly recommended to replace this fire panel, all smoke detectors as they are well past the recommended 10 year replacement period, and install Horn/Strobe alarms so hearing impaired patrons will see the strobe alarms in case of an actual emergency.

Recommendations:

1. Install a new fire alarm panel that meets CAN/ULC codes with addressable inputs and outputs with cellular backup. New signaling devices can be installed to include horn/strobe lights for those persons with hearing disabilities or during events with loud background noise. This is a Priority 1 recommendation. The estimated cost $60,000.

4.4.2 Emergency Lighting

An emergency lighting system is designed to provide a minimum of 5 foot candles (50 lux) of light at an emergency exit and a minimum of 1 foot candles (10 lux) along an exit egress path. All of the emergency lighting systems should be tested and documented. The arena's emergency lighting system consists of several individual; self contained emergency light units complete with battery and charger, one and two lamp heads, wall mounting kit, test switch and receptacle plug. Several of the exit lights are also combination emergency light and exit light units each complete with two emergency light heads as well. Most of the emergency lights are older with battery packs not maintained. Exit lights are visible throughout the building and are in working order.

Recommendations:

1. Replace emergency lighting with LED Heads and a 90 minute rating in the electrical room, ice plant mechanical room, canteen area and throughout the arena to allow safe egress.

2. Add emergency lighting fixtures in pubic washrooms, each dressing room and the stairway to the hospitality room.

Ensure the units tested are capable of illuminating egress pathways to 1 foot-candle and exits to 5 foot-candles. This is a Priority 1 Recommendation. The estimated cost is $3000.

4.4.3 Public Address/House Sound System/Scoreboard

The public address (PA) system controls and amplifier are located in the arena office with cables running to the speaker. A microphone and local controls are available from the timekeeper's booth. The speakers are suspended over center ice. There were no reported problems with the existing equipment. The equipment is dated and newer digital equipment is available with smaller space requirements and fewer cables needed.

The clock and scoreboard are controlled from the timekeeper's bench from a master controller. This system although estimated to be 40 years old is still working and serviceable. There were no reported problems with the system. It is however, original equipment and may need an upgrade or replacement within the next 10 years. Estimated Cost $5000

Appendix A: Photographs

Architectural Photos

A1: Under lineated Parking near main entrance

A2: Steel exit stair, uncontrolled plant growth

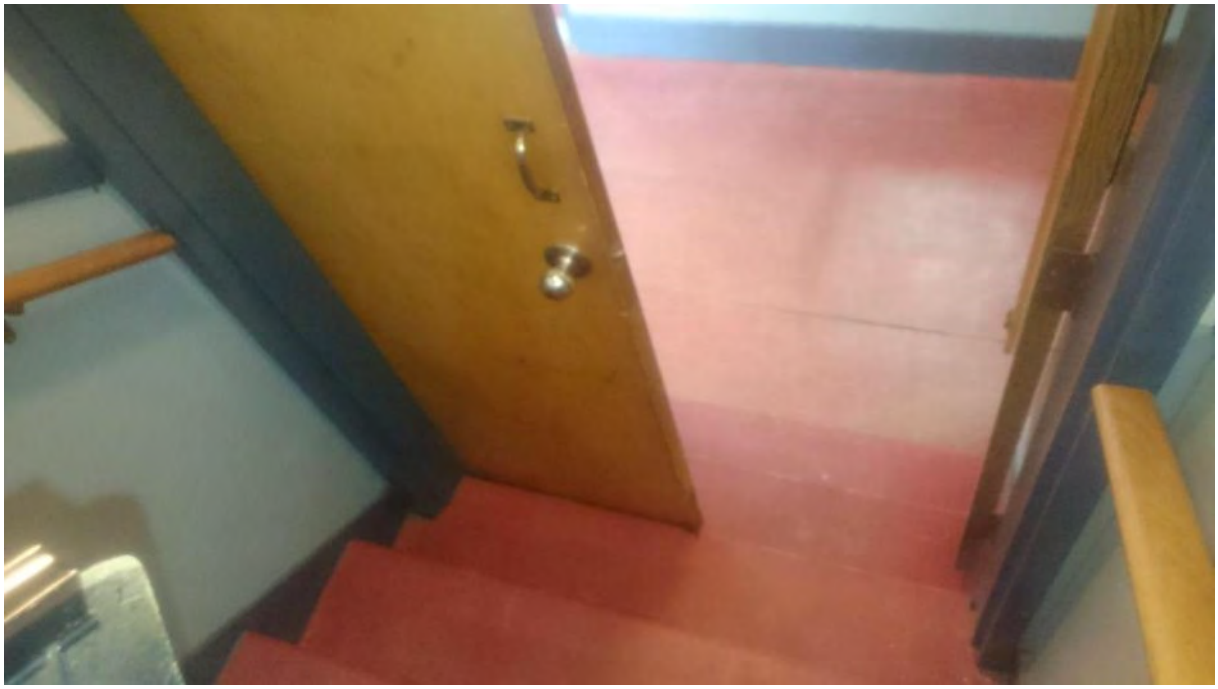
A3: Concrete exit stair, uncontrolled plant growth

A4: Steel door detail

A5: Foyer. Poor door seal, non-barrier-free ticket booth

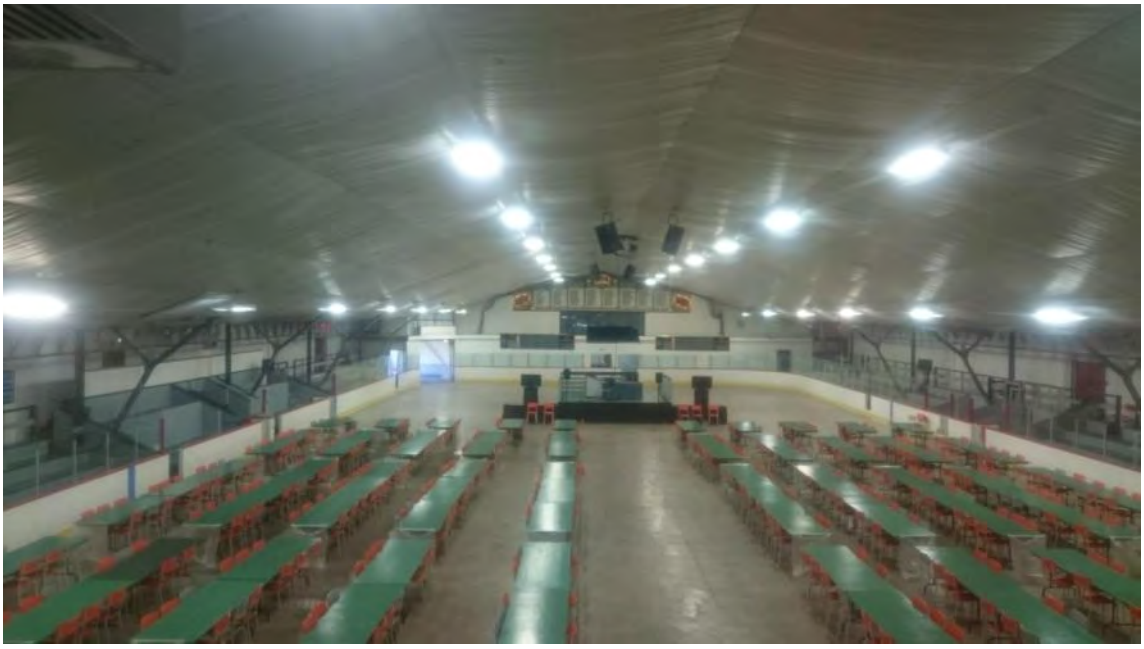
A6: Materials storage in basement electrical room

A7: Uneven stair and corridor behind stands



A8: Door to hospitality room, located on stairs

A9: Washroom off room #4. Door does not meet barrier-free requirements



A10: View of ice surface from hospitality room

Structural Photos

S1

S2

S3

S4

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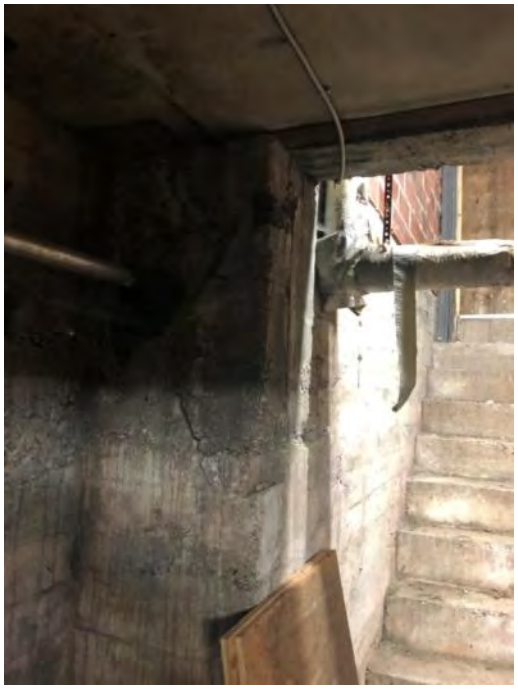
S9



