



2021 CCE AWARDS

Mill Creek Ravine Pedestrian Bridges

Rehabilitating Edmonton's Historic Trestle Bridges

Categories:

Transportation Infrastructure -
Transportation Structures

Client/Owner:

The City of Edmonton
SMA Consulting

Consultant:

ISL

Subconsultants:

Thurber Engineering Ltd.

Spencer Environmental
Management Services

Golder Associates

Turtle Island Cultural Resource
Management

Twenty/20 Communications

Contractors:

Alberco Construction (Prime)

Keller Foundations

Western Archrib

W G Chanin Hardwoods

Shy's Forest Products

iMark Architectural Metals





BACKGROUND

Mill Creek Ravine is an important urban park and key component of the City of Edmonton's ecological and transportation network. The trail system in Mill Creek Ravine makes it a popular recreational destination, and a useful commuter link into Downtown Edmonton. The City of Edmonton wanted to maintain the functionality of this segment of the Mill Creek Ravine trail system by extending the service life of the pedestrian bridges. The many pedestrian bridges that connect the trail system crossing over the meandering creek create a unique experience for trail users.

Originally built in 1902, the timber trestle bridges were part of the Edmonton, Yukon and Pacific Railway. The bridges initially connected the railway that ran between Edmonton and Calgary and was the first link across the North Saskatchewan River. The trestle bridges were later converted for pedestrian use beginning in the 1970's.

ISL was retained in 2016 to complete a condition assessment and recommend design options for the five bridges that are part of this segment of the trail system: three historic trestle bridges and two smaller single-span bridges.

BUILT WITH THE COMMUNITY IN MIND

ISL began with public and stakeholder engagement to understand the needs and desires of the community for the rehabilitation of the pedestrian bridges.

Given the deteriorated condition of these historic bridges, it was determined that the primary goal was to preserve this trail network by repairing or replacing the pedestrian bridges. One option presented to the public was to completely replace the trestle bridges with modern bridges. It was clear by these responses that this option was a nonstarter for the community. The trestle bridges were cherished by Edmontonians and any chance to keep the historic charm of the old bridges was an absolute priority.

With clear direction from the public, ISL began the process of developing a design that achieved the City's desired durability and environmental goals while maintaining the historic look of the existing structures.

HERITAGE CONSERVATION

Stakeholder and community engagement sessions emphasized the importance of preserving the heritage value of the structures. Retaining part of the original building fabric in the final construction was a key objective of this design. To achieve this goal, the bridges were completely dismantled, and each piece of timber was carefully graded and catalogued.

This step added a significant challenge to the construction process and required a high level of coordination between ISL and Alberco Construction. A timber resistograph microdrill was used to determine which timbers could be salvaged. Approximately 20% of the original timbers were salvaged and included in the final bridge construction.



UNIQUE CHALLENGES

Pedestrian Accommodation:

Trail closures were necessary to complete the bridge construction. Mill Creek Ravine is a popular recreational area, off-leash dog park, and an important pedestrian and cyclist commuter link. The project site included an upper paved trail, and a more casual gravel trail lower in the ravine. A pedestrian accommodation plan and construction staging was crucial to ensure logical connectivity of the trail system throughout construction. Clear signage with multiple detour options was essential to accommodate all trail users. Much of the construction work was consolidated over a winter season, a time with fewer pedestrians and park users, to reduce the impact on the public.

Construction Access:

Construction access was a challenge on the project due to the sensitive environmental area and topography in Mill Creek Ravine Park. Minimizing disturbance to the existing park space and community was a key consideration during construction. Construction roads were lined with rig mats to reduce damages and provide access to laydown areas closer to the bridge locations. Off-site fabrication of timber trusses was efficient and allowed erection of the bridge spans using cranes from the top of the ravine.

Slope stability had become an issue on the steep south bank of Trestle Bridge B033 threatening the long term

structural integrity of the bridge. Conventional methods of installing a concrete pile stability wall were not possible due to restricted access for large equipment on the steep slope. The design team addressed this access problem by designing micropile foundations that could be installed with smaller and lighter equipment.

