

THE JACQUES CARTIER BRIDGE

Introduction

The Jacques Cartier Bridge is a five-lane bridge about 2 1/6 miles (3.4 km) in length, spanning the St. Lawrence River between the cities of Montreal and Longueuil.

Annually, it handles approximately 43 million vehicle crossings.

Historic

Recognition of the Need for a New Bridge (1874)

In 1874, the Honourable John Young and a group of Montreal citizens were the first to recognise the need for a new railway and vehicle bridge to link Montreal and the South Shore. The bridge was to be located near the present site of the Jacques Cartier Bridge. Plans were drawn up by Charles Legge, one of the engineers who had built the Victoria Bridge. However, the project was abandoned owing to a lack of money. Between 1897 and 1909, a number of other representations were made, but nothing ever came of them.

Demand of a New Bridge (1921)

In 1921, citizens' committees, the Board of Trade, the Montreal Chamber of Commerce, the League for the Improvement of the City and several other organisations presented a report to the Honourable P.J.A. Cardin, the Minister of Marine and Fisheries. At the time, the Victoria Bridge was the only link between Montreal and the South Shore. Two ferries crossed the river at Longueuil in summer, while in winter, an ice bridge was built and automobiles risked the crossing during the few weeks of severe cold. The need for a new link between Montreal and the South Shore was becoming increasingly urgent.

Port of Montreal Project (July, 19 1924)

It was the Honourable Wilfrid Laurier McDougald, President of The Board of Harbour Commissioners of Montreal (the "Commissioners"), who finally persuaded the federal government to build the bridge as a Port of Montreal project. It was decided that it would be operated as a toll bridge in order to pay back the capital raised through a bond issue. By an Act of Parliament passed on July 19, 1924 (Act 14-15, George V, Chapter 58), the Commissioners were empowered to finance, build and operate the project.

Contest for the Site of the Future Bridge (August 14, 1922)

In the meantime, the Privy Council of the Dominion of Canada had granted the Commissioners \$50,000 on August 14, 1922 to launch a contest for the site of the future bridge. Four projects were selected and the final location was chosen in the spring of 1924. Consulting engineering firms were invited to submit plans for the construction of the bridge. On November 19, 1924, the Commissioners announced that Montsarrat and Pratley of Montreal and J.B. Strauss of Chicago, operating under the name *Montsarrat, Pratley & Strauss*, had been appointed as consulting engineers for the project.

Choice of the Bridge Emplacement (January 27, 1925)

On January 27, 1925, the site was announced and a few months later, the structural drawings were approved. In response to calls for tender launched in early 1925, the following contracts were awarded:

Groundbreaking Ceremony (May 26, 1925)

The groundbreaking ceremony took place on May 26, 1925. Work at the Longueuil job site began the following day, with work at the Montreal site starting soon after.

Laying of the Cornerstone (May 9, 1926)

On August 9, 1926, the cornerstone was laid; it forms part of pier 26 at the corner of Notre Dame and Craig (today St. Antoine) streets, across from the spot known as “the foot of the current” (*Au Pied du Courant*). No one today knows the exact location of the stone, which contains a time capsule with the following 59 objects:

- Annual reports of The Board of Harbour Commissioners of Montreal for 1922, 1923, 1924 and 1925.
- The following newspapers, dated August 7, 1926:
 - . The Montreal Gazette
 - . The Montreal Herald
 - . La Presse
 - . Le Devoir
 - . The Montreal Star
 - . The Montreal Standard
 - . La Patrie
 - . Le Canada
- The following 1925 currency:
 - . 1¢ coin (large and small)
 - . 5¢ coin (large and small)
 - . 10¢ coin
 - . 25¢ coin
 - . 50¢ coin
 - . \$5 gold coin
 - . New \$1 and \$2 bills
- Three aerial photographs of the Port of Montreal.
- Two Board of Harbour Commissioners of Montreal calendars for 1926 (French and English).
- Two illustrated pamphlets put out by The Board of Harbour Commissioners of Montreal (French and English).
- Three plans of the Port of Montreal (in different sizes).
- One plan of the City of Montreal.
- One plan of the City of St. Lambert.
- One plan of the City of Longueuil.
- One plan of the Province of Quebec.
- One geographic map of Canada.
- Three geographic maps of the Montreal region.
- One small drawing of the South Shore Bridge, as seen from the South Shore of Montreal.