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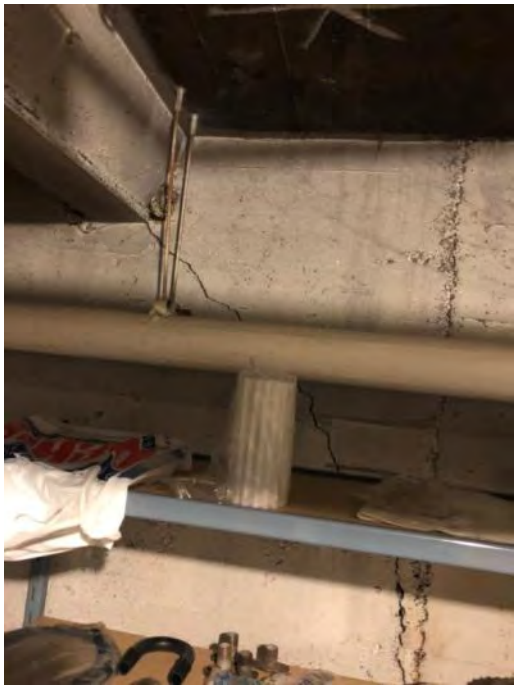

S12

S13 (1)

S13 (2)

S14

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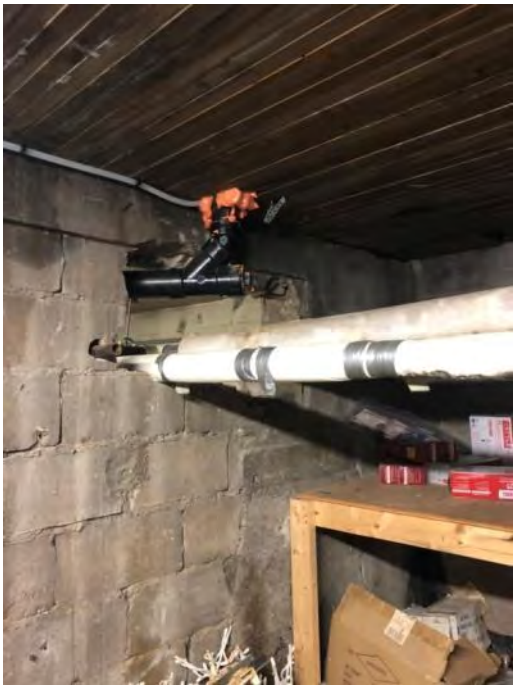
S16

S17



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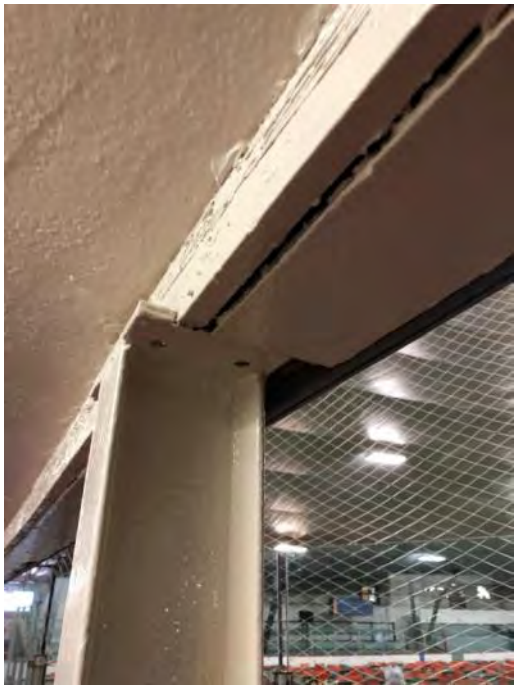

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S26

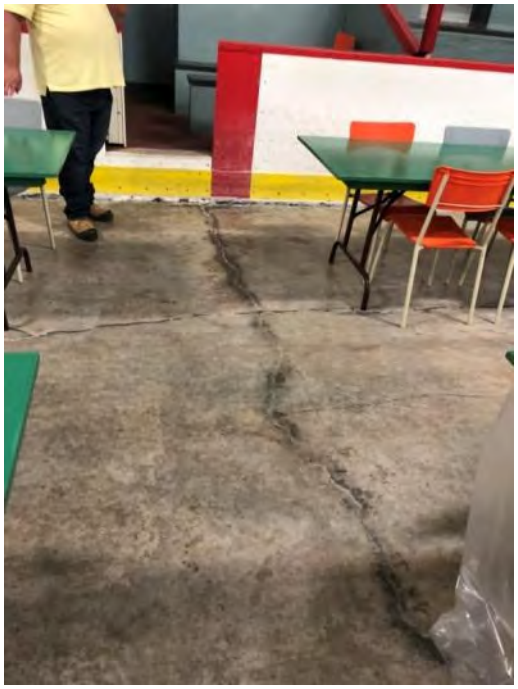
S27 (1)

S27 (2)

S28 (1)

S28 (2)

S29



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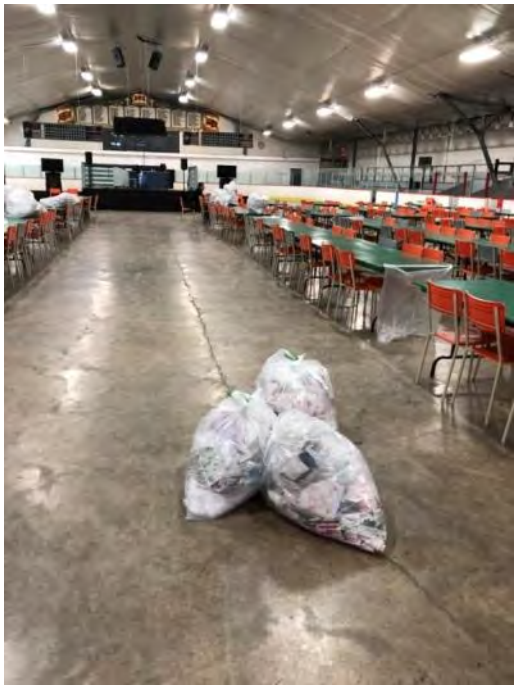

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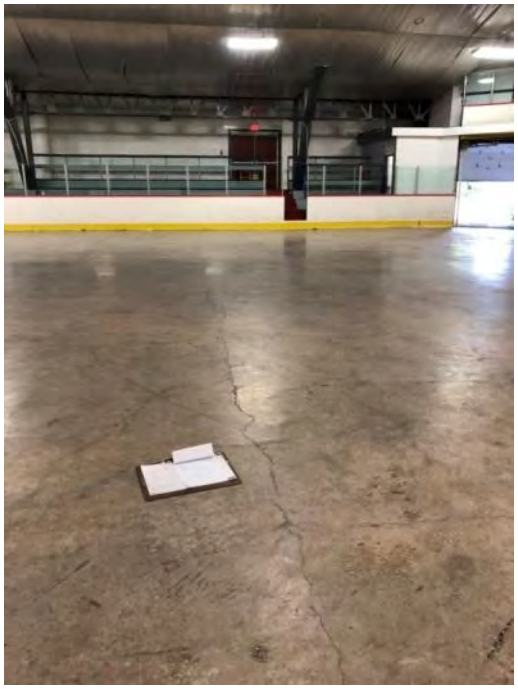

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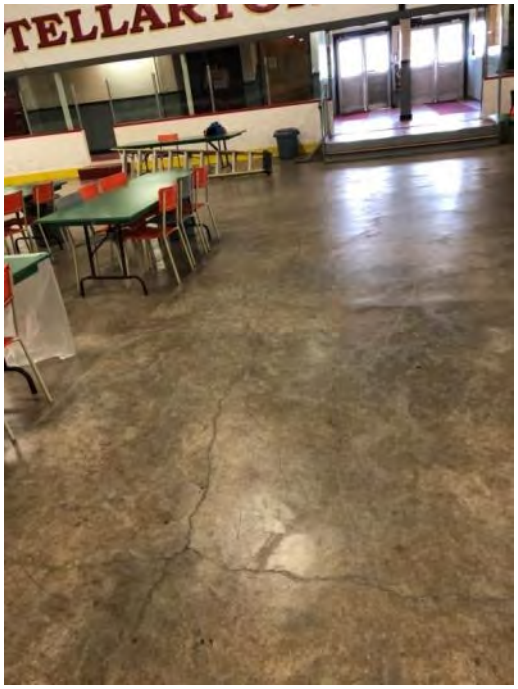

