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Elementary Teachers Federation of Ontario

136 Isabella St.

The Elementary Teachers Federation of Ontario (ETFO) headquarters, located at 136 Isabella St. in Toronto, was the cities first purpose-built LEED Platinum building in the City. Despite zoning hurdles, and a very tight construction timeline, the Owner wanted to exceed the highest environmental standards at the time. This objective required innovation in the buildings energy systems, opening a path for a geo-exchange system that wouldn't impact the critical construction path of the build. By drilling the underground boreholes beneath the building allowed other trades to continue their work concurrently with the installation of the geo-exchange infrastructure.

Year Built	2014
General Contractor	Bird Construction
# Of Boreholes	84
Borehole Depth	450 ft
Building Size	80,000 sqft
Project Type	Drilled Under New Construction

THERMAcityENERGY

New ETFO Office Sets Bar For Sustainability

Ontario teachers earn top marks with Toronto's first purpose-built LEED Platinum building

March 4, 2014
By Michelle Ervin

The Elementary Teachers' Federation of Ontario's (ETFO) new Toronto headquarters is the low-rise, low-impact building that almost wasn't. And after overcoming both zoning hurdles and a tight construction deadline, the new ETFO office made history on Feb. 25, 2014, when it obtained LEED Platinum certification, the first purpose-built facility in the city to do so.

Located at 136 Isabella St., the building faced some serious challenges before it officially opened in June 2013, most notably from neighbours living in the nearby Victorian row houses who were vehemently opposed to an office building being erected in their residential community. But after working with the City, the ETFO was able to get the site rezoned for commercial use.

KPMB Architects eventually won over neighbours with a design that was sympathetic to the facility's surroundings, while also addressed their practical concerns. It incorporated dark, terra cotta-coloured cement-fibre panels, echoing traditional brick masonry on the façade. Partner-in-charge Shirley Blumberg says that it also featured stepped down massing that respected a 45-degree angular plane, mitigating potential privacy and shadow impacts.

But one of the most notable aspects to the building is its sustainable features, one of the most central to its accreditation being its geothermal heating and cooling systems. And it is through these systems that a Canadian first was accomplished.

A First In Geothermal Heating And Cooling

ETFO first vice-president Susan Swackhammer explains that the project was on a tight deadline, as they had to ensure that the new building was ready for occupancy by the time the ETFO's then lease at the corner of Dundas Street West and University Avenue expired. This prompted a novel approach to the building's geothermal heating and cooling.

Sosio Porretta, project director at Bird Construction, says that normally, drilling the 84, 450-metre-deep holes for the geo-exchange installation would require 30 to 40 feet of shaft. This would have added anywhere from two to four months to the front end of construction.

Instead, using new technology, the holes at the ETFO building were drilled from the underground parking structure after much of the building had been constructed. This enabled other trades to work concurrently with the installation of the geo-exchange.

The implications of the successful application of this new technology, which was developed by Vancouver's Fenix Energy, may be significant.

"It opens up (geothermal installations) to existing buildings, if they're able to somehow get into low areas, whether existing office buildings or residential buildings, they can drill these things just like we did, even though the building was up and other work was going on," Porretta says.

In fact, Fenix Energy developed and designed its low-head room drilling solution to be able to retrofit high-rise commercial real estate with geothermal installations, says Adrian Ryan, the company's co-founder and vice-president of engineering.

"It's a closed-loop system that enables us to get down into the building and keep it reasonably clean — it's not white-lab-coat clean, but we're not creating a mud pool in the basement," he says.

The ETFO's new office aims to reduce energy usage by at least 60 per cent over the Model National Energy Code for Buildings. But if KPMB's previous work at the LEED Platinum-certified Manitoba Hydro Place is any precedent, the ETFO office can expect to exceed that target.

Working Towards Green Design

KPMB Architects design partner Bruce Kuwabara says that he is a little jaded by the discourse around sustainable building in Canada. (By his estimation, the country is 20 years behind Europe in the field.) So when Kuwabara made his pitch to the ETFO on building a model of sustainability, he says that he essentially told them, "If not you, the teachers, who teach in the public school system, who have a long-term ownership position on this piece of real estate and this building, then who can really lead the way forward?"

