

# Multimodal Bridges: Removing Barriers to Sustainable Transportation

### Overview

Bridges are expensive and vital pieces of public infrastructure, and present transportation system users with both opportunities and challenges. Pedestrians and cyclists are particularly dependent on bridges to cross major barriers like rivers or freeways with safety and convenience. Many older bridges were built with inadequate facilities for walking and cycling, and rehabilitation projects offer a chance to correct their flaws.

This issue paper discusses more than a dozen significant multimodal bridges in Canadian cities, in three categories:

- New bridges for cycling and walking only
- New bridges for all modes
- Older bridges that have been modified to make walking and cycling safer and more convenient

The bridges highlighted in this paper show that:

- Bridges for walking and cycling can build community spirit and pride.
- The value of road bridges is enhanced by the inclusion of quality walking and cycling facilities.
- The rehabilitation or reconstruction of a bridge is a great opportunity to improve substandard walking and cycling facilities.

### Related case studies in this series

- *The Social Implications of Sustainable and Active Transportation*
- *The Links between Public Health and Sustainable and Active Transportation*
- *Active Transportation Infrastructure Program: Making Sustainable Transportation Choices Easier*



*Claire Stock, City of Edmonton*

### Introduction

Cities around the world can be identified by their bridges, which are among the most visible kinds of public infrastructure. Bridges represent an opportunity to express a cultural or historical statement, they are usually quite costly, and they typically play a vital role in the transportation network. For all these reasons, considerable effort is usually put into their design.

Bridge infrastructure is generally inflexible and long-lasting, so it is critical to think ahead and “get it right” the first time. One of the best-known examples of this practice is the Bloor Street Viaduct across the Don River in Toronto, which incorporated space and structural support for an eventual rail transit system—although the city would not build a subway for more than 50 years.

While bridges can offer great benefits to pedestrians and cyclists by helping them traverse major barriers (e.g. ravines, rivers, railways or freeways), they can create new barriers if they are not designed with non-motorized users in mind. Many older bridges focused on serving automobiles, and their facilities for walking and cycling may offer users limited comfort, safety and convenience.

This issue paper discusses a number of bridges in Canadian cities that contribute successfully to walking and cycling, as well as transit and high-occupancy vehicle use. They are grouped into three categories:

- New bridges reserved for use by pedestrians and cyclists
- New bridges for all modes
- Older bridges that have been modified to improve walking and cycling facilities

### New bridges for walking and cycling

Increasingly, the needs of pedestrians and cyclists are being recognized through the addition of bridges that are reserved for non-motorized users. In some cases, these bridges overcome barriers created by other transportation infrastructure, like freeways or rail lines. In other cases, they simply represent an effective way to encourage walking and cycling by making it more comfortable and convenient.

### ***Whitehorse, YT***

#### **New river crossing sparks trail use**

The new Rotary Centennial Bridge joins two ends of the Millennium Trail that run along both shores of the Yukon River on the outskirts of downtown Whitehorse. The bridge's completion in 2005 enabled trail users to travel a complete loop—leading quickly to a 35% increase in trail use on both sides of the river.

The Rotary Centennial Bridge has a distinctive 70-metre long blue truss structure and a 3-metre wide wooden deck. It was funded through a partnership of the City of Whitehorse, Transport Canada's Urban Transportation Showcase Program, Yukon Energy Corporation and the Rotary Clubs of Whitehorse, with other sponsors.



### ***Port Moody, BC***

#### **Overpass improves safety for cyclists and pedestrians**

In November 2005, the City of Port Moody opened its new CP Rail Pedestrian/Cyclist Overpass after nine years of planning with partners including the Province of British Columbia, TransLink and several private-sector organizations.

The \$1.7-million cost of the overpass cost included a 1% allocation for public art. The bridge itself is almost 175 metres long, with a main span supported by two towers and four cables on each side of the bridge.



*City of Port Moody*

### ***Toronto, ON***

#### **Humber River Bridge creates a local landmark**

Completed in 1994, the Humber River Bridge is an architectural landmark, an urban gateway and an important connection in Toronto's walking and cycling network. The \$4-million structure is 140 metres long and spans the mouth of the Humber River at Lake Ontario. It connects the popular Waterfront and Martin Goodman Trails along Lake Ontario with the Humber Valley's Tommy Thompson Trail.

The 6.5-metre wide bridge deck offers separate cyclist and pedestrian paths. The bridge is supported by two steel pipes formed into twin arches that rise 20 metres above the deck. Several aspects of the award-winning design and landscaped surroundings are meant to reflect the area's cultural and geographic context.



### ***Ottawa, ON***

#### **Residents welcome new bridge over the Rideau Canal**

When it opened in 2006, the new Rideau Canal pedestrian bridge improved Ottawa's transportation networks in three important ways.

