



CCE Awards Phase 3



City of Ottawa | O-Train Trillium Line Fare Gate Structure Upgrade





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## A. INTRODUCTION

**Project:** O-Train Trillium Line Fare Gate Structure Upgrade Project  
**Client & Owner:** City of Ottawa  
**Prime Consultant:** J.L. Richards & Associates Limited

**Construction Cost:** \$4.9M  
**Start Date:** 2015  
**Completion Date:** 2017

In 2015, the City of Ottawa initiated a \$4.9M renewal project to upgrade the fare gates and shelter structures at four light rail transit (LRT) stations. On a fast-track timeline, J.L. Richards & Associates Limited (JLR) delivered integrated multidisciplinary design for the fare gate structures that significantly enhanced accessibility, incorporated elements of sustainable design, followed key principles of crime prevention through environmental design, and allowed the City to field test new fare gates prior to deploying them on additional transit lines.







## B. IMPORTANT INNOVATIONS

*In 2012, the City of Ottawa announced its intent to expand its LRT system by adding an east-west line, the Confederation Line, and making strategic upgrades in advance to its existing north-south line, the Trillium Line. Earlier that same year, the City had first implemented its Accessibility Design Standards, a set of standards for City-owned spaces which expand upon the requirements detailed in the Ontario Building Code (OBC) and offer more stringent and specific accessibility requirements. Thus, this project represented both an important initial phase of the City's long-term rapid transit network development plans, as well as a significant step toward enhancing the accessibility of public transit in Ottawa.*

### Key Considerations

The fundamental intent of this project was to install new fare gates, fare vending machines, and shelter structures at the Carling, Carleton, Greenboro, and Mooney's Bay stations of the O-Train Trillium Line in preparation for future phases of LRT development. Additional key objectives of this project were to enhance accessibility in accordance with the City of Ottawa's improved standards, adapt to existing infrastructure and site elements, and ensure continuous and safe public access during construction so transit service would not be interrupted.

### Central Scope

As part of JLR's scope of work on this project, the shelter structures at all four stations were fully reconstructed and outfitted with new, state-of-the-art fare gates and fare vending machines. The new high-performance structures are fully transparent, characterized by spider clamps and frameless glass that promote visibility. During daylight hours, sunlight permeates the shelters' interiors and, at night, strategically located LED lighting shines outward to light the shelters and surrounding platforms. Offset glazing reduces wind movement through the structures, enhancing user comfort. The structures also feature warm simulated wood ceiling finishes, radiant ceiling-mounted heating, provisions for snow drift screening, and adjacent greenspace and public art installations where possible.





### Supporting User Safety

Key engineering innovations incorporated on this project include enhanced visibility and lighting which, in addition to the specific configuration of each shelter, support user safety in accordance with the key principles of crime prevention through environmental design. These principles also informed the specific location of the fare gates and fare vending machines within the shelters, which were strategically placed to prevent those who had not paid a fare from accessing the O-Train. This framework provided an important level of nuance to the design of the structures as people-driven spaces, and allowed the design team to identify key opportunities to enhance user comfort and safety during all hours of operation. An added benefit to the location of the fare gates and fare vending machines within the shelter structures was additional protection for this important equipment.

### Accessibility Upgrades

The shelter design also featured important accessibility upgrades such as barrier-free fare gate access points, open passageways in place of doorways, streamlined walkways, improved way-finding signage, improved illumination, additional tactile strips, and reduced walkway grading. The effectiveness of these measures was validated prior to construction with the use of advanced modeling software, a technique of immense value which is not often implemented in projects of this kind. This software allowed the design team to manipulate multiple variables to determine how diverse user groups would realistically flow through the structures in a variety of circumstances and how potential crowding would impact accessibility. The use of this modeling technique created an opportunity for the design team to identify potential barriers that were not identified by OBC or client requirements and adapt the design accordingly. This, in turn, allowed for a new level of barrier-free design to be achieved.

### Establishing A New Standard

These design features allowed the City of Ottawa to achieve significant improvements to the accessibility, sustainability, and functionality of the infrastructure along the O-Train Trillium Line, in addition to establishing a new built standard for Ottawa transit stations. This approach, along with the key engineering innovations employed to enhance the design of these structures, was in direct support of the City of Ottawa's future plans for LRT expansion.