Timber Durability:

The existing timber pier columns were consistently rotted just below ground level and piers in the creek were in even worse condition. These bridges had become a continuous maintenance issue for the City – they were seeking a durable solution that would reduce ongoing repair demands. To solve this issue we changed all foundations to a concrete pile and cap design that elevated the timber just above grade. The team also removed the timber pier columns from the creek and replaced them with a timber truss span designed to maintain the authenticity of the historic bridge appearance.

Bridge decking had also been an ongoing maintenance concern for the City. The underlying problem was sandwiched layers of timber placed over the historic rail ties – a system that traps moisture and promotes rotting. Addressing this concern, the ISL team designed a robust free-draining bridge decking solution with large timbers connected from below the deck using galvanized hardware.



SAFETY AND ENVIRONMENT

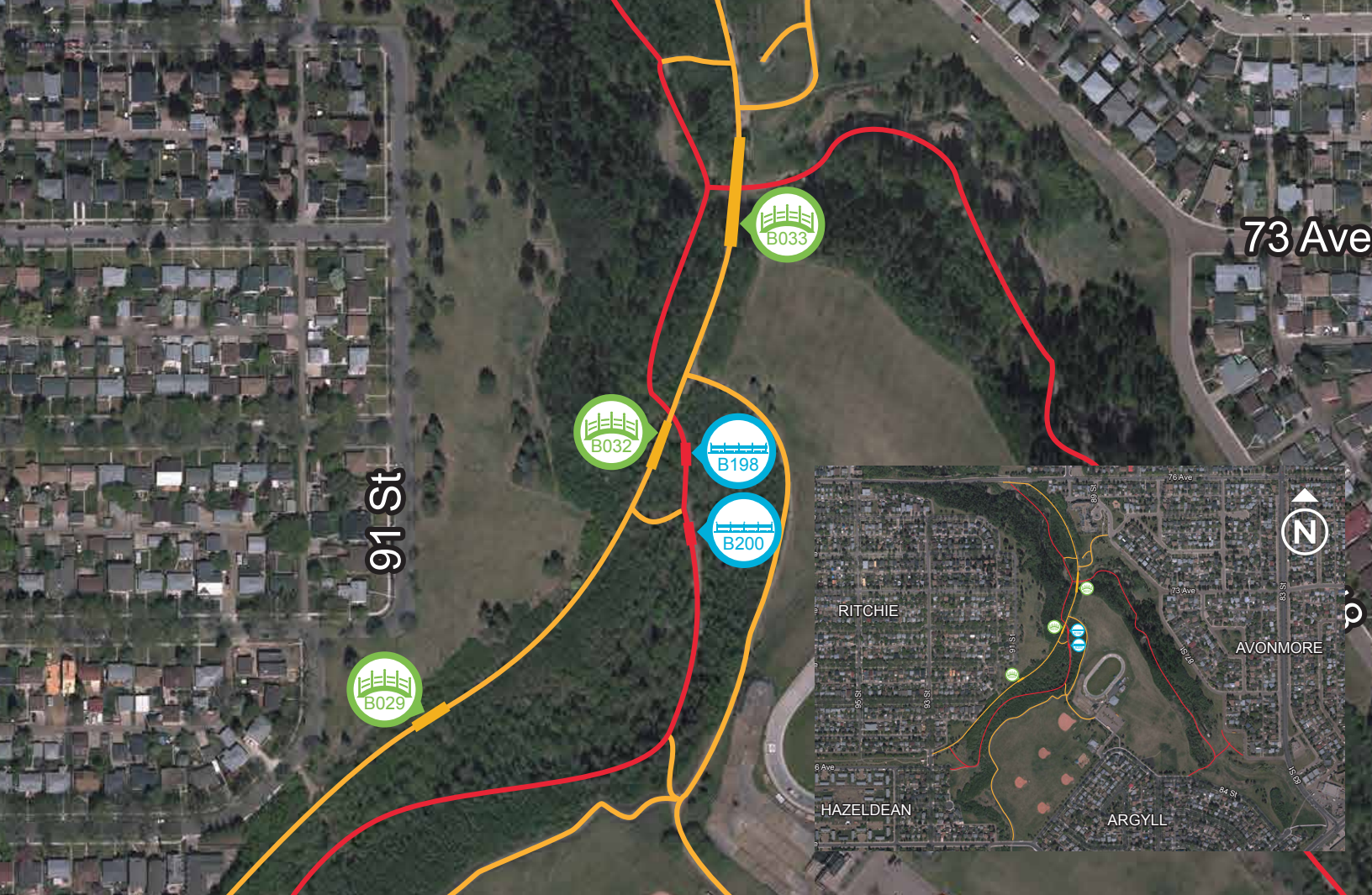
The team developed a design that maintained the original character of the bridges while addressing safety and environmental requirements.