- First, the bridge provides a safe and pleasant connection between the heavily used recreational pathways on the banks of the Rideau Canal, on the south edge of Ottawa's downtown core.
- Second, it provides a direct walking and cycling link between land uses on the east side of the canal (the University of Ottawa campus and Sandy Hill neighbourhood) and the west side (the residential and commercial hub of Centretown).
- Third, it cuts several hundred metres off the shortest walking route to rapid transit for many Centretown residents living across the canal from the Transitway station at the University of Ottawa.

Despite being in city plans for two decades, the bridge had to overcome several challenges to get built. Many residents and elected officials were skeptical of the bridge's value, relative to its \$5-million cost. The design process was also complex, because the federal government was an important stakeholder and aesthetic expectations were high. Twelve alternative designs, with different heights and materials, were developed to satisfy the design parameters.

## New bridges for all modes

In decades past, new road bridges could be planned, designed and constructed at great expense without much consideration being given to the needs of pedestrians and cyclists. That era is now over, and in urban areas the need for a new vehicular bridge is often viewed as an excellent opportunity to improve active transportation facilities—sometimes at relatively little cost.

### *Greater Vancouver, BC*

#### **Golden Ears Bridge will serve all modes**

The Greater Vancouver Transportation Authority contracted with a private consortium for the design, construction and operation of the new six-lane Golden Ears Bridge across the Fraser River. The bridge will connect the communities of Langley and Surrey on the south side to Maple Ridge and Pitt Meadows to the north. Construction began in 2006, and is expected to continue through 2009.

While the main purpose of the bridge is to combat congestion and reduce vehicular travel times across the Fraser River by at least 20 to 30 minutes, it will also enable faster transit connections and provide a vital link between existing cycling networks on both sides of the river. The bridge will feature sidewalks on both sides to safely accommodate pedestrians and cyclists.



*Greater Vancouver Transportation Authority*

### *Winnipeg, MB*

#### **Two Provencher Bridges are better than one**

For 125 years, there has been a bridge across the Red River connecting The Forks area in central Winnipeg to the St. Boniface community. The first bridge was completed in 1882 and replaced in 1912. The second bridge lasted until 2003, when it was replaced with not one but two new parallel bridges—one for cyclists and other vehicles, and a separate bridge for pedestrians.

The 40-metre high, cable-stayed pedestrian bridge (called the Esplanade Riel) is a distinctive structure—not least because a plaza and restaurant are located at the pylon in the middle of its span. Its 5-metre wide deck allows residents and visitors to enjoy river views and the Winnipeg skyline without interference from vehicles.



*City of Winnipeg*

### *Ottawa, ON*

#### **Freeway overpass is cyclist- and pedestrian-friendly**

In 2003, the City of Ottawa opened the Castlefrank Road overpass of Highway 417 in suburban Kanata, linking the residential areas on the south side to a major retail centre and rapid transit station on the north side.

The bridge design emphasizes the local importance of walking and cycling. Its three-lane deck includes a 1.8-metre bicycle lane and 2.0-metre sidewalk in each direction, and a 3.0-metre multi-use pathway “promenade” on one side. The promenade is uninterrupted by freeway ramp intersections, and is evidence of a significant departure from typical urban highway overpasses.

### *Greater Moncton, NB*

#### **Gunningsville Bridge**

In 2005, the Province of New Brunswick opened a new bridge that strengthens the active transportation, transit and road links between the communities of Moncton, Riverview and Dieppe.

The bridge was designed to maximize comfort and convenience for pedestrians and cyclists, who share a 4.0-metre wide pathway featuring observation platforms, low-level lighting and custom railings. Landscaped connections at either end of the pathway provide links to trail systems along the shores of the Petitcodiac River.



*New Brunswick Department of Transportation*



## Upgraded bridges for all modes

As time passes and the condition of older bridges deteriorates, the work required to repair or rehabilitate them grows in both scope and cost. Bridge reconstruction projects can involve replacing an entire bridge deck, which represents an opportunity for improvement. Wider sidewalks and bike lanes are often desired features of reconstructed bridges, but innovative engineering can be required to make them feasible without removing lanes for other traffic.

### *Edmonton, AB*

#### **High Level Bridge pathways link key destinations**

The North Saskatchewan River Valley offers great cycling opportunities in a green corridor that runs through the heart of Edmonton. However, the valley is also a significant topographical barrier for cyclists and pedestrians who want to travel between the downtown area on the valley's north side, and the University of Alberta and its adjacent shopping and entertainment areas on the south side.

Since 1913, the High Level Bridge has been the most convenient way to cross the 50-metre deep river valley (although cyclists and pedestrians within the valley have their own bridge, suspended beneath the adjacent lower-level light rail bridge). The High Level Bridge has two decks, which allowed it to be the first bridge in Canada to serve four modes of travel: motor vehicles, streetcars, trains and pedestrians. However, its original cycling and walking facilities were not up to modern standards.