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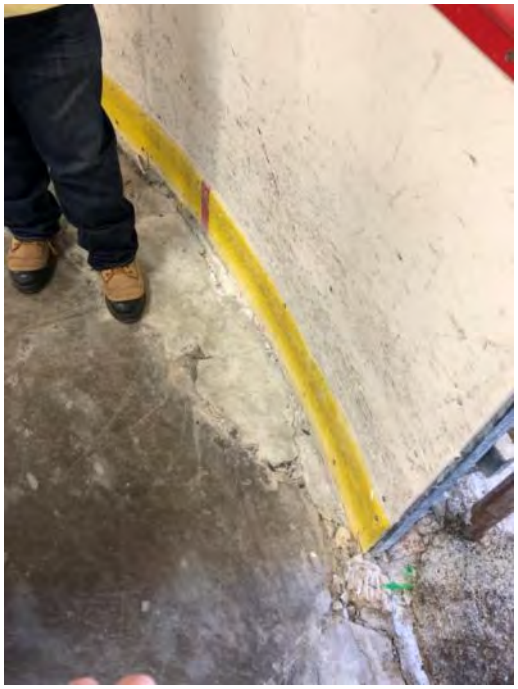

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S51 (2)

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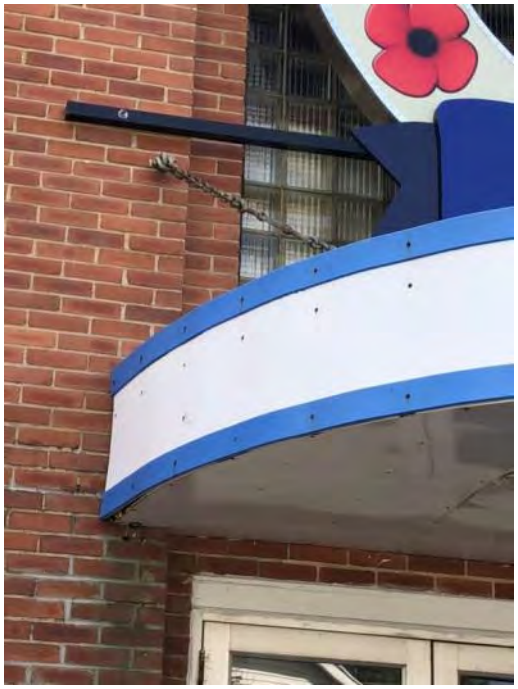
S52

S51 (1)

S53



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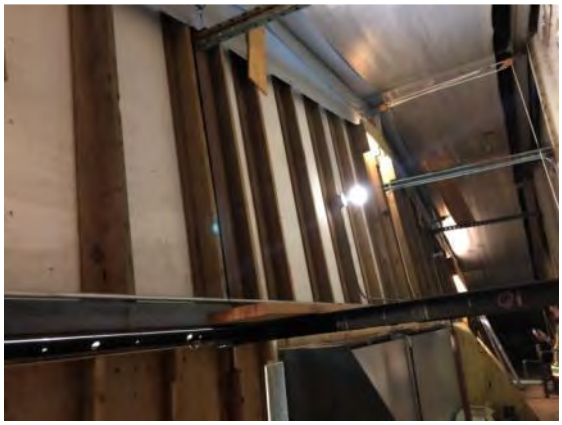

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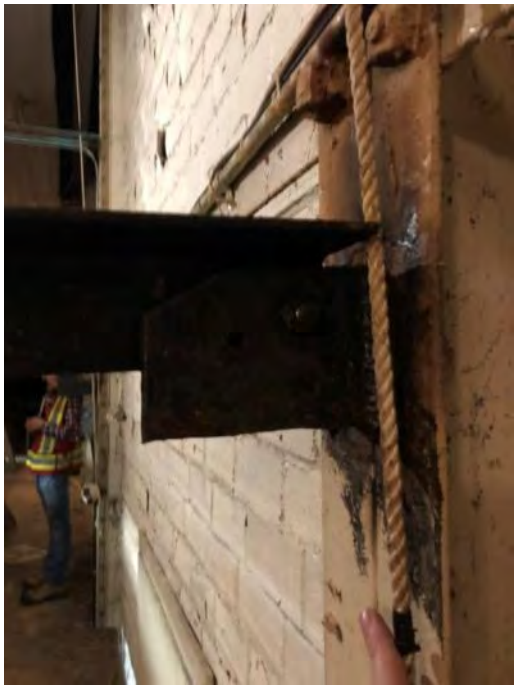

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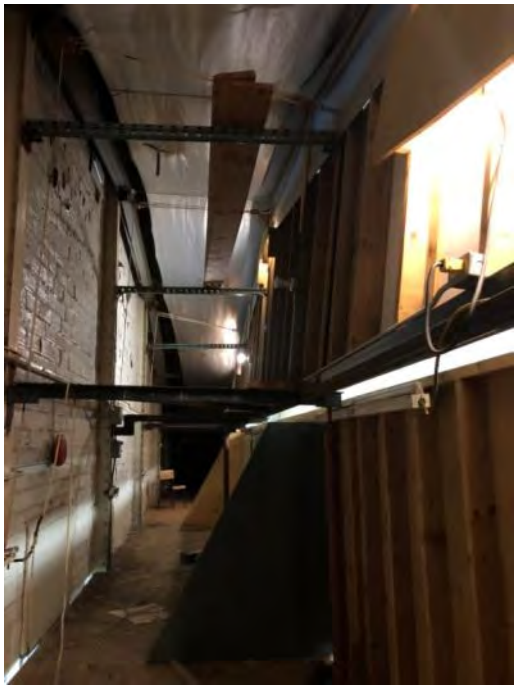

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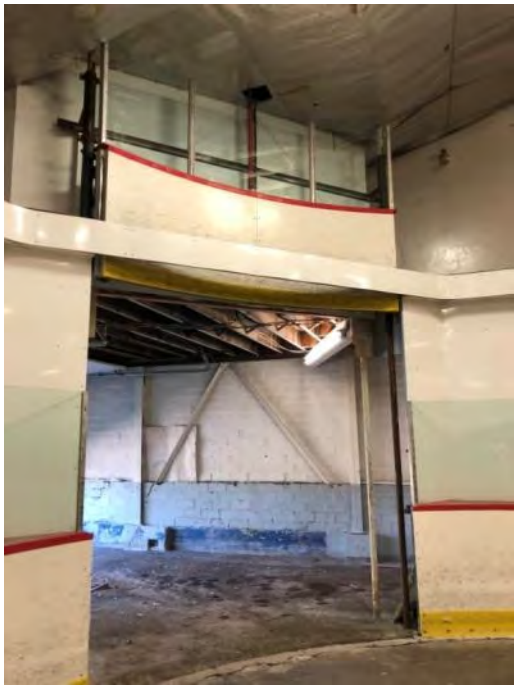

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S65

Mechanical Photos

M1: Refrigeration Plant view from the street. Evaporator located on Roof

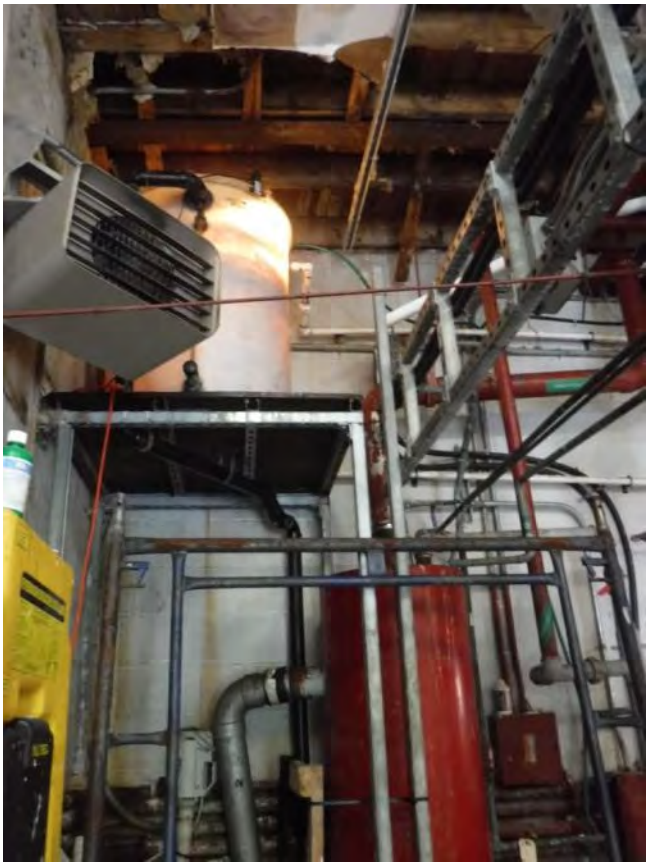
M2: Refrigeration Plant Gravity Backdraft damper damaged

M3: Refrigeration Monitoring System (installed in 2018)

M4: Compressor #2 - J&E Hall 50 hp (installed in 1980)

M5: Refrigeration Plant - Chiller with staging / light fixture leaning on equipment (installed in 1994)

