THE HONORÉ MERCIER BRIDGE

Introduction

The Honoré Mercier Bridge spans the St. Lawrence River and Seaway between Lasalle on the Island of Montreal, and the Mohawk Territory of Kahnawake on the South Shore.

Named for former Quebec premier the Honourable Honoré Mercier, the bridge became the third structure to link the Island of Montreal and the South Shore after the Victoria Bridge (in 1860) and the Jacques Cartier Bridge (in 1930).

The opening of the Honoré Mercier Bridge provided a new route into southern Quebec from the Island of Montreal. It also reduced the distance between Montreal and New York State by many kilometres.

Today, an estimated 28 million vehicles cross the Honoré Mercier Bridge every year.

<u>Historic</u>

Beginning of the Bridge Construction (November 1932)
Construction of the bridge began in November 1932 and was completed in the early summer of 1934.

Built by the Dominion Bridge Company Limited under a government-funded work program devised to remedy the Depression, it was designed by 11 French-Canadian engineers, graduates of the *École Polytechnique de Montréal*.

Opening to Traffic (June 22, 1934)
It was opened to traffic on June 22, 1934, ten months ahead of schedule.

The Foremen
The Honoré Mercier Bridge was built for the *Corporation du pont du lac Saint-Louis*, whose commissioners were:

The Honourable Raoul O. Grothé, legal counsel, President
J. Arthur Trudeau, Vice President
Louis Chatelle, Secretary-Treasurer
Gérald Fauteux, Q.C., Assistant Treasurer
Joseph Dupont
Robert R. Ness

Tolls
The following tolls were charged to cross the bridge:

- 0.50¢ for an automobile and driver;
- 0.05¢ for each additional passenger;
- 0.50¢ for a truck weighing 907.18 kg or less and the driver;
- 0.80¢ for a truck weighing between 907.18 kg and 1,814.36 kg and the driver;
- $1.20 for a truck weighing between 1,814.36 kg and 3,628.72 kg and the driver;
- $1.80, $2.00, $2.40 and $3.00 for trucks weighing 4,535.90 kg, 5,443 kg, 6,350.26 kg and 7,257 kg respectively, and the driver.

A Second Bridge (August 1963)
In August 1963, it was considered that the Mercier Bridge’s two lanes were inadequate for the constantly increasing traffic travelling across it, so the Quebec Department of Public Works had a second bridge built downstream of the first.

The Bridge

Geographic Situation

The Honoré Mercier Bridge spans the St. Lawrence River and Seaway of the western side of the Montreal's Island. It is located between the Champlain bridge and the mouth of the lake Saint Louis. The bridge has direct connections with highway 20, in LaSalle City, and with highway 132 towards Châteauguay, by way of the Mohawk Territory of Kahnawake.

The portion of the bridge under the jurisdiction of the Corporation is located on the South Shore of the St. Lawrence River.

Traffic

Today, an estimated 28 million vehicles cross the Honoré Mercier Bridge every year.

Measures

The bridge was originally 4,464 feet, 11 inches (1,361.25 m) long. Its main steel span was 399 feet, 9 inches (121.87-m) long and consisted of 11 steel spans and 31 reinforced concrete spans. The roadway was 26 feet, 4 inches (8 m) wide, with a 3-foot, six-inch (1.06 m) sidewalk.

Bridge Sections

The federally-owned portion of the Honoré Mercier Bridge and its approaches that came under the jurisdiction of The Jacques Cartier and Champlain Bridges Incorporated on October 1, 1998, and is divided into four sections, built in 1958 and 1959.

Section 1

This section is located at the north end of the Seaway right-of-way between the section of the bridge under the jurisdiction of the Quebec Department of Transport (MTQ) and the South Shore access ramps.

It begins at the north end, on the upstream side at pier 14 and on the downstream side at pier 15, and extends to the south shore of the Seaway, at pier 28. It consists of a four-lane road (two lanes in each direction).

Section 2

Section 2 is known as the "*chaussée divisée est*" [east divided road] or, more simply, the *"Laprairie ramp."* It links Highway 132 between Laprairie and the bridge's main structure in both directions. This section is contained between pier 28 and the east abutment. There are four lanes of traffic (two in each direction) on the ramp.