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- One copy of the notes for the speech made by Dr. Milton Hersey, Commissioner.
 - One summary of the events connected with the building of the South Shore Bridge.
 - One map of the Port of Montreal.
 - Three drawings of the South Shore Bridge, as seen from the South Shore of Montreal.
 - One Annual Report of the City of Montreal, 1925.
 - Three volumes of Dr. Atherton's History of Montreal.
 - One Annual Report of the Montreal Sailors' Institute.
 - One Annual Report of the Catholic Sailors' Club.
 - One History of the Catholic Sailors' Club.
 - Acts of Parliament concerning The Board of Harbour Commissioners of Montreal.
 - One copy of the By-Law concerning The Board of Harbour Commissioners of Montreal.
 - One copy of L'Histoire de Montréal by Albert Leblond, Éditions Brumath.
 - One copy of Mémoires de la Société Historique de Montréal by M. Dollier, Éditions Casson, 1869.
 - One copy of Faits curieux de l'Histoire de Montréal by E.Z. Massicotte.

Bridge Opening to Traffic (May 14, 1930)

The three-lane bridge was opened to traffic on May 14, 1930. The maximum speed on the bridge at the time was 25 miles per hour (40 km/h). Everyone shared the roadway, with the exception of pedestrians, who had a sidewalk. Passing another vehicle travelling in the same direction was prohibited.

Official Inauguration (May 24, 1930)

The ceremony began with a speech by the Chairman of the Port of Montreal Commission, Senator W.L. McDougald. Monseigneur Georges Gauthier, Archbishop of the Archdiocese of Montreal, was then invited to bless the bridge, and at 11:50 am, the Right Honourable William Lyon Mackenzie King, Prime Minister of Canada, gave his speech by telephone from his office in Ottawa and then pressed a button to unveil by remote control the commemorative plaque on the edge of the platform where the guests of honour were seated.

Official Name

During its construction, the structure was known as the "*the South Shore Bridge*" or the "*pont de la Rive-Sud*" until the official opening on May 24, 1930. At its inauguration, the bridge was named the "*Harbour Bridge*" or "*pont du Havre*" since it was built under the auspices of the

Commissioners. Some 4,000 members of the elite from across Canada attended the ceremony. A large crowd filled the pavilion and St. Helen's Island as well.

Changing of the Official Name (September 1st, 1934)

On June 23, 1934, the Commissioners acceded to public demand as expressed in a petition started by Georges Pelletier, editor of *Le Devoir*, and adopted a resolution recommending to His Excellency the Governor General in Council that the "*Harbour Bridge*" be named the "JACQUES CARTIER BRIDGE" in tribute to the explorer who discovered Canada in 1534. It was also a way to mark the 400th anniversary of the discovery of Canada. On June 30, 1934, a Departmental Order, bearing the number P.C. 1358, approved the resolution.

For the occasion, the Government of France presented Canada with a bronze bust of the famed explorer and discoverer from St. Malo. On September 1, 1934, in a ceremony held right on the bridge itself, the name was officially changed and the bronze bust was unveiled. The bust was presented by Mr. Henry Bordeaux and accepted on behalf of Canada by the Minister of Marine, the Honourable Alfred Duranleau.

His Excellency Pierre-Étienne Flandin, France's Minister of Public Works at the time, and later prime minister, attended the ceremony. Also present were representatives of the United States and Great Britain, high-ranking political and ecclesiastical dignitaries, including senators, legislative assembly members, parliamentary representatives, consuls, mayors, and leading citizens representing Montreal's business, financial and industrial communities.

Moving of the Bronze Bust and Commemorative Tablets (May 1962)

The bronze bust of Jacques Cartier and the plaques commemorating the official opening ceremony and the change in the bridge's name were moved in May 1962 when the second access ramp to St. Helen's Island was built. They are now located upstream of the bridge, on a wall of the St. Helen's Island pavilion, just before the access ramp onto the island.

Opening of the Fourth Lane (June 1956)

Initially, the bridge had only three lanes, since there was a 12-foot (3.6 m) wide track on either side for streetcars, leaving 36 feet and 10 inches (11.2 m) of roadway for vehicles. The tracks were never used for the streetcars, so in June 1956, it was decided to open a fourth lane to traffic on the downstream side. The fifth lane was opened in June 1959.

Opening of the Fifth Lane (June 1959)

The fifth lane was opened in June 1959.

Installation of an Automatic Toll System (September 8, 1959)

On September 8, 1959, toll collectors were replaced by an automatic toll system in an attempt to improve traffic movement and control of the money.

