



SNC • LAVALIN

NEW ENTRANCE BUILDING AT VENDÔME MÉTRO STATION AND PEDESTRIAN LINK TO MUHC

Canadian Consulting Engineering Awards 2023

Category : Transportation

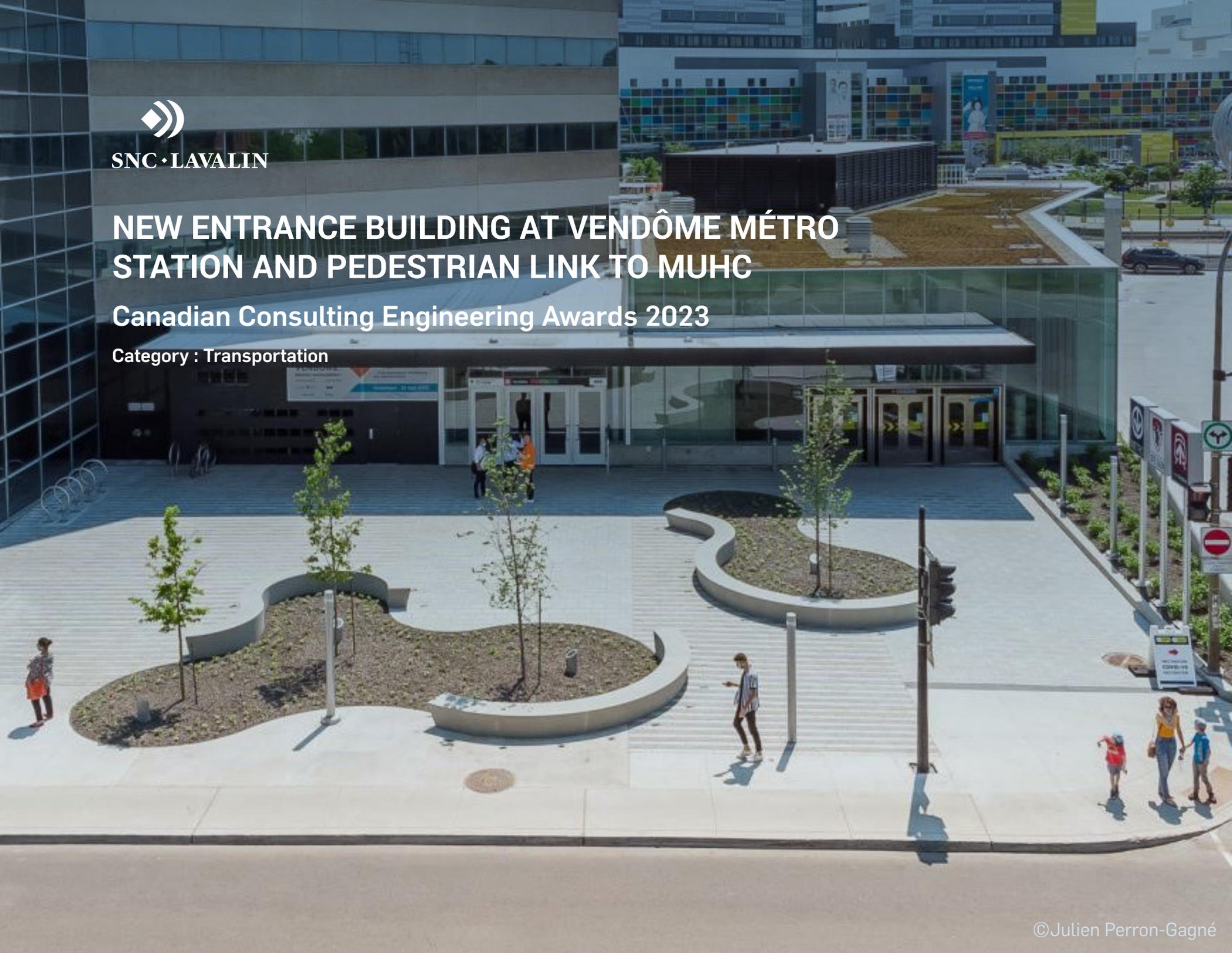




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12m LONG

9m WIDE



Innovative Use of Concrete
Sustainability & Resilience

INNOVATION

In 2015, the Société de Transport de Montréal (STM) announced a project to build a second entrance building to make one of the busiest intermodal station accessible to people with reduced mobility. The project included adding a tunnel and two accesses with universal accessibility to the existing Exo's train station and a tunnel connection to the McGill University Health Centre (MUHC). SNC Lavalin was mandated to provide multidisciplinary engineering (structural, civil, mechanical, electrical and automation). The project received an Envision Gold Award.

The project differed in its approach to constructability. Because transit services were to be disrupted as little as possible, SNC-Lavalin's engineers participated in the implementation of an advanced tunnel concept and a truly innovative construction method. A 12-metre long, 9m wide and 650-ton concrete tunnel slid in place was a challenge in terms of planning and coordination with the various stakeholders. The bottom slab of the tunnel was designed with a tapered geometry towards the front (resembling the tip of a ski) thus facilitating sliding the tunnel on the ground to its final position. This specific sliding technique developed by Freyssinet called Autoripage® was a first in Canada. The reinforced concrete tunnel prefabricated directly on site, right next to its final location, designed by our team for the loads induced by this construction technique, was pushed by computer-assisted hydraulic jacks to limit train service disruption to a maximum of 72 hours.