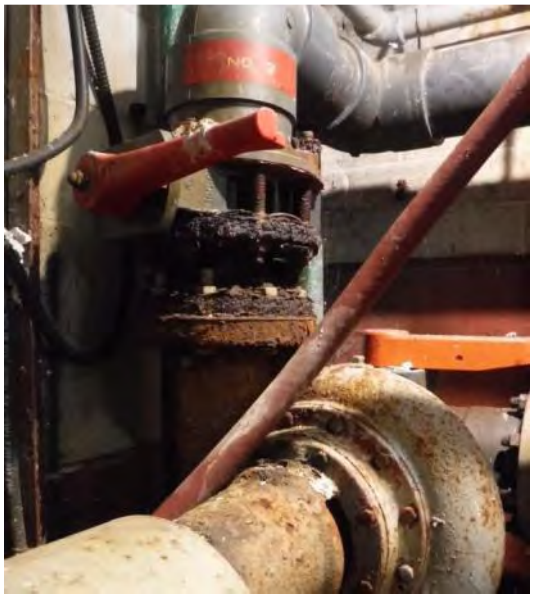
M6: Refrigeration Plant Control Panel



M7: Refrigeration Plant - Condenser water tank & mixing tank (note damage to ceiling)

M8: Refrigeration Plant - Condenser Water Pump (installed in 2003)

M8: Refrigeration Plant – Brine Pump #2 (installed 1985)



M9: Refrigeration Plant – Brine Pump #2 discharge steel adapter (severe corrosion)

M10: Refrigeration Plant – Wall exhaust fan (require safety guard)

M11: Mechanical Room – Boiler System

M12: Mechanical Room – Boiler System Breeching & Piping (breeching in poor condition)

M13: Mechanical Room – Boiler System Fuel Tanks (tanks to be anchored to floor)

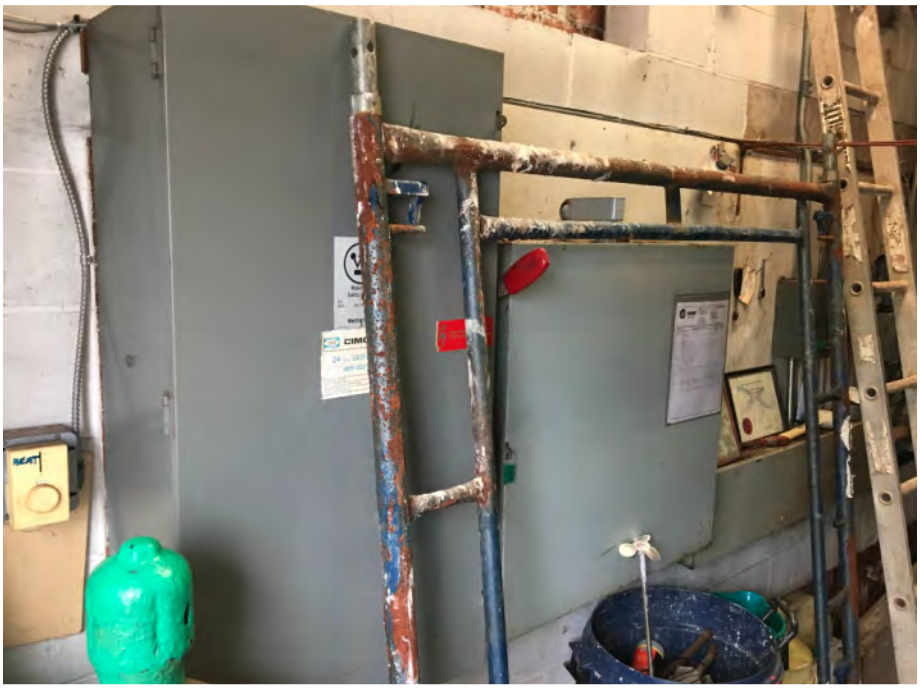
M14: Mech. Room – Ice Surface Heat Exchanger for converting to in-Floor heating with Boiler Water

M15: Ice Surface Force Air Unit Heaters – Required for supplementary heat during non-Ice Season

M16: Dressing Room – Electric Unit Heater

M17: Ice Resurfacing DHW heaters

Electrical Photos



E1: Staging leaning on electrical equipment

E2: Town Water line running on top of a 3-phase 600VAC manual Transfer Switch

E3: Town Water line running on top of a 3-phase 600VAC manual Transfer Switch. Pipes obstruct one meter clearance in front of electrical equipment.

E4: Barrel used to mix brine beside heavily corroded electrical conduits

E5: Exposed wood ceiling in ice plant room near 600VAC equipment. One hour fire proof rated walls and ceiling is required.

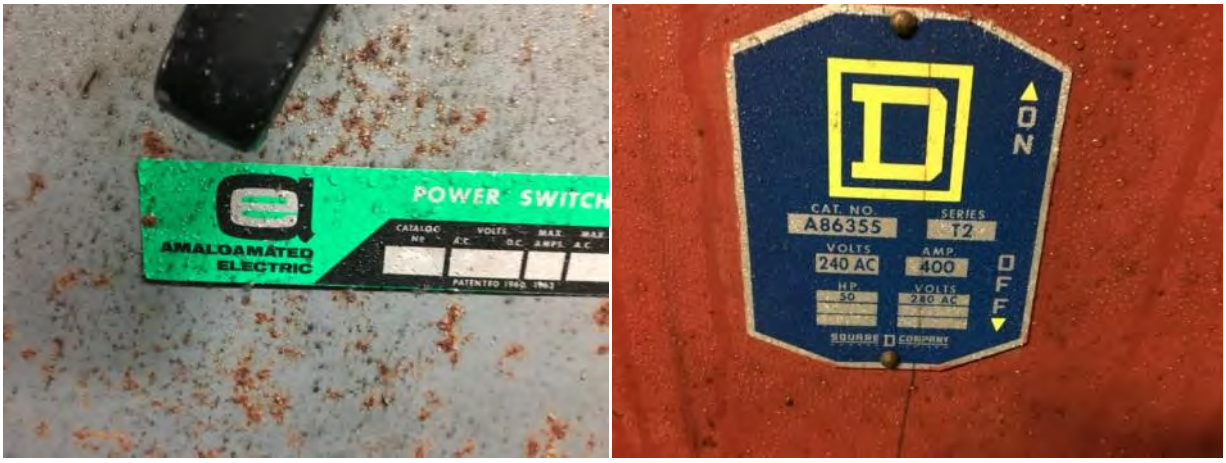
E6: 600/208-120VAC 3 phase 4 wire building electrical entrance

E7: Electrical Room used for storage

E8: One hour fire rating compromised by a previous fire

E9: Exposed wires, no cover on enclosures

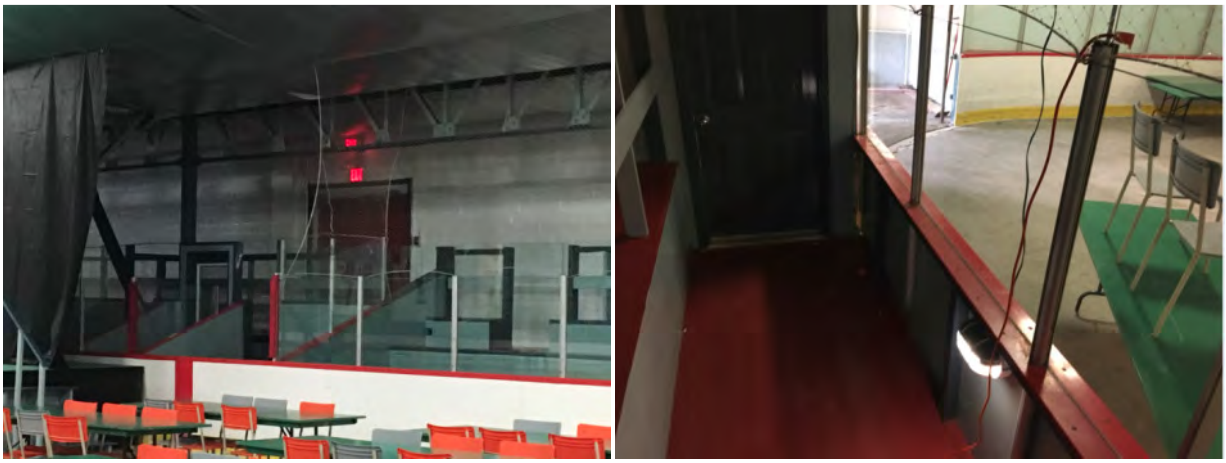
E10: Disconnect Switches labeled with Sharpie. No Electrical shock or arc flash warnings



E11: Water condensing on metal Type 1 electrical enclosures due to lack of ventilation

3

E12: Electrical Panel by ticket booth has less than one meter clearance



E13: Dim lighting in bleacher area

E14: Smoke detectors are well past 10 year replacement recommendation

E15: Aging fire alarm panel

E16: Canteen fused panel. Consider replacing with a circuit breaker panel

E17: Inconsistent outside lighting

E18: Electrical switches and receptacles within 1 meter of a sink with no ground fault protection