Toll Charges

The toll charges were as follows: pedestrian, 15¢; cyclist, 15¢; motorcyclist, 25¢; automobile (for vehicle and driver), 25¢ and 15¢ per passenger; bus, 80¢ to \$1.00 (depending on the category of bus); truck, 25¢ to \$1.50 (depending on the category of truck); animal-drawn vehicle, 15¢ to 60¢ (depending on whether it was drawn by one, two, three or four animals, and whether or not it carried any passengers); oil tank pulled by two animals, 60¢; vehicle pulled by a dog or goat, 15¢; animals (alone or in herds), 3¢ to 15¢ per animal (depending on the species); wheelbarrow, 15¢; free for children five and under.

Abolition of the Toll (June 1st, 1962)

The toll was abolished on June 1, 1962 at 3 p.m. The toll had been in place since the bridge opened in 1930. Since then, the toll collectors' building has been used as the main office for Jacques Cartier and Champlain bridges maintenance personnel.

The Bridge

Geographic Situation

The Jacques Cartier Bridge spans the St-Lawrence River and Seaway facing St-Helens's Island. The bridge is located between the Victoria Bridge and Louis H. Lafontaine bridge-tunnel some 4.5 miles upstream from the latter.

On the South Shore, the bridge has direct connection with Highways 132, 134 and 116. On the North Shore, located on Montreal Island, the bridge is connected to de Lorimier Avenue, north direction into Sherbrooke Street (Highway 138) and in South direction, into Ville-Marie Expressway (A720).

Access and exit ramps, located in the middle of the bridge, allows the road users accessibility to St-Helen's Island.

Traffic

In 1962, an estimated 18 million vehicles crossed the Jacques Cartier Bridge annually.

Traffic on the Jacques Cartier Bridge is currently estimated at 43 million vehicles per year.

Lane Signalling System (September 28, 1961)

A lane signalling system has been in place since September 28, 1961 to reverse the direction of traffic in the middle lane of the bridge. This creates three lanes in one direction and two lanes in the other according to rush hour traffic needs.

Lighting System (1976)

The bridge is lit by 195 light standards installed in 1976.

Bridge Sections

The bridge can be divided into three parts, consisting of nine sections:

South Approaches

This part is approximately 6,625 feet (2,019.8 m) long and consists of sections 1 to 6:

- **Section 1** is limited to the 1,070 feet (326.2 m) of fill.
- **Section 2** extends from piers 1 to 9 and measures 1,450 feet, 4 inches (442.2 m).

- **Section 3** is 249 feet, 6 inches (76 m) long; it spans the St. Lawrence Seaway and is approximately 125 feet (38.1 m) above the surface of the canal.
- **Section 4** measures 2,207 feet, 2 inches (673 m); it runs between piers 10 and 19A, which delimits the southern edge of the St. Helen's Island pavilion.
- **Section 5** is formed by the St. Helen's Island pavilion and is 235 feet (71.6 m) in length; it also includes a ramp approximately 250 feet (76.2 m) long that extends from the pavilion and provides access to St. Helen's Island. The three-storey pavilion was originally meant to be a casino. However, the Catholic Church refused to accept a casino so the federal government turned it into a series of reception halls. Today it is used to store substances such as the de-icing salt applied to the bridge in winter. Jacques Cartier's bust, presented by France in 1934, and the plaques commemorating the bridge's official opening in 1930 and name change in 1934 are found in this section.
- **Section 6**, is 841 feet, 4½ inches (256.5 m) long and extends from the north end of St. Helen's Island pavilion (pier 19B) to pier 23.

Section 7 Main Span

The cantilever section (**section 7**) of the bridge measures 1,937 feet (590.4 m) and extends from pier 23 to pier 26. It is divided into three parts: two anchor arms located between the banks and the piers, two cantilever arms and the suspended span. The anchor arms are each 420 feet (128 m) long and are located between piers 23 and 24 on the south side and between piers 25 and 26 on the north side. The cantilever arms are each 354 feet, 5 inches (108 m) long and are located on either side of the suspended span, which measures 378 feet, 6 inches (115.4 m).

This is the most remarkable section of the bridge. The engineers combined a sense of aesthetics and technical skill to produce a remarkable interplay of proportions. For example, the height of the main spans is three times the height of the suspended span, the length of the suspended span is just over one-third of the cantilever section, and the trusses are spaced 66 feet, 6 inches (20.2 m) apart, resulting in a solid, well-proportioned whole.

Clearance under the suspended span in the centre of the bridge is 162 feet (49.4 m) above the surface of the water (median height in summer); clearance at the Port of Montreal is 156 feet (47.5 m). The highest point of the bridge is 184 feet (56 m) above the tops of pier 24 and 25, or roughly 344 feet (104 m) above the surface of the water.

