

MONTRÉAL'S NEW CHAMPLAIN BRIDGE

Extended durability with stainless steel reinforcement



Crossing both the Saint Lawrence River and Saint Lawrence Seaway, the Champlain Bridge is the busiest in Canada carrying over 50 million vehicles annually and about 11 million transit users. It was first opened in 1962 linking Montréal and the South Shore and has served the Québec and eastern Canadian communities for almost 58 years. Now it is slated for demolition.

Replacing it is the new Samuel de Champlain Bridge, inaugurated on 1 July 2019 by Infrastructure Canada. The 3.4 km long bridge is a cable-stayed structure with three separate parallel road decks totalling 60.2 m in width which accommodates six highway lanes, two additional extra-wide shoulder lanes for buses, two mass transit corridor lanes, and a 3.5 m wide multi-use path for pedestrians and cyclists.

The original structure had severely deteriorated mainly due to the corrosive effect of road salt which was not adequately planned for, and some design flaws. Inadequate and faulty drainage caused water ponding and

spillage onto critical structural elements. As well, the approach span's concrete pre-stressed/post-tensioned girders, which was a new technology in the late 1950s, deteriorated significantly. In 2013 it was announced that the bridge was to be replaced. Construction started in 2015.

Designers were faced with many service-related challenges. Montréal's environment is extremely harsh with winter temperatures often as low as -25°C . Seasonal temperatures can vary as much as 60°C resulting in extreme freeze-thaw cycles. The use of road salt is necessary to keep the bridge open in winter conditions.



Stainless steel reinforcement is a value-added feature to the design with measurable benefits in terms of long term cost savings and higher utilisation of the network by avoiding road-work-induced traffic congestion.



Three possible stainless steel alloys were specified – Types 2304 (UNS S32304), 2101 (S32101) and 304 (S30400). All three alloys would provide substantial corrosion resistance for 125 years as they all include sufficient levels of chromium and nickel. Type 2304 (4% Ni) was used for cost and availability reasons at the time of bidding. The reinforcement was produced and fabricated in North America.

As the bridge is an essential economic link to eastern Canada, the owner mandated a 125-year service life for the roadway component of the structure. The extended durability was achieved through design in combination with the selection of appropriate materials. Extensive life cycle cost analyses justified the cost/benefits of using more durable materials in all the core elements. Savings will come over the life of the bridge from avoided repairs and traffic disruption during roadworks.

To ensure that the desired durability and service life would be achieved, the owner stipulated the use of certain “durability-driving” materials rather than take a performance-based specification approach. This included the reinforcement materials (rebar) chosen.

In the Government’s assessment, the harsh conditions, the extended service life for the main components of the structure, and the economic importance of this link dictated that the reinforcement steel be stainless.

A total of 17,000 tonnes of stainless steel reinforcement was used in the pre-cast and cast-in-place sections of the roadway deck of the entire span of the bridge including the approaches, the abutments and all surfaces around the expansion joints.

The new Samuel de Champlain Bridge combines beauty and utility, with every possible mode of transportation provided for. Thanks to its nickel-containing components, neither climate nor changing transportation patterns will defeat this bridge.