A Learning Experience

By Rick VanSant

When McMaster University in Hamilton, Ontario, Canada, set about constructing its new Engineering Technology Building, it used the latest state-of-the-art technology not only to achieve U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) Gold certification, but also to create a living laboratory to train students on the building systems of the future. One of the components is a rainwater harvesting system that collects, filters and disinfects rainwater for non-potable and potable use in the building.

First-of-its-kind system treats rainwater for potable reuse

Because this project was the first of its kind in Canada, the project team faced some challenges in designing the system. Unable to glean information from similar projects, the team needed to do its homework when sourcing the right products for the system. Tony Cupido, P.E., former assistant vice president of facility services and current Ph.D. student, stressed the importance of designing a proper system from the start with the right products to meet the desired outcomes.

The top two priorities for the university were economic sustainability and the creation of valuable learning opportunities for engineering students. Maintenance costs had to be kept to a minimum and the installation had to use leading-edge technology that would prepare students for today's ever-evolving world of water treatment.

Another challenge was the lack of a consistent building and plumbing code for greywater in Canada. Ensuring system compliance can be challenging and often depends on the specifying engineer's recommendations. In Ontario, there has been some relaxation in building and plumbing codes recently to allow for rainwater harvesting.

System Design

Rainwater is collected on two of the building's roofs with white reflective membranes and directed to two 25-cu-meter (11,000-gal) cisterns. After the rainwater is passed through sand, carbon and micro filters, some of this non-potable water, or greywater, is used to flush toilets and urinals. Some of the water is treated further to become potable water by passing through a UV Pure Technologies Hallett UV disinfection system. The potable water is then directed through the building for use in drinking fountains and the onsite coffee shop. The systems can accommodate up to 50 gal per minute.

Innovative Features

The capacity to treat rainwater to potable standards is a first for any Canadian institution. The system was designed with multiple built-in redundancies, including two of everything and parallel back ups. As a research facility, continuous Web-enabled remote and onsite monitoring tracks performance and finds trends for analysis and optimization. If one element needs to be isolated for a student demonstration, the whole system does not need to shut down.

Moving Forward

The site has performed excellently. According to the site operator and water treatment specialist, the system has not produced a bad sample since it was turned on more than two years ago. One element the site operator particularly appreciates is the lack of required maintenance, resulting in cost benefits. The UV Pure units have met the tough water quality standards and delivered excellent performance, the site operator said.

To maintain a successful rainwater harvesting system, Cupido stresses the importance of continuous monitoring, maintenance and servicing. It is a message that he hopes will be included in the fall semester curriculum. *wqp*

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Top left: Plants hide the system's cisterns for added aesthetic appeal.

Top center: Rainwater is collected from two building roofs.

Top right: Collected rainwater is treated for both potable and non-potable reuse.

Bottom: The systems have multiple built-in redundancies. This increases security and provides educational opportunities without having to shut down the entire system.