Green Companion Guide

Doors Open Toronto 2007

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Absolutely, the Vertical Farm is just one of many ideas that can transform the world through sustainable design. And, at Autodesk, we are helping architects, engineers and designers bring those ideas to life. We support all those who envision a smarter, more efficient, greener future.

For more information, visit autodesk.com/green
Green Companion Guide Maps

Mondial Energy builds and owns solar thermal and photovoltaic sites on commercial buildings and sells the energy.

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- Lower operating costs
- No emissions
- Real-time web-enabled monitoring with web view embedded in the customer web site

Mondial Energy has built two of the most powerful solar panel arrays in Toronto—11 Coatsworth Crescent and 11 Main Street.

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- Multi-unit residential apartments, hotels, seniors’ residences
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Ask your building manager or elected official if they would like to:
- lower operating costs
- with no upfront costs; and
- no emissions.

Visit our two sites in Green Doors Open Toronto at 11 Coatsworth Crescent, a 172 suite seniors’ residence; and 2240 Queen St. East, a coin laundromat; or our website at www.mondial-energy.com.
Welcome to the greener side of Toronto!

This is the first time green buildings are being showcased as part of Doors Open Toronto, giving you a rare opportunity to gain access to more than 20 of the city’s green buildings. Guided tours will introduce you to the fascinating green stories inside, highlighting innovative green strategies such as solar panels, green roofs, living walls, geothermal heating systems and much more.

The Clean Air Partnership is pleased to have partnered with Toronto Culture to celebrate the city’s green architecture and advance our common goal of a healthier and more vibrant city. Enjoy this guide and take the opportunity to explore the greener side of Toronto.

Eva Ligeti
Executive Director, Clean Air Partnership

This guide was made possible by grants from the Toronto Fund with the assistance of the Michael and Honor de Pencier Fund at the Toronto Community Foundation.

 Doors Open Toronto’s special focus on green and sustainable architecture, in collaboration with the Clean Air Partnership, measures the creativity of our city from a new and very current perspective. Visitors will learn firsthand what goes into designing, constructing and operating a green building at over 20 venues citywide.

Rita Davies
Executive Director, Toronto Culture
www.toronto.ca/doorsopen

The Clean Air Partnership’s work is made possible by the generous financial support of the Toronto Atmospheric Fund.

Cover Photos:
Top: Biowall in Multi-Faith Centre at the University of Toronto.
Bottom: Lobby of HOK’s Office and Studio.
Page 18: Photograph by Tom Arban.
401 Richmond is a 200,000 ft² century-old tin factory that has been lovingly restored to include a courtyard, arts-enriched early learning centre, café and stunning roof garden. The building is home to a thriving community of 130 cultural producers and micro-enterprises.

A beautiful organic roof garden sits atop the building consisting of a 6,500 ft² cedar deck, resplendent with flowers, vines, and bushes – many of which have been grown from seed. There are also a number of large planters that hold trees and perennial shrubs that can over winter on the roof. The plants and flowers in the roof garden are selected for beauty, aroma and their ability to attract bees, butterflies, ladybugs, birds, and other insects.

The roof garden is a relaxing destination for summer visitors and tenants at 401 Richmond. It provides an interesting meeting place for lunch breaks, celebrations or just a place to relax in the oasis of greenery – it can be truly rejuvenating. Tenants and visitors particularly enjoy the quiet relief from urban noise pollution, as the trees and plants provide insulation from street noise as well as necessary shade.

A roof composter is used to build up the organic matter required for supporting new seeds and potted plants and a 40 foot greenhouse is a sanctuary for tropical plants that can’t stay outside over the winter and for new seedlings in the spring. The greenhouse captures heat that would normally escape through the skylights of the building to keep everything warm including a growing community of budgies who enjoy spreading their wings amongst the flowers.

In September 2005, another 2,600 ft² extensive roof garden was added covering a blank roof top to the east of the deck, creating a carpet of succulent sedum plants. There were also two small 100 ft² green roofs installed on two of the existing heritage skylights showing that no roof is too small to green!

The reuse of historic buildings is one the greenest things we can do. Using older buildings conserves energy embodied in the existing building, prevents materials from going to landfill, and foregoes the need to produce large amounts of new construction materials.

AWARD:
1999 Award of Merit from Toronto Heritage for outstanding adaptive re-use of a historic building.
The Beach Solar Laundromat is located in a 65-year old building in Toronto’s east end, and houses 21 washers and 14 dryers. When the current owner purchased the building in 2002, it was equipped with highly inefficient oil-fired and electrical systems. After a series of heating and lighting retrofits, the laundromat has become one of Toronto’s most energy-efficient buildings and one of the city’s most profitable laundromats.