E19: No emergency lighting at mezzanine exit

Appendix B: Priority List

Appendix B: Priority List

Discipline	System	Ref.	Rank	Item	Cost
Arch	Doors	A4,A5	1	Replace all exterior doors, include emergency egress hardware	$ 24,000
Arch	Interior	A6	1	Relocate items that are stored in utility rooms (electrical, mechanical)	$ -
Arch	Interior		1	Remediate mold on second floor; provide adequate ventilation to all access spaces	$ 7,500
Arch	Doors	A8	1	Relocate or remove door to hospitality room away from stairs	$ -
Arch	Doors	A5	1	Replace interior door hardware to allow for emergency egress from all rooms	$ 3,000
Electrical	Electrical Room	E11	1	Install heat & ventilation in electrical room to reduce condensation on electrical equipment	$ 10,000
Electrical	Electrical Room	E10	1	Label electrical equipment with Lamacoids with voltage/amprage/CCT #	$ 500
Electrical	Iceplant	E10	1	Label electrical equipment with Lamacoids with voltage/amprage/CCT #	$ 300
Electrical	Electrical Room		1	Have an Electrical Single Line drawing made showing all electrical connections	$ 2,500
Electrical	Iceplant		1	Have an Electrical Single Line drawing made showing all electrical connections	$ 2,500
Electrical	Life Safety/Fire	E14/E15	1	Replace Aged Fire Panel, smoke detectors and replace bells with horn/strobes	$ 60,000
Electrical	Iceplant	E2/E3	1	Replace Compressor Transfer Switch (provide 1 meter clearance)	$ 10,000
Electrical	Iceplant	E4	1	Replace Iceplant Electrical Conduits	$ 10,000
Electrical	Electrical Room	E2/E4	1	Check Grounding and Bonding of equipment	$ 5,000
Electrical	Iceplant	E1	1	Remove Storage Items off of Electrical Panels in Iceplant	$ -
Electrical	Lighting		1	Test Emergency Lights and replace as required	$ 3,000
Electrical	Distribution		1	Install GFCI (ground fault) breakers and receptacles for devices 1 meter from wet areas	$ 1,000
Mechanical	Refrigeration		1	Replace Brine Pump #2 and associated steel fittings	$ 15,000
Mechanical	Space Heating		1	Replace existing boiler breeching	$ 3,000
Mechanical	Ventilation		1	Inspect & repair exhaust ventilation in the dressing rooms, washrooms. Replace as required.	$ 2,500
Mechanical	Ice Resurfacing		1	Relocate & replace if necessary P&T safety valves on DHW tanks	$ 500
Mechanical	Space Heating		1	Anchor exising fuel tanks to concrete floor	$ 1,000
Mechanical	plumbing		1	Annually test backflow preventers	$ 500
Mechanical	plumbing		1	Replace floor drains in washrooms (painted-over)	$ 500
Mechanical	Ventilation		1	Install exhaust ventilation in office 'pink' washroom	$ 500
Mechanical	Ventilation		1	Replace gravity backdraft damper & install safety guard on wall fan in Refrigeration plant	$ 500
Mechanical	Ice Resurfacing		1	Install vacuum breaker on Zamboni fill hose	$ 100
Struct/Arch	Interior		1	In hospitality room, provide guard rail at window	$ 3,000
Structural	Masonry/Brick	S13-17	1	Remove speed tile/brick exterior walls, reinstate with concrete block/brick wall (Alternative 1)	$1,050,000
Structural	Masonry/Brick	S13-17	1	Remove speed tile/brick exterior walls, and reinstate with steel cladding (Alternative2)	$ 500,000
Structural	Foundations	S7-8	1	Replace concrete pilaster along back (east) wall supporting wind post.	$ 25,000
Structural	Exit Structures	S41-48	1	Replace entire concrete exit structure in south-east corner of main building	$ 10,000
Structural	Structural Steel	S27	1	Replace steel columns in basement area that have experienced severe corrosion	$ 5,000
Structural	Foundations	S10-11	1	Install new support for beam where foundation wall in basement has cracked, and repair crack	$ 8,000
Structural	Exit Structures	S39-40	1	Replace brick columns supporting North-west exit structure	$ 6,000
Structural	Foundations	S9	1	Repair concrete perimeter foundation wall (west side) where leaking has occurred	$ 4,000
Structural	Foundations	S6	1	Repair perimeter foundation in South-East corner	$ 3,000

Alternative 1 (Brick walls) Total Priority 1 Cost Estimate	$1,277,400
25% Contingency	$1,596,750
Alternative 2 (Steel Cladding walls) Total Priority 1 Cost Estimate	$ 703,400
25% Contingency	$ 879,250

Discipline	System	Ref.	Rank	Item	Cost
Arch	Interior		2	Remove peeling paint from ceiling, repaint or otherwise treat	$ 20,000
Arch	Access	A9	2	Provide barrier free washroom, optimally with dual use as a barrier free change room	$ 10,000
Arch	Exterior		2	Infill windows on East façade with brick to match other infilled windows	$ 7,500
Arch/Struct	Study	A7	2	Study replacing wood stands with a more appropriate material (Composite or metal)	$ 9,000
Civil	Site		2	Provide drainage at East and South sides of building	$ 20,000
Civil	Site	A2,A3	2	Remove vegetation; create gravel strip beside foundation to discourage future growth	$ 2,000
Electrical	Distribution	E12	2	Referee Dressing Room Electrical Panel requires 1 meter clearance	$ 20,000
Electrical	Lighting	E17	2	Outdoor Light Replacement w photo cell	$ 5,000
Electrical	Distribution		2	Replace aged recepticles and switches	$ 5,000
Electrical	Distribution	E16	2	Replace canteen fused electrical panel with a circuit breaker panel	$ 2,000
Electrical	Electrical Room	E10	2	Label electrical equipment with Arc Flash warning stickers	$ 500
Electrical	Iceplant	E10	2	Label electrical equipment with Arc Flash warning stickers	$ 200
Electrical	Iceplant		2	Add lockable disconnect switches to motor/compressor loads	$ 10,000
Electrical	Distribution		2	Add a row of lights to the spectator walkway	$ 5,000
Mechanical	Space Heating		2	Replace boiler system, controls, pumps, piping, and associated components	$ 80,000
Mechanical	Refrigeration		2	Replace Compressor #2 and associated accessories & fittings	$ 60,000
Mechanical	Space Heating		2	Replace Shell & Tube Heat Exchanger (used for In-Floor heating system)	$ 60,000
Mechanical	plumbing		2	Replace cast iron sanitary drainage piping in basement & inspect lateral to municipal connection	$ 4,000
Structural	Foundations	S12	2	Provide support to beam and repair cracking in concrete wall (east side of basement)	$ 6,000