## C. ADDED COMPLEXITY

*In addition to the specific project considerations already addressed, there were a number of additional key factors that contributed to the technical complexity of this project.*

### Site Specifics

The first was the challenge of developing designs for four different sites. Each of the four sites within the scope of this project had key geographical and geotechnical differences which prevented the design team from simply replicating their design for each station. Rather, each site required a shelter design which was largely unique while still maintaining specific design elements to create consistency across all four sites. The Carling station and Greenboro stations were particularly challenging, as the former is located within a rock cut and 30 feet below street level, and the latter is located in an area with very soft land soil which put the structure at this location at significant risk of settling. In addition, there were unique access requirements to and through each site, including existing pathways and cycling paths. Each change to these pathways had to remain functional both during and after construction. The design team was able to overcome these challenges by identifying a set of critical design elements and finishes which would feature in each shelter and lend the required consistency to all four structures. These were modeled and refined to ensure they would work within the design constraints of each station. This approach allowed the team to deliver a consistent feel and performance for each station, while still adapting to site-specific considerations.

### Ongoing Operations

An additional challenge was the City of Ottawa's mandate that each transit station remain fully operational and accessible throughout construction. This added to the complexity of the project as it required construction activities to be planned around the O-Train schedule. In addition, when paired with the project's fast-track timeline, this mandate required construction to continue after O-Train operating hours and during winter months to successfully adhere to the project schedule. Finally, this mandate required the design team to provide for installation of temporary pathways around the construction zone and early, temporary installation of fare gates and fare vending machines along these pathways. The fare gates and vending machines were then relocated later in the construction process to their final position on site. The design team settled on this approach as it allowed the site to remain functional in the short term while remaining adaptable to the ideal solutions identified for the long-term operation of these spaces.

### Adapting to New Technology

Finally, the fare gates and fare vending machines installed as part of this project added a significant level of complexity, as this was the first application of this specific technology in Ottawa. There was a significant concern about the compatibility of this equipment and its performance requirements with inclement Ottawa weather. In order to ensure equipment performance would not be jeopardized, JLR worked very closely with the fare gate supplier to ensure the equipment was appropriately protected while maintaining the open environment required to meet passenger traffic requirements. Solutions developed through this collaborative approach include placing the fare gates and vending machines within the shelter structures, enclosing the equipment in customized cases that did not impede functionality. The design team also conducted precipitation modeling to verify that the final design would adequately protect the equipment and support ideal performance conditions.

### Integrated Design Advantage

These factors transformed a relatively simple project into a highly complex one, requiring advanced modeling and a comprehensive integrated design in order to meet the Client's expectations. Careful planning and coordination early on ensured that this was achieved.





## D. SOCIAL & ECONOMIC ADVANTAGES

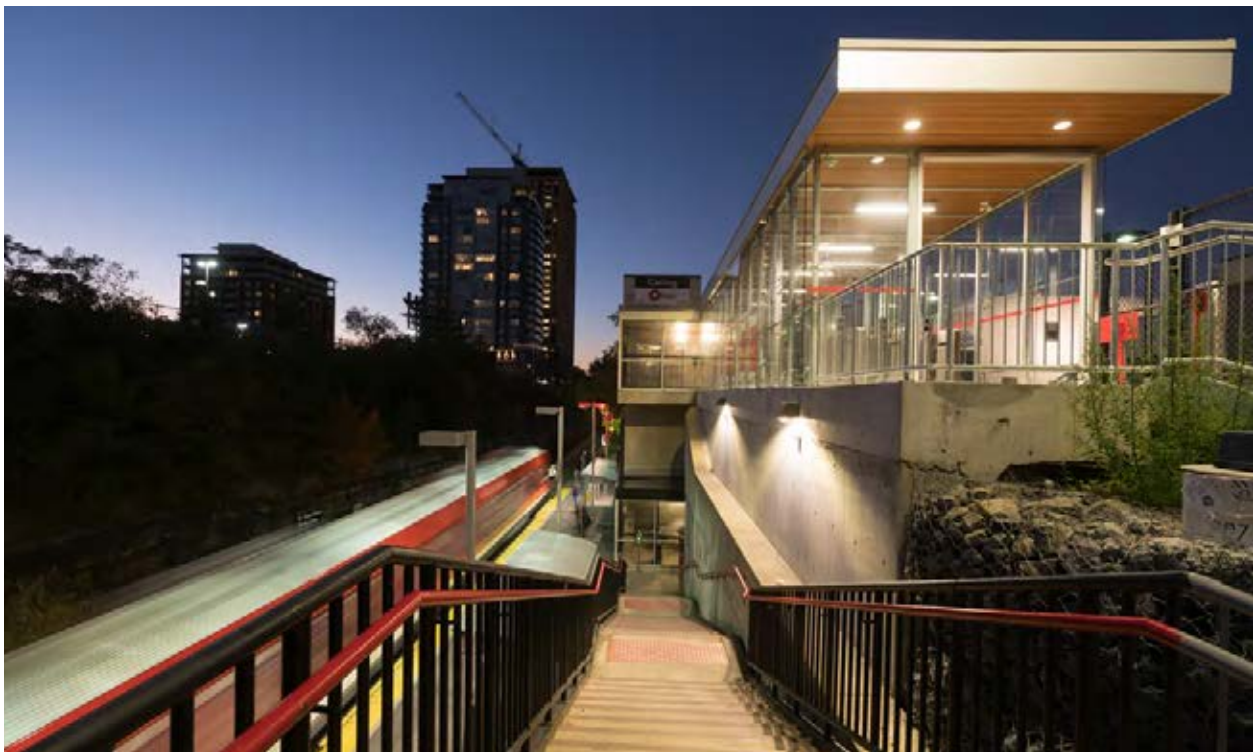
*An important aspect of the success of this project is the extent to which it contributes positively to the social and economic context within the City of Ottawa.*

