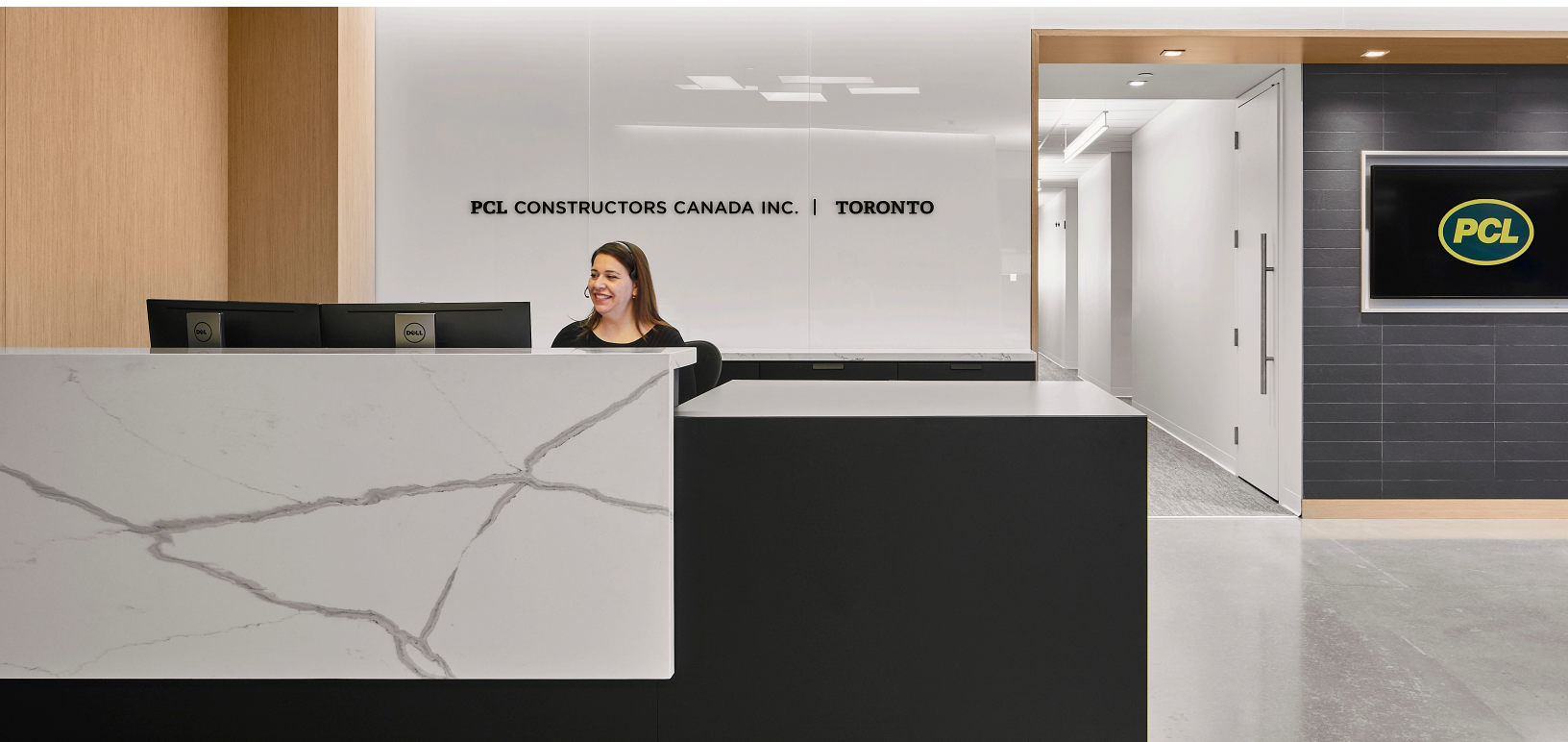




# A LIVING LAB: FACING THE CHALLENGES OF LEED v4

## PCL Toronto Office Case Study

*The expression 'walk the talk' was a driving force behind PCL Construction's decision to relocate its district office serving the Greater Toronto Area by designing a workplace of the future for its 600+ district employees. The vision and result is a sophisticated, contemporary office that exemplifies openness, flexibility, collaboration, digitization and, above all, sustainability. This is the story of PCL's journey to adopting LEED® V4.*