Total Priority 2 Cost Estimate	$ 326,200
25% Contingency	$ 407,750

Appendix B: Priority List

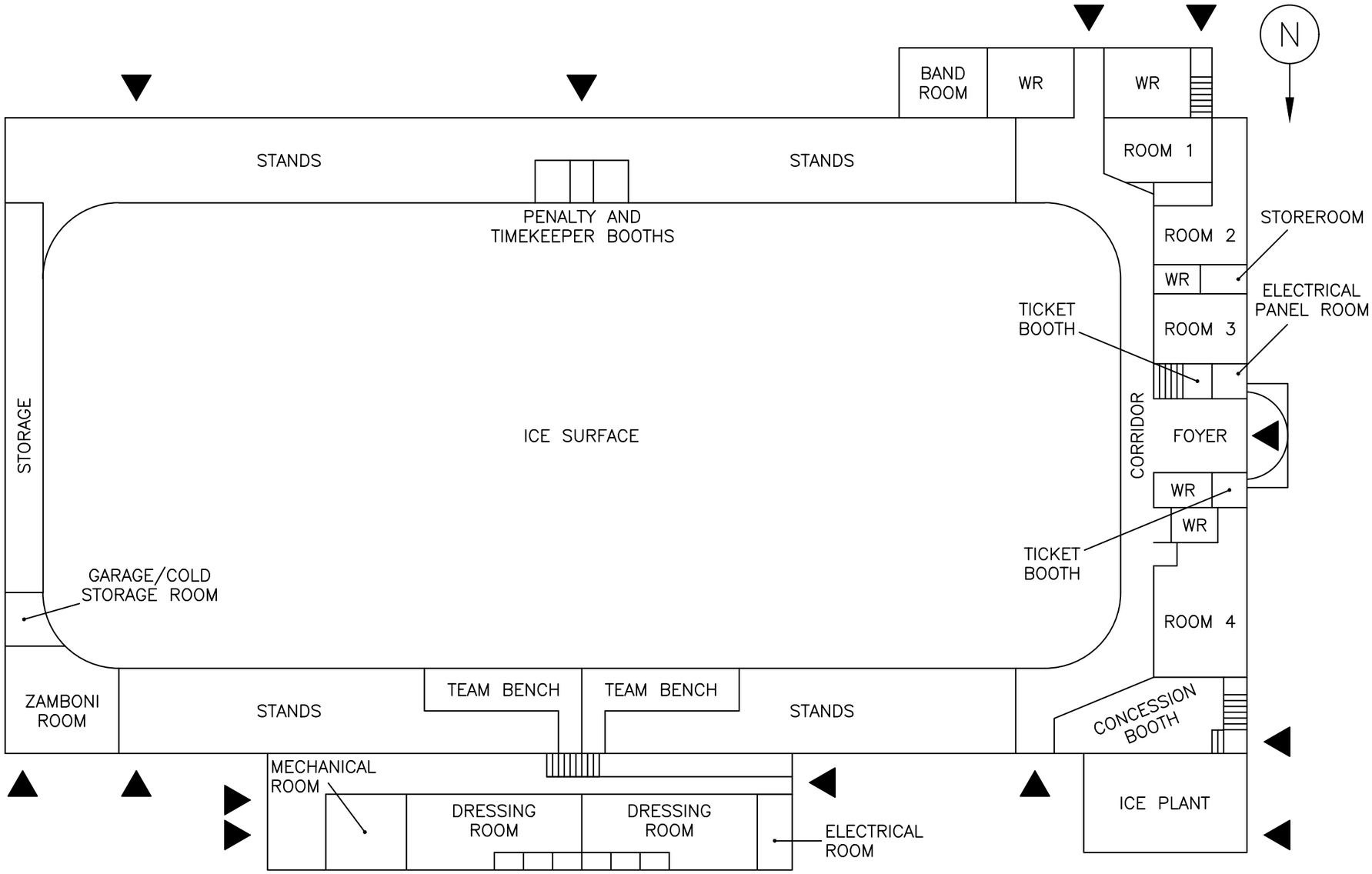
Discipline	System	Ref.	Rank	Item	Cost
Arch	Access		3	Provide lift from foyer to hospitality room	$ 10,000
Arch	Interior	A7	3	In stands, provide railings and steps to code, and provide barrier free ice viewing area	$ 10,000
Arch	Exterior	A1	3	Replace existing plywood door infill on West façade with brick	$ 7,500
Arch	Access	A5	3	Renovate ticket booth and concession counter to improve accessibility	$ 5,000
Arch	Access	A7	3	Provide high-contrast paint strips/bump strips	$ 1,000
Arch	Interior		3	Update “no smoking” signs and signage for gender-neutral washroom	$ 500
Civil	Site	A1,A3	3	Repair/patch damaged asphalt as necessary	$ 7,500
Civil	Site	A1	3	Paint lines in parking area to the South of main entrance for barrier free spaces	$ 500
Electrical	Electrical Room		3	Rebuild Main Electrical Room with 1 hour fireproof rating. Cannot be used as storage	$ 100,000
Electrical	Iceplant		3	Rebuild Iceplant Electrical Room with 1 hour fire rating. Cannot be used as storage	$ 100,000
Electrical	Electrical Room		3	Replacement of the electrical distribution panels below the main office	$ 20,000
Electrical	Iceplant		3	Add a 600VAC Distribution Panel with Circuit Breakers	$ 20,000
Electrical	Lighting		3	Interior lights, bleachers, entry way, dressing rooms	$ 15,000
Electrical	Electrical Room		3	Arc Flash Calculation Study	$ 5,000
Electrical	Iceplant		3	Arc Flash Calculation Study	$ 5,000
Electrical	PA System		3	Replace Public Address system	$ 5,000
Mechanical	Refrigeration		3	Replace Refrigeration Plant equipment / components	$ 300,000
Mechanical	Space Heating		3	Replace electric forced air heaters in dressing rooms, office, washrooms	$ 20,000
Structural	Ice Surface	S29-38	3	Replace exisiting ice surface and dasher boards (Optional)	$1,500,000
Structural	Slab on Grade	S52	3	Replace Zamboni Room concrete/asphalt floor	$ 10,000
Structural	Exit Structures	S50	3	Repair or replace concrete stair treads (main entrance on west side)	$ 5,000
Structural	Foundations	S1-5	3	Repair medium to severe cracks in perimeter foundation	$ 3,500
Structural	Exit Structures	S49	3	Repair concrete stair treads by replacing spalled concrete	$ 2,500
Structural	Masonry/Brick	S18-20	3	Repair areas around steel beams where concrete block walls have been partially removed for pipe passing	$ 2,000

Total Priority 3 Cost Estimate $2,155,000
25% Contingency $2,693,750

Alternative 1 Overall Estimate Upgrade Costs $3,758,600
25% Contingency $4,698,250

Alternative 2 Overall Estimate Upgrade Costs $3,184,600
25% Contingency $3,980,750

Appendix C: Keyplan



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657583-0001

REV.	DATE	DESCRIPTION	BY
B01	2018/09/26	Issued For Report	

SNC•LAVALIN
SNC•LAVALIN Inc.
Antigonish, Nova Scotia, Canada
Telephone: 902-863-1220
Fax: 902-863-3225
Member of the SNC•LAVALIN Group