### Inclusive Local Impact

From a social perspective, this project adds considerable value by sustaining the accessibility of public transit in Ottawa and enhancing user experience of the City's LRT system. The improved Trillium Line stations not only facilitate barrier-free LRT access for users with diverse needs, they also provide a safer environment for all users due to crime prevention measures incorporated into the design. In addition, these stations provide added protection from the elements for users and, where possible, are designed to improve users' interaction with on-site public art installations. The City of Ottawa transit authority estimates that 3 million passengers will access the Trillium LRT line through these new stations annually. This will be an inclusive cross section of the Ottawa population, all sharing equally in the benefits of the LRT system.

### Practical Planning

This project also represents a significant economic benefit for the City of Ottawa. As was previously mentioned, this project is the first in a series of several LRT renewal and expansion projects in Ottawa. As such, the successful completion of this project on a fast-track timeline provided an invaluable opportunity for the City of Ottawa to validate performance of the fare gates and fare vending machines through 12 months of active field testing under local weather conditions prior to the same gates and vending machines being deployed on the forthcoming Confederation Line. This was an important aspect of the City's project planning, and the success of this project directly supports the success of the City's investment in the Confederation Line.





## E. SUSTAINABLE FOCUS

*Due to the relatively small footprint of the shelter structures, opportunities to incorporate sustainable design principles were limited on this project. However, the project team was mindful of the importance of incorporating sustainable features into the design and took every opportunity to do so.*

### Efficient Illumination

There are several elements of the design that reflect the design team's dedication to a sustainable focus. Each of the four shelter structures make use of high-efficiency LED lighting equipped with day-lighting controllers. The extensive use of transparent building elements in each structure allows illumination from interior lighting to permeate the exterior of the stations at night, reducing the need for additional lighting fixtures outside. During daylight hours, the opposite effect occurs. Sunlight permeates the interior of the structures, eliminating the need for artificial interior illumination during the day.

### Key Components

Each of the structures also feature a canopy of recyclable and non-combustible simulated wood planks forming the interior ceilings. This feature represents a more sustainable building material selection, while adding warm tones to the design as well as a functional layer of insulation. Efficient radiant ceiling-mounted heating is utilized on the platform at each station during the winter months in order to keep ice formation at bay. This strategic heating solution not only contributes to user safety, but also reduces the need for road salt use. This, in turn, supports the health of naturally growing vegetation at each site and increases the longevity of specific building materials used at each site, such as concrete and steel.





## F. MEETING MANDATES

*At the outset of this project, the existing shelters at two of the four stations were simplistic and compact. They did not meet the City of Ottawa's updated accessibility standards, nor did they provide adequate protection for public transit users during inclement weather. At one station in particular, the configuration of the existing structure and building materials used created an environment in which visibility was significantly limited, causing concerns for user safety. Two of the stations involved in the scope of this project were lacking shelters altogether. The new shelters serve to isolate a paid fare zone, protect important fare gate and vending equipment, and provide added protection and enhanced user experience for customers.*

### Accelerated Timeline

As was previously alluded to, the core focus of this project was the integration of new fare gates, fare vending machines, and new shelter structures at each of the four stations, while addressing significant accessibility and safety deficiencies. In addition, the project had to be developed in a manner that allowed the O-Train to continue operations throughout the construction process and be planned according to a fast-track timeline to provide for on-site testing of fare gate and vending machine performance and reliability.

### Added Accessibility

In order to meet the City of Ottawa's main project objectives, all four stations were equipped with completely redesigned and reconstructed shelter structures. These new structures were designed according to the principles of crime prevention through environmental design and included a number of important sustainable design elements. As accessibility was a major focus of this project, the design team undertook in-depth modeling in order to identify potential barriers or layout considerations which may be detrimental to accessibility. These barriers were mitigated through a number of leading-edge accessibility upgrades.

## G. CONCLUSION

JLR completed work on the project in 2017. The new Trillium Line fare gate structures are now in place, providing consistent barrier-free access to O-Train passengers. Through careful project phasing and active collaboration with the Client and fare gate supplier, the project was successfully completed on time.





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