On-Campus Reuse

University of South Florida building goes green with rainwater harvesting and treatment system

By Kate Cline

The Dr. Kiran C. Patel Center for Global Solutions at the University of South Florida (USF) in Tampa, Fla., is a flagship for the school's commitment to sustainability. Completed in September 2010, it not only serves USF's School of Global Sustainability and Patel Center for Global Solutions, it also is the first building at the Tampa campus to aim for U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) Gold certification.

Staying faithful to the environmentally friendly goal, it was only natural for the school to consider how it could both conserve water resources and use them sustainably. It opted for a rainwater harvesting and treatment system that allowed the water to be reused to flush all of the toilets and urinals in the four-story, 74,788-sq-ft building.

According to initial calculations made by USF, the building will require 207,000 gal per year to operate the toilets and urinals. The university expects to harvest 506,000 gal per year of rainwater from the roof. Condensation collected from the building's air conditioners will provide another 63,000 gal per year.

The system required a tank large enough to accommodate seasonal heavy rainfall.

Planning for Anything

The system begins with rainwater collection. Rainwater from the rooftop gutter system and downspouts, as well as air conditioning condensation from the building's mechanical systems, is directed to a vortex filter. The filter prescreens the water to approximately 200 microns, removing sediment before it enters the cistern, said Stuart Bailin, director of engineering for Water Harvesting Solutions (Wahaso), which designed the system.

The Tampa area experiences uneven seasonal rainfall, so the cistern needed to be large enough to contain rainwater from a potential downpour. A 30,000-gal watertight fiberglass tank from Containment Solutions Inc. provided the necessary volume.

The system also includes filtration and disinfection components to prepare the water for nonpotable use in the toilets and urinals. A self-cleaning 500-10-micron final filter removes any remaining silt or sediment that could get into the flushing mechanisms and cause them to malfunction, according to Bailin. After filtration, the water goes through ultraviolet (UV) treatment to eliminate bacteria.

Because of the possibility of periods with little or no rainfall, the system needed a backup to ensure that toilets can continue to flush properly even during a drought. The Wahaso team designed a fail-safe that switches the system over to the municipal water supply if needed. According to Bailin, a level sensor inside the underground cistern indicates how many gallons of water remain inside. If the level gets too low, a pump activates to begin providing municipal water from a wet well 4 ft below the cistern. The system has been required to use little to no municipal water since it began operation, Bailin said.

According to USF, the system is rounded out with a programmable logic controller with BACnet interface and a variety of meters and gauges for data collection and measurement verification.

Installation Issues

The project team faced a variety of challenges during construction. Due to the size of the cistern and the depth of the trench needed to install it underground, determining a location for it required careful consideration. Installation too close to the building could have affected its foundations.

According to Walter Pestrak, USF's project manager, and Jennifer Isenbeck, USF's project engineer, the project design team coordinated early in the project with the USF Building Code Administration Department (BCA). Together they determined the depth needed to accommodate the tank, the types of reinforcements needed for the foundation and the optimum location that would allow easy access for maintenance.

Another challenge in installing the cistern was the area's high water table. According to Bailin, the trench was continuously filling with water, which had to be pumped out for the duration of the project.

Further challenges involved meeting BCA requirements for proper treatment of the water. Although the water was intended for nonpotable use, BCA and USF Facilities Planning and Construction conducted research to decide what type of treatment was needed. They determined that disinfection was necessary and, with collaboration from the design team, opted for UV treatment. To protect the municipal potable water supply from possibly becoming contaminated with the nonpotable treated rainwater, a backflow preventer was installed as well.

Successful Solutions

According to Pestrak, Isenbeck and USF LEED Coordinator Suchi Daniels, the system experienced several hiccups when it first began operating. Building occupants became concerned, they said, upon seeing slightly discolored water in the toilets. In response, the university circulated a memo about the rainwater harvesting system and the building's other green features. The memo explained that discoloration is typical when the volume of water collection is low, like during the winter months in Tampa.

An additional problem resulted from the energy-efficient lighting features in the building's restrooms. According to the university, all of the toilets and urinals feature touchless flushing valves that require light to charge. The restrooms are equipped with lights triggered by motion sensors that are preset to turn off after a certain amount of time. As a result, there was not enough light to properly charge the flushing mechanisms. To solve the problem, USF replaced all of the sensors and installed a bypass valve to provide access to backup municipal water in the case of power outages.