Section 3

Section 3 is called the *“chaussée simple ouest”* [single west road] or the *“ramp to Châteauguay.”* This section allows motorists from the bridge (section 1) to join up with Highway 132 to Châteauguay. It is located between piers 31 (shared by sections 2, 3 and 4) and the west abutment (shared by sections 3 and 4) and carries two lanes of traffic from the bridge towards Châteauguay.

Section 4

Section 4, known as the ”*chaussée simple est”* [single east road] or the *“ramp from Châteauguay,”* brings motorists onto the bridge on the Châteauguay side. It is located between pier 31 (shared between sections 2, 3 and 4) and the west abutment (shared between sections 3 and 4) and carries two lanes of traffic from Châteauguay to the bridge.

Construction

Construction of the Piers

A thick layer of glacier marl over the rock, the depth of the river and the speed of the current obliged the engineers to bypass standard techniques and devise a method to erect the bridge piers that was better suited to these conditions.

Because of the depth of the St. Lawrence, the engineers refused the use of cofferdams, and instead chose pneumatic caissons for the construction, a method that had not been used in Montreal in 25 years.

The steel walls of the caissons were built in separate parts by Dominion Bridge at its Lachine works. They were then transported by barges from Lasalle to Dufresne Engineering's yard located downstream of the bridge for assembly.

Rings were welded to the outside walls to insert heavy steel piles 10 inches (0.254 m) in diameter. After they were assembled, the caissons were attached to two beds mounted on barges solidly attached to one another and then transported to the exact spot where the piers were to be built. The workers drove the piles into the rings to ensure the stability of the caissons while they were being sunk.

A batching plant that would supply the concrete for the caissons was also installed on a barge. Another was used for the compressed air plant. The working chambers were connected with the outside through three shafts with airlocks. The workers used the middle shaft, while excavated materials were removed through those on either end. The excavation work was fairly problem-free. Blasting was even done to dislodge large chunks of rock.

However, there were problems installing the two caissons. One of them was to be erected less than 12 inches (0.305 m) from the corresponding pier of the old bridge, which forced the engineers to give it a special shape. Its dimensions (32 by 71 feet, 11 inches (9.75 by 21.94 m)) made it too heavy for Dufresne Engineering's shoring, so they had to have Dominion Bridge assemble it in the Lachine Canal and float it to the bridge site.

Because of its considerable size, special shape and the strong current, a barge had to be added at the upstream end of the caisson. The barge was attached to the caisson with cables and a baffler was added to reduce its resistance to the swift currents. At the upstream Canadian Pacific Bridge, in a 12-foot (3.66-m) per second current, anchors were dropped from the barge on the upstream side. Powerful winches on the immobilised barge held the caisson for the last 599 feet, 6 inches

(182.80 m) of the trip. Once it arrived at its destination, a third cable was affixed to an attachment point on the South Shore to bring the caisson into final position.

An adventure awaited the other caisson, which went adrift. The vibrations caused by the strong currents broke the temporary anchoring cables and the concrete-filled caisson grounded on a bank 999 feet, 3½ inches (304.67 m) downstream from the bridge. Fortunately, the caisson was recovered, despite the strong current.

Raising of the Bridge Sections Straddling the Seaway

In 1958-1959, the St. Lawrence Seaway Authority raised the sections of the bridge straddling the Seaway, which was under construction at the time. The spans on the south side, beginning at pier 14, were jacked up to provide clear passage for ships plying the Seaway. As a result, the raised part of the bridge, representing half of the bridge lengthwise, is under federal jurisdiction.

Construction of a Second Bridge

In August 1963, it was considered that the Mercier Bridge's two lanes were inadequate for the constantly increasing traffic travelling across it, so the Quebec Department of Public Works had a second bridge built downstream of the first. At the same time, the deck of the old bridge was modified to match its capacity to that of its "twin." Minor changes were also made to the piers—the entire surface of each pier was covered with a new layer of reinforced concrete—and their shape was changed to match the piers of the new bridge. The "new" bridge spans the St. Lawrence River and Seaway along the west side of the original.