CLIENT

PROJECT TITLE

STELLARTON MEMORIAL RINK

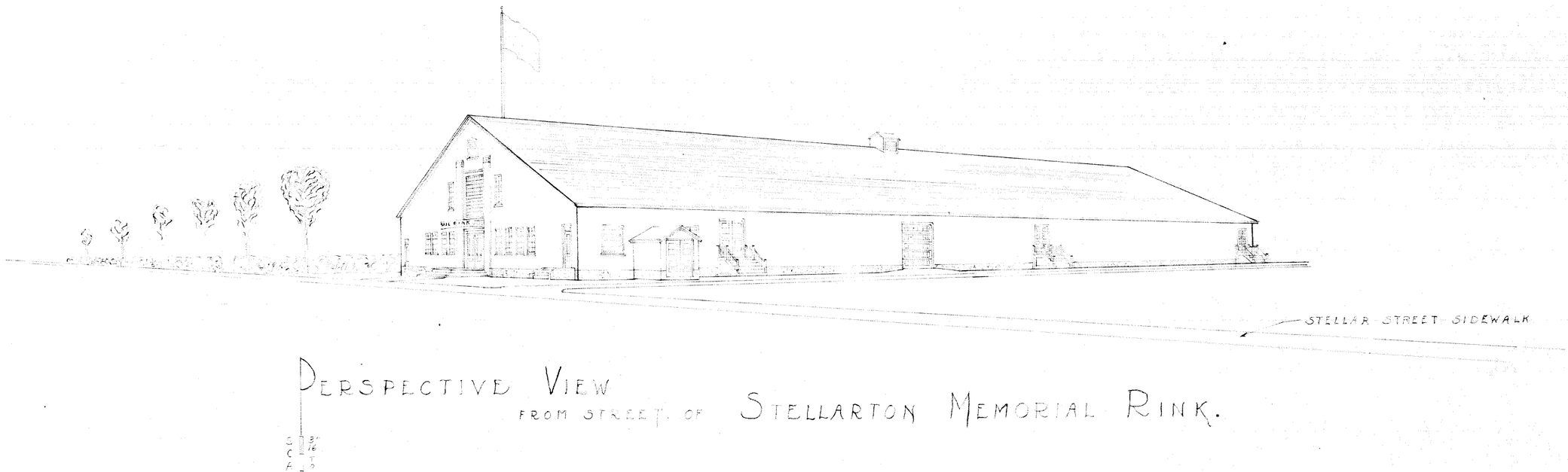
STELLARTON, NS

DESIGNED:	-
DRAWN:	MM
SCALE:	NTS
PROJECT MANAGER:	NVR
CHECKED:	-
DATE:	2018-09-18

DRAWING TITLE: STELLARTON MEMORIAL RINK KEYPLAN

DRAWING No: 657583-0001

Appendix D: Original Construction Drawings



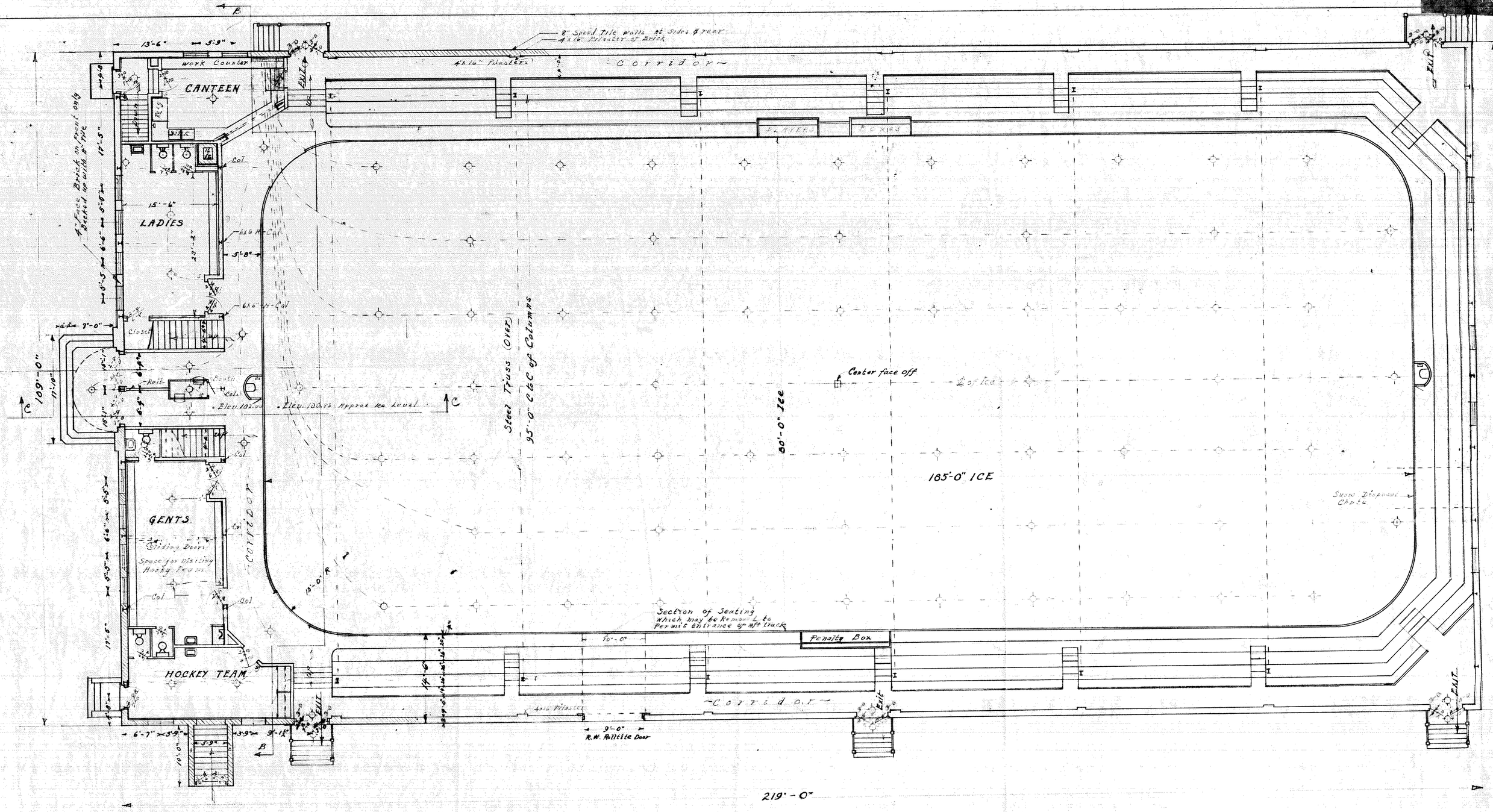
PERSPECTIVE VIEW
FROM STREET OF STELLARTON MEMORIAL RINK.

MEMORIAL HOCKEY RINK
STELLARTON N.S.

Date	Scale	Job	DWG	
Mar 1944	1/8"-1'-0"	118	#1	J.S.F. [redacted] Draftsman.

BASEMENT & FOUNDATION PLAN.

MEMORIAL HOCKEY RINK STELLARTON, N.S.				
Date Mar. 17/47.	Scale ⅛"=1'-0"	Job 118	D.W.G. #1	J.S.F. [redacted] Draftsman

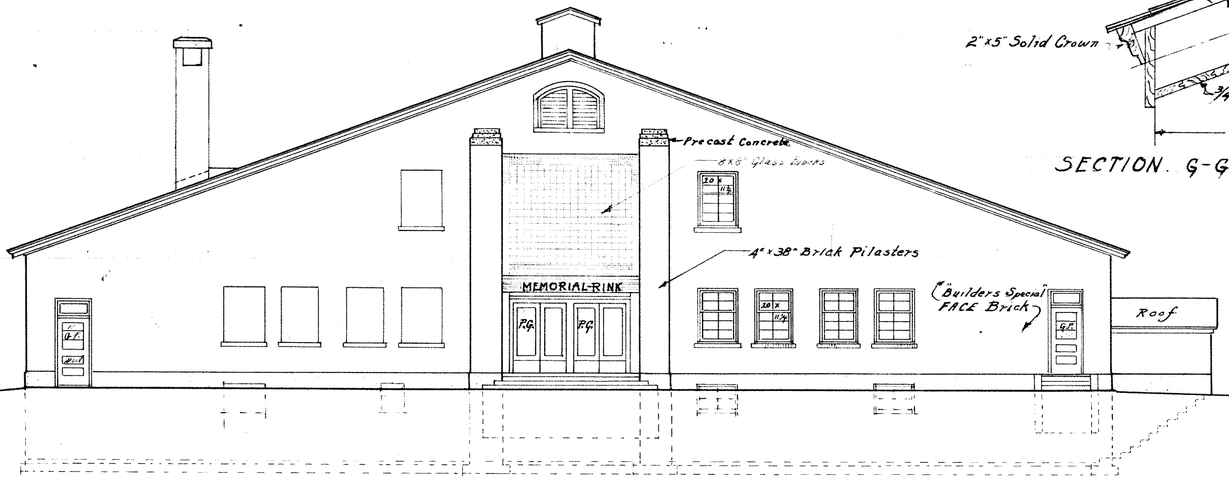


ICE SURFACE PLAN.

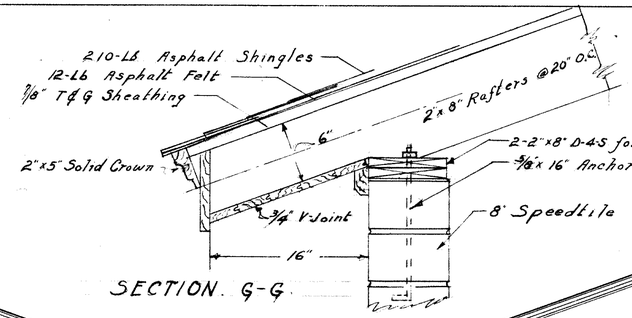
Scale 1/8" = 1'-0"

SEATING - 1300 -

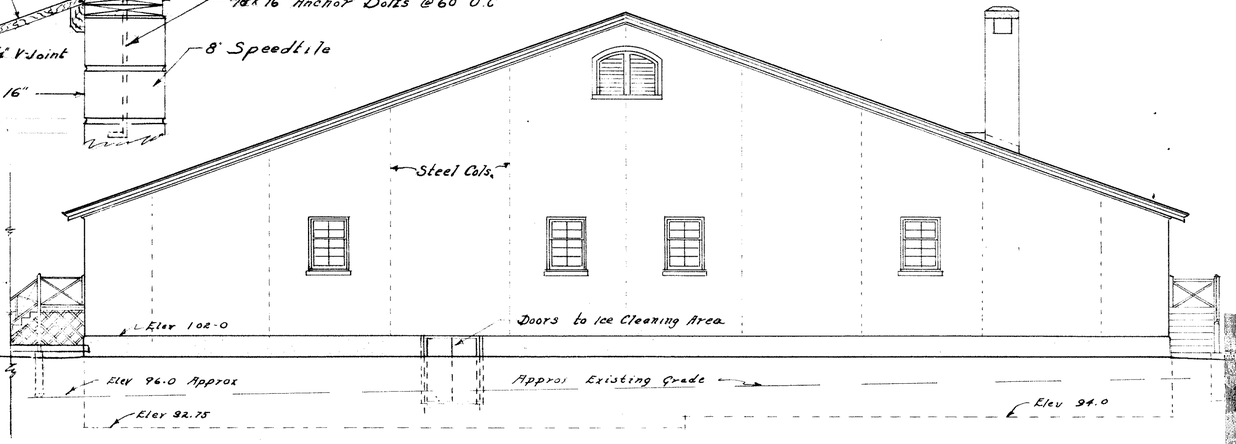
MEMORIAL HOCKEY RINK STELLARTON, N. S.				
Date Mar. 17/41	Scale 1/8" = 1'-0"	Job 118	D.W.G. A 2	J.S.F. [redacted] Draftsmen.



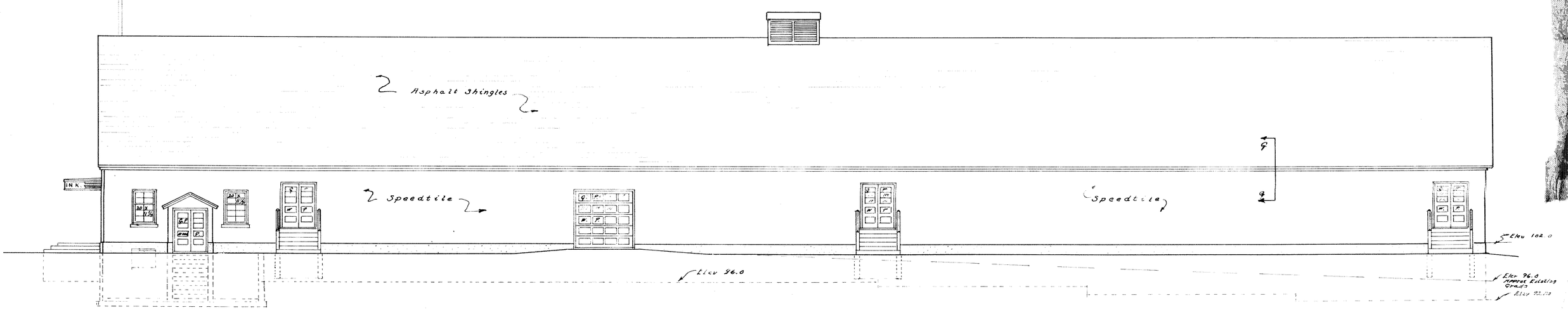
FRONT ELEVATION. Scale 1/8" = 1'-0"



SECTION. C-C.



