



2020 Canadian Consulting Engineering Awards

GUILDWOOD STATION

Transportation



ASSOCIATION OF CONSULTING
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Station building to west tunnel connection



East tunnel

ABOUT THE PROJECT

Guildwood Station, established in 1977, used to serve a few thousand passengers annually before the growth of its surrounding neighbourhoods and commuter rail. Amid area development and population growth, service demand expanded until the station was serving nearly a quarter-million patrons a year, creating an eventual need for redevelopment. The station was redeveloped to provide enhanced accessibility, stronger visual identity and increased flexibility that would accommodate future track expansions and electrification. WSP's design provided for innovative tunnel design and installation methods and many sustainable features contributing to its LEED Silver target, while meeting all of Metrolinx's needs. The project was a true success due to the collaborative efforts between the engineering consultant team lead by WSP, the Owner (Metrolinx) and the general contractor (Kenaidan Contracting Limited - KCL).

INNOVATION

As the existing tunnels at the station were dark, narrow, leaky and not fully AODA-compliant, it was critical to establish two new and accessible tunnels with enhanced safety and visibility features. Because the Lakeshore East Corridor rail lines remained live throughout the redevelopment, constructing the tunnels required extensive work and involved the installation of 330 temporary caissons (nearly 300m of temporary shoring) during evenings and weekends to avoid service interruptions. Once the shoring was complete, concrete tunnels were installed during two 53-hour periods over two weekends, in which train traffic was shut down on two of the three rail lines.

WSP originally proposed various tunnel installation methods to Metrolinx, including jack and slide, open cut with rail trestle support system and open cut crane and assembly. During the design phase, Metrolinx preferred to specify the crane and assembly in an open cut trench, as that method had previously been used by Metrolinx. Once in construction, Metrolinx, WSP and KCL reviewed the options for installation and agreed the best solution, given the site conditions, was to use a jack and slide methodology.



Precast tunnel segments installation



Jack and Slide tunnel installation

The precast tunnels were preassembled outside the rail corridor and pushed into place using a jack and slide method — a first for Metrolinx — which was very successful and is an innovation that has now been successfully implemented on other projects.

This methodology provided a number of advantages. First, it allowed the precast tunnel segments to be assembled and post tensioned together prior to the 53-hour weekend shutdown, thus reducing the activities that needed to happen in that window. Second, the waterproofing for the tunnels was also pre-installed, once again reducing activities that needed to occur during the weekend shutdown. Lastly, it avoided the need for a large crane on an already congested site to hoist the precast segments into place. Fortunately, the construction of the precast tunnel sections was completed after two successful weekends, and the tracks were fully reinstated to all commuter, VIA and freight traffic, allowing regular operations to proceed.

The station also features a unique and innovative tunnel design that provides a clear opening to the roof of the platform canopy at the stairs and elevators, allowing significantly more natural light into the tunnels than any other Metrolinx station. A typical tunnel design within Metrolinx stations has a solid box tunnel that extends from one side of the tracks to the other with the stairs and elevators to platforms branching off at third points. With this new design, the stairs and elevators to the platforms were designed as large volumes to bring natural light into the tunnels and thus giving the feeling of very short tunnels connecting the volumes rather than a long tunnel with access to the platforms branching off. The end result is the tunnels are some of the brightest and most inviting tunnels in the entire Metrolinx network.

Lastly, the station features green roofs over the tunnel entrance structures, the utility building, the station building low roof, and a rooftop birch garden which are the first green roofs in the Metrolinx network. The consultant team, including WSP, RDHA and Elias+, worked to convince Metrolinx of the advantages this would provide, and these features were successfully implemented.



