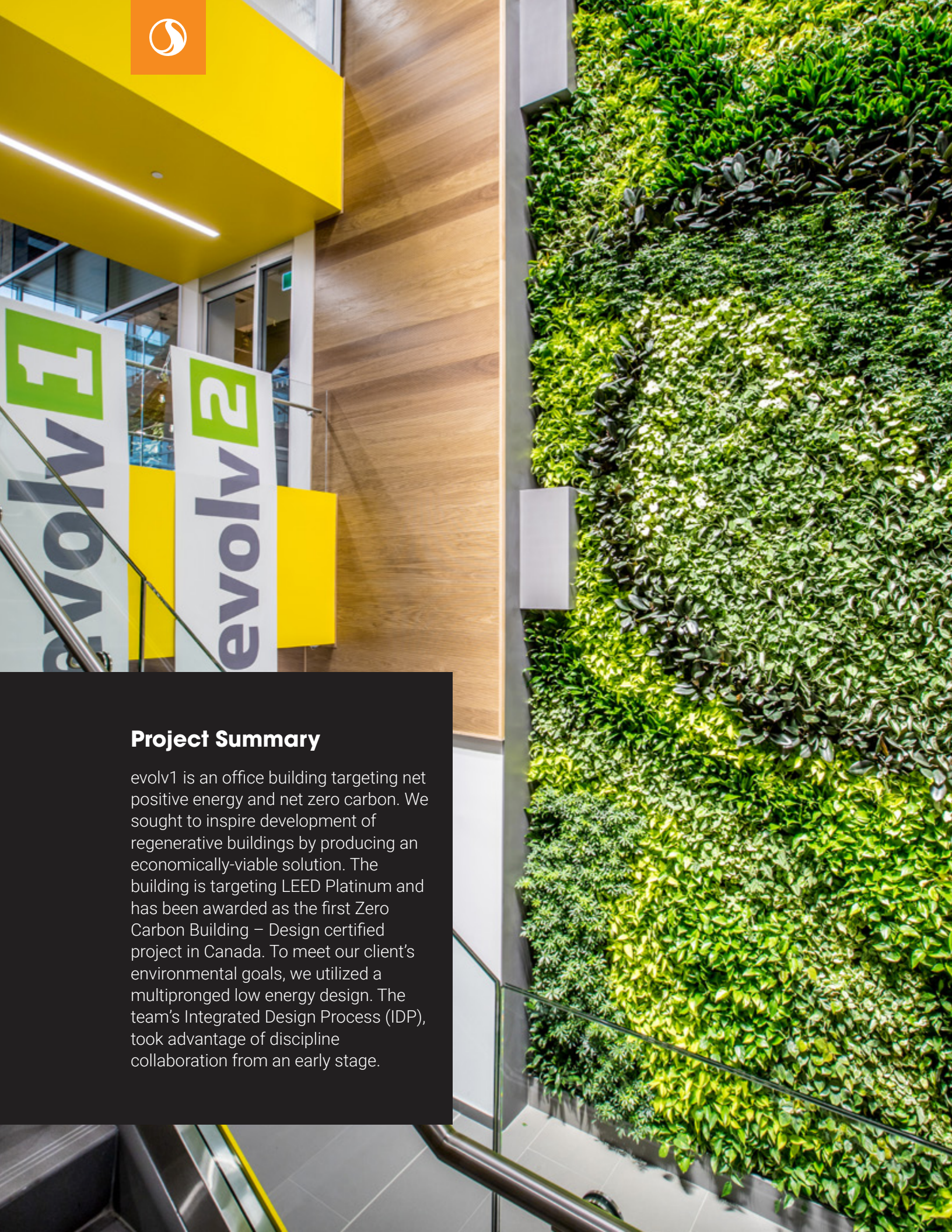




evolv¹

**CANADA'S FIRST ZERO
CARBON BUILDING – DESIGN
CERTIFIED PROJECT**

LOCATION
WATERLOO, ONTARIO



Project Summary

evolv1 is an office building targeting net positive energy and net zero carbon. We sought to inspire development of regenerative buildings by producing an economically-viable solution. The building is targeting LEED Platinum and has been awarded as the first Zero Carbon Building – Design certified project in Canada. To meet our client's environmental goals, we utilized a multipronged low energy design. The team's Integrated Design Process (IDP), took advantage of discipline collaboration from an early stage.

Project Highlights

INNOVATION

evolv1 is a commercial building designed to be net-positive energy, meaning that is designed to produce more energy than it consumes; it is also designed to be zero carbon, its operation is designed to produce no carbon emissions. Both these features contribute to the health of Waterloo's environment and take a step towards reversing climate change. evolv1 is highly visible in the community as a flagship for sustainability. The evolv1 structure is a high-profile project in a very public location, chosen to highlight its sustainable energy features. It will help build Waterloo as a hub for sustainable design and as a city that is interested in the health of our planet. This branding, along with the tech incubators that it will house, will bring in new jobs, new investment and young talent to the Region. It will serve as a vehicle for research in sustainability, as it is set to receive research grants for study of occupant behavior. It will produce tangible data on low energy and low carbon buildings.

