SPECIALTY CONCRETE APPLICATIONS

ERINDALE GO STATION & PARKING STRUCTURE

2013 Ontario Concrete Awards

PROJECT CREDITS

OWNER
GO, A Division of Metrolinx

ARCHITECT OF RECORD
IBI Group

ENGINEER OF RECORD
Read Jones Christoffersen Ltd.

GENERAL CONTRACTOR
Kenaidan Contracting Ltd.

FORMWORK SUPPLIER
Aluma Systems Inc.

MATERIAL SUPPLIERS
Ontario Redimix Ltd., A division of Holcim (Canada) Inc.

ADDITIONAL PARTICIPANTS

- Algonquin Bridge Inc.
- Belmont Concrete Finishing Co. Limited
- Brascon Stainless Steel Fabricators Inc.
- Canadian Iron Corporation
- Crowntech Aluminum & Glass
- Delcan Corporation
- Euclid Canada
- Global Precast Inc.
- H & S Equipment
- Harris BBR-PT
- Harris Rebar
- Ironworkers Local 721
- Kone Inc.
- Mac Masonry Inc.
- Mattina Mechanical Limited
- MCW Consultants Ltd.
- Miranda Painting Inc.
- P.J. Daly Contracting Limited
- Paynel Electrical Contractors Limited
- Pollard Enterprises Ltd.
- Pride Signs Limited
- Structural Contracting Ltd.
- TCS International Inc.
- The Downsview Group
- Topsite Contracting Limited
- Torsteel Co. Limited
- Triumph Roofing & Sheet Metal Inc.
- Zet Master Limited
- Zip Signs Ltd.

PROJECT FACTS

LOCATION Mississauga, Ontario

COMPLETION Fall 2013

BUDGET $65,900,000

VOLUME

- Concrete - 16,000 m^3
- Formwork – 72,200 m^2

QUICK PROJECT SUMMARY

- Targeted LEED Silver
- Six floors of parking decks provide approx. 45,000 m^2 of gross floor area and 1,470 parking spaces.

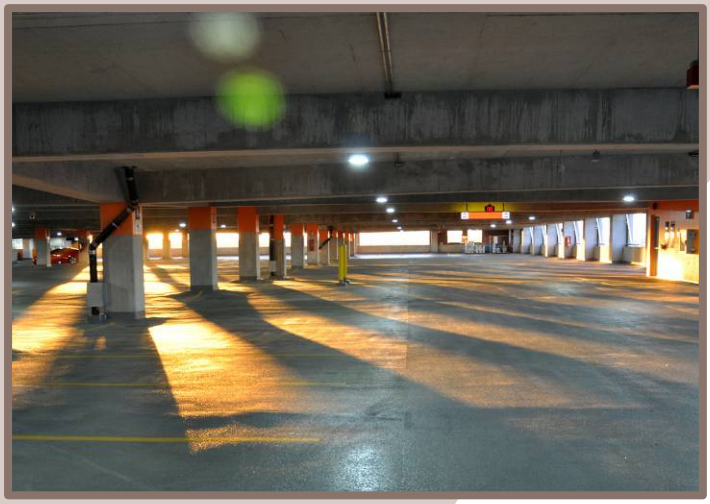
The Erindale GO Station is located on Rathburn Road West in Mississauga, Ontario. The site is directly adjacent to the Rathburn residential mid-rise community to the North and the Burnhamthorpe Road commercial corridor to the East. The GO Erindale parking and rail station solution therefore has inherent social responsibilities. They must at once become an urban landmark and a transit facility which operates easily within the surrounding neighbourhood context.

One of the primary functions for this facility is to provide multi-modal access and seamless transfers between GO and Mississauga transit systems. From an urban perspective the facility serves as the gateway to central Mississauga along Burnhamthorpe Road. The solution for the increasing number of GO patrons is a six-level, above-grade, open-air, cast-in-place concrete parking facility with an integrated station building. The parking facility was designed to have a capacity of approximately 1,500 cars.

Architectural Strategies

The aesthetic objectives of the final buildings were to provide high quality finish materials that were functionally robust. These materials had to be detailed to enhance the visual appearance of a largely industrial building to become a major institutional landmark with a contemporary flare. The shear mass of the building meant that any material chosen for the exterior would need to project strength and permanence and must have the malleability to be detailed in order to relate to a human scale.

The cladding of these buildings is a combination of structural and decorative steel, curtain wall and pre-cast concrete. Around the perimeter the parking facility has been fitted with modular precast concrete panels with punched openings. The red brick pre-cast concrete panels have been embellished with buff coloured fluted pilasters and full storey rusticated bases befitting of an institutional building. Steel mesh screens have been used to articulate the punched openings in the pre-cast walls. The exit stairs and elevator cores for the parking structure form glass towers that punctuate the building vertically. The exterior of the station building detailed to provide maximum visibility, was composed as a simple glass pavilion anchoring the south west corner of the parking structure. The station facility is a double height single storey space with steel and wood finishes which speak to the character of a modern transit system.



