

Structural Investigation and Report
BEAVERTON-THORAH COMMUNITY CENTRE

Township of Brock



BBA PROJECT NO. 17176
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PART 1 – INTRODUCTION

1.1 AUTHORIZATION

This structural condition audit has been undertaken by Barry Bryan Associates, Architects, Engineers, and Project Managers, for the Beaverton-Thorah Community Centre Arena, on behalf of the Township of Brock. Authorization to undertake this study was received from Ms. Ingrid Svelnis, Chief Administrative Officer, for the Township of Brock.

1.2 OBJECTIVES

The objective of the structural review, as outlined in Barry Bryan Associates proposal for Structural Investigation and Report, dated November 25, 2021 are as follows:

1. Gather and review all previous structural audit reports and existing building plans for Beaverton-Thorah Community Centre Arena
2. Visit the building and perform a visual survey of the building structure and note the condition and status of applicable items exposed to view. The review will be done in accordance with the “Guidelines for the Investigation and Repair of Arena Structures” published by the Association of Professional Engineers of Ontario in cooperation with the Safety and Technical Services division of the Ministry of Labour. We will be assisted during our inspections by a member of staff of the Township. In order to complete a thorough review, we will require that the Township provide us with safe access to the building structure. This will require the rental of lifting equipment and the provision of qualified operators to assist in our review. We have not included the costs for equipment rental in our proposal.
3. Note any items of concern that may be observed during our review.
4. Prepare a summary report on the structural conditions as observed on site. The report will include high level recommendations for alterations or repairs if required.

1.3 REVIEW METHODOLOGY

Barry Bryan Associates completed a visual inspection of the building on October 28, 2021. During our inspection we undertook a detailed visual review of the various building structural components, and photographed areas reviewed including any areas of concern.

During the review we checked for evidence of deterioration and/or distress within the pre-engineered frame. In general, the structural review included looking for evidence of the following signs of distress:

- Surface deterioration on the pre-engineered steel frame
- Deterioration/cracking of concrete
- Deterioration/cracking of concrete masonry block walls
- Excessively deflected pre-engineered steel frame

Where reference is made in this report to a Code or other standard, the most recent edition of that referenced material was used.

1.4 STATEMENT OF LIMITATION

All comments and observations contained in this report are based on visual observations made during the inspection on October 28, 2021.

No destructive testing or opening of the building systems was completed during the inspection. Further we did not review the structural steel connections.

We are unable to comment or access structure which is not exposed to view.

Any design and/or construction deficiencies not recorded herein were not evident at the time of the inspection.

PART 2 – BUILDING DESCRIPTION

The Beaverton-Thorah Community Centre Arena consists of a single pad arena with a Zamboni room, condenser/electrical room, ammonia room, change rooms, storage rooms, and bleacher seating. The Beaverton-Thorah Community Centre Arena was constructed and opened for operation in 1972.

The building structure at the ice pad generally consists of steel roof decking, cold formed steel z-purlins, pre-engineered rigid steel frames, concrete masonry block walls, metal siding and concrete slab-on-grades.

PART 3 - OBSERVATIONS

BBA attended a site visit on October 28, 2021 to visually review the condition of the structural building components and exterior building façade. We did not complete any intrusive/destructive testing to expose any concealed structural elements and our observations are based on structural elements that were visually accessible where safe access was provided.

We have summarized our observations below:

3.1 BUILDING INTERIOR

3.1.1 Rink Roof Deck and Purlins

The roof framing above the ice pad consists of steel roof deck spanning across cold formed steel z-purlins. We were unable to complete a detailed review of the steel roof deck or purlins directly above the ice rink as this framing was concealed by the existing low “E” ceiling insulation system throughout the arena.

3.1.2 Pre-Engineered Frames

The main structure of the arena consists of a pre-engineered structural frame system with tapered steel girders supporting the steel purlins. The steel frames span approximately 100'-0" and are spaced at approximately 25'-0" centre to centre. We were unable to complete a detailed review of the entire extents of the tapered girders as this framing was enclosed by the existing insulation system (Photo 001). Our observations are as follows:

- Minor localized surface corrosion and peeled paint was observed on the bottom flange of the frames at several locations (Photos 002-004). This is likely due to condensation and high humidity during occupancy. We recommend for the corroded areas to be wire brushed clean to bare metal and an epoxy protective coating is applied.
- The bolted connection of the pre-engineered frame web appeared to be experiencing localized minor corrosion (Photos 005-007). This is likely due to condensation and high humidity during occupancy. We recommend for the corroded areas to be wire brushed clean to bare metal and an epoxy protective coating is applied.
- The pre-engineered steel frame at the south wall elevation appeared to have moisture staining along the bottom flange (Photo 008 & 009). This is likely due to condensation and high humidity during occupancy. We recommend for the corroded areas to be wire brushed clean to bare metal and an epoxy protective coating is applied.
- The base of several frames appeared to not consist of a protective epoxy coating and appears to have experienced minor surface rusting (Photo 010 & 011). We recommend for the rusted areas to be wire brushed clean to bare metal and a protective coating is applied.
- The bridging of several pre-engineered frames appeared to be peeling (Photo 012). This is likely due to condensation and high humidity during occupancy. We recommend for the peeled paint areas to be removed and repainted with a suitable coating for the high humidity environment.
- The pre-engineered frame bracing located along the east and west perimeter walls and the

bracing at roof level appeared to be experiencing localized minor corrosion (Photo 013-015). We recommend for the corroded areas to be wire brushed clean to bare metal and an epoxy protective coating is applied.

Generally, the pre-engineered frames appeared to be in fair to good condition. The minor observations noted above are recommended to be addressed to maintain the original condition of the building structure.

3.1.3 Bleacher Seating Area

There are two (2) bleacher seating areas, within the ice pad area along the east side and west side of the arena complete with six (6) rows and three (3) rows of seating. The bleacher seating is constructed of precast concrete slabs supported on concrete walls. Our observations are as follows:

- There appeared to be localized honeycombing at the exposed sides of the bleacher seating (Photo 016). This appears to be an existing condition and is not a structural concern at this time.
- Minor cracking was observed on the vertical face of the bleachers (Photo 017). These cracks are not a structural concern at this time however we recommend that they be monitored over a five (5) year period for continued propagation.
- Minor cracking was observed at the base of the pre-engineered frames (Photo 018 & 019). These cracks are not a structural concern at this time however we recommend that they be monitored over a five (5) year period for continued propagation.
- Minor deterioration was observed along the bleacher seating (Photo 020). We recommend that this area be cleaned, and a non-slip industrial coating be applied.

The concrete bleacher seating generally observed to be in fair to good condition.

3.1.4 Masonry Block Walls

The perimeter walls of the arena are constructed of concrete masonry block walls with metal siding above at each elevation. Our observations are as follows:

- Efflorescence accumulation was observed along the base of the concrete block walls in the Zamboni room (Photo 021 & 022). The efflorescence accumulation is likely due to moisture absorption through the wall system. We recommend for the area to be cleaned and coated with a protective coating.
- Efflorescence accumulation was observed along the concrete block walls in the Ammonia room and Mechanical room (Photo 023 & 024). The efflorescence accumulation is likely due to high humidity in the room with poor ventilation. We recommend for the area to be cleaned and coated with a protective coating.
- Minor deterioration of the paint on the concrete masonry block wall was observed within the ammonia room (Photo 025). This is likely a result of condensation within the room due to the high humidity. We recommend for the peeled paint areas to be removed and repainted with a suitable coating for the high humidity environment.

- Water staining on the masonry block walls was observed beneath the condensing unit in the northeast corner of the arena (Photo 026). This is likely a result of moisture from the condensing unit causing water staining on the walls. We recommend the walls be cleaned and a new protective coating applied.
- Minor localized cracking was observed in the mortar joints (Photo 027). We recommend this crack be repaired with a suitable repair mortar.

Generally, the masonry block walls generally appeared to be in fair to good condition with localized areas requiring minor remedial repairs to restore to original conditions.

3.1.5 Concrete Rink Slab

The reinforced concrete rink slab was not exposed at the time of our site visit, and we were unable complete our structural review due to ice being present on the rink.

3.1.6 Concrete Apron Slab

The reinforced concrete apron slab extends around the concrete rink slab at the perimeter of the arena. The north side of the slab, at the Zamboni entrance, the players bench and penalty box locations was concealed and not accessible for our review. Our observations include:

- Localized cracking at the apron slab surface was observed at the corner of the floor drain location extending towards the rink slab (Photo 028). The cracking is likely a result of concrete shrinkage and is not a structural concern.
- Efflorescence accumulation was observed at multiple areas on the exposed concrete apron slab (Photo 029 & 030). The efflorescence accumulation is likely due to high moisture content due to the nearby ice. We recommend for the area to be cleaned and coated with a protective coating.
- Larger cracking at the apron slab surface was observed in the southeast corner of the arena (Photo 031). This crack should be epoxy injected to try and extend the long-term serviceability of the pad.
- Surface deterioration was observed along the bleacher seating (Photo 032 & 033). We recommend that this area be cleaned, and a non-slip industrial coating be applied.

