Learning. Living. Leading.

The Joyce Centre for Partnership & Innovation

An inside look at Mohawk College's zero carbon building.

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From the President

Five years after its opening, The Joyce Centre for Partnership & Innovation continues to capture interest across Canada and around the world, inspiring others to pursue sustainable design and development as the world contends with the climate crisis.

When it opened for the fall 2018 semester as a pilot for the Canada Green Building Council, The Joyce Centre was unique in its innovative design and Mohawk College assumed a strong leadership role in the growing desire for net zero buildings.

The Joyce Centre provides a living example of the benefits of a net zero building, having achieved the net zero performance designation each year since opening, while bringing learning and applied research together under one roof in a living lab. Students have full access to all seven levels of the building. With real-time energy performance of the building visible on hallway dashboards, students can monitor the impacts of the zero carbon building in which they gather and learn.

Industry partners are actively present in lab spaces, embedded in projects to develop new technologies, solutions and best practices for a future in which zero carbon buildings are the standard.

Sharing our success, lessons learned and best practices with the world, Mohawk College can encourage and support Canadian and global institutions and corporations to follow a similar path.

The continued operation of The Joyce Centre as a global zero carbon building success can be directly attributed to the collective actions of our students, faculty, employees and industry partners. We are grateful to everyone who has had a hand in this achievement.

Together, we can continue to demonstrate that the world can shift to a more responsible, sustainable way of working, learning and living.

The past five years have proven that a better future is possible.

Regards,

Ron J. McKerlie,
President & CEO, Mohawk College

Learning. Living. Leading.

The Joyce Centre for Partnership & Innovation at Mohawk College incorporates leading-edge energy harvesting and conservation production and techniques. At 96,000 square feet, the award-winning centre is Canada's largest, and Hamilton's first, zero carbon institutional building.

The Joyce Centre is named in recognition of a historic $5-million donation from The Joyce Family Foundation. The Foundation is a longstanding supporter of education and training at Mohawk College and the family takes great pride in the student learning and creativity that The Joyce Centre will enable.

Seven storeys of learning

Learning is not limited to the Centre's labs. Students have access to every level of the building, from the solar thermal array on the roof to the mechanical room and the sub-basement water room. Students get hands-on learning on how to operate, monitor and maintain a zero carbon building.

The Joyce Centre for Partnership & Innovation also serves as a demonstration site for industry partners looking to adopt zero carbon technologies into commercial, industrial and residential buildings.

Partners work alongside students and faculty on applied research projects, with a special focus on the generation, distribution and storage of renewable energies.

What's inside

Atrium and gallery

Digital Creativity Centre | Lecture Halls | Gallery

The heart of The Joyce Centre is The Digital Creativity Centre supported by the Mohawk Students' Association—a makerspace open to all students, featuring 3D printers, a virtual and augmented reality testing area, media and production editing suites, a green screen and a visualization wall for creating interactive storytelling. The main floor open space—The Marinucci Foundation Gallery—provides access to the lecture hall, The ArcelorMittal Dofasco Theatre and a café with indoor and outdoor seating. This open, common space is used to host college, community and industry events.

Labs and classrooms

Rapid Skills Training Lab

A multipurpose space that reimagines and rejuvenates training in an agile and rapid platform for sector-based, in-demand skills development. An outcome of the leadership and success of the City School model, the lab offers hands-on, short-term, employer-informed training that is responsive to the needs of industry and the community.

Health Studies Experiential Learning Lab

An experiential learning space bringing together Mohawk College faculty, staff, students and the greater Hamilton community. The multipurpose lab is used by Recreation Therapy students to participate in hands-on learning and simulations that integrate theory and practice, as well as the Health Studies team, to engage in research using the flexible classroom model across all programs.

Clean and Renewable Energy Testing Lab

Students collaborate with industry partners on applied research projects, focusing on how to safely integrate renewable energy systems into micro-grids, smart grids and the existing electrical system. Students have access to a weather station and wind turbine for real-time monitoring and testing.

Sustainable Design Lab

Within a showcase of net zero design in The Joyce Centre, students enjoy a fully immersive experience on how to design and build environmentally sustainable buildings. Students develop in-demand skills by using leading-edge technology, including virtual and augmented reality, drones and 3D scanners.