The teachers of the federation agreed. They had decided early on that they would pursue LEED at their new facility, Swackhammer says. They subsequently decided to pursue LEED Platinum.

"It was sort of a grassroots movement of our members saying, 'We're teachers, we have an obligation to care about the environment, to not only say we care about it but to show that we care about it'," she says.

Further sustainable features of the ETFO's new facility include low-flow fixtures, which result in water savings amplified by rainwater harvested from the building's green roofs and stored in a below-grade cistern. The harvested rainwater is used to flush toilets, as well as water some of the landscaping via a high-efficiency irrigation system.

A Sustainable Building That Doesn't Forget About Its Occupants

Sustainable measures did not come at the expense of occupant comfort. In fact, some did double duty to enhance the user experience.

The air distribution system, which employs raised floors and dropped ceilings, is designed in a way so that air is never recycled. Swackhammer attributes this feature to the noticeable difference in her afternoon energy levels compared to when she was in the federation's previous facility. And she was even able to stop taking her allergy medication.

Plus, automatic blinds, which operate by sensor in response to daylight levels, help to regulate building temperature. Green lights in the hallways indicate when it is not too hot, cold or windy outside, telling occupants that they can open office windows. This gives everyone some freedom to adjust their surroundings for comfort.

Also, thanks to the stepped massing of the building, occupants are able to walk out onto wood decks that promote connections to the outdoors on every floor, Kuwabara says.

While the office was designed to serve as a model of sustainability, it still needed to serve the day-to-day functions of the federation.

The 121,000-square-foot facility is organized into east and west wings off a central atrium that spans four storeys. Not only is the atrium is important to the ventilation system, but Kuwabara explains that it also brings daylight into the building. Offices on the perimeters of the upper floors are broken up by smaller 'neighbourhood' meeting spaces, and the ground floor is flexibly designed to accommodate larger on-site meetings of the 76,000-member federation.

"We have teachers coming in for various things: committees, conferences and all that kind of stuff," Swackhammer says. "Everybody is very proud; they look around and they talk about wanting to bring their class here."

Michelle Ervin is the editor of Canadian Facility Management & Design.

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Vancouver, BC

Cadillac Fairview

777 Dunsmuir

A decade before the concept of decarbonizing commercial buildings heating systems was commonplace, Cadillac Fairview self imposed mandates to improve the efficiency of their Class A building portfolio. Despite falling natural gas prices and a lack of green house gas emissions reductions target from any level of government, Cadillac Fairview led the industry with a solution to retrofit geo-exchange under the existing occupied building. In 2017, ThermaStor Solutions original management team successfully planned and installed the worlds first, 12,000 linear foot retrofit borefield under this commercial building to decarbonize the fossil fuel based heating system.

Year Built	2017
General Contractor	Cadillac Fairview
Boreholes	30
Borehole Depth	400 ft
Building Size	264,000 sqft
LEED Rating	Silver
Project Type	Retrofit

THERMAcityENERGY

The Push To Decarbonize Real Estate Is Heating Up

March 5, 2024

By Jennifer Van Evra, BC Business

By traditional business standards, it looked like a questionable idea.

It was 2014 and Cadillac Fairview, a national commercial real estate firm, was about to install a cutting-edge geo-exchange system. The project would involve drilling 30 boreholes 400 feet below the parkade at 777 Dunsmuir Street—a mixed-use tower built in 1990 in the heart of downtown Vancouver—and inserting a piping system that would help remove heat in the summer and provide it in the winter.

The geothermal retrofit would reduce the nearly 200,000-square-foot building's carbon emissions from heating by 85 percent. Still, the $2-million project was a tough sell, especially since it would take more than a decade to recoup the cost.

"People weren't talking about carbon reduction and looking at these new, unique technologies for office buildings. And an 11-year payback? People wouldn't even look at projects like that," recalls Lillian Tummonds, Cadillac Fairview's VP of office operations for Western Canada. "Our finance department was like, 'No.' But we said, 'You know what? We want to be bold. We want to try out these new technologies.'"

At the time it was a lonely bandwagon, but now the push to decarbonize is rapidly gathering steam across North America. According to a City of Vancouver report, the burning of natural gas in buildings accounts for a whopping 57 percent of the total carbon emissions generated in Vancouver. And because of a new city bylaw that comes into effect this year, owners of large commercial properties are going to have to reckon with those emissions—and soon.