Eight solar thermal panels were installed on the roof of the building to heat water for the laundromat, potable water for the second floor apartment, and to provide space heating in radiators. As a result natural gas consumption was reduced by more than 30% and revenue has grown an astounding 200% over 4 years.

A new, high-efficiency lighting system was also installed, which consists of fluorescent tubes under an aluminum reflector. The reflector essentially doubles the amount of light output. As a result the lighting bill has been reduced by 72%, yielding cost savings of $650 annually. This paid for the new lights in approximately two years. A unique air conditioning system emits no exhaust heat and does not use any refrigerants. The laundromat has succeeded in reducing harmful emissions by 40% and lowering utility expenses by over $9,500 per year.

All the heating and cooling processes are controlled by thermostats, and a sophisticated measurement system calculates how much natural gas has been saved by using solar energy. This system is connected to the Internet and can be monitored online at: www.bslvideo.com. The Beach Solar Laundromat is an inspiring example of how green initiatives can become profitable ventures.

AWARDS:
2004 Best Small Business in Canada for Pollution Prevention
2004 Best Greenhouse Gas Emission Reduction Project in Canada
2004 Bremen Partnership Award (Germany)
Bloorview Kids Rehab is Canada’s largest children’s rehabilitation hospital. As a provincial facility it sees more than 7,000 children and youth on an outpatient basis, and has over 600 inpatient admissions each year from across the province, across Canada and around the world. In 2002, they partnered with the University of Toronto to become Canada’s first teaching hospital in children’s rehabilitation. In 2006 they broke the institutional mould by opening a new state-of-the-art facility that sets the standard for universal accessibility. The beautiful new building draws on timeless elements such as stone, wood, and glass, and incorporates a number of green strategies. The building is situated on 11 acres of land adjacent to the Don Valley, connecting cityscape and the natural surroundings of the ravine. Many of the mature trees on site were carefully protected during construction to ensure that they will continue to flourish beside the new building. Covering more than 1,900 ft², the building’s green roof is an extension of its natural surroundings. Planted with wildflowers and grasses, the green roof is visible from the waiting area on the second floor. Rain sensors are used to monitor irrigation and water the roof as needed. Rainwater is collected from the roof, balconies, and from the north side of the building in a large underground storage tank with a capacity of 114,000 litres. The water is fed into the facility’s underground irrigation system and is used to water all grassy areas, planters and the green roof.

The new facility makes use of several air-handling units that have heat recovery "wheels". These capture heat before it is discharged outside and pre-heat the incoming air. Waste heat is also recovered from the air conditioning system and is then used to offset heating costs for the swimming pool. High efficiency fan motors were also installed as many of the building’s systems operate close to 24 hours per day.

The main solar panel array is located on the flat section of the facility’s roof, which will offset the facility’s energy requirements from the grid. A smaller panel array is located on the garden storage shed. Other energy-saving features to look out for include: light sensors that automatically turn off lights when a room is not in use, thermally glazed windows, and LED energy-saving light bulbs.
Sixty (60) solar thermal panels were recently installed on the roof of 11 Coatsworth Crescent, a 174-unit residential building run by Neighbourhood Link Homes (NLH). This non-profit social service agency recently signed an energy purchase agreement with Mondial Energy Inc., allowing it to buy clean, renewable energy without any upfront capital costs.

The solar array is currently the largest solar set-up in the City of Toronto. It is expected to generate 134,000 kWh of power annually, and will be used to offset natural gas consumption for domestic water heating. The solar panels capture the radiant energy of the sun, and use this energy to heat the water for showers and sinks in the building. Large tubs of water in the rooftop mechanical room are warmed during the daylight hours and deliver heat during the evening and night. Energy savings accrued through the use of solar energy are expected to be $10,200. The actual amount of energy produced by the solar array is remotely monitored and can been seen online at www.mondial-energy.com.

Mondial commissioned and funded the solar array, and will own and maintain the system for the next ten years. NLH is billed each month for the delivered energy, according to a fixed rate. If the system fails in any way, or even if the sun doesn’t shine, there is no energy charge.

The innovative arrangement between Mondial and NLH has allowed a non-profit agency to pursue cleaner methods of energy production and manage its costs. Because the solar array is actually owned by Mondial, NLH did not have to put forward any capital costs to have the system installed. They have also taken on very little risk as Mondial will be responsible for the ongoing maintenance of the solar system, and only bills for delivered energy.
The 24-storey Element condominium building is Tridel’s first completed green condo. As Toronto’s largest condominium developer, Tridel is striving to build more energy-efficient buildings and healthier living environments.

Element is the first residential building connected to Enwave’s deep lake water-cooling (DLWC) system, which will result in 20% energy savings when compared to a conventional high-rise condominium. DLWC is the largest system of its kind in the world. It consists of three massive pipes that extend 83 metres below the surface of Lake Ontario and extract water from its depths, where the temperature is a consistent 4°C. By way of an energy-transfer station, cold-air energy is extracted and distributed to Element for air conditioning.