### BACKGROUND

PCL entered the Toronto marketplace with a satellite office in 1972, seeking to define itself as a national builder capable of offering services across the country. If the organization truly wanted to be a major player in Canada's construction industry, it needed to establish a presence in central Canada. By 1983, PCL Constructors Canada Inc. (Toronto) was created, with an office established in what was then a standard office tower with modern conveniences.

Over the course of the subsequent 35 years, PCL delivered thousands of projects, each one introducing new systems or design innovations that raised the standard for safe, productive, and collaborative workspaces.

In the opening years of the new millennium, PCL Toronto's departmental teams were siloed and segmented across several floors and the growing distance between the 1980's office and the new standard that PCL was building became apparent. It was determined that the PCL Toronto office would relocate to showcase the expertise gained through experience building for its clients. With an eye for sustainability and productivity, PCL began the process of rethinking the space where drawings become plans, and plans become the built environment.

"We recognized the need to elevate our Toronto workplace to sustain our operations well into the future," said Todd Craigen, PCL president of Eastern Canada. "Our new space is an important investment in our employees and our

partners and sets the stage for PCL to recruit and retain the best people in the industry.”

## BUILDING A CULTURE OF COLLABORATION

PCL Toronto’s new office resides in a newly constructed, 51,000-square-foot building, occupying the fourth and fifth floors joined with an interconnected feature stair. It is located in a seven-storey building at 2201 Bristol Circle in Oakville, known as the Westbury International Centre in the Winston Business Park.

The LEED® Silver certified base building was completed in 2016 and has many beneficial features in comparison to PCL’s previous office space, including a great view, better air quality, better accessibility, good transit as well as highway access and excellent proximity to restaurants and entertainment whether driving or walking.

To inform the workplace strategy, B+H Architects conducted extensive research and visioning exercises with PCL’s leadership team and its next generation of leaders to uncover the current challenges each group was experiencing, as well as their aspirations for the new design.

The focus groups revealed key driving goals for the new space, including the need to connect the entire PCL team, facilitate teamwork and collaboration, leverage technology to promote productivity and knowledge transfer, promote health and well-being and create an appropriate balance between open and private areas.



The new office design is intended to improve the work environment and allow the team to work more cohesively than the previous space which spread PCL over five floors. Departments are closer together allowing for more communication and interaction and facilitating different levels of engagement. The design features an open office area and perimeter offices with glazed fronts to maintain views for

## PCL TORONTO NEW OFFICE VISION

1. Facilitate team work and collaboration
2. Leverage technology toward increased productivity
3. Health and wellness – LEED® ID+C
4. Create a proportionate balance between open and private space
5. Showcase PCL’s commitment to craftsmanship value.
6. Provide bright and inviting space in which to work.

open office staff. The central feature of the office is a large welcoming work café, a multi-functional social space serving up more than just lunch. Collaboration, networking, brainstorming, casual meetings, relaxation, recreation and celebration are all suited to, and materialize in this space. It was designed to be the hub and heart of PCL’s operations so that staff no longer eat lunch at their desks.

The creation of other social spaces provides informal areas for meetings or gatherings, with collision zones strategically placed throughout the office to encourage spontaneous interaction and to maximize opportunities for collaboration.

## LEED V4 ACHIEVEMENT

Through the new office project, PCL established a standard for environmentally sustainable development in August 2020 by achieving LEED® Version 4 Silver certification in the Interior Design and Construction category for commercial interiors. The LEED® rating system recognizes excellence in the design, construction and operation of green buildings.



