

Green schools

Cleveland's building program enters a new era

December 8, 2009

Summary

Overview The Ohio School Facilities Commission (OSFC) has required that all schools built under its co-funded program meet design and construction standards for energy efficiency and environmental responsibility established under a program of the non-profit U.S. Green Building Council. **Page 2**

Worth the effort? The U.S. Green Building Council says schools designed according to its criteria cost less to operate, make learning easier and more comfortable, and improve the health of students and teachers. **Page 3**

Energy leads list of savings The OSFC has calculated that a 130,000-square-foot school meeting the new standards will save \$6 million in energy costs alone over 40 years. **Page 4**

A better place for learning Anecdotal evidence and a number of studies suggest that green schools lead to improved student performance. **Page 4**

Reap what you sow Fear of higher construction costs ranks as the chief barrier to adoption of green building standards, but advocates say close examination does not support that fear, at least not long-range. In fact, there is evidence that *not* building green will cost everyone more. **Page 6**

First up, Mound school The requirement for green schools takes effect with Segment 5 for the Cleveland Metropolitan School District, but the District decided to make Segment 4's Mound K-8 school in Slavic Village a pilot effort. **Page 7**

Measuring up A closer look at the ratings criteria of Leadership in Energy and Environmental Design (LEED) for Schools 2009. **Page 9**

Overview

Cleveland's public schools are going green.

All schools built in the future under a state-subsidized program must meet design and construction standards for energy efficiency and environmental responsibility established under a program of the non-profit U.S. Green Building Council.

In September 2007, the Ohio School Facilities Commission (OSFC) adopted the LEED for Schools Rating System as part of its design standards. The OSFC pays 68 percent of most construction costs for new and renovated Cleveland schools.

The widely recognized LEED (Leadership in Energy and Environmental Design) program not only serves as a design guideline for green buildings but also offers third-party validation of a building's green features.

The program promotes a whole-building approach to sustainability by rating performance in a number of areas, most of which directly affect human and environmental health: site sustainability, energy and water efficiency, conservation, building materials and resources, indoor environmental quality, design innovation, and compatibility with regional environmental priorities. To qualify for LEED status, new buildings of the Cleveland Metropolitan School District must meet criteria in those areas.

The LEED rating system has four levels – Certified, Silver, Gold, and Platinum -- which are awarded based on the number of criteria met during design and construction. OSFC co-funded buildings are required to earn LEED Silver certification. The OSFC pays all costs for LEED registration and certification reviews.

The Cleveland District will be required to meet LEED for Schools 2009 Silver qualifications for Segments 5 through 10 of its construction and renovation program.

However, the District has chosen with OSFC approval to make Segment 4's Mound preK-8 school its first LEED Silver project, though under the less expansive LEED for Schools 2007 criteria that were in effect when Mound planning began. The OSFC and the District agreed to a 3 percent budget increase to accommodate the effort at Mound, in Cleveland's Slavic Village neighborhood.

"We wanted a Segment 4 school to be our learning model," says Gary Sautter, deputy chief of capital programs for the District. "This particular school, with its surrounding community partnerships, was a good candidate."

When the OSFC approved the LEED requirement, its executive director at the time, Michael C. Shoemaker, said that the requirements and guidelines of the Ohio School Design Manual in effect then already aligned with 20 to 28 of the 37 points necessary for LEED for Schools Silver (2007) status.

Attaining LEED Silver status will still involve extra effort and expense, but Mr. Sautter prefers to focus on the opportunity to incorporate high-level energy efficiency into the schools.

'Cleveland will not have another chance like this for another 50 years or so. In addition, we hope these schools will be used as teaching labs for students.'

*-- Gary Sautter
Deputy chief of capital programs, Cleveland Metropolitan School District*

“Cleveland will not have another chance like this for another 50 years or so,” he notes. “In addition, we hope these schools will be used as teaching labs for students. There is a lot of math, science, architecture, engineering that can be witnessed and incorporated into the curriculum.”