The new station building was designed to achieve LEED Silver designation; featuring erosion control measures, waste management plans, use of recycled content and regional materials, solar powered renewable energies, FSC certified wood products, monitored indoor air quality, low emitting materials, water efficient landscaping, low water consumption, and optimized energy performance controls in designing the building to LEED standards. The landscape design was founded on the notion of indigenous low maintenance materials in accordance with Plant Hardiness Zones in Canada. The landscape enhancements serve as transitional areas between urban, regional and facility realms. Hard and soft landscape elements enhance movement throughout the site while creating safe visually pleasing pedestrian areas. A cast in place architectural retaining wall with bold reveals sets the stage for a backdrop to a future bridge over Burnhamthorpe Road.

The GO Erindale complex has been designed to create an ease of movement within and around the site. As a major multi-modal transit station way finding a clear unencumbered traffic flow of all sorts are key success factors for this type of facility. The thoughtful organization of building mass, materials finishes and paths of travel have been composed to achieve these goals.

Structural Strategies

The architectural features are supported by an open air, cast-in-place concrete frame with post-tensioned beams and an enclosed pedestrian bridge linking the parking facility to the train platform. The beams are sloped to maintain the 200 mm thick reinforced, 4-way suspended slabs divided into 7.5 m x 18 m bays from column to column, and sloped to drains. Unlike traditional precast parking structures, shear walls are non-existent providing clear sightlines creating a sense of security and open space.

Contract Services: Design Build
Concrete: 16,000 m^3
Formwork: 72,200 m^2

Key Challenges:

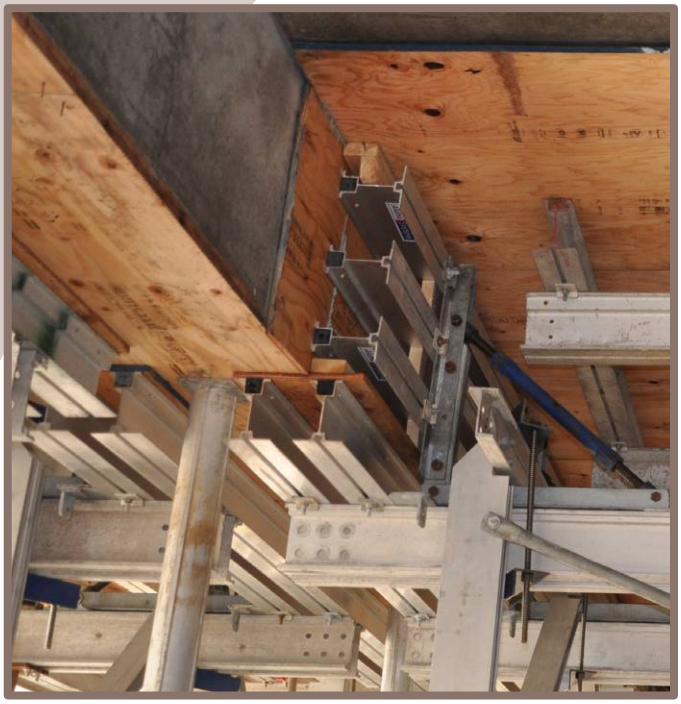
- Maintaining operation of existing station throughout construction
- Working on existing platform while maintaining uninterrupted service and access
- Crane swing limitations and mitigating environmental impacts

Design Features:

- Cast-in-place concrete with normal reinforced slabs and post-tensioned beams
- Enclosed pedestrian access bridge from the garage over railway tracks to the new platform elevator and stair tower
- Four elevator shafts in the parking structure and two at the rail platform
- Building treatment to compliment the urban environment yet maintain free air requirements

Innovative Table Formwork System

'Table' refers to a type of concrete formwork system that involves reusing large, pre-assembled formwork sections that are lifted from one level to the next. A table system is typically used for large floor layouts or suspended slabs often found in office and residential buildings where the underside of suspended slabs are level and beam forms are not required to remain if they are not post-tensioning. With sloped beams and 4-way sloping soffits, the norm would be to handset a significant amount of the formwork. Kenaidan collaborated with Aluma Systems to design a unique flying table formwork system, which addressed key challenges associated with the structural design of the parking structure. Aluma was able to incorporate forming a 4-way sloping soffit (underside of the slab) and beam in one system while allowing the crew to strip and cycle all of the formwork prior to post-tensioning, including beam forms.



Aluma came up with a design using J-heads to suspend a fully adjustable slab off the main truss and incorporated the tapered beam side with every table. The beam soffit (underside of the beam) has its own slope, and is regulated by the main truss legs sitting on the 4-way slab. The J-heads are used to regulate and achieve the 4-way soffit. The beam sides were incorporated with the tables while allowing just enough space between two tables under the beam to place reshoring posts. ***This is the first time Aluma has designed a 4-way sloped slab with a beam side incorporated all into one table form.***

The 4-way sloped slab required the use of smaller tables (average 30 m^2 soffit area ranging from 6.5 m-11 m in length by 3.5 m in width tables), and each has a unique slab configuration that requires that table to stay at the same location on each subsequent level. A typical slab pour, approximately 375 m^3 of concrete and 1,200 m^2 of formwork, took 24 calendar days to complete a full cycle from one entire parking level to the next. At one point, there were a total of 186 tables occupying a single level of parking.

Once the tables had been positioned, with shores along the centre line of each beam, the concrete was then placed. The tables were lowered from the slab by jacks and rolled out to the edge of the structure with beam shores remaining until post-tensioning. The tables then were hoisted by a crane and flown into position on the next level directly above.