Prior to the construction phase, our design team met with different specialized contractors after a call of interest in order to collect risk management information regarding this challenging procedure and to validate the availability of skilled labour for the period targeted. It helped us develop the 72 hours construction sequence in 9 major steps that were detailed in our documents (plan views, section cuts, loads considered, excavation and shoring steps, CP's requirements, geometrical tolerances, etc.). This detailed sequence would be the starting point for the main contractor's hour per hour schedule. Finally, the initiative was essential in minimizing the client's impact on its operation for less than 60 hours and making this important milestone a true success.

Moreover, supporting the client's approach to use by-products, to gain experience for future projects and to earn environmental points for the Envision certification, our team partnered with the Research chair of the Sherbrooke University and the City of Montreal in specifying a concrete including recycled glass powder for the totality of the new bus loop pavement.



The tunnel is moving at
1.8 m/hour

[Autoripage by Freyssinet/CRT](#)

[STM Vendôme - Sliding of the tunnel](#)



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COMPLEXITY

The project involved many stakeholders, all converging at the Vendôme intermodal station, and the complexity lied primarily in respecting all their needs and requirements. The project—commissioned by the STM and financed by the Ministry of Transport of Quebec—required the acceptance of EXO (the commuter train operator), the adjacent MUHC, the adjacent building at 5100 de Maisonneuve W. (new entrance partially integrated in its ground floor) and thousands of residents in one of the oldest and most densely populated Montreal neighbourhoods. For example, our team detailed a vibration monitoring program that would be required from the main contractor before and during construction period to avoid any impact in the stakeholder's nearby operations (train, metro, research center and clinical activities, etc.).

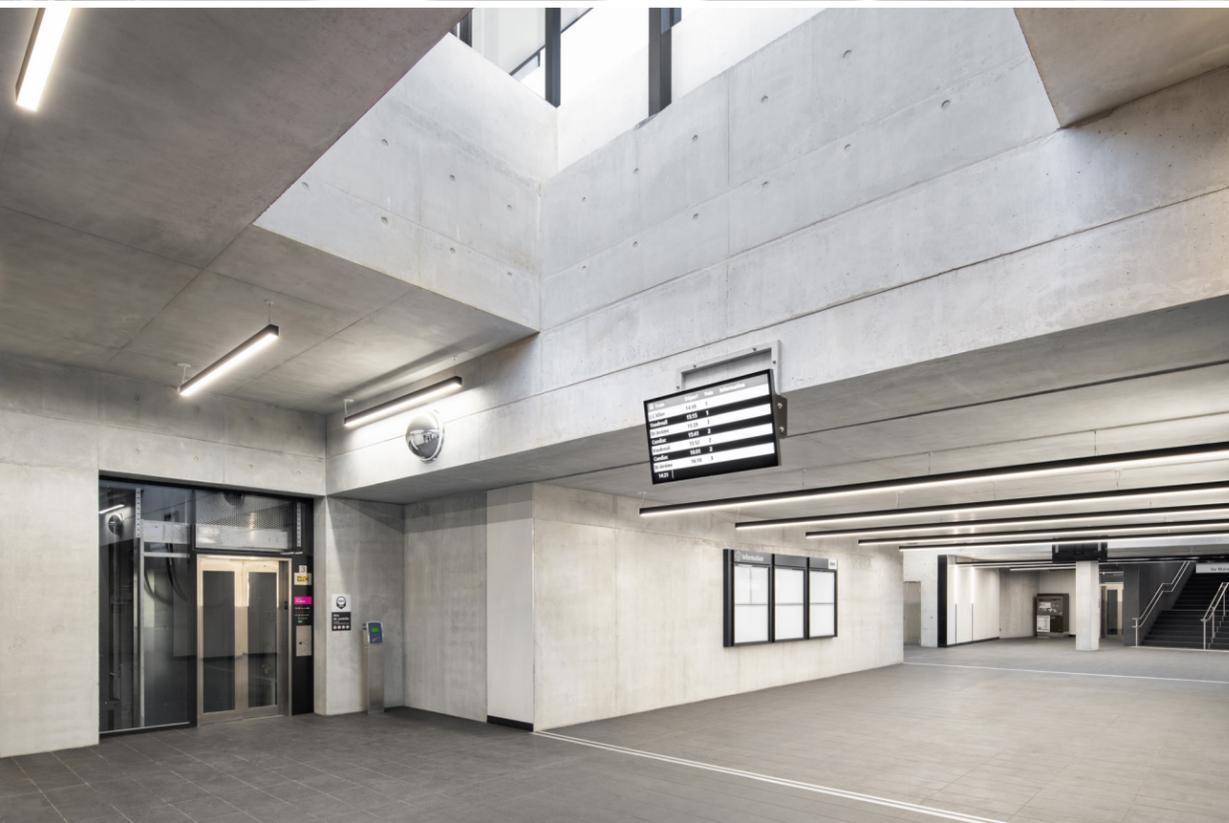
In addition to stakeholder's specifications, the new structures within the Canadian Pacific (CP) right-of-way had to be designed in compliance with CP's standards (AREMA – American Railway Engineering and Maintenance-of-Way Association) and approved by CP's structural team. In consideration of a future fourth train track, our team designed a 900-mm-thick, 6m high and 37m long crash wall to resist a train derailment impact load of 2700kN and thus protect commuters in the new adjacent entrance building.