The concrete apron slab generally observed to be in fair to good condition.

3.1.7 Partial Roof Framing

The partial second floor area is located along the South side of the arena above the main lobby and consists of a storage room, community gathering room, kitchen, viewing area, and washrooms. The majority of the roof structure consists of steel decking spanning across steel Z girts supported by the pre-engineered frames (Photo 034). We were unable to complete a detailed review of the steel roof deck as this was concealed by the existing low "E" ceiling insulation system throughout the arena. We completed our review of localized areas of the underside of the roof structure within the suspended ceiling. Our observations are as follows:

- There appeared to be some water staining on the underside of the Z girts (Photo 035). We recommend these stains be removed and a protective coating be applied.

The Z girts and pre-engineered frame reviewed generally appeared to be in fair to good condition.

3.2 BUILDING EXTERIOR

3.2.1 SOUTH ELEVATION

The exterior South wall elevation generally consists of pre-finished metal cladding wall. Our observations are as follows:

- There appears to be an opening beneath the metal cladding at ground level (Photo 036). This opening will allow moisture to enter the building and should be repaired by a suitable repair mortar the exposed portion.
- The block wall was observed to be corroded around a mechanical unit (Photo 037). This is most likely due to leaks from the mechanical unit. We recommend for the corroded areas to be cleaned and an epoxy protective coating is applied.
- Vegetation growth on the concrete masonry block wall was observed behind a gutter (Photo 038). This is likely due to the moisture from gutter. We recommend this area be cleaned and a protective coating be applied.
- Efflorescence accumulation was observed along the block wall (Photo 039). We recommend for the area to be cleaned and coated with a protective coating.
- Parging at the base of the block wall appeared to be deteriorating (Photo 040). This is likely due to de-icing salts and snow accumulation against the wall. We recommend a protective coating be applied and this area be re-parged to prevent further deterioration.

Generally, the exterior metal cladding and architectural concrete masonry block wall along the South elevation appeared to be in fair to good condition.

3.2.2 EAST ELEVATION

The exterior East wall elevation generally consists of prefinished metal cladding above an architectural concrete masonry block wall (Photo 045). Our observations are as follows:

- Vegetation growth on the concrete masonry block wall was observed at the base of the wall (Photos 041 & 042). The walls should be cleaned and coated with a suitable protective coating.
- The metal cladding was observed to be corroded around a mechanical unit (Photo 043). This is most likely due to leaks from the mechanical unit. We recommend for the corroded areas to be wire brushed clean to bare metal and an epoxy protective coating is applied.
- Efflorescence accumulation was observed along the block wall (Photo 044). We recommend for the area to be cleaned and coated with a protective coating.

Generally, the exterior metal cladding and architectural concrete masonry block wall along the East elevation appeared to be in fair to good condition.

3.2.3 NORTH ELEVATION

The exterior North wall elevation generally consists of prefinished metal cladding above an architectural concrete masonry block wall (Photo 046). Our observations are as follows:

- The metal cladding was observed to be corroded around a mechanical unit (Photo 047). This is most likely due to leaks from the mechanical unit. We recommend for the corroded areas to be wire brushed clean to bare metal and an epoxy protective coating is applied.
- Parging at the base of the block wall appeared to be deteriorating and in return the block wall was observed to be deteriorating (Photo 048 & 049). This is likely due to de-icing salts and snow accumulation against the wall. We recommend a protective coating be applied and this area be re-parged to prevent further deterioration.
- Vegetation growth on the concrete masonry block wall was observed at the base of the wall below a water supply (Photos 050). This is likely due to the moisture from the water supply. We recommend this area be cleaned, a protective coating be applied and this area be re-parged to prevent further deterioration.
- Localized deterioration of the block was observed (Photo 051 & 052). We recommend for the deteriorated concrete to be repaired with a suitable repair mortar and protective coating to prevent further deterioration of the exterior wall.

Generally, the exterior metal cladding and architectural concrete masonry block wall along the North elevation appeared to be in fair to good condition.

3.2.4 WEST ELEVATION

The exterior West wall elevation generally consists of prefinished metal cladding above an architectural concrete masonry block wall. Our observations are as follows:

- The base of the exterior column supporting the partial second floor appeared to be experiencing localized minor corrosion (Photos 053 & 054). This is likely due to condensation and high humidity during occupancy. We recommend for the corroded areas to be wire brushed clean to bare metal and an epoxy protective coating is applied.
- Vegetation growth and efflorescence on the concrete foundation wall was observed at the base of the wall (Photos 055 & 056). We recommend this area be cleaned and a protective coating be applied.
- Minor cracking was observed on the concrete foundation wall (Photo 057). We recommend the wall be repaired with a suitable repair mortar.