Elaine Lipman Barnes, energy and environment administrator for the OSFC, says creation of a high-performance school building requires an interactive approach to the design process. “It means all the stakeholders — everyone involved in the planning, design, use, construction, operation, and maintenance of the facility — must fully understand the issues and concerns of all the other parties and interact closely throughout all phases of the project.”

In the case of the Cleveland District, the Core Teams of teachers, parents, neighbors and civic leaders that advise architects in the design of new schools could play a key role.

Ms. Barnes shares a vision of green schools that goes beyond design and construction. “Picture this,” she says, “High school students learning about alternative energy from the solar panels on their roof. Kindergarteners growing the organic vegetables they eat for lunch. Middle school students studying ecosystems in their constructed wetland. This is the green school experience.”

Worth the effort?

Why should new schools go green?

The BAC surveyed a number of studies and reports by reputable though not necessarily impartial organizations. Their conclusion: The students learn better, the teachers teach better, everyone in the school is healthier and the taxpayers save money. Indirect benefits include reduction in greenhouse gases, less dependence on foreign suppliers of energy, and conservation of natural resources.

“Green schools cost less to operate, freeing up resources to truly improve students’ education. Their carefully planned acoustics and abundant daylight make it easier and more comfortable for students to learn. Their clean indoor air cuts down sick days and gives our children a head start for a healthy, prosperous future. And their innovative design provides a wealth of hands-on learning opportunities,” the U.S. Green building Council says.

According to the “Advanced Energy Design Guide for K-12 School Buildings,” (2008) published by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) and developed by ASHRAE, the American Institute of Architects, the Illuminating Engineering Society of North America, the U.S. Green Building Council, and the U.S. Department of Energy, the benefits of a greens school can include:

- Improved learning environment.
- Reduced operating costs.
- Lower construction costs and/or faster payback.
- More community support for construction financing.
- Enhanced environmental curriculum.
- Energy security.
- Water conservation and reduced greenhouse emissions.

Energy leads list of savings

In “Building Minds, Minding Buildings: Our Union’s Road Map to Green and Sustainable Schools” (2008), published by the American Federation of Teachers, the OSFC Planning Director Franklin Brown talks about why Ohio adopted the LEED standard for new schools projects.

He says the OSFC compared the cost of building and operating a 130,000-square-foot green middle school with the costs for a 130,000-square-foot middle school built according to the Ohio School Design Manual at the time. He says the comparison

predicted a savings of \$6 million for energy alone over the 40-year life of one school.

The Cleveland District’s current Master Plan calls for 42 new or fully renovated schools in Segments 5-10, though most are about half the size of the ones in the OSFC comparison. Still, that translates into District energy cost savings of more than \$129 million over 40 years, or more than \$3.3 million a year.

Brown lists other benefits as use of environmentally friendly building materials that don’t contribute to asthma, increased daylight in classrooms, better temperature and humidity control, elimination of toxins like formaldehyde, improved classroom acoustics, and the ability to attract a better staff.

Other states are buying the argument for green schools. Eleven states and the District of Columbia have passed legislation requiring that all new schools comply with LEED or similar standards, and four states have incentive programs, the Environmental Law Institute reported in July 2009.

In general, the goal of green building standards for schools is to save money and improve education by cutting energy costs, improving lighting and air quality, reducing noise, conserving water, and using recycled and recyclable building materials and renewable resources.

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A better place for learning

Do green schools improve education?

“Green Schools: Attributes for Health and Learning” (2006), published by the National Research Council, notes a growing number of studies that suggest they do, but the report concludes generally that scientific evidence was insufficient at the time to say so with certainty.

The OSFC’s Shoemaker pledged in 2007 that the agency would monitor the effect of the new LEED Silver standards on student performance. Such work could help fill the data gaps identified by the council.

