AECOM

Casavant Boulevard Connection Project

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Project Summary

The new CN railway overpass allowing for the connection of Casavant Boulevard under its tracks is a long-anticipated project that will reduce traffic congestion and improve mobility in the City of Saint-Hyacinthe.
The AECOM and CN teams implemented innovative design and scheduling solutions that minimized environmental impacts and allowed construction to proceed without disrupting train operations. This was achieved through careful planning and execution of multiple work blocks while also managing the impacts of nearby sensitive clay soils.

1. Innovation

In September 2017, the governments of Canada and Quebec announced investments to build a railway grade separation as part of the extension of Casavant Ouest Boulevard to connect the north end of Saint-Hyacinthe to the Douville area. On behalf of the City of Saint-Hyacinthe, CN was asked to construct a railway overpass to seamlessly connect Casavant Boulevard beneath the railway tracks. AECOM was retained to provide engineering design and construction management services.

This project presented numerous challenges due to the presence of highly sensitive clay soils and the need to divert the Plein Champ Creek, which flowed in the path of the new structure. Traditional techniques would have involved diverting existing tracks onto temporary tracks to allow for the erection of the new bridge. However, due to the clay soils, this would have required constructing an embankment made of lightweight backfill under at least one kilometre of temporary track—at a cost that exceeded that of the entire project. Since traditional methods were not feasible, AECOM showed great ingenuity by proposing to underpin the new bridge structure directly underneath the active tracks. Applying this innovative technique on a Class I Railway project of this magnitude is a unique achievement in Canadian railway engineering.

To compensate for the clay soils and their low bearing capacity, work platforms made of lightweight backfill were installed to transport and position equipment, temporarily relocate signal cables and fibre-optic cables along the tracks, and to execute the work during each phase of the project.

It was important to CN that railway operations were maintained without disruption during the work. As such, the project had to be carried out in work blocks, mostly at night. Rail traffic from one track was diverted to the adjacent track, allowing bridge components to be installed underneath the first track, all while respecting the project schedule. Careful phasing and modular construction with prefabricated elements were implemented so that each bridge element could be installed during specific work blocks. Due to the passage of trains near the work areas and for safety reasons, the active track was supported by sheet piles installed through the ballast between the two tracks.

Once the bridge elements were all installed, the ground was excavated in stages to account for geotechnical constraints and to complete the bracing and reveal the underpinned structure.

2. Complexity

The complexity of the project is reflected in the following challenges faced during its implementation:

Maintaining railway operations:

- Work was performed under active railway tracks on one of CN's busiest subdivisions.
- Careful organization and planning were needed to execute 87 short-duration work blocks —averaging six hours each—while maintaining operation of +/- 24 daily and six nightly trains.
- Shutdown and removal of all equipment for passing trains created an average work interruption of 15 minutes per train.
- Exceptional skill and expertise were required to remove the track, excavate the ground without damaging the newly installed elements, execute the work, backfill and put the track back into service.

Nature of Soils:

- Piles that made up the bridge piers were driven through the ballast to an average depth of 18 metres into the clay. Any misalignment during pile driving would only have been detected during excavation when it would have been almost impossible to correct. The required precision was achieved through the development of a custom jig to ensure proper alignment during pile installation.
- For work carried out before mass excavation of clay soils, methods were implemented to avoid liquefying the clay and compromising the railway track and the portion of the bridge already constructed below ground.

Turnaround time:

- Several techniques were used to ensure maximum productivity and maintain project schedule including scheduling back-up equipment in the event of a breakdown, multiple simultaneous shifts, pre-assembled systems, pile-driving jigs at required angles, and the removal/reinstallation of the track in track panels.

3. Social and/or Economic Benefits

The connection of Casavant Boulevard, made possible by this railway grade separation, is a particularly important achievement for the City of Saint-Hyacinthe. The population in the area had grown significantly during the previous decade, leading to significant traffic congestion during peak travel periods.

With the railway overpass, the transportation of goods and services is facilitated, and the flow of traffic is greatly improved, thereby meeting two of the project's key goals. This new connection allows the City of Saint-Hyacinthe to increase residential and economic development in its western sector and provides an alternative to the at-grade crossing on Grand Rang Road, which benefits motorists, cyclists and pedestrians alike. By incorporating a safe multifunctional path for cyclists and pedestrians on this project, additional modes of transportation are also made available in the community.

Finally, over 75% of the project was completed by local workers using materials sourced in Quebec. What's more, the underpinning method applied to the bridge work resulted in reduced construction costs by approximately 70%. In a press release about the project, Martin Coiteux, former Minister of Municipal Affairs and Land Occupancy, Minister of Public Security, and Minister Responsible for the Montreal Region said:

> **"Support for key infrastructure, such as this one, provides significant support to the economy and the development of communities across the regions of Quebec. More specifically, this project in Saint-Hyacinthe will improve traffic flow and safety while improving access for Montérégie residents to the Olivier-Chalifoux Industrial Park, the Quartier des études supérieures, and large supermarkets."**

4. Environmental Benefits

The City of Saint-Hyacinthe is located in a region of Quebec where agricultural development and land protection are a significant priority. AECOM's innovative approach to the design and construction of the Casavant railway overpass eliminated the need for a track diversion during construction and avoided a significant encroachment on agricultural land that is adjacent to the railway right-of-way, an area of approximately 9,320 square metres.

By delivering the project's prefabricated elements mostly by rail, the project team reduced the need for transport by truck and therefore reduced potential impacts on the road network including traffic congestion, harmful emissions, and any potential maintenance issues.

Sustainability on the project was incorporated in the selection and re-use of materials. The lightweight fill was recovered for future use and some of the soil from the temporary work was repurposed by the City. This was a cost-effective and environmentally beneficial approach that not only re-used the soil, but also eliminated the need to transport these materials over long distances.

The connection of Casavant Boulevard on either side of the tracks will reduce vehicle travel distances, contribute to efficient traffic flow, and reduce the potential for green house gas emissions. The safe multifunctional path for cyclists and pedestrians that was built as part of this project will encourage active transportation and promote a healthier lifestyle.

Finally, GR7, the architects who were responsible for the aesthetic appearance of the structural elements and bridge components created an attractive structure that is harmoniously integrated into its environment.

5. Meeting Client's Needs

When this project was announced in 2017, Claude Corbeil, Mayor of Saint-Hyacinthe said:

> **"Maskoutains residents have been waiting for this project since 2006. It will provide better connections among different sectors of the city and improve traffic flow in the heart of an urban core whose origins date back more than 250 years. It is another great project that proves the future is being built in Saint-Hyacinthe"**

The long-awaited completion of the Casavant overpass is the result of hard work and close collaboration between many stakeholders to benefit the community and businesses in the greater Saint-Hyacinthe area. CN and AECOM pooled their knowledge and expertise to support the City and its partners and stakeholders in making this project a success.

CN's main objective, in partnership with the City, was to create a perfectly integrated structure that is not only compliant with standards, but adhered to rigid project schedules and fixed costs, while maintaining railway operations.

Today, this project can be recognized for its innovation and optimization throughout each construction phase. The structure was completed almost a year ahead of schedule, despite being implemented largely in winter conditions. Complex challenges were successfully managed during the execution phases with no hindrance to rail operations while also meeting safety requirements, which are paramount to CN.

AECOM and its partners were able to meet client objectives and overcome technical challenges with innovative solutions, expertise and creativity. Success can be attributed to proactive problem solving, sustained efforts and effective collaboration among the project's multidisciplinary teams.

About AECOM

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