Under the bylaw—the first of its kind in Canada, and inspired by similar measures in cities like New York, Boston and Washington, D.C.—owners of buildings over 100,000 square feet must report their emissions starting June 1. Beginning in 2026, they'll need to gradually limit those emissions to the point where, by 2040, all existing large office and retail buildings will be zero-emission.

To start, the regulations will only apply to existing office and retail buildings—roughly 200 in Vancouver—but the city is looking at expanding to other property types. Meanwhile, provincial rules require that all buildings constructed in 2030 or later be zero emission.

For the most part, owners have been accepting of the change, says Micah Lang, team lead for large existing buildings in the City of Vancouver's sustainability group.

"These buildings are often occupied by large multinational companies that have set their own very high corporate sustainability goals," says Lang. "So they're looking to lease space and buildings that are also going to be decarbonizing."

Kenneth McNamee, principal with Impact Engineering, has noticed a definite uptick in interest in decarbonization. His firm has worked on a host of major upgrades in Vancouver, including at St. Paul's Hospital, Mount Saint Joseph Hospital and the Brock Fahrni Pavilion, where it achieved an 80-percent reduction in carbon emissions thanks to a heat recovery chiller, which captures warmth from exhaust air and uses it for heating and hot water.

Still, there are headwinds, he says. In large commercial buildings, HVAC and hot water are responsible for the lion's share of emissions, and while the high-tech solutions—including heat pumps, heat recovery chillers and electric boilers—have moved in leaps and bounds, they still have a ways to go, and they require different installation and maintenance processes from those used for fossil fuel-powered systems.

Then there's the cost. Retrofits regularly cost millions of dollars, and many buildings also have to undergo pricey electrical upgrades to power the new tech. Incentives from governments and utilities, as well as the federal carbon tax, are narrowing that gap, says McNamee, but bigger perks would help speed up the adoption of cleaner tech.

"It's been proven on the residential side that if the incentives are there, people are motivated to make a positive change," he says. "The carbon tax is a stick, but there should also be more carrots if the government wants to get more aggressive in terms of decarbonization."

Tummonds agrees that cost is a big barrier to change. Supply chain woes and a high demand for equipment have also pushed up costs and made it tougher to complete upgrades.

All 11 of Cadillac Fairview's Vancouver buildings, which together represent 4.4 million square feet, have been certified zero-carbon a full 16 years before the city's 2040 limits kick in.

Tummonds says that in countries where climate change is having catastrophic effects, governments, the public sector and private businesses are all working together toward change. Now she hopes Canadians do the same before it's too late.

"Heat domes and drought are going to make us pay attention," she says. "But my hope would be that we don't need to get into crisis situations for all of us to be pulling in the same direction."

Jennifer Van Evra is an award-winning Vancouver journalist, broadcaster, and UBC writing instructor.

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Surrey, BC

Surrey City Hall

In the early 2000's, the municipal government in Surrey, BC's largest municipality, started on the path of designing a new central Civic Centre that will be comprised of a new City Hall to house a growing government, an underground parkade, a central outdoor public plaza, as well as a future hotel, university campus, library, and commercial office space. With a growing population that placed a particular emphasis on environmental sustainability, the buildings HVAC system was originally designed around a geothermal borefield drilled under the building. The award winning City Hall's renewable heating system operated so well in its early years of operation, that it initiated a plan for a city wide district energy system.

Year Built	2015
General Contractor	PCL Constructors Westcoast Inc.
# Of Boreholes	400
Borehole Depth	200 ft
Building Size	178,000 sqft
LEED Rating	Gold
Project Type	New Construction