## RULES TO LIVE BY

To commemorate the past while embracing the workplace of the future, PCL commissioned a graphic artist to etch its founder Ernest Poole’s Rules, a set of business principles defining PCL’s core values, in his handwriting on glass panels. This artwork, which is prominently displayed in the main lobby, gracefully interweaves the company’s past with its current narrative.

“Poole’s Rules remind us of the core principles that guided our founder over a century ago. Adherence to these principles has made PCL what it is today, and they are still very much a part of our culture today,” shares Craigen.

PCL’s legacy was further integrated into the architecture of the workspace through its use of materials and finishes. Natural and raw materials like wood, brick, concrete, steel, glass and stone are used throughout

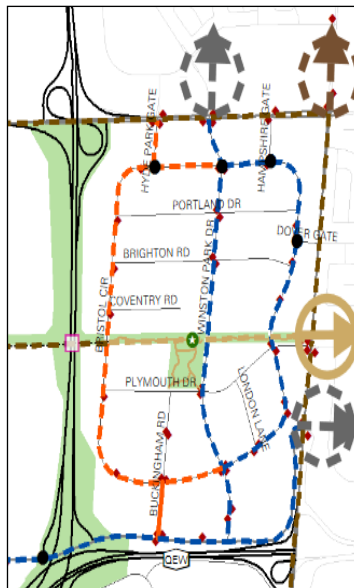
public spaces to connect with PCL's identity as a construction company.

### SITE LOCATION AND TRANSPORTATION

The building is located within walking distance to a wide variety of amenities with diverse uses such as banking, fitness centres, medical services and pharmacies, restaurants, childcare, public parkland, movie theatre, golf putting park, as well as large and small retail stores.

While the new office is conveniently located near major highways such as the Queen Elizabeth Way, Highways 403 and 407, providing easy access for driving commuters, PCL recognizes that accessible transit is key in reducing pollution and greenhouse gas production and encourages employees to use transit rather than personal cars. The office is located close to multiple transit stops including Oakville Transit, Mississauga Transit and the Clarkson GO train station. These options provide easy access to surrounding areas where many employees reside, with convenient connections to downtown Toronto.

More and more companies are encouraging employees to reduce their impact on the environment by participating in active modes of transportation including cycling. The building offers bicycle storage and shower facilities to encourage active transportation methods. Amenities may also be used by staff who want to exercise during the day, making use of natural local features such as the neighbouring Sheridan Park and the athletic pathway that runs through it.



Future cycling network on Bristol Circle

Showers are a small feature, but greatly expand the capacity of busy employees to manage their time, health and fitness. Employees who participate in regular exercise are more productive than those who don't exercise and less likely to suffer depression and work burnout. By enabling active employees to engage in athletic activity more easily, PCL hopes to motivate more activity among all employees toward a healthier daily routine.

### ENERGY AND ATMOSPHERE

Canada's Building Strategy ('Build Smart', issued by Canada's federal environment ministry), notes that heating and cooling buildings represents 17% of our country's annual greenhouse gas production. Over and above this 17%, the

requirement to meet other power demands in commercial buildings necessitates an enormous amount of pollution to operate our built environment.

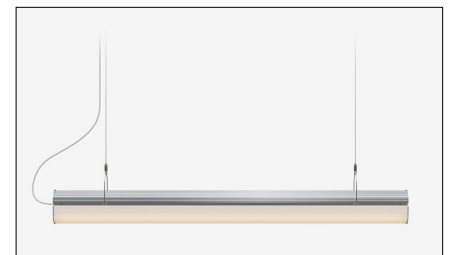
With Canada among the highest per capita energy users in the world, minimizing energy use becomes an obvious goal, reducing the demand intensity of our portion of the grid, opening up future opportunities for smaller, more efficient local production facilities. As local demand intensity is reduced, we also open up the possibility of future renewable energy and battery installations that traditionally have not been viable in urban settings.