Element is the first residential development to achieve the elite energy performance benchmark of Natural Resources Canada’s Commercial Building Incentive Program.

In order to improve indoor air quality, the suite has low volatile organic compound paints, wall coverings, adhesives, coatings, fabrics, and furniture. There is also an in-suite energy recovery ventilator that provides continuous filtered fresh air directly into the suite while being energy efficient.

The suite also includes other environmentally friendly products such as FSC-certified flooring, shelving and wall panelling, FLOR (Interface) carpets, recycled glass and quartz countertops, organic linens, and custom crafted furniture including a dining room table made out of salvaged wood from Tridel’s very own development site in Scarborough!

The suite serves as an educational facility with signage located throughout the rooms to explain the environmental benefits of each product.

Eco-suite at Tridel’s Element Condominium

20 Blue Jays Way | Saturday: 10:00 am – 5:00 pm | Sunday: 10:00 am – 5:00 pm

The model eco-suite features low-flow faucets, low-flow high-pressure shower heads, an Energy Star™ double drawer dishwasher, an Energy Star washing machine, and dual flush toilets that reduce water consumption by 40%. It displays other energy efficient features such as LED lighting, which will reduce overall electricity consumption by an estimated 81,000 kWh annually.
HOK is an international design firm with offices in Toronto, Ottawa, and Calgary, that is firmly committed to sustainable design. The company strives to practice what it preaches and has a policy of upgrading to LEED standards whenever any of its 25 offices are relocated or substantially renovated.

The criteria for gaining LEED certification includes a number of factors including proximity to public transit, windows that can open and close as weather dictates to save on heating and air conditioning, use of environmentally sound materials and as much use as possible of recycled materials.

HOK’s office and studio (25,000 ft²) are located on two-thirds of the 5th floor of a 10-storey building in Toronto’s business district. A major factor in the site selection was the landlord’s agreement to allow the installation of operable windows, bringing fresh air into the studio. Enclosed offices and meeting rooms, located at the interior of the space, have glazed walls to admit natural light as well as motion sensors which turn lights off when these rooms are no longer occupied.

To protect against fumes and pollutants, office equipment such as copiers and printers are in separate closed rooms with negative air pressure to ensure the fumes do not escape.

All paint and carpeting and other materials are free of noxious fumes, and all new furniture products are GreenGuard certified.

Over 30% of construction materials contained recycled content, and more than 45% of materials were locally manufactured. The company even made use of lighting and ductwork left by the previous tenant and recycled over 18,000 pounds (or 85%) of construction waste instead of having it trucked to a landfill site.

HOK uses Green-e certified renewable energy provided by Ontario Power Generation, where 75% of electricity is provided by renewable sources such as wind, water and landfill gas. Overall, power consumption in the offices has been reduced by about 45% compared to a standard design.

The office is one of the first in Canada and the first in Toronto to achieve LEED-CI Gold certification. HOK has recently expanded its studio to occupy the rest of the 5th floor. The new space has been constructed to LEED-CI standards and is expected to be certified LEED-CI Gold.

AWARDS:
2006 ARIDO Commitment to the Environment
2006 IIDA Metropolis Smart Environment Award
2006 Out of the Box Awards, Building Magazine
Exhibition Place is striving to be energy self-sufficient by 2010 and is keen to promote environmental technologies along the way. With a host of world class events and thousands of visitors every year, Exhibition Place is the ideal venue to promote green technologies.

In August 2006, the Horse Palace at Exhibition Place became home to Canada’s largest single solar photovoltaic (PV) installation, with an output of 100 kilowatts, to demonstrate the effectiveness of solar technologies in an urban environment. Once the pilot has been completed, Exhibition Place plans to expand the installation to 1.5 to 2 megawatts (15 to 20 times larger than the pilot).

The PV installation generates roughly 120,000 kWh of electricity annually, enough to power up to 35 homes. It reduces greenhouse gas emissions by 115 tonnes annually, which is equivalent to annual carbon dioxide absorption of almost 1,600 trees. By using solar power, Exhibition Place will save more than $10,000 in hydro costs a year.

The Horse Palace is also home to a 2,500 ft² meadow as part of the City of Toronto’s goal to green 6% of the city’s rooftops. The green roof will help reduce the urban heat island effect, reduce storm water runoff as the meadow soaks up the water, and improves building insulation by preventing heat from moving through the roof into the building.

The Exhibition Place is also home to North America’s first urban wind turbine; a hydrogen re-fuelling station; a tri-generation plant; a geothermal heat pump (to be installed this fall); and a variety of building retrofits. A consultant’s study to advise Exhibition Place on the next steps towards self-sufficiency will be undertaken this fall.