Utility building, northeast tunnel entrance & north plaza

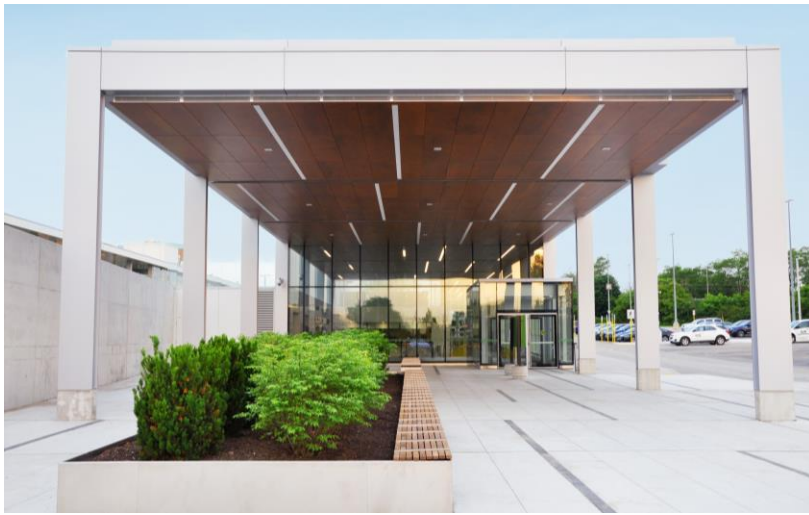


Southwest tunnel entrance

COMPLEXITY

The greatest complexities of the project included designing for train loads and ensuring the station could remain fully operational throughout the construction period. The existing train right of way is elevated over both the north and south parking lot. In order to design and provision for a future fourth rail, while minimizing any parking losses, large retaining structures were required. On the north side of the tracks, a 4.5m tall retaining wall was designed to accommodate the train loading and ensure over 40 parking spaces were not lost. In the middle section of the north side a cast-in-place utility building was constructed that also functioned as a retaining structure. Typically, precast utility buildings are used at Metrolinx sites; however, cast-in-place was used at Guildwood to design for multipurpose functionality. On the west end of the north side the station building is built into the berm, serving double duty with rooms below the berm serving as washrooms and utility spaces while also retaining the future train loads from the fourth track.

Staging was a critical aspect to the project to ensure the station could remain operational throughout construction. During design, an elaborate staging plan was created. After reviewing the WSP-proposed staging, KCL elected to use the staging with minor modifications to account for the progress of their work. The end result was that all platforms remained fully operational during construction with full accessibility, as did the old station building until the new one was commissioned.



Station building main entrance canopy



Station building waiting area

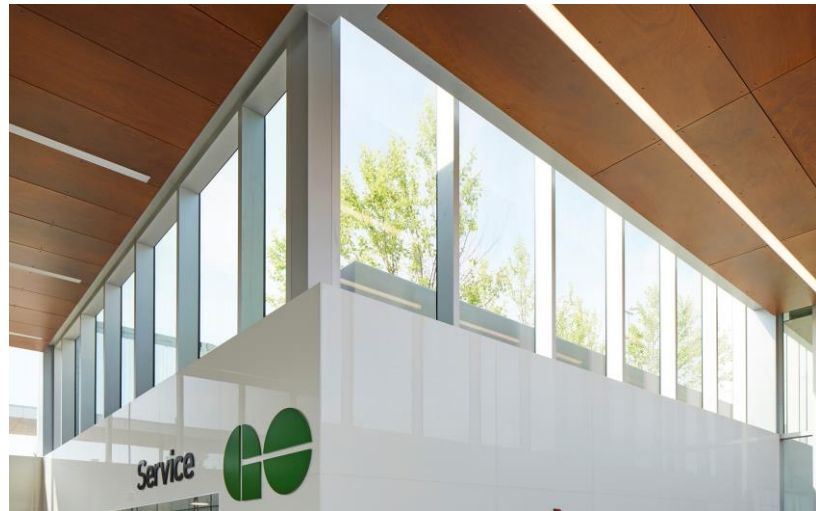
SOCIAL AND ECONOMIC BENEFITS

The redevelopment of Guildwood Station provides two distinct social and economic benefits to the surrounding community. With the station fully redeveloped, the site is now much more inviting for the general public to use. Although the main function of the site is a transit station, it also acts as a community hub. The Highland Creek bike trail connects just north of Guildwood Station and can be used to access the Waterfront Trail system. Community bike groups regularly meet up at the station before going out on rides. The new station and plaza areas provide safe gathering places and the new fully accessible tunnels provide convenient ramps for individuals to get their bikes from the south side to the north side of the tracks.