The teachers union cites numerous studies that indicate educational benefits of green schools. For example:

- In North Carolina, two elementary schools with low test scores were replaced in 2002 by one new green school, Third Creek Elementary in

Statesville. The same students, with the same teachers, improved from only 60 percent at grade level in reading and math to 80 percent at grade level.

- In Oregon, the absentee rate fell 15 percent among students at the new Ash Creek Intermediate School in 2002.

One aspect of green building goals is to control noise inside the school from people and heating and cooling systems and inhibiting noise from outside the school, such as from street traffic and aircraft. Noise is said to detract from students' memory, attention and ability to understand what is being said in class as well as lead to teacher voice strain.

Green schools also feature advanced heating and air-conditioning systems that are said to reduce the incidence of respiratory ailments, including asthma, colds and flu, as well as make students and teachers more comfortable.

Another goal is to improve lighting, especially through use of daylight, outdoor views, and glare reduction.

Prompted by energy, security and other concerns, school designers in the 1970s began minimizing windows in schools. Now studies suggest that health and educational benefits of windows – daylight, views, and, if they open, fresh air – might tip the balance toward more windows.

“An Investigation into the Relationship Between Daylighting and Human Performance” (1999) a report prepared by the Heschong Mahone Group for Pacific Gas and Electric Company and funded by California utility customers under the auspices of the California Public Utilities Commission, focused on the Capistrano Unified School District in Southern California.

“Controlling for all other influences,” it says, “we found that students with the most daylighting in their classrooms progressed 20 percent faster on math tests and 26

percent on reading tests in one year than those with the least. Similarly, students in classrooms with the largest window areas were found to progress 15 percent faster in math and 23 percent faster in reading than those with the least.

“Students that had a well-designed skylight in their room, one that diffused the daylight throughout the room and which allowed teachers to control the amount of daylight entering the room, also improved 19-20 percent faster than those students without a skylight.

“We also identified another window-related effect, in that students in classrooms where windows could be opened were found to progress 7-8 percent faster than those with fixed windows. This occurred regardless of whether the classroom also had air conditioning.

“These effects were all observed with 99% statistical certainty.”

A 1992 Alberta, Canada, report on a study comparing upper-elementary schoolchildren found that students exposed to the equivalent of daylight -- full-spectrum fluorescent enhanced with ultraviolet light -- had better academic achievement, fewer

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-- Heschong Mahone Group

‘An Investigation into the Relationship Between Daylighting and Human Performance’ (1999)

absences, less tooth decay and better moods, and they grew up to 2 centimeters taller than those taught in cool-white fluorescent or high-pressure sodium vapor lighting.

Reap what you sow

Fear of higher construction costs ranks as the chief barrier to adoption of green building standards, but advocates say close examination does not support that fear, at least not long-range. In fact, there is evidence that *not* building green will cost everyone more.

According to “Unlocking Energy Efficiency in the U.S. Economy” (July 2009) by McKinsey & Company, a nationwide holistic pursuit of energy efficiency opportunities “would yield gross energy savings worth more than \$1.2 trillion, well above the \$520 billion needed through 2020 for upfront investment in efficiency measures (not including program costs). Such a program is estimated to reduce end-use energy consumption in 2020 by 9.1 quadrillion BTUs, roughly 23 percent of projected demand, potentially abating up to 1.21 gigatons [billion tons] of greenhouse gases annually.”

In “Greening America’s Schools, Costs and Benefits” (2006), author Gregory Kats says a national review of 30 green schools demonstrated that green schools cost less than 2 percent more than conventional schools -- about \$3 per square foot more -- but provide financial benefits of lower energy and water costs, improved teacher retention, and lowered health costs worth \$12 per square foot. Financial savings to the broader community are significantly larger, he says, citing as examples reduced cost of public infrastructure, lower air and water pollution, and a better-educated and -compensated workforce. He calculates the total savings from green schools as being worth \$71 per square foot.

