DALHOUSIE UNIVERSITY

THE IDEA PROJECT

IDEA and DESIGN (New Construction) C BLDG (Renovation):
OWNER: Dalhousie University | ARCHITECT: DSRA | CONSTRUCTION MANAGER: Lindsay Construction
MECHANICAL & ELECTRICAL CONSULTING ENGINEERS: M&R Engineering Ltd
PROJECT MANAGER: Dalhousie University

D BLDG (Renovation): ARCHITECT: DRKR MECHANICAL ENGINEER: Mark Lawrence
ELECTRICAL ENGINEER: Emtech GENERAL CONTRACTOR: RCS Construction
PROJECT MANAGER: Dalhousie University

F&P BLDG (Renovation): ARCHITECT: DRKR MECHANICAL & ELECTRICAL ENGINEER: CBCL
STRUCTURAL ENGINEER: BMR GENERAL CONTRACTOR: Pomerleau
PROJECT MANAGER: Dalhousie University

THE IDEA PROJECT is a transformational $64-million investment to Dalhousie's Engineering and Architecture campus in the heart of Halifax's emerging innovation district. The Project included the upgrades of three existing buildings and the construction of two new buildings: the Emera IDEA Building (4,803 square meters) and the Richard Murray Design Building (3,683 square meters).

The Emera IDEA Building houses the ideaHUB – an advanced engineering incubator/accelerator space to equip students with the creative and entrepreneurial skills they need for the future and workshops and prototyping labs for the Faculty of Engineering.
The Richard Murray Design Building features numerous bookable meeting rooms, an auditorium, and studio space for the Faculty of Architecture & Planning.

Several sustainability features have been incorporated into all aspects of the IDEA Project development.

ENERGY EFFICIENCY THROUGH DESIGN AND SYSTEMS

BUILDING ENVELOPE

The building roof systems has an average R value of 40; the wall systems a value of 30. R-value measures the resistance of a barrier to heat flow. The higher the number the less heat loss there is. Combined with the high-performance curtain wall system, the building's envelope is dramatically more energy efficient than an equivalent code compliant commercial building. With the increased insulation and construction of the building, the HVAC and controls systems have been designed to utilize the building's mass as thermal storage, further reducing peak heating and cooling demands. The Design building has triple-glazed windows. A full building envelope retrofit of the D building was undertaken. Triple-pane windows, additional insulation, and thermally-broken connections were added throughout.

Air and water leakage can be a significant contributor to energy loss. Dalhousie air leakage standards were used to guide the water testing of wall assemblies and thermal scanning.

EFFICIENT SYSTEMS

Key energy efficiency measures include:

- Reduced lighting power density using natural daylighting, occupancy sensor controls, and LED lighting.
- A radiant heating and cooling system reduces energy use compared to air based systems by using small horsepower pumps rather than large horsepower fans.
- Heat is recovered from exhaust air and transferred to incoming ventilation air reducing heating and cooling requirements.
- All heating/cooling pumps and air handling unit fans are equipped with variable frequency drives (VFD's) that reduce the motor speed.
- "Carbon dioxide (CO2) demand-control ventilation" is utilized throughout the facility to measure the CO2 levels within each of the spaces and adjust the amount of outdoor air.
- Enhanced commissioning was performed. This includes third-party comprehensive document review.

RENEWABLE ENERGY

EARTH ENERGY: The ground absorbs energy from the sun. It acts like a battery in storing relatively constant temperatures all-year round. A test well was used before the installation to determine the thermal conductivity of the ground. A ground temperature of 10.9 was measured.

A 60 borehole geo-exchange field provides a heat source/heat sink for the IDEA and Design Buildings and nearby buildings, reducing energy use and reliance of fossil fuels for the whole campus. The field is situated in the Sexton soccer field. Each bore hole is drilled 500 feet deep. The bore hole is filled with a conductive grouting compound to prevent surface water from penetrating the underground aquifier. Polyethylene piping is snaked through the bore holes. In the pipe, a food grade glycol/water solution is used to capture energy from the ground through heat transfer. This is a closed loop system so the same solution circulates repeatedly between the building and the bore holes.