Another complex milestone was the installation of the tunnel under the third existing train track. Due to lack of space on the adjacent MUHC grounds (vehicle and ambulance traffic), poor soil capacity and time constraint (another 72 hours), our team designed four prefabricated sections to be assembled on a steel beam mattress filled with grout to limit differential settlements.



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SOCIAL AND / OR ECONOMIC BENEFITS

Public transportation plays an important role in environmental and health benefits and should be favored whenever possible. This is also why it is essential to make it as attractive as possible for all citizens. All stakeholders are currently making every effort to ensure that their facilities are universally accessible and that everybody can exercise their rights and carry out their daily activities independently and without hindrance, regardless of their abilities.

Vendôme station is a highly trafficked intermodal station with three Exo suburban train connections, one metro connection, eight bus transfers and is also adjacent to the McGill University Health Centre (MUHC). Inaugurated in 2014, the MUHC is the largest health care facility in Montreal, providing care to thousands of patients each day. Prior to the renovation, travel between the hospital and the Vendôme station was a real challenge due to poor accessibility and safety issues. The station is now equipped with 5 elevators, enlarged motorized doors and swing gates that meet the highest standards of universal accessibility and provide a fluid and accessible link between the station and the hospital, thus improving the travelling experience for all users, but especially for those with reduced mobility.

More than 1,100 jobs were created during design and construction and once the station is fully operational, a total of eight employees will be working at the facility. Also, to support the local economy and reduce long distance transportation, 40% of total materials (by cost) were regionally sourced.

40% ARE REGIONALLY SOURCED

100 years FREQUENCY STORM WATER EVENT



OVER 75% CAN BE EASILY RECYCLED OR REUSED

WHEN THE PROJECT REACHES THE END OF ITS USEFUL LIFE

75% OF TOTAL MATERIAL SUBSTITUTION

ENVIRONMENTAL BENEFITS

By the nature of its objectives to improve the mobility and access to mass transit, the project is undeniably in line with STM's sustainable commitment, thus it was awarded an Envision Gold Award, making it the first STM metro station to obtain such a distinction. The project's elements and environmental benefits that contributed to this recognition included the use of sustainable materials. For example, the bus loop pavement was built with a concrete including glass powder from recycled glass bottles waste to reduce the proportion of cement content (biggest pollutant). Some elements of the infrastructures used a 50% limestone cement with 50% less CO₂ emissions. Recycling of more than 75% of construction residues, management of contaminated soil, integration of a green roof and prevention of pollution during construction were also part of the measures put in place to obtain the certification. Finally, considering the impacts of climate change is also a key element of ENVISION. Our civil engineering team therefore oversized the stormwater management design to resist heavier rainfall: a 100-years frequency storm water event was considered rather than what is normatively prescribed (a standard 25-years).

In the ENVISION process, communities are actively involved in the design and construction of the infrastructure. It was therefore essential to obtain the agreement of all stakeholders involved. To address that challenge, several impact studies were conducted and presented to the main stakeholders prior to developing the concept. The studies included noise impact, traffic, air quality, light pollution and pollutant dispersion. This approach allowed our client to gain extensive stakeholder engagement.



MEETING CLIENT'S NEEDS

In creating a new direct link from Maisonneuve Blvd to the MUHC with new accesses to the subway and train platforms, we met the client's needs to:

- » Make the metro station, train station and pedestrian link to the MUHC universally accessible, as soon as possible.
- » Improve the evacuation time (response time) of the metro station in emergency situations;
- » Prioritize intermodality and pedestrian traffic flow to improve travel time;
- » Improve capacity to accommodate increased ridership.

Promoting the use of public transit being STM's main goal all along, our team, along with the consortium of Bisson Fortin and Provencher Roy architects, designed the future facilities universally accessible and attractive for the neighboring communities. Some delicate structural elements with exposed concrete such as the columns and beams of the metro entrance's repetitive portal frames were designed to respect the architectural design of the Montreal Metro stations and to create an open, light-filled space that facilitates movement.

The new facilities have the unanimous approval of all the stakeholders involved, especially those of the MUHC's users and citizens living nearby, who now benefit from the decompartmentalization of this site and pleasant access to public transit for all.

«Today, the STM accepts our second Envision Award, having received our first for the Côte-Vertu underground garage project. This recognition reaffirms our commitment to sustainable development and our teams' expertise in implementing innovative solutions for major projects that benefit neighboring communities—truly, everybody wins.»

Eric Alan Caldwell, Chair of the STM Board of Directors.



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