Our engineering achievements were many:

- We optimized the thermal performance of our building envelope, including reducing thermal bridging, increasing insulation, and increasing glazing performance to a balanced point where it was equally as cost effective to produce energy from the photovoltaic array. The materials selected were also aesthetically pleasing.
- We created a building that was a true prototype instead of being a single iteration. evolv1 is designed to be a repeatable model that inspires other developers to build sustainably. Cora Group sought to work within real market constraints, and to build a profitable commercial building.
- Cora wanted a Class AAA office building that didn't appear "green washed". Incorporating the solar wall into the building façade was a challenge, our team had to think of innovative ways to blend the wall into the façade using a dark grey metal cladding system.
- The ground source open loop system was designed to heat and cool the building. It involved tapping into the aquifer and driving this natural water to the building, where it can heat or cool the building. Once used, the water is filtered and returned to the aquifer. Hundreds of gallons of water pass through this system every minute. Because the water temperature stays unaffected by the seasons, no supplementary cooling is needed.
- This ground source open loop system coupled with a Variable Refrigeration Flow (VRF) system to create a truly low energy system.



View of electric charging stations, solar PV Array carport and solar wall on the south face of the building



View of evol1 through the newly operational LRT station

COMPLEXITY

The basis of evol1's design and development were a series of strategic decisions; critical to not only the success of the project but the market's perception of sustainable buildings. The first strategic decision to be made was around the economic viability of the business case, we knew what we could achieve but had to make it feasible in the market and appropriate to create widespread impact. We frontloaded this process by using a proprietary parametric modeling tool that allowed us to analyze thousands of design scenarios simultaneously.

Our next decision was the site selection; the choice of the David Johnson Research and Technology Park, located within and owned by the University of Waterloo, was deemed best as it would feed off the University's culture of innovation and attract young, tech-savvy prospective tenants.

The location of the LRT Station was also a key factor in the decision, offering accessible and sustainable commuting to the building. The decision was made to orient the building east-west to optimize solar heat gain from both the building's and the parking lot's PV Array.

Our big challenge on evol1 was making sure we created a practical building that is leasable for our client and commercially attractive to tenants. We wanted to design a building that is net positive and meets industry standards, in terms of occupancy, lighting and plug loads. We refined design decisions to accommodate the domino effects onto other disciplines and overcame these obstacles through constant communication and free flow of information between teams.



Views of the evolV1 atrium

SOCIAL AND ECONOMIC BENEFITS

evolV1 is cutting edge in design, it puts Waterloo on the map as a sustainable, green city and will support the Region's goal of becoming known as a centre for sustainability. It attracts tech and start-up businesses, which will aid in creating attractive jobs for young people and thereby retention of young people in the city, who currently vacate upon graduating.

The building will create interest in sustainable buildings especially for developers who worry about the cost and return on investment of sustainable buildings, demonstrating that it can be built and operated cost effectively. It is essentially a working prototype of a sustainable net zero building, that can be modelled again.

Collaboration is at the heart of evolV1 from inception, operation and beyond. Collaboration and community outreach will continue through

operation. The building will house a Greentech accelerator, providing space for sustainability research and innovation to take shape. The atrium space is the heart of the building and is a space where occupants will "collide" and collaborate informally during the day and draws in the community for large events in the evenings, particularly the nearby universities who come to share their ideas with the public. Our solar engineering team is also completing research into building a microgrid that will support the energy needs of the entire park.

evolV1 lives and breathes education and information sharing. The building itself tells a visual story of how sustainability can be achieved and invites the public and the development community to investigate its features.



Open loop geoeexchange system

ENVIRONMENTAL BENEFITS

Energy efficiency, sustainability and longevity were the crucial factors in our design of evol1. We are extremely proud to have designed and built the first Zero Carbon Building – Design project in Canada, as certified by CaGBC; which is on-track to achieve LEED Platinum.

Our initial design approach began with passive strategies to reduce the energy consumption before applying active strategies. These included:

- East-West building orientation and solar carports to the south to maximise solar heat gain; generating the peak input of energy to the microgrid.
- Efficient building envelope avoiding thermal bridging; theorizing that an efficient envelope would do the 'heavy lifting' of the heating loads. This successful strategy saw us achieve TEDI of 24kWh/m².
- Heating loads are carried by the open loop geoeexchange system, the first open loop system in Ontario, tapping into an existing aquifer below the site.

The advantages of the open loop were:

- Cost, we only needed to drill three wells, rather than the entire field;
- Greater efficiency.

The active strategies included:

- VRF HVAC system which heats and cools zones dependent on the localized temperature, and gains efficiencies by moving excess heat into cool zones before actively producing heat.
- Heat recovery ventilation system with 80% efficiency
- Solar PV array comprised of ground-mounted solar carports and rooftop ballasted system, producing 105% of the buildings total energy consumption, displacing 110 tons of Co₂ annually.
- Annual energy consumption EUI is 81kWh/m² and the building is all electric - **NO FOSSIL FUELS WILL BE USED TO OPERATE THE BUILDING!**



Front Entrance of the evolv1 Building,
facing Wes Graham Way, Waterloo

MEETING CLIENT'S NEEDS

evolv1 is a commercial office building targeting net positive energy and air quality, net zero carbon, and net zero water usage and waste. Cora Group's vision for this project was an iconic, yet functional building.

To meet our client's environmental goals, we enlisted a multi-pronged low energy design approach. We used a ground source open loop system that heats and cools the building in a very efficient and environmentally friendly way and photovoltaic panels to produce more energy than the building was going to consume.

To achieve the net zero targets, the team used an Integrated Design Process (IDP), taking advantage of collaboration between very different disciplines from an early stage. The core team was supported

by specialists from within Stantec that considered advantages and trade-offs between systems design, user comfort and costs simultaneously.

We also collaborated on parametric modeling within our disciplines to quickly analyze thousands of scenarios and their effects on both construction and long-term operation costs. A reason many high-performance buildings fail is that users and operations staff are not usually equipped to understand how their actions can impact the overall environment. To mitigate this, Stantec worked closely with a team of researchers at University of Waterloo, as part of the IDP team, to understand the impact that occupant behavior would have on the building's efficiency.