Partnering Studio

With dozens of applied research and capstone projects underway at any time within The Joyce Centre, the studio is a popular meeting place and collaborative space for students, faculty, staff and industry partners. The studio can be used for pitches, presentations, brainstorming sessions, project updates, meetings and special events.

Technology Automation Lab (IIOT)

Students use Industrial Internet of Things (IIOT) technology to prepare for in-demand careers at the forefront of Industry 4.0. Through training and applied research projects, students study the development and applications of sensors for machine-to-machine communication, including robotics, motor controllers, power protection systems, and residential, commercial and industrial automation systems.

Cyber Security Testing Lab

Teams of students plan, launch, thwart and defend against real-time cyber-attack simulations played out on giant wall monitors that teach them how to prevent, detect, predict and respond to threats against computer systems, networks and data. The lab also delivers customized training for industry partners.

Physics and Metrology Lab

Students from five Engineering Technology programs use the Physics and Metrology Lab to get hands-on experience in quality control, which is critical to the competitiveness and profitability of advanced manufacturers. The lab features precision equipment for the measuring, scanning and testing of parts. Mohawk College is the first postsecondary institution in Canada to partner with Mitutoyo Canada, the world's largest metrology company.

Energy and Power Management Lab

Part of the IDEAWORKS' Energy & Power Innovation Centre, students work with real-time data from multiple locations including The Joyce Centre. Students collaborate with industry partners on energy storage technologies, power protection, the control of grid systems and the development of new energy monitoring and control systems.

Centre for Climate Change Management

Focused on supporting Canada's transition to a thriving net zero economy, the Centre for Climate Change Management (CCCM) serves as an applied research centre and physical hub for climate action across the region. Given the urgency and scale of the climate crisis, the CCCM focuses on high-impact projects where there is the opportunity to significantly reduce greenhouse gas emissions. Together with partners in industry, cleantech and the community, the CCCM team works to co-develop decarbonization solutions and create lasting solutions to some of our toughest climate change problems.

The CCCM is home to the applied research team, and the college's Sustainability Office. Through a "Coalitions in Residence" program, the Centre also provides supports and resources to collaborations for climate action. This includes providing administrative space to the Bay Area Climate Change Council, a collective impact collaborative focused on accelerating Hamilton and Burlington's transition to thriving net zero communities.

CENTRE FOR CLIMATE CHANGE MANAGEMENT AT MOHAWK COLLEGE | BAY AREA CLIMATE CHANGE OFFICE

Leadership and performance
Making a measurable impact on climate change

Climate change is one of the biggest challenges of our lifetime.

Mohawk College recognizes that initiatives and commitments, such as The Joyce Centre and sharing knowledge, play a vital role in ensuring our students, community and Canadians are headed in the right direction. Mohawk College's Strategic Plan, released in 2022, states Make a Measurable Impact on Climate Change as one of six aspirations of the college.

Climate Action has been a core area of focus in previous strategic plans. Mohawk College was the first college to release an Environmental Management Plan, in 2011, and this year will be releasing our Climate Action Plan, which outlines our commitment to decarbonize and reach net zero emissions.

We have taken significant action to reduce greenhouse gas, and to inspire our students to be the sustainability leaders of tomorrow through curriculum and research, campus and public engagement, purchasing, transportation, energy, buildings and waste management.

We are leaders and continue to lead in climate action and sustainability in Canada and beyond, being recognized for our exceptional climate action education and research, as well as the bold targets we continue to set for the college.

The Joyce Centre for Partnership & Innovation has maintained its zero-carbon building (ZCB) performance certification with the Canada Green Building Council (CaGBC) annually since 2018, producing more electricity than it used.

The design and performance of The Joyce Centre reinforces Mohawk College's commitment to supporting a strong culture of environmental responsibility and to be a leader in environmental sustainability.

The ZCB-Performance Standard verifies that buildings achieve zero carbon operations annually.

Snapshot on performance

In 2021, The Joyce Centre generated 665,582 kWh of electricity and used 376,853 kWh, creating a surplus of 288,729 kWh. Of the energy used by the building last year, 236,066 kWh was provided by the municipal power grid and, over that same period, 524,795 kWh of green energy was used by other facilities on the college campus. The Energy Use Intensity (EUI) for The Joyce Centre during this period was 42 kWh/square metre, which is 85% lower than the Canadian national median EUI value for college/university facilities, as published by Energy Star.