**AWARDS:**

At the 2006 Recycling Council of Ontario’s Waste Minimization Awards ceremony, Exhibition Place won a BRONZE in the Facility Management Category, SILVER in the Sustainable Technology Category and GOLD for the Board’s across-the-grounds Waste Diversion Program.
This private residence is contemporary, modest in scale and incorporates a remarkable number of green building strategies that enhance its clean and elegant style. 328 Euclid Avenue is an urban infill site in downtown Toronto that sits 2-storeys high atop a day lit basement. At approximately 1,550 ft², all spaces were used to maintain a small footprint on the lot.

The main floor has an open floor plan with large sliding doors at the front and back. This coupled with a 12 foot ceiling contributes to the feeling of a generous interior larger than its actual size. Large windows and a 13 foot skylight allow for excellent natural light throughout the entire house, which helps to moderate the long dark Toronto winter and reduces the need for artificial lighting.

There is no air conditioning in the house. Instead, ceiling fans are used and the building design ensures effective cross ventilation.

Large trees were planted to the east and west to provide shading, which further cools the interior of the home.

The house contains a water-based radiant floor heating system, with supplemental heat provided from a wood burning stove. All of the hot water is supplied by an "on demand" hot water boiler, manufactured in New Brunswick.

Much of the building materials were locally sourced. The exterior cladding of the home is clear, rough cut local pine, reclaimed Douglas fir was used for the furniture and counter tops, and the main washroom vanity is a recycled Steelcase office desk.

All stormwater is handled on-site, thanks to the "working landscapes". All roofs are planted and native grasses, ground cover and heritage tomatoes grow in the front and back yards. There are no lawns on the property. One of the green roofs is visible from the master bedroom, bestowing a sense of quiet and calm.

**AWARD:**
2007 Ontario Association of Architects Award of Excellence

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**Levitt Goodman House**

_328 Euclid Avenue | Saturday: 12:00 pm – 5:00 pm | Sunday: 12:00 pm – 5:00 pm_
The Metro Label Group is a leading manufacturer of pressure-sensitive labels for the food and cosmetic industry. Recognized as one of Canada’s 50 Best Managed Companies for 2005 and 2006, its new 132,000 ft² printing facility contains label press equipment, adjoining office space, truck loading docks and parking. The building provides a superior indoor work environment with minimal impact on the external environment.

The Metro Label building design has led to annual energy cost savings of 28% when compared to a building built to the Model National Energy Code for buildings. The HVAC system includes high efficiency mechanical equipment, energy and heat recovery ventilators, demand control ventilation (CO²), and high efficiency rooftop units.

A high priority for the company was to reduce the impact of the printing process. To accomplish this exhaust heat is re-used to heat the building, and energy use has been reduced significantly.

The building shell incorporates increased insulation in the roof and walls and high-performance, double-glazed, argon-filled, thermally-broken windows are used. Occupancy sensors control the amount of lighting.

Emissions from process equipment were significantly reduced by replacing solvent-based inks used for the labels with UV and water-based inks, thus reducing volatile organic compound emissions. Process exhaust air is filtered by MERV 13 filters to reduce particulate emissions, resulting in an 85% reduction.

Concern over indoor air quality led to the selection of office furniture and seating certified by Greenguard Certification ProgramSM. Low-emitting adhesives, sealants, paints and coatings were used by all trades and the carpeting passed the Carpet and Rug Institute’s Green Label certification.

Metro Label installed a 10 m³ rainwater cistern to collect water for use in toilets. Ultra low-flow fountains and faucets and waterless urinals further reduce water requirements, leading to projected water savings of over 63% annually. Drought resistant vegetation was used for landscaping, which minimizes the need for watering.

Committed to a strong waste management program, 54% of construction and demolition waste was diverted from landfills. Building components with high recycled content were selected where possible, and locally sourced and manufactured materials comprised over 36% of the project material cost.
Opened in 1998, the Toronto Mountain Equipment Co-op (MEC) store is the co-op’s first green building. The four R’s – reduce, reuse, recycle and rethink – guided the design and construction of this 42,000 ft² facility.

The MEC building reduces energy use for heating and cooling as well as water consumption. Some of the lights are automated, turning on when it is overcast outside, and off when it is bright. Numerous windows and skylights allow for plenty of natural light and ventilation, reducing energy use, and computerized windows are used to control store temperature.

Material use was also reduced as the building does not have a “false ceiling”, which is typically suspended from the actual ceiling. This is a simple reduction of what MEC believes to be unnecessary materials. As a result all heating, cooling and electrical mechanics are in full view, reminding us of what it takes to operate a modern building.