Katz is managing principal of Capital E, a national clean energy technology and green building firm. He served as the director of financing for energy efficiency and renewable energy at the U.S. Department of Energy (1996-2001). The study was funded by the George Gund Foundation, the Kendall Foundation and the U.S. Green Building Council.

Green schools use an average of 33% less energy than conventionally designed schools, Kats says, citing as typical enhancements more-efficient lighting, greater use of daylighting and sensors, more-efficient heating and cooling systems, and better-insulated walls and roofs. He puts the water savings as 32 percent.

He cites data from the Building Investment Decision Support program of Carnegie Mellon University’s Center for Building Performance indicating that improved indoor air quality reduced prevalence of symptoms by an average of 41 percent for asthma, flu, sick building syndrome, respiratory problems and headaches.

He says that a Carnegie Mellon review of 14 studies on the impact of improved temperature control found that worker productivity improved an average of 3.6 percent and that another Carnegie Mellon review of 11 studies on high-performance lighting found an average 3.2 percent gain in worker productivity.

Guy Mehula, chief facilities executive of the Los Angeles Unified School District, is a believer.

In 2001, his Board of Education ordered that a 132-school construction program meet sustainability standards set by California’s Collaborative for High Performance

Schools, similar to LEED. With more than half the schools built, Mehula says in the AFT report that he expects that utility costs will be reduced by 30-40 percent per year.”

Considering this and other financial benefits, he says the cost of building green schools is now nearly equal to the cost of constructing schools without green elements.

“So the choice to go green is obvious from a financial, education and environmental perspective.”

First up, Mound school



The architect is the key player in meeting LEED requirements for a particular building. For Mound, the School District selected CEDA (Cleveland Educational Design Alliance). CEDA comprises several Cleveland-area architectural and engineering firms, ThenDesign Architecture, Polytech Engineers, and Thorson Baker & Associates.

CEDA has been a major player in Cleveland District’s facilities program. It was the architect for remedial work on 17 schools in the Warm, Safe and Dry program, and for the new John Adams High School and Miles Park K-8 in Segment 1; the phased renovation James Ford Rhodes High School in Segment Two; and the new Artemus Ward, East Clark, Robinson G. Jones and Wade Park PreK-8 schools in Segment 3. It is the architect for the new Charles Dickens preK-8 and Euclid Park, Nathan Hale, Thomas Jefferson and Mound K-8 schools in the ongoing Segment 4.

The School District is aiming for LEED for Schools 2007 Gold certification at Mound.

The architects describe some of the planned green features for Mound as: main classroom wing oriented on an east-west axis to optimize control of daylight and heat gain; increased areas of glazing [windows] to maximize natural light in classrooms; highly reflective roofs to reduce heat gain; higher levels of roof insulation (R-30); high efficiency HVAC [heating, ventilating, and air-conditioning] systems and controls; low-flow toilets and waterless urinals; on-site storm water management with no connection to a public sewer; dedicated bicycle path on Linton Avenue and Ackley Road; teaching tools – special recycling stations at three locations in building.

As of Nov. 10, 2009, in the ongoing LEED certification process, the Mound project had qualified for 30 points. It will need at least 37 to qualify for Silver status, at least 44 for Gold.

Although the OSFC boosted the pre-LEED budget by 3 percent for Mound, Mr. Sautter, the District’s facilities chief, characterizes that as accommodating basic LEED-type components. More-advanced features – he cited capacitors for storing solar energy as an example – would have to be financed by the District only, Mr. Sautter says.

The LEED program, being relatively new to the construction industry and including extra documentation and reporting steps, would seem to hold potential for reducing interest in bidding or raising the amount of bids. Mr. Sautter says this was not the case for Mound, however. He reports that the Mound project attracted more bidders than usual for a District school project and that the low bids came in 16 percent below the construction manager’s estimate.

“We kept the specifications simple,” he says, “and yet are reaching for gold certification without all the specialized systems which would require specialty contractors. CEDA designed the project taking a common-sense approach -- energy-efficient and cost-efficient building systems familiar to most contractors.”



