Sustainable collaboration

An integrated design approach produced an ultra-green facility for Toronto and Region Conservation Authority

By Pamela Young

Santiago Künzle of Montgomery Sisam Architects is dangling a piece of toilet paper over a composting toilet and smiling triumphantly. "Look at that," he says as an unseen force sucks the ribbon of paper against the inner rim of the seat. "Routing the building's air exhaust system through the composting units creates negative air pressure, and that's why there's no smell." The toilet paper demonstration may not be the most elegant stop on a tour of the **Toronto and Region Conservation Authority's Restoration Services Centre** in Vaughan, Ontario, but it's a memorable illustration of how the building's systems have been carefully integrated to create a pleasant workplace with a minuscule environmental footprint. The Restoration Services Centre's ultra-green – and yes, odourless – washrooms are linked to a septic system and contribute no sewage to the municipal pipeline.

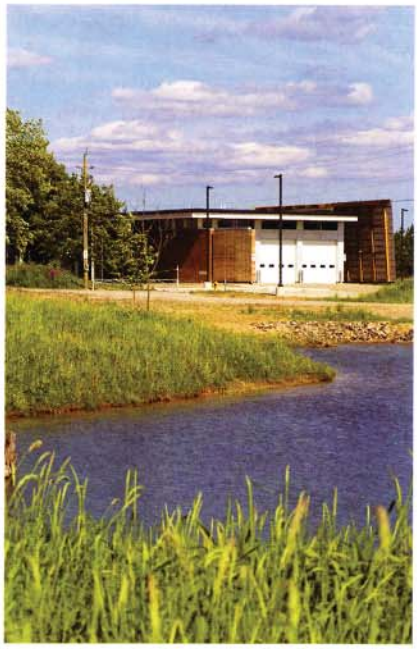
Toronto and Region Conservation Authority (TRCA) was founded in 1957 to conserve and manage the natural resources of the nine watersheds in a region that stretches slightly beyond Toronto's borders. On TRCA's Living City Campus northwest of Toronto, LEED Gold is the minimum standard for new construction. The 11,800 sq.-ft. Restoration Services Centre, which opened earlier this year on the property, is now close to achieving LEED certification, most likely at the Platinum level. The building's projected annual energy cost is half that of a comparably sized conventional building. It uses no offsite water for sanitary services and its potable water consumption is one-sixth that of a conventional building. Along with the composting toilets, waterless urinals and low-flow faucets and showers minimize water consumption. Non-potable water is drawn from on-site ponds; the ponds are replenished with filtered storm water runoff.

The Restoration Services Centre was designed by Montgomery Sisam Architects of Toronto, with sustainability consulting by Enermodal Engineering of Kitchener, Ontario. The facility is, as principal and LEED AP Mr. Künzle says, a small building with a complex program. It provides office space for management and the field personnel of TRCA's tree nursery and is designed to accommodate large seasonal staff increases; it includes garages, storage space and support space.

The oblong building is oriented so that its long sides face directly north and south. Workstations for the office workers, who are in the building most of the time, are concentrated in the generously glazed southeastern section; the west edge, where the garage located, is the most opaque façade. West facades are particularly susceptible to heat gain in the summer months, so keeping this edge narrow and unglazed – apart from an overhang-shaded strip of clerestory windows – passively reduces the structure's energy demands. At the southwest corner, a wood-framed, galvanized metal canopy extends out from the building, providing protection for field workers in the loading zone and further insulating the structure from heat gain.

Paving the parking area and driveway with crushed concrete instead of asphalt proved doubly advantageous: using this recycled material helped earn LEED points and also saved a large amount of money. Mr. Künzle estimates that this single initiative saved enough money to cover about 70 per cent of the additional costs involved in constructing this building to conform to the highest LEED standards.

A sophisticated Building Automation System monitors systems performance and makes this information available online to



Top: Placing the garage at the west end of the Restoration Services Centre shielded the office area from the hot afternoon summer sun. A projecting canopy screens the garage's south side. Above: On-site ponds supply non-potable water.

Photography by Tom Arban

Above: The mezzanine at the east end of the office area overlooks the free-standing meeting room. The base of the column in the central foreground in this view is one of the points at which air enters the building. Fans concealed in the meeting room roof provide additional cooling on the warmest days. Below: The load-bearing, south-facing trellis shades the office and could in time become the outer wall of a greenhouse addition.

property management staff. One of the most important energy-saving strategies was the installation of ground source heat pump technology. A network of polyethylene tubing laid horizontally 10 feet below the ground functions as a heat exchanger, absorbing heat in the winter and releasing it in the summer. Linked to this loop is heat pump apparatus in the building's basement that mechanically transfers the heat. The connection of these heat pumps to a hydronic radiant floor system and fan coils provides 100 per cent of the facility's heating and cooling requirements and contributes heat to the domestic hot water system. This system eliminates the need for boilers and cooling towers.

Strategies employed to reduce the cooling demand include the extensive shading of windows, and sensors that switch on heat-generating artificial lighting only when it is needed. The building also has a highly reflective white roof, which helps to combat the greenhouse effect.

In the double-height office zone, non-structural materials are kept to a minimum. On the ceiling, bands of white-painted drywall line up with the windows to draw natural light into the interior, but over the rest of the ceiling the engineered-wood structural components are exposed. The mezzanine has been designed so that bays can be added toward the centre if staffing levels increase.

Not all of the energy-saving initiatives implemented at the Restoration Services Centre are applicable to urban office buildings – in a high-density environment, a client probably wouldn't have total control over building orientation, and septic-system plumbing would be a non-starter. However, the importance of integrated design is clearly illustrated by this project, and that's one lesson that's applicable to any quest for LEED certification. "You cannot do sustainable design unless you're prepared to go through an integrated design process," says Mr. Künzle.

The wood trellis on the south face illustrates the advantages of this design approach. The architect wanted a large canopy and a trellis element on this side to provide protection from low-angled morning sun. The structural engineer proposed that the trellis be load bearing to eliminate the need for additional columns, and the landscape architect noted that planting vines at the base of the trellis would provide additional shading after the vines had been given some time to mature.

Aware that the client wanted to build a greenhouse sometime in the future, the architect indicated that the trellis could be designed in a way that would enable it to become the support for a greenhouse enclosure. The mechanical engineer indicated that the same exhaust system that already keeps the compost toilets odour-free could easily be routed through the greenhouse on its way out of the building to provide preheated air and carbon monoxide to the plants, which would thrive on both.

The lesson is clear: when the design process is truly integrated, the results tend to add up to more than the sum of the parts.