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The Bertschi School's Living Science Building, Seattle, has sustainable features that are all visible to students. These include net-zero energy, net-zero water, a solar array and rainwater cistern. (Architect: KMD Architects)

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Taking Green to new Levels

Schools and universities are raising the bar of what can be done to provide sustainably designed facilities that are managed in an environmentally responsible way.

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The architects and engineers had sweated over the details of the energy consumption at Richardsville Elementary School in Bowling Green, Ky., in an effort to deliver a net-zero-energy building.

But after the facility opened its doors to students in 2010, the engineers who were monitoring the facility's energy numbers were dismayed by an unplanned and unwanted spike in electricity that threatened their net-zero goals. Had they miscalculated their energy projections or used wrong assumptions that skewed their predictions?

A little legwork and the culprit was fingered: The ice cream guy.

It turned out that after the school opened, a vendor brought a freezer to the school to sell ice cream treats to the children, and the power it was consuming was defeating Richardsville's energy-saving goals. The school now has the freezer operating only during lunch periods, and during other times, it is unplugged and wheeled into a walk-in freezer.

That's the kind of detail that many schools and universities are putting into the design, construction and operations of facilities as they search out every possible way to reduce the consumption of energy, water and other resources. As the green school movement evolves and matures, education institutions are raising the bar of what can be done to provide sustainably designed facilities that are managed in an environmentally responsible way.

"You really have to start to pinpoint where you can reduce as much of the energy as possible," says Kenny Stanfield, architect on the Richardsville project for Sherman Carter Barnhart. "It's a matter of knowing where your energy use is."

School focus

Some schools and universities have been striving for years to save natural resources and operate more efficiently. Organizations such as the Collaborative for High Performance Schools (CHPS) and the U.S. Green Building Council have not only

provided education institutions with guidance on how to design, build and operate in the efficient and environmentally friendly way, but also established formalized ways for those institutions to be recognized for achieving sustainable buildings and practices. By seeking status as a CHPS-verified school or certification through the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system, schools and universities had tangible documentation that a facility was eco-friendly.

By sheer numbers, not to mention their educational impact, school facilities were seen as a vital part of the greater green building movement, so the Green Building Council decided in 2010 to create the Center for Green Schools.

"Twenty-five percent of the U.S. population goes to a school every day," says Jenny Wiedower, K-12 manager for the center. "It was a ready-made audience, and we thought the green message would resonate with them."

The center has teamed up with the federal government, non-profit groups and other organization in an attempt to further the understanding of how green school can be beneficial. It has been involved in creating the Green Apple Day of Service, in which students and community members around the world are encouraged to carry out service projects to support healthful and sustainable schools. Last fall's first Green Apple Day resulted in more than 1,200 projects.

The center helped the U.S. Department of Education establish its Green Ribbon Schools program, which recognizes schools that have taken a comprehensive approach to creating green environments.

"As the green schools movement grows, we become better informed about what makes schools buildings high-performance and healthy," Wiedower says.

Net-Zero

Pursuing a net-zero-energy design at Richardsville Elementary seemed like a logical step for the Warren County district and the architects, Stanfield says. Sherman Carter Barnhart had worked with the district on earlier school construction projects and already had achieved impressive energy savings. Plano Elementary School in Bowling Green was using 28 kBtus per square foot per year, compared with the average school in the region, which uses 73 kBtus, Stanfield says.

“The utility came out to Plano and installed a meter because they couldn’t believe the numbers of how well the school was performing,” says Stanfield.

The design for Richardsville pushed the energy savings further. Among its sustainable elements: north-south building orientation to enhance daylight; a compact building configuration and volume; insulated concrete forms; geothermal heating and cooling; controls that monitor occupancy, motion and carbon dioxide; light shelves, clerestory windows and solar tubing to bring daylight into the school; combi-ovens instead of fryers in the kitchen and tilting skillets, which enable the school to eliminate Class 1 fume hoods.

The result is a building that uses only 18 kBtus per square foot a year. Very good, but not net zero. That’s where the 2,000 solar panels on the school roof and the 700 panels on the parking structure come in.



The energy generated by 2,000 solar panels on the Richardsville Elementary School, Bowling Green, Ky. , roof and 700 panels on the parking structure are more than enough to offset the school’s modest

energy use. (Architect: Sherman Carter Barnhart, PSC.) Photo by Joshua White

The energy generated by the solar array at Richardsville is more than enough to offset the modest amount of power used in the school building. The excess energy produced is being bought by the area's electric utility, the Tennessee Valley Authority, for 22 cents a kilowatt hour, the school says. In 2012, that amounted to more than \$37,000.

The unprecedented achievement in energy efficiency for a school helped Richardsville win recognition as part of the Department of Education's inaugural class of Green Ribbon Schools in 2012.

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