All that remains of the 1932 bridge is the section between both shores, that is, the concrete infrastructure and steel superstructure.

By twinning the old and new bridges, the number of lanes between the two shores was increased from two to four. Southbound traffic travels over the old bridge while northbound traffic crosses the new one.

Technical Data

The federally-owned portion of the Honoré Mercier Bridge and its approaches that came under the jurisdiction of The Jacques Cartier and Champlain Bridges Incorporated on October 1, 1998, and is divided into four sections, built in 1958 and 1959.

These sections are briefly described below:

Section 1
This section is located at the north end of the Seaway right-of-way between the section of the bridge under the jurisdiction of the Quebec Department of Transport (MTQ) and the South Shore access ramps.

It begins at the north end, on the upstream side at pier 14 and on the downstream side at pier 15, and extends to the south shore of the Seaway, at pier 28. It consists of a four-lane road (two lanes in each direction).

- 1,726 feet, 4½ inches (526.33 m) in length.

- There are 14 spans totalling

- The concrete deck unit is 6½ inches (165 mm) thick and rests on steel stringers spaced 5 feet, 3 inches (1.6 m) apart.

- The overall width is 65 feet, 2 inches (19.8 m), including two roadways 26 feet (7.925 m) each, a 2-foot, 10-inch (0.86-m) curb downstream, a 4-foot, 4-inch (1.32-m) sidewalk upstream and a 6-foot (1.83-m) separator supporting a semi-rigid steel barrier which is under jurisdiction of the Quebec Department of Transport (MTQ).

Superstructure:

- A span in the form of continuous steel structures between piers 15 and 27. There are four steel trusses. The fixed supports are located at pier 21.

- Over the Seaway, between piers 27 and 28, the span consists of three steel trusses measuring approximately 302 feet (92.07 m). The deck is located at the bottom chord level.

- Between piers 14 and 15, only the two upstream lanes (Châteauguay-bound) are under the jurisdiction of The Jacques Cartier and Champlain Bridges Incorporated. This upstream span lies on single supports and is made up of four steel trusses.

Infrastructure:

- Piers vary in height from 47 feet, 6 inches to 103 feet, 9 inches (14.48 m to 31.63 m) and are formed by two legs and a concrete portal. Pier 21 is a full pier.

Section 2

Section 2 is known as the "*chaussée divisée est*" [east divided road] or, more simply, the *"Laprairie ramp."* It links Highway 132 between Laprairie and the bridge's main structure in both directions. This section is contained between pier 28 and the east abutment. There are four lanes of traffic (two in each direction) on the ramp.

- There are 16 spans in this section, which is 1,310 feet, 6 inches (399.54 m) long.

- The overall width is 63 feet, 8 inches (19.41 m), and includes two 26-foot (7.925-m) roadways, two 2-foot, 10-inch (0.86-m) curbs, a 6-foot (1.83-m) separator supporting a semi-rigid steel barrier between piers 28 and 32, and a rigid concrete, "New Jersey"-type barrier between pier 32 and the east abutment. These two barriers are under the jurisdiction of the Quebec Department of Transport (MTQ).

- The concrete deck unit is 6½ inches (165 mm) thick and rests on steel stringers spaced 5 feet, 2 inches (1.60 m) apart.

  <u>Superstructure:</u>

- Made of steel plate girders with a maximum span of 96 feet (29.27 m);

- Single main girders, with one end resting on a fixed steel support and the other on a mobile roller support.

  <u>Infrastructure:</u>

- Double-legged concrete piers capped with a portal and connected by a concrete diaphragm; their total height varies from between 40 feet, 10 inches and 109 feet, 6 inches (12.44 m and 33.38 m).

Section 3

Section 3 is called the *"chaussée simple ouest"* [single west road] or the *"ramp to Châteauguay."* This section allows motorists from the bridge (section 1) to join up with Highway 132 to Châteauguay. It is located between piers 31 (shared by sections 2, 3 and 4) and the west abutment (shared by sections 3 and 4) and carries two lanes of traffic from the bridge towards Châteauguay.