The original position of the bridges was maintained, but safety improvements were introduced such as widening the bridge decks to meet current design standards for multi-use trails. New handrails were designed which meet current safety standards for pedestrians and cyclists, but also matched the architectural style of the timber bridges.

Some tree removal was required adjacent to the bridges for structural concerns, as the trees had become entangled with the existing trestle piers. Modest tree clearing also promotes good air flow around these bridges allowing drying to occur which improves long-term health of the timber structures. The project team worked with The City's Urban Forestry group to document and provide compensation for the tree removals. The areas around the bridges were restored with low-height naturalization planting.

The original trestle bridge piers were removed from the waterways and replaced with timber truss spans. The new clear spans improved structural durability and hydraulic performance of the bridges, which were previously susceptible to debris jams. The removal of chemically treated timbers from the creek had added environmental benefits on the aquatic habitat.

Many years of railway operation through the Mill Creek Ravine had contributed to accumulation of hydrocarbons in the soil adjacent to the trestle bridge. Soil remediation was included in this project to clean-up the adjacent slopes improving the environmental health of the area.



BRIDGE CHANGES AT A GLANCE

Trestle Bridge B029

This 16 m long timber trestle crossing a small drainage channel was replaced with a similar looking structure. The changes included:

- Widening the bridge deck from 3.2 m to 4.2 m
- Detailing for improved structural durability
- Construction of new concrete abutments and foundations
- Enhancement of bridge approaches and handrails

Trestle Bridges B032 and B033

These taller timber trestle structures cross the Mill Creek main channel (Bridge B033 – 56 m long) and the Mill Creek west tributary (Bridge B032 – 41 m long). The structures were fully rehabilitated while maintaining their unique historical look and original alignment. This included:

- Widening the bridge deck from 3.2 m to 4.2 m
- Replacing all rotten timbers throughout the two trestle bridges
- Retaining over 20% of the historic timbers for reuse in the new construction
- Construction of new concrete abutments and foundations
- Adding new handrails for improved safety considerations
- Repairing and improving erosion protection and stabilizing slopes
- Removal of piers from the creeks and replacing them with timber truss spans
- Improved structural durability
- Enhancement of the bridge approaches

Glulam Bridges B198 and B200

These smaller single span bridges that carry a lower trail over the Mill Creek west tributary were replaced. The changes included:

- Widening the bridge deck from 2.4 m to 3.0 m
- Detailing for improved structural durability
- Construction of new concrete abutments and foundations
- Improving hydraulics by increasing freeboard below the bridges
- Single span glulam timber spans were fabricated using durable Yellow Cedar
- Enhancing the bridge approaches and handrails



Bob Thompson has lived in the area for about 40 years. Joking the bridges are now the “eighth wonder of the world,” he said he plans to walk them two to three times a week.

“You’ve got to feel good. You’re in touch with nature,” Thompson said. “They’ve done a nice job on this. It’s just a feel-good project.”

AHEAD OF SCHEDULE

The Mill Creek Pedestrian bridges officially opened on June 22, 2018 a full four months ahead of the proposed schedule and within budget. ISL and Alberco worked through the cold winter months to minimize impact to the popular trails and ensure the public could enjoy the newly rehabilitated bridges throughout the whole summer.

Avonmore, a community located east of the Mill Creek Ravine, cherishes these old bridges so much that they updated their street signage to incorporate an image of the

historic trestles. ISL's ability to deliver a rehabilitation project that maintained the original character of the bridges ensured they were extremely happy with the final product.

Community Appreciation

The Ritchie Community League held a special BBQ for the entire project team in appreciation for opening early so they could enjoy the bridges and pathways during the summer.