One of the more prominent features of the MEC building is its wooden front. The beams and supports were cut from logs once waterlogged and sunk to the bottom of the Ottawa River. The wood was reclaimed, air dried, and cut, avoiding taking down living trees. The support beams and planking on the window sky-light area came from the Marconi Building in Montreal, which was torn down. The gravel used in the poured concrete of the building’s foundation was made by crushing old concrete taken from building sites that would have ended up in the landfill.

The metal used on the main stairway within the building was made from recycled automobiles. Metal is one of the most recycled materials in the world and is readily available and reasonably priced. The carpet is 100% recycled and was purchased locally, from a company just down the street from the MEC facility.

The building also has a beautiful 10,000 ft² green roof planted with native grasses and flowers. The green roof provides habitat for birds, bees, and butterflies, keeps the building cool in the summer, and keeps heat in during winter. The green roof also retains a remarkable 75% of the rain water that falls on it, thereby diverting stormwater runoff from entering the municipal sewer system.

AWARDS:
2005 – 2009 BOMA Environmental Excellence Award
2006 Green Toronto Award for Environmental Awareness
The Ravina Project is a fascinating experiment in residential renewable energy and off-grid living. The project is being carried out in an 80-year old house in one of Toronto’s older east-end neighbourhoods, and is on the verge of becoming one of the first homes in Toronto to generate all its electrical power using its own resources.

Several upgrades were made to the house to improve its energy efficiency, such as adding insulation to the attic and basement and replacing the old windows with modern double-pane glass. The old oil furnace was replaced with a computer controlled boiler, no bigger than two breadboxes. Using natural gas, the boiler provides hot water to heat the house, and heated water on demand when a hot water tap is used within the house. The boiler operates at an astounding 95% efficiency.

Perched on the roof of the house is a 1,500 watt solar array that provides power for the house on a daily basis, charges the storage batteries, and exports excess energy into the grid. There are two remarkable features of this solar set-up: it is comprised of "off the shelf" technology that everyone has access to; and it is designed to be tiltable to maximize the amount of energy it retrieves from the sun. The panels can move from a flat position, parallel to the ground to a raised position at an angle of 70°. The array is fully programmable and can be remotely adjusted to match the position of the sun on an hour by hour basis. This allows the array to eliminate any power loss due to a poor elevation angle of the sun. Today, depending on the time of year, the house can operate for several days on power generated by the solar array and storage batteries.

The next step for the Ravina Project is to install a 1.8 kilowatt wind turbine atop a 25 metre tower. The project leaders are currently seeking sponsors to fulfill this portion of the project. Using the house as an experimental test bed the Ravina Project will generate and publish a wide range of data, test new theories to increase the efficiency of solar power generation, and produce technical papers across several disciplines. Initial results using the new theories are very promising. Nine (9.0) kWh were generated on March 29, 2007 with many days over 8.0 kWh in March and in February, which is remarkable for the time of year and size of system.
The building at 743 Queen St. E. has been a grocery store, a burger joint, a lawyer’s office and it recently served as the Regal Hand Laundry in the film Cinderella Man, its big screen debut. Now, this 120-year old building is being converted into mixed-use space, containing one storefront commercial unit and three residential condominium units with shared amenities. It is also poised to be one of the greenest buildings in the city.

To improve energy efficiency, reduce heating and cooling costs and reduce noise pollution, extra high levels of insulation (nearly twice the building code requirements) were installed. Heating and cooling is provided through earth energy, a fascinating technology that is still rarely used in Toronto. In the winter, a ground source heat pump will take heat from five 195 foot deep ground wells under the building to warm building spaces. This process will be reversed in the summer to cool spaces. The heat pump operates at 400% + efficiency (meaning for every 1 unit of energy in, 4 units of energy are created for use in the building), compared to a maximum of about 95% for new natural gas systems.

The sun’s energy is harnessed to pre-heat domestic hot water via four vacuum tube collectors on the roof of the building. When solar energy is low, a tankless hot water generator creates hot water on-demand, which will be as much as 60% - 70% more efficient than a typical hot water tank system.

The building utilises two types of energy recycling technologies. The drain water from showers is run through a heat exchanger, and 60% - 70% of the heat going down the drain can be transferred into the cold water, reducing hot water demand. Air from exhaust fans runs through an energy recovery ventilator, and heat and humidity from warm air inside the building are transferred to cooler outside fresh air being brought in. This process is reversed in the summer, minimising the need for air conditioning.

Later this summer, the building will be completed with the addition of a green roof, covering more than half of the building’s roof. Residents of 743 Queen St. E. are also eligible for a discounted AutoShare membership, making access to an automobile easy and affordable.
The Robertson Building is a restored factory/warehouse that is home to a cluster of community businesses, entrepreneurs, and non-governmental organizations, including the Centre for Social Innovation. Built from 1911 to 1913, the 5-storey 100,000 ft² building was purchased by UrbanSpace Property Group in 2002. Two years was spent restoring the building to its former historic beauty and innovative green elements were included in the renovations.