Measuring up

Participation in the LEED program adds a series of reporting and compliance steps to each phase of the Ohio school design process (Program of Requirements, Schematic Design, Design Development, Construction Documents). Among those steps, registration of the project with U.S. Green Building Council is required in the first phase, and the Council's design-review approval is required for the last. Unlike LEED 2007, the 2009 version also requires the owners of all certified projects to provide energy- and water-use data to USGBC for five years from the time of occupancy.

The U.S. Green Building Council offers the following explanation of its LEED for Schools 2009 rating criteria:

Sustainable Sites Choosing a building's site and managing that site during construction are important considerations for a project's sustainability. The Sustainable Sites category discourages development on previously undeveloped land; minimizes a building's impact on ecosystems and waterways; encourages regionally appropriate landscaping; rewards smart transportation choices; controls stormwater runoff; and reduces erosion, light pollution, heat island effect and construction-related pollution.

Water Efficiency Buildings are major users of our potable water supply. The goal of the Water Efficiency credit category is to encourage smarter use of water, inside and out. Water reduction is typically achieved through more efficient appliances, fixtures and fittings inside and water-wise landscaping outside.


Energy & Atmosphere According to the U.S. Department of Energy, buildings use 39% of the energy and 74% of the electricity produced each year in the United States. The Energy & Atmosphere category encourages a wide variety of energy strategies: commissioning; energy use monitoring; efficient design and construction; efficient appliances, systems and lighting; the use of renewable and clean sources of energy, generated on-site or off-site; and other innovative strategies.

Materials & Resources During both the construction and operations phases, buildings generate a lot of waste and use a lot of materials and resources. This credit category encourages the selection of sustainably grown, harvested, produced and transported products and materials. It promotes the reduction of waste as well as reuse and recycling, and it takes into account the reduction of waste at a product's source.

Indoor Environmental Quality The U.S. Environmental Protection Agency estimates that Americans spend about 90% of their day indoors, where the air quality can be significantly worse than outside. The Indoor Environmental Quality credit category promotes strategies that can improve indoor air as well as providing access to natural daylight and views and improving acoustics.

Innovation in Design The Innovation in Design credit category provides bonus points for projects that use new and innovative technologies and strategies to improve a building's performance well beyond what is required by other LEED credits or in green building considerations that are not specifically addressed elsewhere in LEED. This credit category also rewards projects for including a LEED Accredited Professional on the team to ensure a holistic, integrated approach to the design and construction phase.

Regional Priority USGBC's regional councils, chapters and affiliates have identified the environmental concerns that are locally most important for every region of the country, and six LEED credits that address those local priorities were selected for each region. A project that earns a regional priority credit will earn one bonus point in addition to any points awarded for that credit. Up to four extra points can be earned in this way.

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			Credit 1 Outdoor Air Delivery Monitoring 1																																																																																																		
			Credit 2 Increased Ventilation 1																																																																																																		
			Credit 3.1 Construction IAQ Management Plan—During Construction 1																																																																																																		
			Credit 3.2 Construction IAQ Management Plan—Before Occupancy 1																																																																																																		
			Credit 4 Low-Emitting Materials 1 to 4																																																																																																		
			Credit 5 Indoor Chemical and Pollutant Source Control 1																																																																																																		
			Credit 6.1 Controllability of Systems—Lighting 1																																																																																																		
			Credit 6.2 Controllability of Systems—Thermal Comfort 1																																																																																																		
			Credit 7.1 Thermal Comfort—Design 1																																																																																																		
			Credit 7.2 Thermal Comfort—Verification 1																																																																																																		
			Credit 8.1 Daylight and Views—Daylight 1 to 3																																																																																																		
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Contact the Bond Accountability Commission: bondaccountability@hotmail.com

Read BAC reports at <http://net.cmsdnet.net/Administration/BAC.htm>