With these variables in mind, the office's base building includes a high efficiency HVAC system based on a heat pump loop with electronically commutated motors served by condensing boilers and heat rejection from a fluid cooler controlled by a variable frequency drive (VFD) demand-based motor speed control. There is heat recovery on the dedicated outdoor air system serving the heat pumps.

While the base building provides flexibility by providing more much fresh air than is required for expected occupancy by code, PCL installed balancing dampers to adjust the ventilation levels to code which was a major factor in the project's energy efficiency score.

PCL also designed their space with demand control ventilation, giving further control over the volume exchange of outside air into the office space to ensure the space is not being overventilated and using excess energy to condition outdoor air.

LED lighting is featured throughout the new space - a significant upgrade in both efficiency and quality over the fluorescent system PCL left behind. On the energy side, this reduces power demand and, on the health and wellness side, it provides higher quality light at colour temperatures conducive to higher brain function.



LED light fixtures installed in the project.

Energy savings are further increased with digital lighting controls. All enclosed offices are equipped with occupancy sensors and meeting rooms have additional lighting control options with programmability to minimize their consumption of power as schedules change. Functional lighting levels were used to distribute light across the floorplate and LED desktop task lighting is provided to staff upon request.

PCL's dedication to energy efficiency has also led to the implementation of ENERGY STAR certified appliances throughout the office. ENERGY STAR meets strict technical



guidelines which guarantee high-efficiency performance. With these measures, the project's energy model predicts a 33% energy performance improvement over the ASHRAE

90.1 2010 reference building and an 11% improvement in energy cost savings.

### WATER EFFICIENCY

PCL's new office operates at a more sustainable level than most, given their commitment to LEED® V4. With regard to water use reduction, PCL has achieved a 35% reduction over the baseline case in water use by installing low-flow and low-flush water fixtures. Within the PCL suite, WaterSense low-flush toilets, low-flow urinals, low-flow showers and low-flow sensor lavatory faucets with automatic shut-off were installed. The faucets in the base building washrooms on PCL's floors were also upgraded to improve water savings.



### MATERIALS AND RESOURCES

Construction and demolition activities generate approximately 33% of the solid waste generated in North America. To reduce this impact, PCL implemented a construction waste management plan to achieve almost 90% diversion of all the waste generated by the project. Diverted waste streams included wood, metal, plastics and drywall.

Responsible materials selection was important for the project. Effort was taken to ensure as many products as possible were documented with environmental product declarations and health product declarations. These evaluations are the new industry standard that promote transparency in the building products industry regarding the environmental and health impacts associated with the production and life-cycle of a product and its ingredients.

With increased demands for recycled content, the industry takes notice, ensuring that materials can continue to be recycled and not sent to landfill.

When recycled materials become the norm within the industry, it reduces the need for mineral and petroleum extraction and the harvesting of materials such as wood. Recycled materials also require less water and energy consumption. Over \$800,000 of recycled content materials were incorporated in the project.



The Forest Stewardship Council (FSC) promotes environmentally-friendly forest management practices to ensure that harvesting the wood is not destroying the

## SMACNA IAQ GUIDELINES FOR OCCUPIED BUILDINGS UNDER CONSTRUCTION

- Protection of HVAC components prior to commissioning
- Pathway interruption
- Source control
- Housekeeping
- Scheduling

surrounding ecosystems and biodiversity of the forest. A large percentage of the wood-based materials installed in the project, including millwork substrates and furniture, were certified by the FSC as being harvested from sustainably-managed forests.



### INDOOR ENVIRONMENTAL QUALITY

Protecting indoor air quality during construction activities is important to protect construction workers as well as future occupants. The construction management team developed and implemented an indoor air quality management program for the construction phase to reduce contamination risks of dust, chemicals and moisture. The plan followed the SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) guidelines, which is considered best practice for projects under construction. The guidelines cover all aspects of construction that could contaminate the air during or after construction.