THERMAcityENERGY

2015 Award Winning Project: Surrey Civic Centre

May 31, 2015

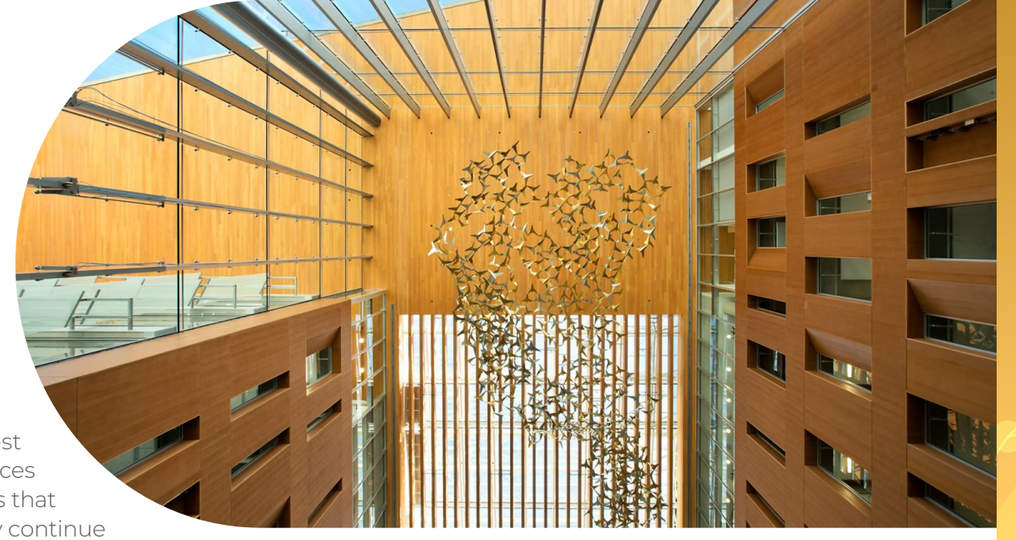
By SABMag

A bold and dramatic building that is nonetheless refined and elegant. A fitting statement for a municipality that is forging a new identity based on the consideration of sustainability at all levels – including transit, civic and community space, and the transparency and accessibility of government. This is a building that will draw the community in. Its performance metrics are equally impressive.

Designed to LEED Gold standard, the new Surrey City Hall and Plaza house the City's municipal government and anchor a vibrant new urban Civic Centre. Central to City Hall's public role is its light-filled atrium, a gathering and event space at the heart of the 16,500m2 building. It provides physical and symbolic connections between the Plaza and the city beyond and expresses open and democratic governance. A dramatic roof canopy, lined with local Douglas fir, provides east and south sun shading.

Sustainable design strategies include a geothermal heat exchange system that provides winter heating and summer cooling. The success of this installation has initiated planning for a city-wide district energy system. The Plaza invigorates public life with its multi-level green terraces, rows of shade trees, and connects the new City Hall with Surrey Central Library, a future performing arts centre, high-density mixed-use developments and the SkyTrain rapid-transit system.

Originally an agricultural region, transformed into a suburb, then into a city – Surrey is now the second largest municipality in British Columbia, with a rapidly-growing multicultural population. Civic engagement, social interaction and sustainable stewardship were the primary goals of the project, addressed through the orientation of the building in the master plan of the Civic Centre and through the formal organization and design qualities of City Hall. Addressing all of the community needs, the new Civic Complex is a cultural, educational and urban centre piece providing exceptional and seamless interior and exterior spaces.



One of the greatest paradoxes that faces current suburbs is that on one hand they continue to grow, and on the other hand, the population is becoming increasingly conscious of environmental issues and the importance of reducing energy-dependence and ecological footprint. The strategic decision to move City Hall from the outskirts of Surrey, a location accessible only by car, to a centrally located brownfield site has done just that. As such, the project sets an important precedent for a new, integrated and more sustainable urban vision for the city.

Situated on the flood plain of the Fraser River, the Civic Centre has been designed in accordance with regional flood mitigation strategies, and has a number of storm water features implemented to alleviate flooding and excessive run-off. The large plaza is made of permeable concrete pavers and has two retention tanks to maximize water reuse and control flow-back to the regional water systems. The green roofs and garden terraces are planted with low-maintenance, native vegetation. Rainwater is collected and stored for re-use, while low-flow fixtures minimize water usage within the building.