In the summer, the cooler ground temperatures allow heat to be rejected from the fluid into the near-by ground and in the winter the warmer ground provides heat to the piping fluid for heating. Near the surface, three boreholes are connected on one horizontal loop. Twenty loops are brought into the basement of the Design building to a header. From the header heating or cooling energy is extracted from the fluid through a heat pump system within the buildings. The heat pumps can provide all the cooling and 95% of the heating energy.

SOLAR PV AND ENERGY STORAGE: 469 solar photovoltaics (PV) panels are mounted on the IDEA and Design building roofs converting solar light to electricity. The system has the capacity to generate 150 kW of DC power and to deliver 125 kW of AC power through its inverters. The PV panels are ballasted mounted at 10^{o} angle to maximize energy production while minimizing shading between rows of panels. Annual electricity production is anticipated at 159,335 kWh or roughly 25% of the annual electricity needs of the buildings.

The solar PV system is connected to the building electrical system. Also connected to the building is an electrical battery energy storage system and software. This emulated micro-grid infrastructure will enable research investigation and peak saving opportunities for operations.

The L1000 Distributed Energy Storage, consists of two 92 kWh battery units with two 50 kW inverters creating a total rated storage of 184 kWh. The main chemistry makeup of batteries is Lithium Ion technology. The systems are integrated into the building automation system to improve monitoring and control.

TRANSPORTATION

The IDEA and Design Buildings are conveniently located near local transit with over 15 bus routes servicing stops within a 400 m distance. Within 180 m of the two new buildings 212 bike parking spots are located and 10 spots are located inside in the new bike room area. Shower facilities are available on campus in the Sexton Gym. An on-campus Car Share spot is located in a campus parking spot next to the IDEA and Design Buildings along with a level 2 electric vehicle charge station providing a full charge in 4 – 6 hours.

As part of the project, the Green Corridor was implemented to address storm water, biodiversity, and active transportation. At 300m the corridor serves to improve pedestrian and cyclist accessibility and safety from Spring Garden Road in the north to Morris Street in the South.

The corridor includes dedicated space and edging markings and symbols to denote the lane. Transportation counters are used on the lane to conduct ongoing research. A new pedestrian and cycling pathway through the campus replaces compacted earth and gravel at the first section of the corridor with permeable pavers and natural retention gardens. Permeable pavers include 150mm of base gravel and a minimum of 450mm of sub-base gravel; these layers are open-graded stone with approximately 20-30% void space for storage of rainwater. The subgrade is sloped to a low infiltration area.

STORM WATER MANAGEMENT AND WATER EFFICIENCY

WATER: LOW-FLOW FIXTURES AND FOUNTAIN

This facility utilizes low-flow faucets (1.9 liters per minute) low-flow toilets (4.8 liters/flush). Refillable bottle stations and fountains are prominently displayed to reduce single use containers.

RAINWATER CISTERN: Rainwater is collected from roof drains on the Design building, is filtered, and stored in a 25,000 litre fiberglass tank in the basement of the building. Rainwater is treated with UV light before it is used for toilet and urinal flushing.

GREEN ROOF: The extensive green roof, located on the Design building, provides biodiversity, heat island, and stormwater benefits. The roof is designed for testing various planting species, green roof applications, stormwater retention, and evaporative cooling trends. The green roof assembly is five inches of growth medium, and sedum plantings.

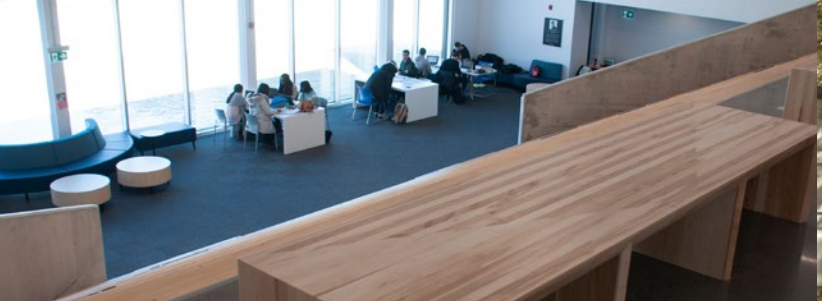
PROCESS WATER: Connected to the IDEA building are other research buildings that were using once through potable water for cooling. With the installation of the geo-exchange system, cooling is provided by this system thus reducing a significant amount of water annually.