In 1995, the bridge emerged from a major repair project that replaced the old sidewalk with bi-directional multi-use trails on either side of the bridge (with widths of 2.1 metres and 2.4 metres). Now, even in cool fall weather, more than 1,200 cyclists and 600 pedestrians cross the bridge every day. During the summer, restored heritage streetcars operated by the Edmonton Radial Railway Society can also be seen trundling across the upper deck.



*Claire Stock, City of Edmonton*

### *National Capital Region*

#### **Rehabilitation of historic bridges improves travel**

The geography of Ottawa-Gatineau is defined largely by the confluence of three major rivers. Bridges figure prominently in regional transportation issues, and are frequently a focus of public debate.

**Champlain Bridge.** In 2002, the National Capital Commission completed an ambitious four-year reconstruction of the 1.1-kilometre Champlain Bridge spanning the Ottawa River between the west ends of Ottawa and Gatineau. The 70-year-old bridge was widened and its multimodal facilities were greatly improved.

The rebuilt three-lane Champlain Bridge offers a wider sidewalk for pedestrians and in-line skaters, dedicated 2.0-metre cycling lanes, and a new reversible high-occupancy vehicle lane to serve carpools, taxis and buses.

**Laurier Bridge.** This has been one of the region's most recognizable bridges since 1900, and is frequently the setting for postcard pictures of the Rideau Canal winding through downtown Ottawa. However, its original design was not well-liked by pedestrians due to its narrow sidewalks, nor by cyclists due to its narrow traffic lanes and steep grades.

In 2001 the Laurier Bridge was due for rehabilitation, and the City of Ottawa took advantage of the opportunity to widen the bridge by 50%. This allowed the creation of dedicated bicycle lanes and much wider sidewalks. At either end, new connections were also added to the recreational pathways that run beside the Rideau Canal.



### *Greater Montreal, QC*

#### **Walking and cycling paths are part of improved Jacques Cartier Bridge**

The Jacques Cartier Bridge is a steel truss cantilever bridge across the Saint Lawrence River, joining the island of Montreal to the community of Longueuil on the south shore. It is the second busiest bridge in Canada.

When the bridge opened in 1930 it had three motor vehicle lanes and two sidewalks. In the 1950s, extra space that had been reserved for tramway tracks were converted to two additional traffic lanes, bringing the total to five. When the bridge deck needed to be completely replaced in 2001, the bridge's owner (the Jacques Cartier and Champlain Bridges

Incorporated, a Crown corporation) decided to improve walking and cycling facilities as part of the \$125-million project.

Along the 2.7-kilometre length of the bridge, prefabricated deck units were designed with cantilevers outside the main structure to support a new 2.5-metre wide bicycle path on the west side, and a new 1.5-metre wide pedestrian sidewalk on the east side. The bicycle path is part of the 4,000-kilometre Route Verte provincial bikeway network.



*Jacques Cartier and Champlain Bridges Incorporated*

### **Halifax, NS**

#### **Bridge widening benefits cyclists and pedestrians**

The Angus L. Macdonald Bridge connects downtown Dartmouth to downtown Halifax. The only other bridge across Halifax Harbour is closed to pedestrians and cyclists, so the Macdonald Bridge is an important link for many students and commuters who choose to walk or ride their bicycle. The bridge also carries several local Metro Transit routes.

The bridge opened in 1955, with two traffic lanes and a narrow 1.5-metre sidewalk. By the 1990s it was in need of modernization, and a project was undertaken to improve the bridge's multimodal function. The structure's limited width posed a real constraint to improving either the bridge's vehicular capacity or its facilities for walking and cycling. The challenge was overcome by attaching new 2.6-metre cantilevered structures to each side of the bridge, which are dedicated to cyclists on one side and pedestrians on the other. By doing so, room was created to add a third reversible lane that serves traffic in the peak direction.



## **Conclusion**

This case study illustrates several examples of how progress toward sustainable transportation is being aided by the agencies responsible for bridges in Canadian cities. Pedestrians and cyclists have much to gain from the removal of bridge-related barriers, and better walking and cycling routes make a real difference to individuals who want to make more sustainable travel choices.

The projects presented here are proof that Canadian communities are making multimodal transportation a real priority. Several lessons can be learned from them:

- **Bridges for walking and cycling can increase active transportation levels and build community spirit.** The active transportation bridges profiled in this paper enabled new walking and cycling trips that previously could not be made with safety, comfort and convenience. They also generated significant community energy and goodwill, and their openings sparked real celebrations involving a wide range of stakeholders.
- **The value of road bridges is enhanced by including quality walking and cycling facilities.** Although active transportation demands across new bridges can be hard to predict, pedestrians and cyclists are important users of most transportation corridors. Increasingly, new road bridges are being designed to give active transportation users levels of safety, comfort and convenience that equal those being provided to motor vehicle users.
- **The rehabilitation or reconstruction of a bridge is a great opportunity to improve substandard walking and cycling facilities.** Mistakes of the past can be fixed, and sometimes at relatively little cost. Often, open minds and innovative engineering are all that is really required to make older bridges function as if they were new.