



RESILIENT INFRASTRUCTURE

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THE DECK REPLACEMENT OF THE HONORE-MERCIER BRIDGE. AN INNOVATIVE SOLUTION USING ACCELERATED BRIDGE CONSTRUCTION TECHNIQUES

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ABSTRACT

Today, the Honoré-Mercier Bridge crosses the St. Lawrence River and the seaway on the west side of the Island of Montreal, (see Aerial view of photo below).



Figure 1: Aerial View of Honore-Mercier Bridge.

Named after the Honorable Honoré-Mercier, a former Premier of Quebec, this bridge became the fourth structure to connect the Island of Montreal to the South Shore.

The entire steel structure was built by the Dominion Bridge Company Limited as part of work funded by the government to address the economic downturn.

The Honoré-Mercier Bridge was inaugurated 10 months earlier than planned on June 22, 1934, and initially belonged to the Corporation du pont du Lac Saint-Louis.

Its administration was later transferred to the Government of Quebec in 1942.

The bridge was later modified during the construction of the St. Lawrence Seaway project in 1959, where the St. Lawrence Seaway Management Corporation (SLSMC) worked to raise and extend the south section so that ships could pass underneath.

To increase capacity, (from two to four lanes), in 1963, construction of the second bridge downstream from the first was completed and the entire bridge was once again managed by the Quebec provincial government.

Finally, on October 1, 1998, the 3 approaches from the South Shore, the seaway, as well as, the spans over the Island of Maline, (now referred to as the Federal section and on Mohawk Territory of Kahnawake), were transferred to the

Jacques Cartier and Champlain Bridges Incorporated (JCCBI), while the balance is continued to be managed by the Government of Quebec.

Today an estimated 30 million vehicles annually cross the Honoré-Mercier Bridge.

In 2008, the JCCBI Corporation launched a major rehabilitation project for the Honoré-Mercier Bridge. A first in this country, this project was composed of a tri-party agreement between the governments of Canada, Quebec, and the Mohawk Council of Kahnawake. It will be the largest bridge rehabilitation project ever undertaken in Canada.

This project consists of the complete deck replacement of the 92.0 meter seaway span of the Honoré-Mercier Bridge to achieve required strength, safety and durability and to provide a further 50 years of useful service within the highway network system. The existing bridge deck of the seaway span has reached the end of its useful life, as evident by the steel structure showing significant signs of deterioration.

In order to meet the Canadian Highway Bridge Design Code (CHBDC) requirements, as well as, managing time and costs constraints, innovative and out-of-the box thinking was required to propose the most competitive design and method for this bridge rehabilitation. Eight (8) different concepts for the bridge deck replacement were studied at a preliminary stage and evaluated through a grid matrix system. Several criteria for each case were considered and weighted accordingly; including weight of deck panels, traffic management constructability, user's impact and associated costs. The use of Accelerated Bridge Construction (ABC) techniques was paramount to a rapid deck replacement. The selected concept consisted of erecting a series of precast concrete panels integral with steel stringers, installed side-by-side and connected longitudinal by means of longitudinal post-tension cables. The major challenge was to introduce a flexible connection between the new deck panels and the existing floor beams to allow the post-tensioning installation, considering the time dependent losses in pre-stressed members.

The following 5 photos represent different construction phases for the bridge deck replacement where the ABC techniques were used.



Figure 2: Existing Deck Demolition



Figure 3: Strengthening of Existing Floor Beam



Figure 4: Structural Steel prior to Deck Panel Installation



Figure 5: Deck Panel Transportation



Figure 6: Precast Concrete Panel Installation