Volatile Organic Compounds (VOCs) are chemicals contained in many construction materials and they can have an adverse effect on human health by off-gassing into the indoor air. PCL made the responsible choice to select as many products as possible that had either zero or very low VOC content. Some of the products used on site with zero or low VOCs included paints, adhesives and sealants. PCL used GREENGUARD-certified products to ensure only using products that meet some of the world's most rigorous, third-party chemical emissions standards.



One of the low-emitting products used on the project.

Urea-formaldehyde is another chemical that has a negative impact on human health. This chemical is often used during the manufacturing process of composite wood products such as plywood, particleboard and medium-density fiberboard (MDF). The composite wood products used on the project are verified as ultra low emitting formaldehyde (ULEF) products.

The building enforces the Smoke-Free Ontario Act wherein smoking is prohibited in enclosed workspaces and public



places in order to protect workers and the general public from the effects of secondhand smoke. All building users must comply with these regulations and not smoke any cigarettes or other substances which is extended by Oakville bylaws to 9 metres (30 feet) from any building entrances operable windows and outdoor air intakes.

## ERGONOMIC WELLNESS

PCL is dedicated to the health and wellness of their employees and had a goal of creating a space where everyone is encouraged to be active during the day. Employees are encouraged to get up from their desks and collaborate with one another in the newly-designed space. The feature interconnected stair also encourages employees to be active rather than riding the elevator between floors.

New to PCL was engaging an ergonomist to ensure the office setting was ergonomically designed to improve overall occupant wellbeing. With the consideration of three critical factors: repetition, posture, and force; PCL has implemented furniture to ensure that employees are reducing risk of musculoskeletal disorders. Adjustability of furniture and equipment is key to making the work environment healthy and safe. Ergonomic education and consultations are available on an ongoing basis to PCL staff.

This ergonomic review went further. While health studies to date are inconclusive, enough statistical research exists to strongly suggest that prolonged sitting is not good for the human body. Standing desks will probably not save our lives, but time spent on our feet can encourage more mobility, suggests more active postures, and provides employees a variety of options to achieve comfort in their workspace. These considerations led PCL to implement 100% sit-stand desks so each employee can vary their posture throughout the workday as suits their need.

A noteworthy benefit of these desks was revealed early in occupancy, where an employee with a reconstructed knee was able to modify his environment for comfort over several months of recovery while maintaining his commitment to projects.

## LESSONS LEARNED

Knowing that it would take a steep learning curve to implement new requirements to obtain LEED® V4 for commercial interiors, PCL decided to use the project as a test case.

While PCL has successfully achieved LEED® certification under previous versions of LEED®, the update to Version 4 is substantial and creates challenges across all divisions of project scope. Accepting the LEED® V4 challenge intended to show PCL's dedication to sustainability and eagerness to gain experience under new standards. The full project team rose to the additional challenges of targeting Version 4 certification even when the industry was still in transition from Version 3. The design team had several new factors to consider and additional investigations and evaluations were implemented to find the right combination of new LEED® V4 credits to meet the project vision.

"PCL's commitment to sustainability is truly evidenced in their new Toronto office where they pushed the boundaries to lead the industry through early adoption of LEED® V4," says Alan Murphy, principal of Green Reason. "By utilizing the project as a living lab for this new rigorous set of standards, we explored this new and challenging rating system together for application on future client projects."

Some of the new LEED® credits that were pursued include points associated with energy efficiency, lighting quality and reflectivity of wall, ceiling and furniture surfaces. Points associated with space acoustics and controllability were investigated but not pursued. It is worthy of note however, that engaging in the review of LEED® V4 and space acoustics introduced the use of basic ambient noise controls in the space, even if it did not yield credits.