Generally, the exterior metal cladding and architectural concrete masonry block wall along the West elevation appeared to be in fair to good condition.

PART 4 – CONCLUSION AND RECOMMENDATIONS

We completed a structural condition review of the existing building framing and exterior building façade where safe access was available for our review. The building structure generally appeared in fair to good condition. We observed several areas of deterioration that should be addressed to ensure the long term serviceable life of the building structure. We have summarized our recommendations with appropriate time frames below.

RECOMMENDED REPAIRS: (Recommended to be completed within next 2 – 5 years)

1. The efflorescence and algae accumulation on the exterior walls should be cleaned from the structural systems and an adequate protective coating applied.
2. All deteriorated/open/cracked mortar joints should be routed and infilled with a suitable repair mortar to restore the integrity of the existing building envelop.
3. Patch any locations of spalled concrete masonry block with a suitable repair mortar to restore the integrity of the existing building envelop. Replace any damaged/cracked concrete masonry block with new block to match existing as required.
4. Any corroded areas should be wire brushed to bare metal and epoxy painted to prevent further deterioration of the structural framing.
5. Any peeled/flaked paint areas to be removed and repainted with a new coat of epoxy paint.
6. Any areas of moisture staining on structural framing should be cleaned and a protective coating should be applied.

We trust the above information meets your requirements. Should you have any further questions, please do not hesitate to contact our office.

Yours very truly,

BARRY BRYAN ASSOCIATES

Architects, Engineers, Project Managers



Doug McLaughlin, P. Eng.

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APPENDIX

PHOTOGRAPHS

**Structural Investigation and Report for the
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Photo 01 - Pre Engineered Frames



Photo 02 - Pre Engineered Frame Bottom Flange Corrosion



Photo 03 - Pre Engineered Frame Bottom Flange Corrosion



Photo 04 - Pre Engineered Frame Bottom Flange Corrosion



Photo 05 - Pre Engineered Frame Bolted Connection Corrosion

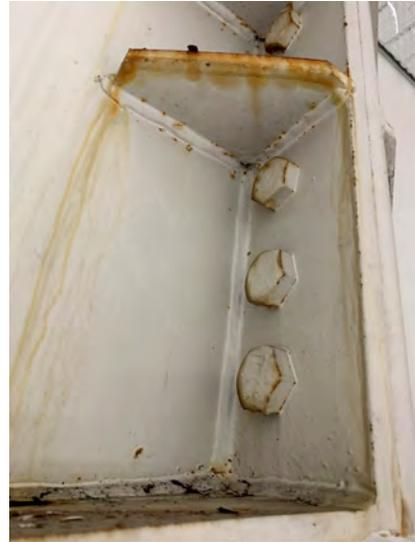


Photo 06 - Pre Engineered Frame Bolted Connection Corrosion



Photo 07 - Pre Engineered Frame Bolted Connection Corrosion



Photo 08 - Pre Engineered Frame Moisture Staining

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Photo 09 - Pre Engineered Frame Moisture Staining



Photo 10 - Pre Engineered Frame Base Corrosion



Photo 11 - Pre Engineered Frame Base Corrosion



Photo 12 - Pre Engineered Frame Bridging Peeling



Photo 13 - Pre Engineered Frame Bracing Corrosion



Photo 14 - Pre Engineered Frame Bracing Corrosion



Photo 15 - Pre Engineered Frame Bracing Corrosion



Photo 16 - Bleacher Seating Honeycombing



Photo 17 - Bleacher Seating Minor Cracking



Photo 18 - Bleacher Seating Cracking



Photo 19 - Bleacher Seating Cracking



Photo 20 - Bleacher Seating Deterioration

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Photo 21 - Masonry Block Wall Efflorescence

