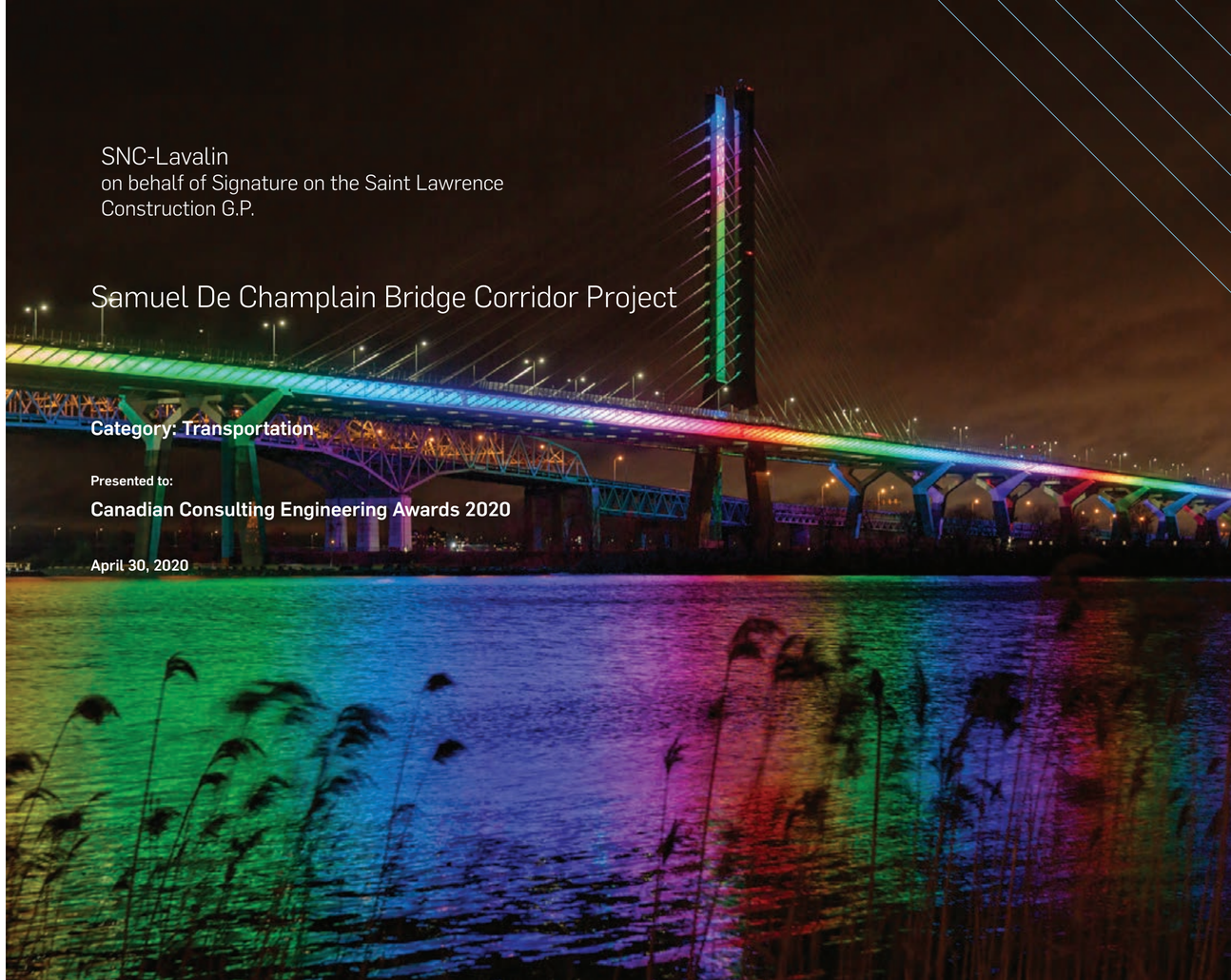

SNC-Lavalin
on behalf of Signature on the Saint Lawrence
Construction G.P.

Samuel De Champlain Bridge Corridor Project

Category: Transportation

Presented to:

Canadian Consulting Engineering Awards 2020

April 30, 2020

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SNC-LAVALIN INC.