In March 2004, a 250 ft² plant wall (biowall) was installed in the lobby of the building. The biowall is composed of several varieties of native and exotic green and flowering plants that are snuggled into their own individual pockets in a blanket of special planting material that allows water to filter through the plant roots. The plants were all selected based on their tolerance to limited natural light, as well as their ability to reduce indoor air contaminants. Common air contaminants include toluene, benzene and many other volatile organic compounds generated from the off-gassing of furniture, paint, and drywall but, in this application, most contaminants come directly from the steady flow of traffic on Spadina Avenue.

The biowall runs independently of any mechanical systems in the building and requires very little maintenance; just a bit of dusting, pest control, and the occasional removal of any dead or wilting foliage.

To assist in keeping the biowall healthy, there are two one-thousand watt light systems that provide some seasonal UV light. The lights come on at night using off-peak energy supplies throughout the year.

In June 2004, a 4,000 ft², extensive green roof was installed over half of the Robertson roof. The green roof is supported by five inches of organic, light-weight planting media with over 10 plant species native to Ontario growing in the unique soil. To complement the green roof, a greenhouse and cedar viewing deck were installed so that tenants and special guests can enjoy a spectacular skyline view of the city as well as proximity to this roofscape environment. The extensive green roof provides several other important environmental benefits to Toronto including; a habitat for birds, insects and other plant species; a micro-climate that reduces the "urban heat island" effect; the retention of storm water when it rains preventing sewer overflow into Lake Ontario; the reduction of air pollutants by trapping and degrading contaminants; and protection of the roof membrane from harsh temperature changes, thereby increasing the longevity of the roof.
St. Gabriel’s church has been designed to embody the eco-theology of Passionist Father Thomas Berry and his belief that the most important challenge of our time is to establish a mutually-enhancing human-earth relationship. To meet this challenge, the entire building process from design through construction was rethought to help reduce the project’s ecological footprint.

In contrast to most churches that are inward-focused, the entire south façade of the worship space at St. Gabriel’s is glazed with clear glass. This has been done to passively harness the winter sun’s energy and extend the sacred space of the worship area into the garden and world beyond. The "green roof" garden over the underground parking, with its drought-tolerant plants and drip-irrigation system, reduces potable water use by 78%. Waterless urinals, dual flush toilets, and solar-powered low-flow faucets provide an additional 47% water reduction for an annual savings of $3,000.

Maximizing insulation values; specifying highly efficient mechanical systems that incorporate heat recovery methodologies; the supplemental use of passive solar heating; maximizing natural ventilation and daylighting; use of room occupancy and daylight sensors to control electrical lighting; use of high-performance glazing systems, and incorporating a "living wall" of tropical plants to purify and condition the air are all strategies that have been used to achieve 50% energy use reduction for an annual cost savings of $22,500. The parish also purchases power from a renewable energy supplier.

Other notable achievements are the incorporation of 15% recycled materials, 10% salvaged content, 30% regionally produced content, and the diversion of 59% of construction waste.

As part of their ongoing commitment to educating others, the parish has installed an interactive computer kiosk in the narthex explaining the various sustainable design features employed. Coloured brochures, essays on their website, frequent tours, and presentations round out their commitment to contributing to a greener Toronto.

AWARD:
2007 Green Toronto Award for Green Design
SAS is the world’s largest privately held software company providing business intelligence software to clients around the world. The company’s Canadian headquarters building is an 8-storey structure, with retail space on the first floor, and seven floors of office space. While many green buildings set out to achieve LEED certification, SAS Canada was primarily interested in creating a positive work environment for its employees. The software company spoke to their staff about what they wanted in a work environment, and delivered a building that provides fresh air, natural light, bright comfortable spaces, and access to public transit.

Floor-to-ceiling glass walls on the south and west walls are blue tinted with low-e glazing to allow sunlight in with minimal heat gain. The top floors of the building have a central atrium that brings natural light into the centre of the building, as well as opening up the entire top three floors to each other.

All office space contains an under-floor air distribution system, which saves on energy costs and provides the highest possible level of individual environmental control for each occupant. The system circulates air five to six times faster than a normal system, so that if someone sneezes, the system will pull that air out five to six times faster.

All rainwater from the site is collected in tanks in the lower level of the building. The water is treated and re-used to provide flushing of washroom fixtures. This prevents stormwater from entering the municipal sewer system and reduces the need for potable water by almost 50%.

The roof surface is covered in a white membrane that reflects solar energy to reduce the urban heat island effect, and reduce heat gain in the building. As a result, air conditioning costs are lowered.