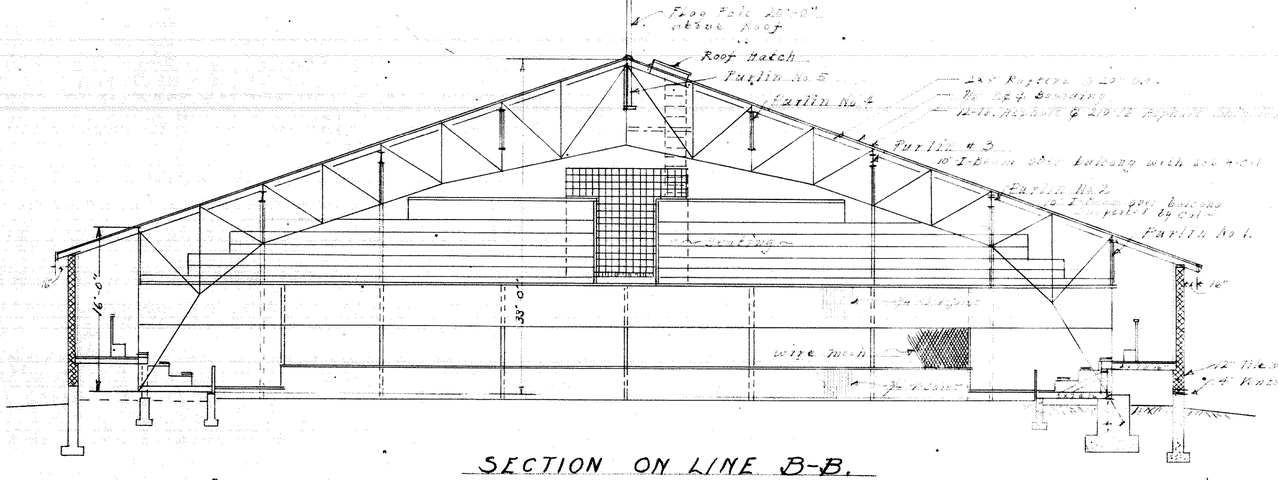
REAR ELEVATION.



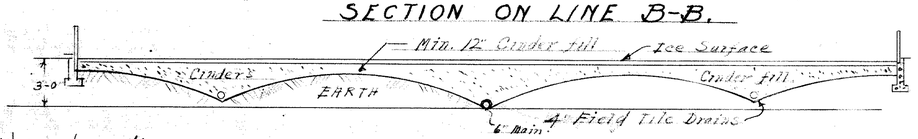
SOUTH SIDE ELEVATION

MEMORIAL HOCKEY RINK
STELLARTON. N. S.

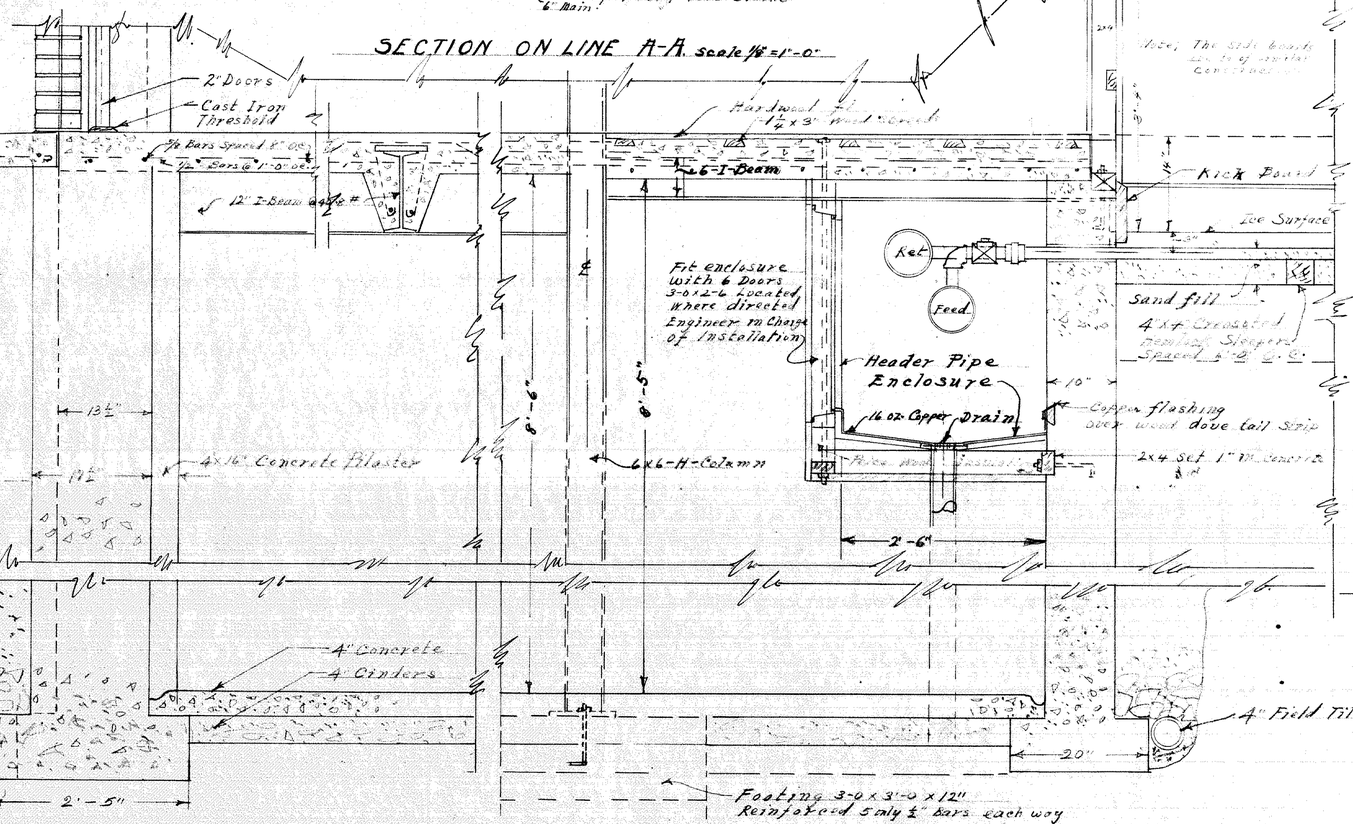
Date	Scale	Job	DWG	
Mar. 17/47	8" = 1'-0"	118	# 3	J.S.F. [redacted] Draftsman



SECTION ON LINE B-B.

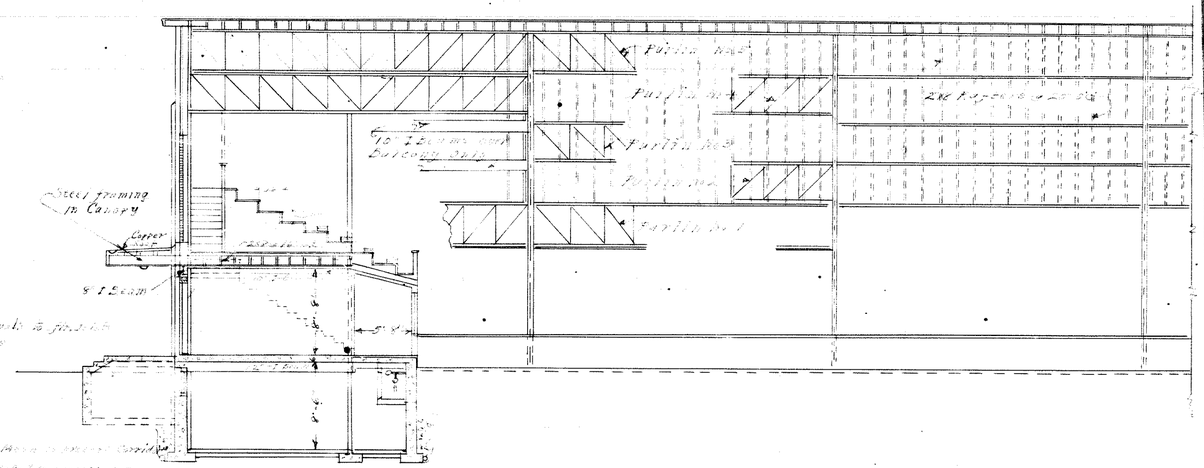


SECTION ON LINE A-A. scale ⅛"=1'-0"



SECTION ON LINE C-C Scale 1"=1'-0"

BALCONY PLAN



SECTION ON LINE C-C Scale ⅛" = 1'-0"

MEMORIAL HOCKEY RINK
STELLARTON, N.S.

Date	Scale	Job	DWG	
Mar 17/48	⅛"=1'-0"	118	#4	J.S.F. [redacted] Draftsman

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