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RAILWAYS CONNECTING COMMUNITIES

Railways created and defined Canada. In the late 1800's fortunes were made and lost in the economic boom to own and construct railways. These railways opened up communities and aided economic growth.

Alberta was no different, with up to four different northern rail lines running in separate attempts to build local fortunes and connect communities to each other and to important resourcesⁱ.

The Edmonton Calgary Railway was one of those connections with the first train from Calgary arriving at Strathcona station on August 1, 1891ⁱⁱ. There was only one issue - this railway only went as far north as Strathcona (now South Edmonton) and didn't cross the North Saskatchewan river to the City of Edmontonⁱⁱⁱ. Frustrated by this, a local businessman formed the Edmonton District Railway in 1896 with the intent of bringing the train over the river.

Two years later, in 1898, Edmonton District Railway was purchased by the Canadian Northern Railway Company and the line was named the Edmonton, Yukon and Pacific Railway (EY&PR). This is the line that built the trestle bridges that are still a part of Edmonton's Mill Creek Ravine today.

In 1902, the connection between Edmonton and Strathcona (South Edmonton) was made^{iv}.

EY&PR further connected cities in Alberta by extending the line north to meet the Canadian Northern main line in 1905 and extending west to Stony Plain in 1907. EY&PR amalgamated with Canadian Northern Railway in 1910, eventually being purchased by Canadian National Railway in 1923.








RESPECTING HISTORIC TRANSPORTATION CORRIDORS

The north - south connection in Alberta is an important one, both historically and currently. From Alberta's earliest days, the need to connect Alberta's two major cities has changed its landscape. Red Deer and Wetaskiwin are two cities that exist today because of the rail line connection.

The corridor itself continues to be an important economic link with three of Alberta's most densely populated cities residing in it. After the heyday of trains, the corridor still served day lines running between the cities and when rail passenger service discontinued in 1985, there were immediate studies done to determine the viability of a bullet train.

The corridor continues to shape Alberta, with current discussion of an Edmonton Calgary hyperloop running through it^v.

MILL CREEK RAVINE PEDESTRIAN BRIDGES AT A GLANCE

	Innovation / Technology Advancement	<ul style="list-style-type: none"> To solve timber rotting issues, all foundations of the bridges were changed to cast-in-place concrete pile and cap design with the timbers connected to the top of pier caps. The bridge decking solution involved a design with large timbers connected from under the deck rather than traditionally thin deck boards secured from the top surface.
	Technical Excellence	<ul style="list-style-type: none"> Pier columns were removed from the creek and replaced with timber truss spans while maintaining the historic look of the bridges. Timber resistograph microdrill was used to confirm which of the timbers could be salvaged for reuse.
	Management of Risk	<ul style="list-style-type: none"> ISL was able to maintain the original position of the bridges but brought them to current safety standards such as widening the bridge decks and incorporating new handrails.
	Environmental Value	<ul style="list-style-type: none"> ISL ensured the environment was at the forefront throughout construction, bridge piers were removed from the waterways and replaced with timber truss spans. Untreated timbers were used whenever practical, at member locations that the City could easily maintain, to reduce the amount of chemical treatment in the structures.
	Added Value	<ul style="list-style-type: none"> The Mill Creek Pedestrian bridges officially opened a full four months ahead of the proposed schedule. The project was delivered on budget. The bridges are expected to last 50 years with regular maintenance before needing another upgrade.
	Degree of Difficulty	<ul style="list-style-type: none"> Stakeholder and community engagement sessions emphasized the importance of preserving the heritage value of the structures. The bridges were completely dismantled during construction and each individual piece of timber was carefully graded and catalogued. This added a significant challenge to construction but was managed successfully by ISL and Alberco. 20% of the original timbers were incorporated into the final bridge construction.
	Benefit to Society	<ul style="list-style-type: none"> The Avonmore community cherishes the bridges so much that they have incorporated an image of the historic trestle into their street signage. Mill Creek Ravine is an important urban park and key component of the City of Edmonton's ecological network. The trail system in the Mill Creek Ravine makes it a popular recreational destination and commuter link to Downtown Edmonton. This bridge rehabilitation project ensures these trails will remain functional for many years to come. The three trestle bridges were recorded and photographed based on Historical Resource Act requirements.