Other green features include high-technology elevators that use 50% less energy and the use of recycled material. Overall, the building consumes 30 to 50% less energy than a comparable building of typical design.
Steam Whistle Brewing is housed in the CPR John Street Roundhouse, which was built in 1929 to service steam locomotives hauling trains in and out of Union Station. Back then, the Roundhouse was the first to use a new clean air and energy conservation method, called “the direct steaming system” which improved locomotive maintenance, reduced fuel consumption, and lowered smoke inhalation by workers.

Today, the building remains an architectural gem with paneled glass windows and hand-hewn wooden beams. Steam Whistle kept many of the original features through thoughtful renovations prior to it opening its doors in May 2000, and has also incorporated environmentally-friendly measures into its brewing and operating processes.

Rather than using conventional air conditioners that rely on mechanical chillers using harmful CFC refrigerants and enormous amounts of energy, Steam Whistle Brewing has opted to use Enwave’s Deep Lake Water Cooling. This system uses 90% less energy than conventional air conditioners, eliminating 61 megawatts from Ontario’s electricity grid – the equivalent of the energy needed to supply 6,800 homes. It also removes 79,000 tonnes of carbon dioxide from the air, which is equivalent to taking over 15,800 cars off the road.

Steam Whistle also uses steam heat from Enwave’s Centralized Steam Plant to boil water in brewing, to wash its beer bottles, to heat its building, and to sound-off its functioning steam whistles! This efficient heat system eliminates the need for a boiler on site.

The brewery is powered by Bullfrog Power, the first 100% green, carbon-free electricity retailer in Ontario and its fleet of delivery vehicles is fueled on bio-diesel.
The Thomas L. Wells Public School is the first of a new generation of high performance, green schools by the Toronto District School Board. This is the first LEED Silver-certified school in Canada and is most notable for its seamless integration of architectural design and environmental sustainability.

Classrooms face south and are laid out to maximize solar exposure. Their façades are designed to both maximize daylight and provide sun control through the use of light shelves. These shade against the high summer sun, however, in the winter they reflect the low sun deep into the building. A combination of high and low window vents provides passive ventilation as an alternative to mechanical cooling and sensors turn off unneeded classroom lights. Teachers have attributed greater student alertness, better behaviour, and higher morale in part to the increased natural lighting.

Each classroom is situated around a shaded courtyard to provide students with a connection to the outdoors. The gym in particular was designed so that the windows maximize daylighting and lend a feeling of being outdoors.

The pre-cast concrete floor and masonry structure provide thermal mass to harvest winter solar energy and prevent summer heat build up. The cores in the slabs function as return air ducts for the unique displacement air ventilation and radiant floor heating system. Heat in the return air stream is recovered in the central plant along with exhaust heat from the bathroom and service room. Durable materials used throughout promote long term sustainability as well as improve indoor air quality.

Energy use throughout the building is 40% less when compared to a similar structure of standard design.
In September 2006, Toronto Botanical Garden officially reopened after a $7.2 million revitalization project and is proud to feature The George and Kathy Dembroski Centre for Horticulture, which showcases environmental sustainability and architectural beauty. The building exhibits an impressive 8,100 ft² glass pavilion that houses offices, event and educational spaces, a library and garden shop.

One of the most striking features of the pavilion is its sloping green roof. Half of the roof area is planted with drought-resistant sedums and the other half with native wildflowers. The green roof minimizes heat gain through the building’s roof and reduces the urban heat island effect. Stormwater runoff from the roof is collected in a cistern and fed into the garden’s irrigation system.

Landscaping materials around the pavilion were chosen for high reflectivity, further reducing the build up of heat. In addition, absorbent landscaping surfaces were used to soak up rainwater where it falls. The combination of the green roof, two 30 m³ rainwater cisterns, and soft landscaping surfaces results in a remarkable 37% reduction in stormwater runoff.

Indoor air quality was made a priority by specifying building products and finishes that do not off-gas volatile organic compounds. Natural beauty comes indoors, as the design of the building allows for exceptional daylighting. All interior spaces are drenched with filtered natural light and have a line of sight to the outdoor landscapes and the vast sky above.

Potable water use within the building has been reduced by 21%. This is achieved through the use of low-flow plumbing fixtures, a waterless urinal, and low-flow lavatories.

Approximately 90% of the demolition materials were diverted from landfill sites. The architect was able to salvage and reuse most of the existing material and much of the unused portions were taken offsite to be recycled.

The new addition and the existing building combined use 30% less energy than a building built to current energy standards. The building shell is well insulated and new windows are high performance (argon-filled double glazed low-e glazing). The mechanical system consists of high-efficiency mechanical equipment, including an energy recovery ventilator. Both building ventilation and lighting are automatically controlled by occupancy sensors: fans and lights are activated only when interior spaces are in use.