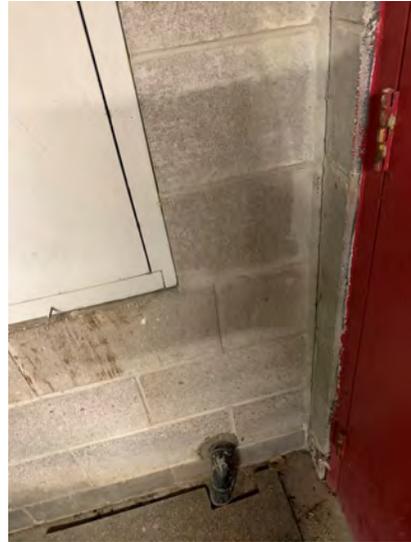


Photo 22 - Masonry Block Wall Efflorescence



Photo 23 - Masonry Block Wall Efflorescence



Photo 24 - Masonry Block Wall Efflorescence



Photo 25 - Masonry Block Wall Deterioration



Photo 26 - Masonry Block Wall Staining



Photo 27 - Masonry Block Wall Cracking



Photo 28 - Concrete Apron Slab Cracking



Photo 29 - Concrete Apron Slab Efflorescence



Photo 30 - Concrete Apron Slab Efflorescence



Photo 31 - Concrete Apron Slab Bigger Cracking



Photo 32 - Concrete Apron Slab Deterioration



Photo 33 - Concrete Apron Slab Deterioration



Photo 34 - Partial Second Floor Framing



Photo 35 - Partial Second Floor Z Girt Water Staining



Photo 36 - South Elevation Opening

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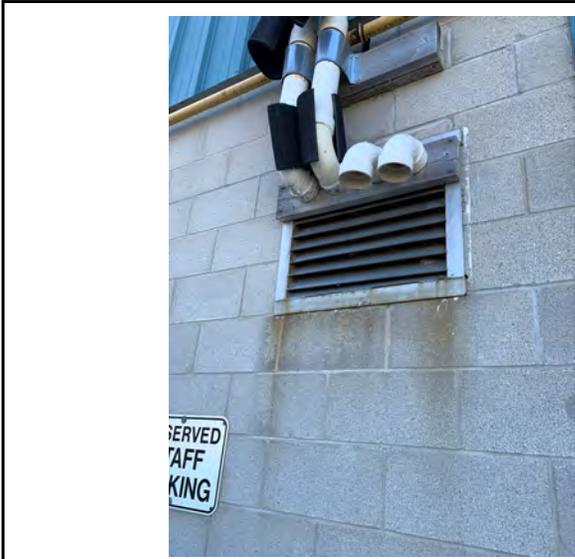


Photo 37 - South Elevation Block Wall Corrosion



Photo 38 - South Elevation Block Wall Vegetation



Photo 39 - South Elevation Block Wall Efflorescence



Photo 040 - South Elevation Block Wall Parging

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Photo 41 - East Elevation Vegetation



Photo 42 - East Elevation Vegetation 2



Photo 43 - East Elevation Corroded Cladding



Photo 44 - East Elevation Block Wall Efflorescence

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Photo 45 - East Elevation



Photo 46 - North Elevation



Photo 47 - North Elevation Corroded Cladding



Photo 48 - North Elevation Parging

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Photo 49 - North Elevation Parging2



Photo 50 - North Elevation Vegetation and Deteriorated Parging



Photo 51 - North Elevation Deterioration



Photo 52 - North Elevation Deterioration 2

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Photo 53 - West Elevation Exterior Column Bolted Connection Corrosion



Photo 54 - West Elevation Exterior Column Base Corrosion



Photo 55 - West Elevation Foundation Wall Vegetation and Efflorescence



Photo 56 - West Elevation Block Wall Efflorescence

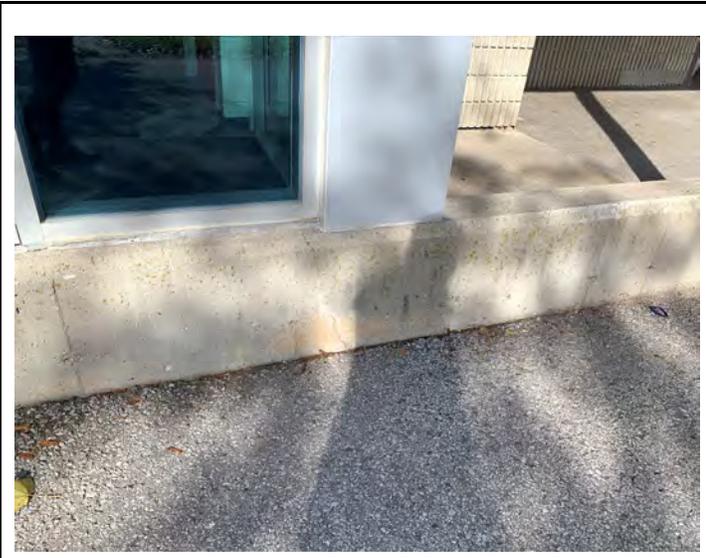


Photo 57 - West Elevation Foundation Wall Minor Cracking