Project Performance

- Energy intensity building and process energy = 1049MJ/m2/year
- Energy intensity reduction relative to reference building under ASHRAE 90.1 [2007] = 33%
- Potable water consumption from municipal sources = 4,232 L/occupant/year
- Reduction in potable water consumption relative to reference building = 39%
- Regional materials [800km radius] by value = 15.5%
- Reclaimed and recycled materials by value = 23%

Project Credits

- Owner/Developer: Surrey City Development Corporation
- Architect: Moriyama & Teshima Architects
- Joint Venture Architect: Kasian
- Project Manager: Pivotal
- General Contractor: PCL
- Structural Engineer: Read Jones Christoffersen Consulting Engineers
- Mechanical/Electrical Engineer: MCW Consultants Ltd.
- Landscape Architects: Moriyama & Teshima Planners
- Civil Engineer: Aplin & Martin Consultant Ltd.
- LEED & Building Envelope Consultant: Morrison Hershfield
- Cost Consultant: Gage Babcock & Associates Ltd.
- Photos: Emma Peter

Materials

Structural system is concrete, and steel structure for the main roof and mechanical penthouse roof; point-support atrium glazing, canopy and interior glass guards designed and supplied by Stella Custom Glass Hardware; precast cladding panels and fibre-cement board; geothermal heat exchange system, fan coil four pipe system for offices and VAV for council chamber, in-floor heating for atrium.

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Burnaby, BC

Solo District Condo

In 2010, when Jim Bosa, President of Appia Developments conceived of their flagship mixed use project in North Burnaby BC, The design team placed an emphasis on sourcing a high quality, cost effective, and environmentally friendly heating and cooling solution. With the project scheduled to be completed in four phases over a decade of construction, locating HVAC infrastructure was critically important so that early work that was required for the first phase of construction wouldn't impact future work. Drilling geo-exchange borefields under each tower as it was being built was a desirable solution to a complex issue that a traditional geo-exchange system drilled from the surface of the property wasn't suitable for.

Year Built	2012 to 2023
General Contractor	Appia Developments
Building Size	1,400,000 sqft
LEED Rating	N/A
Project Type	Multi-stage new construction

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Case Study: Solo District
Reaching New Heights in Heating and Cooling

2020

By Mitsubishi Electric

The Challenge

Located in the vibrant community of North Burnaby, British Columbia, just a short drive from Vancouver, Solo District is a mixed-use development that includes four towers with residential, office and commercial space. Jim Bosa, President of Appia Development, the developer of Solo District, had a clear vision – to create a community complete with everything the residents might need, from doctors' offices to grocery stores to event spaces.

The first of four construction phases was completed in 2015, and phases three and four are scheduled for completion through 2022. During the development process, Appia Development was looking for a heating and cooling solution that was of excellent quality and energy efficiency, while being cost effective during the installation process and throughout the product lifecycle. Ease of operation, future compatibility and reduced cost were also key considerations.