Of particular note was the challenge of indoor air quality testing under LEED® V4. The construction process was carefully managed and the schedule allowed for an indoor air quality testing period after construction and before staff moved into the new space. Unfortunately, with the new much longer list of contaminants and lower maximum

## PROJECT TEAM

**Client:** PCL Constructors Canada Inc. (Toronto)

**Construction Management:** PCL Constructors Canada Inc. (Toronto)

**Architecture and Interior Design:** B+H Architects

**Electrical Design:** Mulvey & Banani International

**Mechanical Design:** The Mitchell Partnership

**Sustainability Consulting:** Green Reason

**Commissioning:** Integral Group

concentrations for V4, the results exceeded the limits in the initial testing and one contaminant in one area remained just over the threshold in a retest directly before occupancy so the LEED® credit could not be achieved. This is considered valuable LEED® experience for PCL in guiding clients through the V4 process in future; schedule and material reviews will adapt to these requirements.

The specification of interior products and furniture was also much more challenging under LEED® V4. Many products that were previously acceptable under LEED® were rendered non-compliant under V4 and many manufacturers were still working to update their product documentation to be compliant with LEED® V4 requirements.

“With the evolution of the LEED® V4 rating system, spaces that could have been Gold in the old system may struggle to even certify,” adds Murphy. “As evidenced on PCL Toronto’s new office, with commitment and integration of goals from the early stages of the project, it is still possible to reach the design and performance levels that are now required to earn a LEED® certification.”

PCL also experienced new challenges in project execution and management of the supply chain. Product reviews aimed at confirming both materials and processes were compliant with new requirements required deeper analysis and requests for documentation from trades and suppliers. This ties into the experience noted above, as documentation and reporting requirements were new to each link in the supply chain. Many product manufacturers and wholesalers were still updating their product

certifications and associated documentation for LEED® V4 compliance.

Despite the challenges of moving to LEED® V4, the project was a success and resulted in a great space for PCL that is on track to achieve LEED® V4 Silver certification. True to PCL’s experience with LEED® since launching in 2000, simply engaging in the process is an education and an invitation to engage in innovation.

“As Canada’s leading general contractor, PCL is known for achieving our partners’ sustainability goals for their projects,” concludes Craigen. “By acting as both the client and construction manager on this project, we’ve created a successful outcome for our employees, while gaining important knowledge that we can translate for our clients interested in adopting LEED® V4 on their projects.”

PCL looks forward to leveraging this experience to provide better insight to its customers - enabling them to better achieve their LEED® vision while accepting LEED®’s invitation to learn, engage and innovate up and down the commercial construction supply chain.



## CONTINUED EMPLOYEE WELLBEING IN THE AFTERMATH OF THE PANDEMIC

A major change specific to ID+C is that LEED v4 drives the project to energy modeling, rather than a series of prescriptive measures. As noted previously, there are also much higher expectations on indoor air quality, including emissions testing for low-emitting materials. In a post-pandemic environment, these considerations are more valuable than ever.

Our new address, Westbury's 2201 Bristol Circle, is served by a dedicated outdoor air system feeding zoned heat pumps on each floor. Essentially, this means that outdoor air (formerly called "fresh air") is controlled by a separate "dedicated" system. The system conditions more, or less, outdoor air in response to carbon dioxide sensors located throughout our space. Outdoor air volumes are adjusted up to deliver more oxygen on a busy office day, and adjusted down to save energy at night, on weekends and through holidays. With this level of control, we only condition the air we need instead of a constant code-determined air exchange rate. Better breathing conditions when we're busy, and no wasted energy when we're closed.

"As we continue to navigate through the COVID-19 pandemic, the well-being of our employees and safety measures within the work environment are absolutely essential," says Bruce Sonnenberg, senior vice president and Toronto's district manager. "With enhanced air quality, socially distanced seating and COVID-19 vaccinations, our office is a key part of providing a safe workplace for our PCL Toronto family."

"PCL's decision to adopt LEED v4's ambitious sustainability targets for its corporate offices demonstrates the company's commitment to lead by example," says Thomas Mueller, president and CEO of the Canada Green Building Council. "LEED v4 for Interior Design also places strong emphasis on human health and well-being, which has become so critical during the global pandemic. LEED certification provides both a healthy and sustainable workplace, which meets Canadians' changed expectations as they gradually return to work."

