New Ways to Save Water in LEED v4

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This article was originally posted on edc magazine online on April 5, 2013. The LEED rating system has introduced highly efficient toilets, urinals and entire irrigation systems to thousands of buildings—measures that will continue to be a focus of the next version of LEED. Mission accomplished? Not quite. LEED v4 expands those water-savings targets to appliances, cooling towers, commercial kitchen equipment and other areas that consume a huge proportion of water in many buildings. **Saving Water in Cooling Towers** Cooling tower water management has been part of LEED for Existing Buildings: Operations & Maintenance (EB:O+M) for years, but LEED v4 brings it into the building design and construction (BD+C) rating systems such as LEED for New Construction (LEED-NC). Just as our bodies cool us off by sweating, cooling towers chill buildings by evaporating water. In a typical cooling tower, warm water from the air-conditioning system is pumped to the top of a cooling tower and is either sprayed or dripped down. Air blown through the falling water causes water vapor to evaporate at a rate of about three gallons per minute (gpm) in a tower serving a 100-ton chiller bringing down the temperature of the water that's left. That's just one way that cooling towers consume water. Drift losses occur through mist being carried out of the tower by the airflow. Then there is blowdown, the practice of draining water from the cooling tower when—due to evaporation—it gets too high in dissolved minerals and other contaminants. The remaining water can cause scale (buildup of minerals within the cooling tower and the piping) and create bacteria-laden biofilms, so it is drained and replaced with makeup water to reduce mineral concentrations. **More Gallons Saved Than Anywhere Else** Reducing water lost through blowdown is the focus of LEED v4's cooling tower credit. Projects pursuing the credit increase the number of cycles through which water can be re-circulated before it is removed by blowdown. Thousands of gallons of water can be saved by increasing those cycles, and it can be done without negative effects on the equipment, or on energy efficiency, when done using a sound chemical analysis and with the help of a qualified engineer. Depending on its chemistry, the blowdown water can also be captured and reused in appropriate applications such as irrigation—particularly if it is mixed and diluted with other water sources, like captured rainwater. Projects with cooling towers are likely to save more water—in gallons—through the Cooling Tower Water Management credit (which offers up to two points to BD+C projects, and up to four for EB:O+M) than through other efficiency efforts. "If you do have a cooling tower, that's probably where the majority of savings will be," says Batya Metalitz, a LEED manager at USGBC. **Attention to Appliance and "Process" Water Use** While lavatory sinks and toilets can save water in a visible way, the highest-performing buildings have long paid equal, if not more, attention to appliance and process water efficiency—water used in clothes washers and dishwashers, as well as in manufacturing or treatment processes. In LEED v4, all BD+C buildings will have to meet appliance and process water efficiency requirements at a prerequisite level with a higher bar for savings at the credit level. For example, pre-rinse spray valves are used in commercial kitchens to rinse dishes before they go into the dishwasher. These fixtures can use as much as 5 gpm with an average of about 3.2 gpm. The typical commercial kitchen uses more water rinsing dishes than washing them in dishwashers. The Energy Policy Act of 2005 (EPAct 2005) established a maximum legal flow rate of 1.6 gpm, while the LEED v4 prerequisite will require 1.3 gpm or less—a benchmark achieved by several products on the market. **Once-Through Cooling Gets the Boot** Process equipment used in labs, healthcare and industry settings can generate a lot of heat, and water is often used to cool it. This occurs either through re-circulating cooling systems, or once-through cooling, in which cool (usually potable) water is used to dissipate heat and then sent down the drain. A 20-horsepower (15 kW) vacuum pump used around the clock in a small manufacturing plant may use 12 gpm of water for cooling—more than six million gallons per year. LEED v4 would ban once-through cooling at the prerequisite level in BD+C, requiring project teams to use other strategies such as re-circulating cooling systems, air-cooled systems, chillers, cooling towers or some combination of those. Some buildings are using variable refrigerant flow (VRF) systems to capture waste heat from server rooms for heating elsewhere in the building. **Leaving No Stone Unturned** Additional indoor water-savings opportunities addressed in LEED v4 include the following.

- Venturi-type flow-through vacuum generators or aspirators: Common in medical applications (such as dentist offices), these devices generate a vacuum by flowing water continuously down a drain. These devices would not be allowed.
- Commercial kitchens: Water-efficiency requirements for dishwashers, steamers and combination ovens, based on gallons of water consumed per rack of dishes or gallons of water per pan.
- Ice machines: These would need to be ENERGY STAR or equivalent and use either air-cooled or closed-loop cooling, such as a chilled or condenser water system. Water-cooled models would be prohibited, since they use up to 10 times the amount of water as air-cooled compressors.

Water-Efficiency Benefits of District Energy Systems The new LEED v4 requirements are a lot to digest, but Andrea Traber, principal at DNV KEMA Energy & Sustainability, says she has already picked out one gem in the Indoor Water Use Reduction credit. In that credit, most points are earned through typical fixture and fitting efficiency, but schools, retail, hospitality and healthcare projects have access to additional points through meeting tighter requirements for washing machines, commercial kitchen equipment, laboratory and medical equipment, and municipal steam systems. The last item on that list tackles the problem of what happens to steam delivered by district energy systems after it has been used in buildings. Although there is typically a lot of heat remaining in that steam or condensate, systems that don't recapture it waste that energy, and even worse, use fresh potable water to cool it down before sending it into wastewater treatment systems. Projects hooked up to municipal steam systems could earn a point if that system either recaptures steam, or if it allows condensate to drain after passing through a heat recovery system or system that cools it with reclaimed water. "While this is not relevant to many projects," says Traber, "it provides an avenue for capturing benefits of district systems."

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