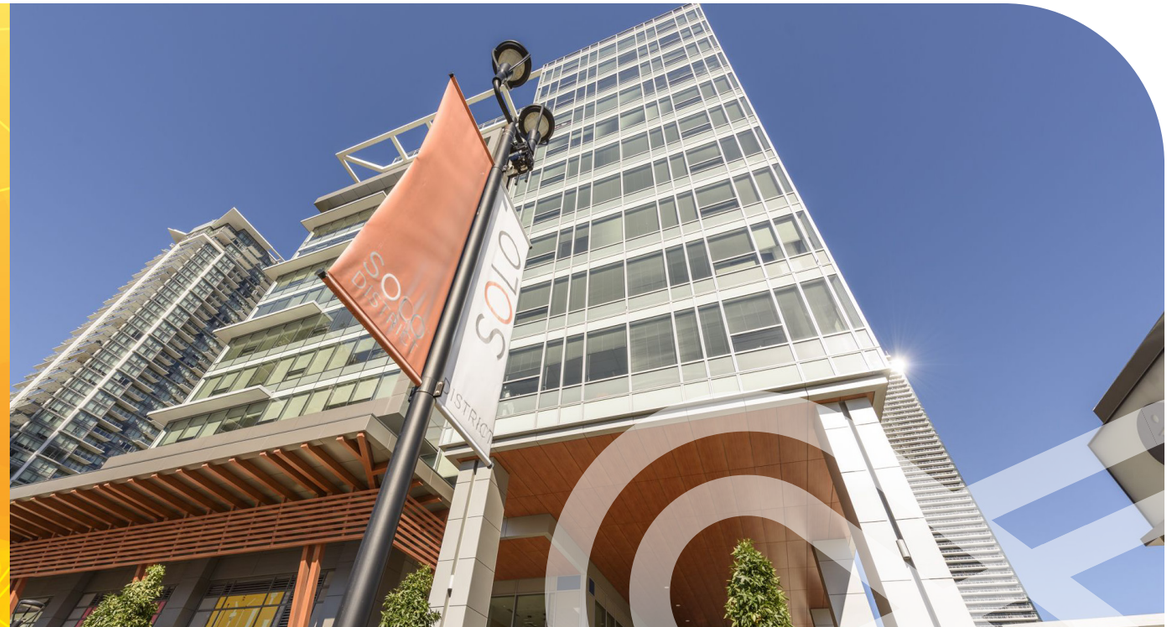
The Solution

Mitsubishi Electric's Water-Source VRF and Heat Pumps serving the residential, commercial and retail buildings were selected for this development. For the grocery store Mitsubishi Electric's Hydronic Heat Recovery was selected.

Mitsubishi Electric products were chosen for its flexibility, heat recovery and overall product excellence. The fact that the control systems were all included was also a deciding factor, as traditionally control systems belong to a third party, which makes operation more complicated and leads to ongoing service and maintenance. Mitsubishi Electric's system also has backward and forward compatibility, meaning the systems can "speak" to older and future systems that may be added to new buildings in the complex. Mitsubishi Electric systems are also excellent at redirecting heat from an area that needs cooling (for example, the kitchen) to an area that needs warming (like the residential hot water).

Another consideration was that Mitsubishi's Electric two-pipe VRF system is less labour intensive during installation than traditional four-pipe systems. This reduces installation time and costs. To ensure the success of this project and the systems used, Mitsubishi Electric Sales Canada Inc. worked closely with the owner, architect and engineers involved in the design of the mechanical system to earn their trust. Also involved was a third-party utility company that ultimately took ownership of the common space mechanical system components, including the geothermal field and the Citi Multi system.

As the towers range from 41 to 55 storeys in height, Solo District now boasts the tallest building in Canada to use VRF technology. Because of the unique height requirements, Mitsubishi Electric Sales Canada Inc. had the first ever 575-volt condenser system designed, manufactured and delivered to this project. The mechanical design includes a development-scale vertical closed loop geo-exchange system and "ambient temperature" loop with interconnecting capabilities of the individual building hydronic heating and cooling systems. Essentially, this means that the Mitsubishi Electric system can draw energy from virtually any water source, whether it's a geothermal loop or a traditional boiler chiller.



The Results

The Solo District buildings can now boast that they are the tallest in Canada with a VRF system. After nine years, phases one and two are now wrapped up and the project is considered a success that will be further developed in phases three and four.

Summary

- Owner/Developer: Appia Developments
- Distributor: Mitsubishi Electric BC Office
- Mechanical Engineers: Integral Group
- HVAC Contractor: Enersolv Design & Build Ltd.
- Architectural Firm: Chris Dikeakos Architects Inc.
- Challenges: Select an energy efficient and cost-effective heating and cooling solution for a master-planned, mixed-use residential, office and commercial community in BC.
- Selection Criteria:
  - Excellent quality
  - Energy efficiency
  - Proprietary control systems
  - Installation time and cost
  - Cost effectiveness
- Location: Burnaby, British Columbia
- Industry: Mixed use residential & commercial
- Size: 4 towers ranging between 41 to 55 storeys with a total of 1351 suites, 100,000 square feet of shops and 400,000 square feet of office space built on 6.06 acres of land.
- Design/Engineering Solution:
- Indoor Unit Models:
  - 510 – PEFY-P**NMSU
  - 399 – PEFY-P**NMAU
  - 26 – PEFY-P**NMHU/NMHSU
  - 10 – PKFY-P**MHMU/NKMU
  - 8 – PLFY-P**NCMU/NBMU
- Outdoor Units Models (Phase 1 & 2):
  - 335 - PQRY/PQHY-P**ZKMU-A
  - 1 – PUHY-96TKMU-A
  - 2 – PUMY-P48NHMUR4
- Results: Solo District's successful completion of the first two key phases is transforming life in Burnaby, creating a vibrant community that is well connected to Vancouver.