The main span includes four finials nicknamed “*Eiffel Towers*” by many people. There is a persistent popular belief that France provided the four towers adorning the top of the main span, but in fact, they were included in the original plans. Looking at them from the deck, you would never believe that they each stand almost 13 feet (3.95 m) tall and weigh roughly six tons!

North Approaches

- **Section 8** includes a section approximately 1,950 feet (594 m) long on steel towers.
- **Section 9** the 335-foot approaches (102.1 m), including a part on the concrete arches.

Bridge Deck

Today, the deck of the bridge is 72 feet, 6 inches (22.1 m) wide, including five feet (1.5 m) on each side for cantilevered sidewalks and 60 feet (18.3 m) of roadway between the curbs. The deck is supported by riveted trusses resting on piers or steel towers (north approach). Also, in the cantilever section, studs were used in a way permitting articulation of some structures including the anchor of trusses to the piers.

Bridge Curbs

The bridge has three curves, two of them on the north side.

First Curb

The first curve is a 10.5° jog before the section that passes over St. Helen’s Island. In order to keep the piers from being exposed to undue turbulence caused by the currents that run at slightly different angles on either side of the Island, the engineers had two options: keep the deck in a straight line and compensate for the different angles with an asymmetrical structure, or keep the structure symmetrical and curve the deck. The second option was chosen as being the most technically feasible at the time!

Second Curb

The second curve, named the “*Craig Curve*,” was designed to align the axis of the deck with the axis of the north-south traffic lanes on the Island of Montreal.

Third Curb

The last curve meets De Lorimier Avenue. According to the initial plans, the traffic on the bridge was to travel onto Bordeaux Street. However, a man by the name of Hector Barsalou, the owner of a soap factory on De Lorimier Avenue near De Maisonneuve Blvd, obstinately refused to let his building be expropriated to make way for the entrance to the bridge. As the expropriation laws were different from those today, the engineers had to come up with a way to circumvent this obstacle.

Construction

Construction Cost

The initial cost of building the bridge was approximately \$20,000,000, including expropriation expenses. If the approach roads are included, the cost was \$23,000,000.

1st Awarded Contract– South Shore Piers (May 22, 1925)

The first contract, in the amount of \$936,000, was awarded on May 22, 1925 to Quinlan, Robertson and Janin Limited for the piers on the South Shore.

2nd Awarded Contract – Piers and North Approaches (Summer 1925)

In the late summer of 1925, Dufresne Construction Co. Limited obtained a \$125,000 contract for the piers and approaches on the north part of the bridge.

Superstructure Erection Contract (October 25, 1925)

The contract to erect the steel superstructure, worth \$6,954,000, was awarded to the lowest bidder, Dominion Bridge Company Limited, on October 25, 1925.

Pier 24 Construction – Important Challenge

The caissons used to construct the piers were built by Canadian Vickers. They were then towed by tugs from the firm's workshops to the exact location of each pier. Construction of pier 24, one of the two main piers supporting the structure's cantilever section, presented the most problems and was in itself a considerable challenge for the engineers. The pier was anchored in the river bed and the friable soil made it necessary to dig 11 feet (3.35 m) deep to make it solid. To fill the pier, 3,775 cubic yards (2,886 m³) of concrete were required, while above water, 23,000 cubic yards (17,584 m³) of concrete and 100 tons of steel were needed. The caisson used to build it was 128 feet (39 m) wide, 52 feet (15.8 m) deep and weighed 1,030 tons. It cost \$500,000, an astronomical amount at the time!

Construction of the Superstructure (September 1926 to September 1929)

Construction of the superstructure took place between September 1926 and June 1928 on the South Shore, from October 1928 to February 1929 on the Montreal shore, and from May 1927 to September 1929 in the centre. Construction of the main span in the central, cantilevered section presented a number of difficulties. This type of structure has three distinct sections, namely two anchor arms between the shores and the piers, and two cantilever arms located on either side of the suspended span in the centre. The cantilevered sections have to be built out from the piers

towards one another, piece by piece, panel by panel. Each side has to remain in constant balance as it is extended out into space. The sections must be erected and aligned with exact precision so that both halves of the suspended span meet and can be joined together.

Last Girder (July 10, 1929)

The last girder joining the two sections of the bridge was put in place on July 10, 1929. The whole operation was carried out quickly and the workers completed the operation in less than five hours without any problems. On this occasion, the superintendents of both work sites came face to face and shook hands. They had just accomplished their mission brilliantly!