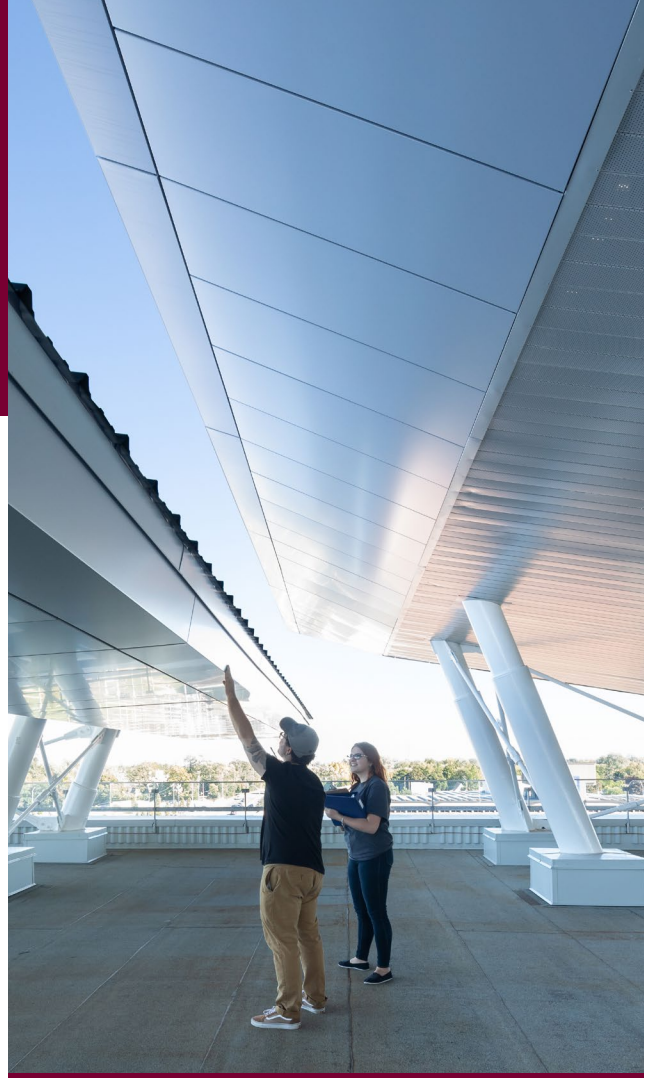
Technology

What is a zero carbon building?

The Joyce Centre showcases leading-edge environmental technologies that significantly reduce the building's carbon emissions. The building's technology includes:

- A high-performance building envelope that maximizes natural light in the building and also reduces the building's heating and cooling loads
- 1,980 solar photovoltaic panel arrays generating up to 721,000 kWh of clean, renewable electricity per year
- A solar thermal array to produce all domestic hot water
- 28 geothermal wells
- A variable refrigerant flow heat pump system
- Stormwater harvesting of up to 228,000 litres
- Sensor-controlled LED lighting
- A green roof with extensive planted areas
- High-efficiency plumbing fixtures

Taken together, these technologies make The Joyce Centre the country's largest net zero institutional building.



Did you know?

Buildings account for nearly 40 per cent of global greenhouse gas emissions.

Students have access to every part of the building, from the mechanical penthouse to the basement. Students monitor and get real-time data on the energy being generated and consumed.

Water

Large institutional buildings provide an opportunity to save thousands of litres of water every year through rainwater harvesting systems that collect, store and reuse rainwater on site.

The Joyce Centre's rainwater harvesting system is designed to collect 228,000 litres of rainwater runoff for reuse. Two cisterns are located below ground to store rainwater that is used for plumbing purposes, such as low-flush toilets, urinals, and landscaping needs.

On average, an individual Canadian uses 329 litres of water per day, mainly for uses like toilet flushing and showering. Very little potable water is actually used for drinking. Installing a rainwater harvesting system can help to reduce the use and waste of our drinkable water supply.

Understanding geothermal wells

Geothermal energy is one of the cleanest renewable energy sources available, emitting close to zero greenhouse gases, storing unneeded heat in the summer for use in the winter, and generating no noise pollution.