From an economic standpoint, the previous station and grounds were run down and unsightly. With the redevelopment has come some reinvigorated interest in the area. Two new condo developments have begun the process of site plan approval and design, one of which is on the northeast corner of the property, while the other is located just across Kingston Road. The investment in the station will continue to help spur development in the neighbourhood, furthering the economic benefits.



Northeast plaza



Roof top birch garden above ticket counter

ENVIRONMENTAL BENEFITS

Guildwood Station was designed to achieve LEED Silver certification and is currently going through the certification process. Throughout the design and construction process, there were several aspects that have created environmental benefits.

Improved water quality: Previously, any rain runoff from the station was simply funneled into the local storm system with no quality or quantity control. Through design and construction, two major elements were added to assist with these issues. On the platform, nearly full-length canopies were added that capture the rainwater and convey it to the new storm detention system. This prevents that water from landing in the right of way and washing down to the parking lots, potentially picking up contaminants along the way. The second aspect is a large storm detention system on both the north and south side. These underground detention systems, combined with Oil Grit Separators (OGS), ensure the water flowing off site does so at a sustainable rate and also partial pre-treats the water. Additionally, it provides a large area for the water to infiltrate into the ground, recharging the aquifer.

Reduced energy: Another unique aspect for Metrolinx on this project was the use of stainless steel boilers for the snow melt systems on the platforms. Previously, cast steel boilers had been used, but they are far more energy intensive. The use of stainless steel boilers provides better efficiency and the ability to fluctuate the number of burners needed, all leading to reduced energy usage.

Removal of lead paint and toxins: The old station building that was a main waiting area for patrons contained lead paint and other environmental toxins. By demolishing the building, patrons will no longer be exposed to these toxins.

Upon commissioning, the project's environmental benefits included these as well as numerous other initiatives to ensure the building will achieve its LEED Silver certification.



Northeast plaza



Ticket counter – with roof top birch garden above

MEETING CLIENT NEEDS

Metrolinx had four main goals to define project success, including: provide full accessibility to the platforms with two means of access; provide a new station building with a strong visual identity and utility building to meet all the systems demands, minimizing parking losses; and ensure the station stays operational throughout construction.

- The design of the platforms provides for two stairs and elevators to each platform as well as full AODA-compliant designs. Previously, the platforms were only serviced by one elevator and did not meet AODA requirements. With the successful staged construction of the platforms, Metrolinx's first goal was achieved.
- The new station building, and utility building provide room to accommodate all of Metrolinx's current and future needs. The new station building is extremely bright and inviting with a large waiting area that allows patrons to wait in a temperature-conditioned space, rather than standing out in the cold to wait for their train. The architectural design also provides a strong visual identity to the station building, utility building and all tunnel entrances adding a consistency across the site.
- Through the consultant teams' design, only approximately three per cent of parking spaces were lost on the property while dramatically increasing the footprint of the station building and provisioning for a future fourth rail.
- Finally, the station remained completely operational throughout construction. Staging was required to shut down portions of the site at certain times during construction, but patrons were never unable to access the transit services they needed, whether GO or VIA.



Southeast tunnel entrance and Kiss n'Ride



Station building main entrance canopy

PROJECT SUCCESS

At the conclusion of the project, all parties involved were extremely happy with the outcome. Working collaboratively through design, into construction and commissioning, Metrolinx, the consultant team and the contracting team all worked seamlessly to achieve Metrolinx's goals. The team's fantastic work has already been recognized by the Ontario Concrete Association as the "Project of the Year," and continues to serve as a benchmark for other Metrolinx projects and test case for many innovative and unique elements incorporated into the project, including:

- Jack and slide tunnel installation
- Open tunnels design to increase natural light
- One of the first projects to use a cast in place utility building
- First project to use green roofs
- One of the first projects to have stainless steel boilers.

The combination of these elements and more have led this to be a true success for Metrolinx and everyone involved.



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