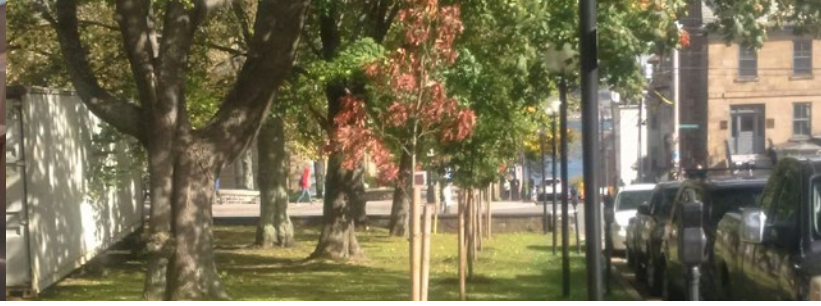
MATERIALS & WASTE MANAGEMENT

CONSTRUCTION AND DEMOLITION (C&D) WASTE AND SITE REMEDIATION

On the project close to 80% of (construction and demolition) C&D materials were diverted from landfills. This includes aggregates, wood, metals, cardboard, glass, and salvaged building components. These materials were delivered to local recycling facilities.

C&D DEPOT: Wood, metal, and concrete materials are used extensively in the academic programs of the Sexton campus. An improved and consolidated area for Construction & Demolition (C&D) wastes has been





created to make it easier to sort and store the materials for collection into the appropriate waste streams for recycling.

GREEN CLEANING AND WASTE MANAGEMENT

Green cleaning products and practices outlined in Dalhousie's green cleaning policy are used in the building. Four-bin waste management systems are used throughout the building (paper, recyclables, organics, and waste).

FINISHES

Most building finishes have zero or low emissions. These materials reduce the release of significant pollutants, such as volatile organic compounds (VOCs), into the indoor environment. As well, all manufactured wood products are produced with no added urea formaldehyde (NAF). These measures make for a healthier indoor environment.

Most wood products used throughout the building have been sustainably harvested as defined by third-party forest certification bodies, such as the Forest Stewardship Council (FSC). From harvest, to manufacturing and distribution, FSC certification is given to companies and landowners to verify that they practice sustainable forestry that is consistent with FSC standards.

BIODIVERSITY

Dalhousie has a Natural Environment Plan that requires biomass replacement. All 17 trees that come down for the IDEA project were replaced with an equal amount of biomass planted on Dalhousie campuses equalling 178 trees of 5 cm caliper.

Some of the trees on site were used to makes benches for the buildings. The bulk of the benches were made from maple, with the pattern accents in red oak.

For the stormwater retention areas in the green corridor, native plants have been selected. The plaza area "butterfly garden" attracts butterflies and other pollinators, and the Serviceberry plantings along the corridor provide food and shelter for birds.

EDUCATION

The central and subsystems of the building and the outdoor environments are used for operations, research and teaching purposes. Key features incorporated include:

- Sensors, meters, gauges have been installed to monitor electrical, water, temperature, precipitation, wind, heat, cooling, solar pv, geoexchange, wall temperatures, and car/pedestrian/cycling movement. The data from sensors and meters are integrated into building automation software that can be accessible to researchers and students in enough resolution for research.
- Green building tours are provided. A video (https://www.youtube.com/watch?v=VL6YhFg6yzQ&t=11s) about the sustainable features of the project has been created and is used for teaching, community presentations, and promotional purposes. Green building signage and dashboard have been created. Utility meter information from the building is used for ongoing energy and water management.
- Socially important building exhibits have been commissioned and installed. *Here We Are Here: Naming Names* created by artist Sylvia D. Hamilton
  – Located in the IDEA building main hallway. This installation is both a memorial and a witness to the lives of African people in Nova Scotia, from their earliest presence as enslaved people, to their experiences as free, self-directed human beings. By naming names, the work inscribes the presence of African people in the only place they have ever called home, even when that place was neither kind or welcoming to them. Early African people were architects, designers, engineers and visionaries. They had to be: their project was to imagine freedom and assert dignity.
- Artist Tonya "Sam'Gwan" Paris's work is suspended in the Design building main seating area. The piece highlights important Mi'kmaq symbols of the medicine wheel and dream catcher. The circle is symbolic of equality, where no person is more prominent than any other person.