The Joyce Centre includes 28 geothermal wells that have been drilled into rock to a depth of 184.4 metres or 605 feet. These boreholes are, on average, four metres apart and the well field encompasses approximately 53,000m³ of volume below ground. This below-ground space is often referred to as a geoexchange well field and can store heat in the summer for extraction during the winter months when heating is needed for the building.

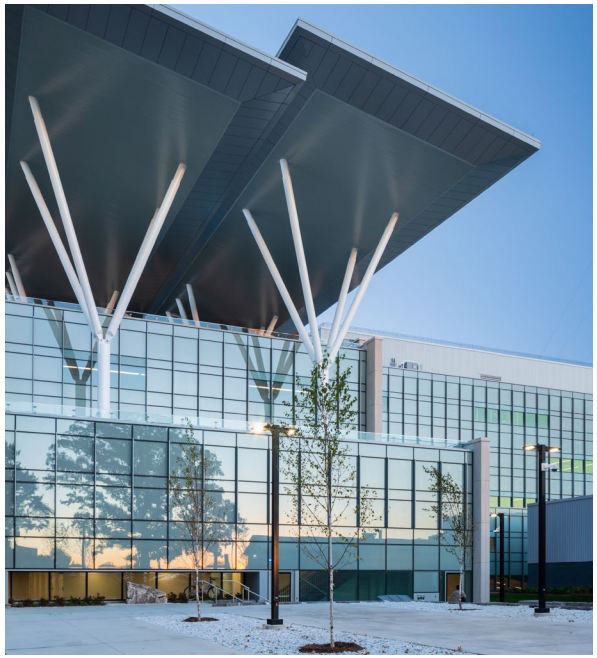
Mohawk's wells are designed in a closed-loop system, which means heat transfer fluid is circulated through a continuous loop of pipe into heat pumps located in the building. The system has a lifespan of 100 years. Each drilled well for The Joyce Centre stores enough heat for a 2,000 square foot home each year and will help offset seven tonnes of greenhouse gases.

Capturing sunlight and access to natural light

Two large steel structures on the roof of The Joyce Centre support photovoltaic arrays, with additional arrays installed on adjoining buildings at Mohawk's Fennell Campus to support the net zero performance of the building. Orientation of the building allows daylight to be captured and distributed to all levels of the building through the light well feature, located near the centre of the building.

The arrays, made up of solar cells, produce power when exposed to sunlight. That power can be used to charge batteries, operate motors, or power any number of electrical loads. The energy is free and renewable, and no noise pollution is created from operating these systems. As well, solar arrays have no moving parts, and are easily expandable and transportable.

The Joyce Centre generates 100 per cent of the energy required to power itself over the course of the year. This is achieved by generating the total yearly energy usage onsite and powering the building entirely with electricity.



An envelope design to minimize energy use

Outside and inside, The Joyce Centre maximizes green building techniques and efficiencies to meet and exceed the goals of a net zero institutional building.

The outer envelope of the building regulates the interior climate by creating an air and vapour barrier, so that the HVAC systems work a minimal amount of time—if at all.

The Joyce Centre includes two wall system designs to keep the building as airtight as possible: a rain screen glass system and an insulated opaque assembly.

The laminated rain screen glass, installed on thermal clip supports, have a mineral wool cavity. The wall layers in this system are made up of an air and vapour barrier on exterior sheathing, structural steel studs, followed by spray foam in the stud cavity, and finishing with 16mm drywall.

