



Minto Bridges East & Centre Rehabilitation

Ottawa, Ontario Canada

PARSONS



Minto Bridges East and Centre Rehabilitation

PROJECT OUTLINE

75-WORD SUMMARY

The City of Ottawa retained Parsons to complete the rehabilitation design of the historically significant 115-year-old Minto Bridges East and Centre. These bridges are registered on the Ontario Heritage Bridge List, necessitating an extra level of attention to fulfill requirements while maintaining their heritage status. Parsons completed the design and met the goals of the project while preserving unique architectural elements; delivering a long-life, sustainable solution; and providing benefits for the surrounding community. (73)

PROJECT HIGHLIGHTS

QUESTION 1 – INNOVATION

The City of Ottawa retained Parsons to complete the rehabilitation design of the 115-year-old Minto Bridges East and Centre, which are steel camelback through truss structures crossing the Rideau River supported on stone masonry substructures. These bridges are registered on the Ontario Heritage Bridge List and are designated under the Ontario Heritage Act due to:

- Their significant historical importance as part of the ceremonial route of the governor-general from Rideau Hall to Parliament Hill
- Architectural features of interest such as the decorative railings and cresting with finials above end portals of trusses

The bridges were closed to vehicular traffic from November 2013 to their re-opening, in December 2016, due to the extensive deterioration of the structural steel floor system members, forcing vehicles to detour to adjacent bridges.

The objectives of the project were to rehabilitate the bridges to extend their service life and to re-open them to vehicular traffic with a triple load posting of at least 16/26/30 tonnes per code while respecting and preserving the heritage value of the historic architectural features.

The project was designed and constructed with a high degree of technical excellence and innovation, and successfully achieved the functional requirements while addressing the following key design features:

- **Durability:** The existing open-grating decks exposed the bridges' main components below-deck to severe environmental conditions from de-icing salt, which significantly accelerated deterioration. Care was taken to enhance the durability of the structures, and innovative products were used, such as prefabricated fiber-reinforced polymer (FRP) bridge deck panels (the first use of an FRP deck on a City of Ottawa vehicular bridge), which offered several advantages:
 - Provided a lightweight closed deck (avoiding strengthening of trusses)
 - Accelerated the bridge construction schedule (modular systems could be erected in only a few days)
 - Improved durability (FRP composite materials are not susceptible to corrosion)
 - Decreased expected maintenance, resulting in lower life-cycle costs

- **Preservation of Heritage Architecture:** The heritage designation is intended to provide structures public recognition and a measure of statutory protection from demolition or unsympathetic alteration. Because of this designation, the design allowed for the maintenance of heritage attributes, such as pedestrian railings that are noncompliant with current Bridge Code requirements, but to minimal risk; making only local repairs to maintain integrity and decorative features; and only undertaking structural steel repairs, stone masonry repairs, and timber sidewalk replacement on severely deteriorated components and/or using similar materials. (400)

QUESTION 2 - COMPLEXITY

Complexity arose from the requirements to maintain at least the same load posting on the bridges and to preserve the heritage features while adhering to construction staging, environmental, and schedule constraints. Key challenges included the following:

- **Structural Steel Repairs:** Advanced deterioration of the structural steel components below deck meant that member replacement rather than repair would be required for floor beams and bottom lateral bracing, and it precipitated the complete replacement of some truss diagonals and sections of the bottom chords. To maintain stability of the existing structures, specific repair sequences and constraints had to be developed during the design.
- **Bridge Deck Replacement:** Replacing the existing open-grating bridge decks with a closed-deck system while maintaining at least the same load posting was a significant challenge without strengthening the bridges. A lightweight and durable FRP deck panel system was selected that avoided substantial alterations to the bridges.
- **Integration With Adjacent Construction Projects:** Temporary construction staging/storage areas were required on adjacent National Capital Commission (NCC) parklands during the East Bridge rehabilitation, which also necessitated the detour of an NCC pathway. However, as the City's primary Combined Storage Sewage Tunnel (CSST) project was scheduled to start at the same time, the NCC identified concerns late in the design phase regarding the cumulative social effects of the projects on park users. Parsons revised the construction phasing to avoid conflicts with the CSST project, alleviating any concerns by federal authorities and permitting the project to obtain approvals and proceed on schedule. (249)

QUESTION 3 - SOCIAL AND/OR ECONOMIC BENEFITS

The rehabilitated bridges and associated pathways significantly contribute to the social and economic quality of life in Lowertown and New Edinburgh environs. These scenic bridges provide access for employees at the Global Affairs Canada (GAC) building on Green Island, they connect communities located on either side of the Rideau River, and they are tourist attractions due to their ornamental features and locations on the historic waterway.

The rehabilitated bridges, with their safer and improved roadway riding surface for cyclists and walkway surface for pedestrians, serve as an essential pedestrian/cycling link between NCC and City of Ottawa recreational pathways located on both sides of the river. Over 900 pedestrians and 500 cyclists can now cross the safer, rehabilitated bridges every day on their way to downtown, to the GAC buildings on Sussex Drive, or to the parks along the river.