AWARDS:
2007 Water Conservation Award, Landscape Ontario
2006 Landscape Architecture Design Award, The Design Exchange
2006 Green Toronto Award for Green Design
When entering the atrium of the Guelph-Humber building, one immediately notices the magnificent 4-storey living, breathing wall. The biowall measures 10 metres wide by 17 metres high for a total surface area of 165 m², and is comprised of hundreds of orchids, ferns, ivy and hibiscus plants. The wall acts as a biofilter, effectively breaking down hundreds of different chemicals found in indoor air.

The living wall is connected to the building’s air handling system, which draws dirty air over the root zone of the plants. Tiny microbes live on the plant roots, which take common indoor air pollutants such as formaldehyde, toluene, and benzene and transform them into harmless water and carbon dioxide. While the plants themselves have little impact on the contaminants, they provide the appropriate environment for the microbes to work effectively. The cleaned air is then distributed by the building’s air handling system.

Another key feature of the wall is its potential to reduce costs. Most buildings maintain indoor air quality by bringing in fresh air from the outside through ventilation systems. In the winter, this air must first be heated to room temperature, and in the summer it needs cooling. This can amount to 10% of a building’s total energy consumption.

A biofilter can significantly reduce the need to bring in fresh air by generating clean air indoors. And unlike conventional filters, the living wall does not become saturated as the microbes actually break down the contaminants rather than simply soaking them up.

The positive psychological effect of plants on people was another reason to install the biowall. Many studies have shown that greening indoor space can reduce absenteeism and increase productivity.

**AWARD:**

2005 Award of Excellence for Innovation in Architecture from the Royal Architectural Institute of Canada
The Bahen Centre is a state of the art facility for education of information technology professionals in electrical and computer engineering, computer science and IT research. As a computer science facility it requires an enormous amount of energy to both power equipment and keep it cool. In keeping with the University’s sustainability goals passive and active strategies were used to increase the energy efficiency of the building and minimize its impact on the surrounding landscape.

The large computer labs, which require a space with minimal glare and tend to generate a significant amount of heat, are located on the building’s sparingly glazed and heavily insulated north side. Lounges and faculty offices face south and east, allowing occupants to enjoy the winter sun. These same spaces are shaded in the summer through a system of louvered shading devices, which significantly reduces the need for air conditioning and generates cost savings of up to $60,000 per year. The building is also ventilated naturally and uses the atrium as a thermal chimney.

Other green strategies used include the retention and recycling of stormwater, the use of low-flow plumbing fixtures, and a raised floor plenum that allows for maximum flexibility and highly efficient displacement ventilation. Exposed concrete ceiling slabs serve as thermal mass for heat retention.

The Bahen Centre is also located next to the University’s central steam plant, which provides 100% of the facility’s heating requirements. A heat exchanger is used to recover heat from the steam plant’s chimney for the Centre.

Another important and visible contribution to sustainable design is the landscaping around the Centre. The project replaces an asphalt-paved parking lot and service yard with half a million square feet of usable space and three distinct landscaped courtyards.
The remarkable diversity of the student population at the University of Toronto brings with it a variety of spiritual beliefs and practices. In response, the Multi-Faith Centre was established to support the spiritual well-being of students, staff and faculty. The centre’s 2-storey space features a Main Activity Hall for prayer and worship, a meditation room with separate women’s and men’s ablution rooms, meeting and multi-purpose rooms, private offices for spiritual consultation and a resource centre. The design style does not reflect any one religion but creates a universal spiritual esthetic that inspires divinity, civility and tolerance.

The Multi-Faith Centre is an adaptive reuse of an existing building. The building envelope has been improved with the addition of a new light-coloured roof surface. Light colours reflect more solar radiation than dark colours thereby reducing heat gain in the building. This translates into a reduction of energy needed to run the HVAC system and increases the life expectancy of the units.

The Centre also has a beautiful 2.5 metres high by 7 metres wide living wall that effectively removes indoor air contaminants and improves the living environment. The system is a vertical hydroponic wall made up of ferns, mosses and a range of other flowering and foliage plants. Air is actively drawn through the green wall of plants and highly specialized microbes actively degrade pollutants in the air into water and carbon dioxide. The clean air is then distributed throughout the space by a mechanical ventilation system. Up to 3,000 ft³ of air can be cleaned per minute. The biowall growth lighting is run on a night cycle to reduce daytime electrical load.

The flooring used in the mediation and multi-purpose rooms, the quiet room and the Main Activity Hall is 100% post industrial recycled content and was finished with oil, as opposed to more conventional sealers that are high in volatile organic compounds (VOCs). In keeping with the University of Toronto’s standards the carpet is also low in VOCs and is 100% recyclable. All of the artificial lighting is high energy efficient, T5 fluorescents.

The building is also easily accessible by transit, and its front door is located on an internal pedestrian street. Secure bike racks will be installed this spring to encourage cyclist use of the neighbourhood.
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