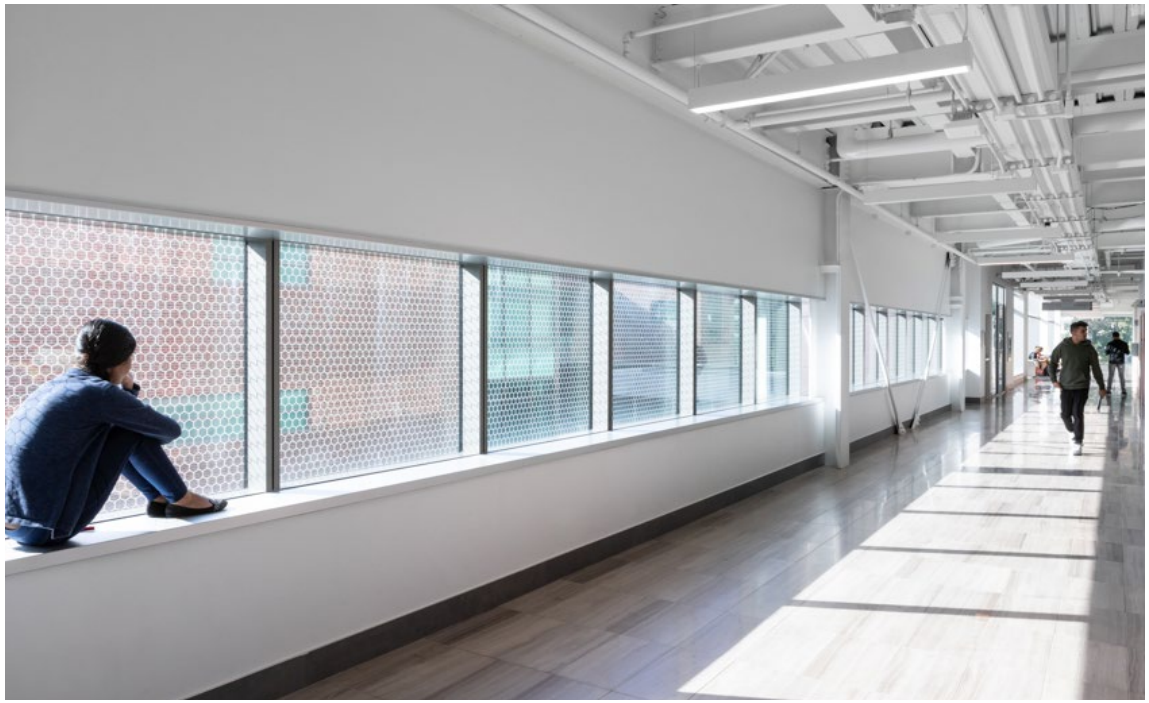
The insulated opaque assembly is a precast panel in which extruded polystyrene insulation is sandwiched between patterned concrete and board. On the interior, there is also spray foam insulation and drywall.

All windows in The Joyce Centre are triple glazed, which increases thermal performance. The roof surfaces are designed for increased thermal performance and have a highly reflective top surface.

Natural light

Let the light in!

The Joyce Centre uses natural light to reduce energy needed for lighting. Large, insulated windows allow sunlight to illuminate classrooms, labs and hallways. A specially designed central light well allows natural light to flow through five floors. Sensor-controlled LED lighting detects sunlight and will dim, or turn off, when there’s plenty of sunshine available.



Years of accolades

The Joyce Centre has been recognized locally and globally with awards and certifications beginning in 2017.

- Zero Carbon Building – Performance Certification – 2019, 2020, 2021 and 2022
  Canada Green Building Council
- Inspired Educator – Leadership – 2020
  Canada Green Building Council
- Award for Excellence Innovation in Architecture – 2019
  RAIC – Royal Architecture Institute of Canada
- Outstanding Post-Secondary Institution Award of Excellence – 2018
  Canadian Network for Environmental Education and Communication
- Institutional (Built) Category of Rethinking the Future's Architecture – 2018
  3rd Construction & Design Awards
- Award of Merit for New Institutional – 2018
  Hamilton/Burlington Society of Architects
- Zero Carbon Building – Design Certification – 2018
  Canada Green Building Council
- Engineering Project of the Year – 2018
  Ontario Society of Professional Engineers
- Environment Leadership Award – 2018
  Hamilton-Halton Home Builders' Association
- Sustainable Project of the Year – 2018
  Ontario Sustainable Energy Association
- Environmental Sustainability Award – 2018
  Alectra Energy Evolution Summit
- Innovation in Sustainability Award – 2017
  Canada Green Building Council

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Mohawk College educates and serves more than 32,500 full-time, part-time, apprenticeship and international students at four main campuses in Hamilton, Ontario and learning hubs across Hamilton through City School by Mohawk, and at the Mohawk College Mississauga Campus in partnership with triOS College. Mohawk is among the top colleges for applied research in Canada. It has been named one of Canada's top employers and greenest employers, and holds a GOLD STARS rating from AASHE for sustainability achievements. More than 165,000 people have graduated from Mohawk since it was founded.

Mohawk College is situated on the traditional territory of the Haudenosaunee and Anishnaabeg nations, within the lands protected by the Dish with One Spoon wampum agreement, a region currently home to many Indigenous peoples from across Turtle Island.

mohawkcollege.ca