We are SNC-Lavalin, and we are experts at mastering complexity. Using our industry know-how and leading resources, we create and deliver predictable outcomes for an unpredictable world. How do we do it? By thinking – and working – differently. From our 50 offices around the world, we connect people, technology and data to shape the future of our industry and the world around us, and this, since 1911.

It's how we generate the knowledge, the ingenuity and the drive to meet so many of today's most pressing challenges – from population growth and increasing transportation needs, to climate change. And because we cover everything from blueprint to delivery, across the entire lifespan of a project, you can count on us for a client experience that is smoother, smarter and more efficient. At SNC-Lavalin, we're not just embracing change – we're driving it!

INNOVATION

THE PYLON

170 m

ABOVE SEE LEVEL SAME HEIGHT AS
THE MAST OF THE OLYMPIC STADIUM

60 STAY CABLES

INNOVATION

The project involves the replacement of the old Champlain Bridge with a 3.4 km long structure comprising three separate decks supported by 37 piers and a main cable-stayed portion with an elevation pylon of 170 m in height. In addition to the six traffic lanes and shoulders, the bridge is equipped with a central corridor dedicated to light rail transit and a multi-purpose path for active transportation. The project also involves rebuilding and upgrading the approaches to the bridge, with the redevelopment of the 4.5 km urban federal highway corridor.

The Samuel De Champlain Bridge, which is to be a durable and high-quality architectural structure, had to be built on an accelerated construction schedule due to the critical condition of the old Champlain Bridge, which was maintained until the new bridge was complete.

One of the strategies selected by SNC-Lavalin and its consortium partners (under Signature on the Saint Lawrence Construction G.P. (SSLC)) to achieve these objectives was to maximize the prefabrication of concrete elements and the assembly of steel elements on site through the construction of temporary jetties with high-performance docks geared for marine access. This strategy allowed for the fast construction of the bridge, while maintaining optimal control over the quality of its components.

Several unique pieces of equipment have been designed and manufactured to maximize on-site efficiency and productivity:

- An industrial catamaran for transporting and installing footings and pier starters directly to the bottom of the river within allowable tolerances;
- A winch barge to transport heavy parts in the strong river currents;
- A single mounting system, including a mobile lifting beam, transport carts and lifting equipment to lift the main span of the cable-stayed bridge without impeding traffic in the St. Lawrence Seaway, a vital economic corridor for Canada.

The high sustainability requirements of the public partner, the Government of Canada (GC), led SSLC to innovate in its practices, material selection and monitoring. For example, several measures have been put forth to ensure concrete quality, including the use of thermal probes, infrared thermography and numerical analysis, all used to assess thermal behaviour and the risk of cracking of concrete. Furthermore, in order to prevent fall of ice from cables, the consortium conducted innovative research to design a custom sheath for the cables. In sum, the highest sustainability requirements of infrastructure combined with the goal of 125- year durability have paved the way for sustainable engineering.

MEETING CLIENT'S NEEDS

The GC pursued the construction of world-class infrastructure with a unique visual and architectural identity for Montreal. Using reference designs, 3D visualization and animation, the team, in collaboration with an architectural review committee, clearly understood the client's expectations with regards to the architectural vision and quality of the project and, hence, delivered a project as envisaged.

Equally important for the client was that the design be consistent with the general principle of fib Bulletin 34 – Model Code for Service Life Design. SNC-Lavalin's expertise in quality and geotechnical matters has helped SSLC achieve this objective. This included modeling corrosion time of concrete using a probabilistic approach and an advanced modelling software (STADIUM), developed in Quebec.

The SNC-Lavalin engineering team's standards and best practices in Quality, Health & Safety and Environment guided the SSLC consortium on on-site procedures in delivering this project within a tight schedule and while adhering to the same high safety and environmental standards expected by the client.

Without a doubt, SNC-Lavalin's global expertise and experience in a wide range of services have made it a major player in SSLC and a major contributor to the success of this project. High sustainability and quality standards in design and construction have resulted in an extraordinary bridge that has exceeded all expectations in Montreal and beyond.