Quick Completion

The work was completed so quickly that the contractors were able to deliver the bridge almost a year and a half ahead of schedule, in December 1929 instead of May 1931. It took four years to build, a relatively short period at the time for an undertaking of that size. The construction also took place without ever interfering with traffic in the St. Lawrence.

Jacking of the Bridge (1958 and 1959)

In 1958 and 1959, the deck between piers 9 and 10 had to be jacked up from its original 40 to 120 feet (12.2 m to 36.5 m) above the water for ships to pass through the St. Lawrence Seaway, which was under construction at the time. This work took 16 months and cost \$6,698,750. The contract was awarded to the Dominion Bridge Company Limited, under the supervision of consulting engineer Dr. P.L. Pratley. Thirty jacks with a capacity of 362.87 to 544.3 tons were used to raise this section of the bridge. The work was carried out without disrupting traffic on the bridge thanks to the installation of two temporary "Bailey" bridges.

Construction of the Second Access Ramp (1961)

In 1961, a second access ramp to St. Helen's Island was built downstream of the bridge in section five to allow motorists from Longueuil to access St. Helen's Island without having to cut across oncoming traffic from Montreal, thereby eliminating a potential source of accidents, particularly during rush hour.

Bridge Maintenance

Maintenance Program

In the past few years, major ongoing repair programs have been carried out to preserve the structure's integrity and ensure that the bridge remains safe. Among the most important are the structural steel painting and repair program, the guardrail replacement program, the signalling replacement program and the pavement repair program.

Bridge Deck

Studies on the feasibility and cost of replacing all of the deck on the Jacques Cartier Bridge have been conducted. Deck replacement is set to begin in April 2001 and be completed in November 2002. The work will involve removing the existing deck, including the stringers, and replacement with prefabricated concrete panels and then covering them with a waterproof membrane and asphalt. The project is expected to cost over \$100 million.

Technical Data

- Type of structure: Concrete for the deck and for the south approach and main span infrastructure. Steel for the superstructure and for the north approach infrastructure (steel towers).

- Length of bridge:
 - Including the north and south abutments: 9 272 ft (2.725 m)
 - Including the approaches: 11 236 fr or 2 1/6 miles (3,425.6 m)

- Length of main span: 1,937 ft (590.5 m), centre to centre from piers 23 to 26, with two 420-foot (128-m) anchor arms (between piers 23/24 and 25/26) and two 354-ft (108-m) cantilever arms located on either side of the 378-ft, 6-in. (115.4-m) suspended span.

- Length of spans on upper deck:
 - 12 245 ft (74.7 m)
 - 2 100 ft (30.5 m)
 - 3 150 ft (45.7 m)
 - 7 125 ft (38.1 m)
 - 14 90 ft to 133 ft (27.4 m to 34.4 m)

- Total number of spans: 40 (24 on the Longueuil side and 16 on the Montreal side) supported by 13 steel towers and two concrete piers covered with masonry.

- Width of main channel span: 1,000 ft (304.8 m) between the wharf and the pier located in the river.

- Clearance above the high-water line:	162 ft (49.4m) at the centre and 156 ft (47.5 m) at the wharf in the Port of Montreal.
- Width of roadway:	60 ft (18.3 m) between the curbs.
- Width of two sidewalks:	5 ft (1.5 m) each.
- Total width between outer railings on upper deck spans:	72 ft, 5 in. (22 m)
- Distance between main span trusses:	66 ft, 6 in. (20.2 m)
- Height from tops of pier 24 and 25 to summit:	184 ft, 7 in. (56.3 m)
- Distance from the highest point on the structure to the water level:	344 ft (104 m)
- Weight of steel in bridge and pavilion:	33,267 tons
- Quantity of concrete in piers and other supports:	113,200 cubic yards (86,547 m ³)
- Quantity of concrete in pavilion:	9,000 cubic yards (6,880.9 m ³)
- Quantity of concrete in decks and ramps:	13,000 cubic yards (9,939.2 m ³)
- Quantity of cut stone in piers:	17,500 cubic yards (13,379.7 m ³)
- Quantity of gravel, etc. in embankments:	125,000 cubic yards (95,569 m ³)
- Quantity of paint needed for one coat:	8,500 gallons (38,641.8 l)
- Number of rivets:	Approximately 4 million

- Number of pillars: 28 piers (Nos. 1 to 26 and 45 and 46), 2 abutments, 13 towers with 4 pedestals each and 200 ft (60.9 m) of concrete arches.

- Number of pneumatic caissons: 8

April 2000