According to Pestrak, the rainwater harvesting and reuse system now is running smoothly and the building is living up to its sustainable ambitions. Because of the system's success, USF is considering implementing reuse systems on other campus buildings. SWS

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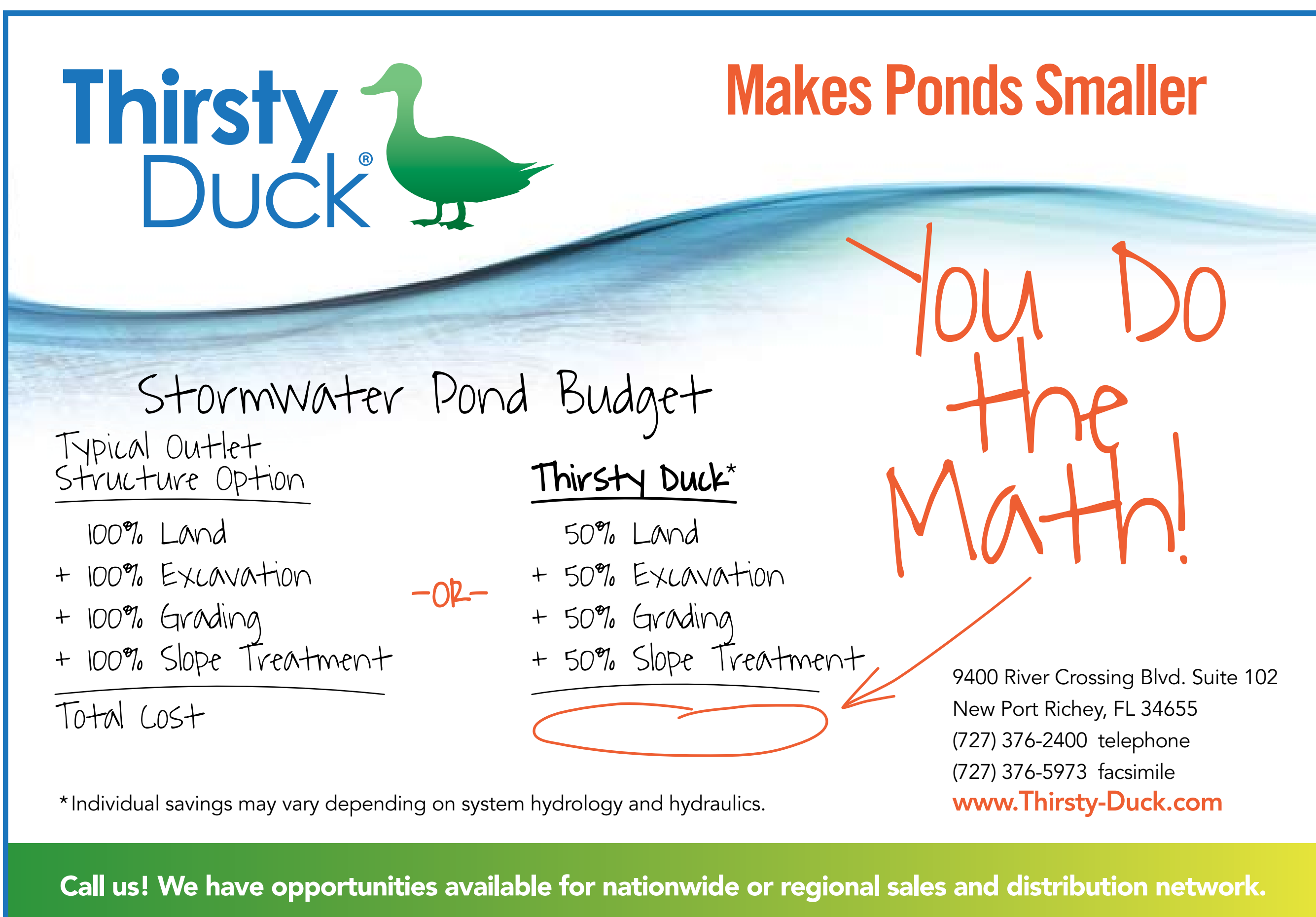

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