Also, a pathway connecting the rear of the GAC building on Green Island to Union Street was re-aligned, providing safer access for cyclists and pedestrians due to improved sightlines for vehicles and grades. This design feature allows the pathway to meet the requirements of the Accessibility for Ontarians with Disabilities Act and serves as an emergency exit route from the building for employees if needed.

The restoration of existing components, such as the stone masonry substructures and decorative steel railings, and the reuse of similar construction materials for reconstructed elements, such as the timber plank sidewalks, preserved the cultural heritage features of these bridges. (243)

QUESTION 4 - ENVIRONMENTAL BENEFITS

The rehabilitation design incorporated reliability, long-term durability, and sustainability features to significantly extend the service life of these 115-year-old bridges while minimizing future maintenance costs and associated impacts to the environment. This was achieved through a combination of durable material selection, resilient detailing, and designs aimed at reducing maintenance needs. Other sustainable design features included specifying materials that are not susceptible to the degradation process of corrosion.

Galvanized rebar was used in the reconstructed substructure components to increase their corrosion resistance. The structural steel coating system included an additional clear coat, which provides extended service life and extra resistance to abrasive de-icing salts. The existing open-grating bridge decks were replaced with closed bridge decks made of FRP composite materials that are not susceptible to corrosion caused by de-icing salts and other chemicals and that provide a low-maintenance, durable solution, with an expected service life of at least 75 years. Deck drains were extended below the bottom of the trusses to ensure that runoff does not degrade the structures.

One of the more significant sustainability features of the project was the reuse of wood, a natural and renewable product that is carbon negative. This means it stores more carbon dioxide than the emissions associated with harvesting, transporting, and processing it in comparison to other materials for the sidewalks on both bridges. This avoided any additional strengthening requirement and preserved the historic character of the bridges. (234)

QUESTION 5 - MEETING CLIENT'S NEEDS

The rehabilitation of Minto Bridges East and Centre achieved the project's functional requirements of re-opening the bridges to traffic with a single load posting increase to 21 tonnes while extending their service life and preserving their heritage character.

Ottawa has a legacy of high design standards and material quality within the public realm. The rehabilitation of Minto Bridges East and Centre offered an opportunity to improve the prominence of both the crossing and the bridges. At the same time, there was a responsibility to be respectful and sensitive to the surrounding visual context. The architectural character of the bridges had to be appreciated, and the bridges had to remain visual markers along Union Street, indicating the crossings of the Rideau River at both Maple and Green Islands.

The rehabilitation design is a testament to the engineering team's success in preserving the cultural heritage features of these bridges, while still achieving the owner's functional requirements. Related design elements included the restoration of existing components, such as the stone masonry substructures and decorative steel railings, and the reuse of similar construction materials for reconstructed features, such as the timber plank sidewalks, (233 including caption)

"You have (Parsons Inc.) been mindful of the heritage significance of the bridges throughout every stage of the process and I think that it will be a better project in the end because of this."

*Anne Fitzpatrick, MCIP RPP
City of Ottawa Heritage Planner*

Images

Minto Bridges East and Centre Rehabilitation

PHOTO CAPTIONS

Photo name	Caption/Description
"Hero" Photo – best overall project photo - To be used on cover/later per request	Used on the cover
Photo 1	Located in Ottawa's urban core, Minto Bridges East and Centre span the North Branch of the Rideau River along Union following the former processional route from the Governor General's residence to Parliament Hill, now linking recreational pathways.
Photo 2	South elevation of rehabilitated Minto Bridge Centre (foreground) and Minto Bridge East (background right); light and open ornamental truss bridges harmonize well with the surrounding environment
Photo 3	Extensively deteriorated structural steel on deck underside due to road salt exposure; note deteriorated coating and very severe corrosion with perforations in roadway stringers below open deck grating; bridges had been closed to vehicular traffic since November 2013
Photo 4	Post-rehabilitation pre-fabricated FRP deck panels and wearing surface on Minto Bridge Centre; initial deck panel erection completed in only a few days
Photo 5	Reconstructed timber plank sidewalk and rehabilitated ornamental pedestrian railing on Minto Bridge East preserving heritage components of structures
Photo 6	Bridges re-opened to vehicles, pedestrians and cyclists in December 2016, three years after bridges closed; important pedestrian and cycling link between both shores of the Rideau River



Ottawa River

24 Sussex Drive
Prime Minister's
Residence

Rockcliffe Pkwy

Governor General's
Residence
(Rideau Hall)

Stanley Ave

Union St

Minto Bridge
East

Minto
Bridge
Centre

Minto Bridge
West

NCC Rideau River
Eastern Pathway

Rideau River

Rideau River Western Pathway

King Edward Ave

King Edward Ave

111 Sussex Drive
(GAC)
Green
Island

100 Sussex
Drive (NRCC)

125 Sussex Drive
(GAC)

To Macdonald Cartier Bridge
(Gatineau, Quebec)