- It is 1,539 feet, 6½ inches (469.37 m) long with 14 spans.

- The overall width is 33 feet, 2 inches (10.11 m), including a 26-foot (7.925-m) roadway, a 4-foot, 4-inch (1.32-m) sidewalk on the west side and a 2-foot, 10-inch (0.86-m) curb on the east side.

- The concrete deck unit is 6½ inches (165 mm) thick and rests on steel stringers spaced approximately 5 feet, 3 inches (1.60 m) apart.

Superstructure:

- Consists of steel plate girders with a maximum span of between 96 and 121 feet (29.26 and 36.88 m).

- Single main girders, with one end resting on a fixed steel support and the other on a mobile roller support.

Infrastructure:

- T-shaped concrete piers. The main section of each pier is an 8- by 15-foot (2.44- by 4.57-m) rectangular block. The total height of the piers ranges from 47 to 98 feet (14.3 to 29.9 m).

Section 4

Section 4, known as the ”*chaussée simple est*” [single east road] or the *“ramp from Châteauguay,”* brings motorists onto the bridge on the Châteauguay side. It is located between pier 31 (shared between sections 2, 3 and 4) and the west abutment (shared between sections 3 and 4) and carries two lanes of traffic from Châteauguay to the bridge.

- This section measures 1,764 feet, 6 inches (537.95 m) in length and has 20 spans.

- The overall width is 31 feet, 8 inches (6.65 m), including a 26-foot (7.93-m) roadway with two 2-foot, 10-inch (0.86-m) curbs.

- The concrete deck unit is 6½ inches (165 mm) thick and rests on steel stringers spaced approximately 5 feet, 3 inches (1.60 m) apart.

- The span between piers E5 and E6, which overhangs span 37-38 in section 2, consists of a special superstructure made up of five main girders spaced 1.854 m (6 feet, 1 inch) apart. The part of span E5-E6 directly above piers 37 and 38 is made up of five main girders. The crossbeams (43 feet, 10 11/16 inches/13.38 m) are longer than the width of the span (31 feet, 8 inches/9.65 m).

Superstructure:

- Consists of steel plate girders with a maximum span of between 82 and 96 feet (25.0 and 29.27 m).

- Single main girders, with one end resting on a fixed steel support and the other on a mobile roller support.

Infrastructure:

- T-shaped concrete piers. The main section of each pier is an 8- by 15-foot (2.44- by 4.57-m) rectangular shaft. The total height of the piers ranges from 50 to 98 feet (15.3 to 29.9 m).

Technical Data

HONORÉ MERCIER BRIDGE

SUMMARY OF THE CHARACTERISTICS OF THE BRIDGE SECTIONS UNDER THE JURISDICTION OF THE JACQUES CARTIER AND CHAMPLAIN BRIDGES INCORPORATED

	SECTION 1	SECTION 2	SECTION 3	SECTION 4
Number of Spans	14	16	14	20
Length	1,726’ 4 3/8" (526.33 m)	1,310’ 6" (399.54 m)	1,539’ 6 3/8" 469.37 m	1,764’ 5¾" (537.95 m)
Overall Width	64’ 11" (19.8 m) (4 lanes)	63’ 7½" (19.4 m) (4 lanes)	33’ 1½" (10.1 m) (2 lanes)	31’ 8" (9.65 m) (2 lanes)
Deck	Reinforced concrete h=6½" (165 mm)	Reinforced concrete h=6½" (165 mm)	Reinforced concrete h=6½" (165 mm)	Reinforced concrete h=6½" (165 mm)
Superstructure	Steel trusses	Steel girders	Steel girders	Steel girders
Infrastructure	Concrete piers 47’ 7"<H<103’ 8" (14.5 m<H<31.6 m)	Concrete piers 40’ 8"<H<109 ’7" (12.4 m<H<33.4 m)	Concrete piers 46’ 11"<H<98’ 5" (14.3 m<H<30 m)	Concrete piers 50’ 2"<H<98’ 5" (15.3 m<H<30 m)