COMPONENTS

37 PIERS CAPS : 400t
600 box girders : avg. 40 to 80t
9 638 concrete deck slabs : 16t each

COMPLEXITY

COMPLEXITY

In parallel to the fabrication of concrete elements on site, SSLC opted for the off-site manufacture of oversized parts that were to be transported mostly by road. The deteriorating condition of the old Champlain Bridge and the ring road network, which led to more restrictive weight limits, forced the consortium to review its logistics plan so as not to jeopardize the timely arrival of parts critical to the successful completion of the project. Consequently, SNC-Lavalin broadened their logistics plan to be able to deliver over 10,000 components, of mostly nonconventional sizes and weights, by resorting to different modes of transportation and delivery, such as sea, rail and road.

The initial method of construction for the erection of the main span over the seaway was to lift 15 main span segments from the pylon. In order to accelerate construction and complete the infrastructure in a timely manner, a major change was made, to this method: a temporary tower was installed east of the Seaway to allow for the erection of segments, in parallel, on either side of the Seaway.

These two instances demonstrate the great agility and flexibility of SSLC's multidisciplinary teams in overcoming difficulties encountered, not to mention all the effort made to operate and manage a worksite of this magnitude throughout the harsh winters of recent years.

MEETING CLIENT'S NEEDS

ENVIRONMENTAL BENEFITS

SOCIAL AND / OR ECONOMIC BENEFITS

During the construction phase, the project created more than 2,000 jobs and had significant positive economic impact:

- 50% of the $2.48 billion cost was awarded to Canadian subcontractors and suppliers.
- Vehicular and marine traffic was maintained throughout the construction, by undertaking various provisions, which allowed for the maintenance of trade and transit routes on this key transportation corridor for the general population.

Since opening to traffic, the Samuel De Champlain Bridge and its new approaches have improved the flow of traffic by focusing on sustainable mobility and with its dedicated corridors for active transportation and transit. These improvements are boosting the region economically, with approximately 50 million vehicles and $20 billion worth of goods crossing the bridge – a true testament to the bridge's role in the Eastern North American economy.

The project team in collaboration with Infrastructure Canada, consulted a wide range of stakeholders and has set up significant communication lines (a dynamic bilingual web site and Web Series, an efficient information request system which manages more than 10 000 requests, over 250 worksite visits and public presentations) to ensure that the needs of the community are met while making this project a reality. A number of measures have helped to build lasting ties with neighbouring communities, such as frequent communication channels, school programs, funding of cultural events, shoreline cleanup by workers, and so on. This ongoing and informative dialogue with stakeholders helped design and build this major project while maintaining the respect and dignity of surrounding communities.

SOCIAL AND/OR ECONOMIC BENEFITS

ENVIRONMENTAL BENEFITS

In partnership with the GC, SSLC has been a leader in developing and maintaining sustainable practices in the construction of this major infrastructure. The team has actively implemented and achieved the highest level of recognition by the Institute for Sustainable Infrastructure (ISI) Envision® (Platinum), which assesses the integration of 60 sustainable development criteria into infrastructure projects. Not to mention that this is the first ENVISION® project evaluated in Quebec and the first large-scale bridge in Canada to receive this award, which recognizes all the efforts made to observe the highest standards in terms of environmental performance and sustainable development.

In addition to its lifespan of 125 years, a new active transportation link and a dedicated light rail corridor, the Champlain Bridge has several measures in place to minimize the impact of its construction and commissioning on the environment:

- Use of biodegradable and bio-sourced hydraulic oils for devices working on or near the watercourse;
- Mass reuse of demolition materials (less than 1.5% sent for disposal);
- Maximizing the reuse of excavated soils in accordance with risk assessment for the management of contaminated soils;
- Improvement and modification to infrastructure of the niche of white-fronted swallows;
- Construction of three fish passages in the fluvial jetty for species migration;
- Implementation of a drainage and piping system to protect areas sensitive to the fish habitat;
- Lighting to international standards to minimize light pollution;
- Architectural lighting adjustment to minimize risk of migratory bird disorientation;
- Compensation program for greenhouse gas emissions.