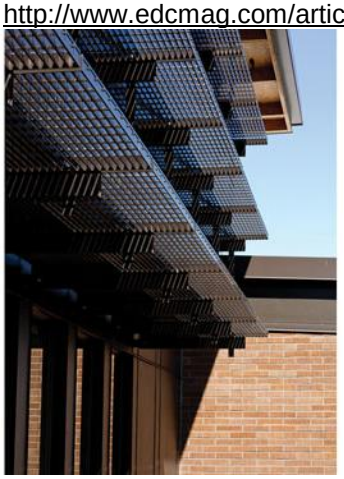
On The Record: School Strategies
Net-zero energy buildings expert roundtable V

By Bruce Haxton, LEED AP and Derrick Teal
July 05, 2011

ed+c Environment Design + construction
http://www.edcmag.com/articles/on-the-record-school-strategies



Hayes Freedom High school. Image courtesy of Hayes Freedom High School.




NOTE: The discussion of the NZEB roundtable on NZE Schools is meant to be a starting point for a greater dialogue and investigation about sustainable and NZEB whole building interactive design sessions. The information in this discussion is related to specific NZEB buildings that the members designed. It is meant for discussion purposes and is not meant to be a prescriptive design process for your building. Each building and site is very special and the analysis and design process should be custom tailored to each project. When dealing with sustainable facilities, net-zero energy buildings and sustainable campuses: seek professionals with experience in each and every aspect of the building you are working with. Regarding NZE schools: seek professional consultant with specific expertise to meet your project needs.

The fifth Net-Zero Energy (NZE) Roundtable focused its discussion on schools. The teams on these recently-built, or still-in-design or in-construction, schools wanted to share their

experiences in order to help other professionals improve the energy performance on their future projects.

The roundtable was broken down into two groups: the first group of schools is functioning (or will in the near future) as NZE schools now; the second group is designed to be NZE, but is still waiting to install the final, cost-prohibited items (such as solar collectors) to complete the process.

The full transcript of the roundtable, as well as ED+C's webinar featuring Richardsville Elementary School, can be downloaded at the bottom of this article.

Special thanks to moderator Bruce Haxton, LEED AP, sustainable consulting architect, for organizing this and previous roundtables, and Russ Drinker from Perkins+Will, San Francisco, for hosting the teleconference.

MarinCountry Day School in Corte Madera, Calif.
Architect: EHDD Architecture
Construction budget: $12,800,000
Cost per Square Foot: $380
Floor Area: 23,094 GSF (new); 33,740 GSF (total)
Roof Area: 19,369 (new)
Site Area: 78,696 square feet (1.8 acres)
Climate Zone: 3

- Scott Shell, principal, EHDD Architecture.scott.shell@ehdd.com
- Alice Moore, director of Environmental Sustainability, Marin Country Day School. amoore@mcds.org
- John Andary, principal, Stantec in SanFrancisco.john.andary@stantec.com

Now in its second phase, Marin Country Day School site overlooks the San Francisco Bay. The design emphasized connecting the children with the site's natural ecology as a part of imparting ecological literacy with the students as called for by the school's new Strategic Plan. The building itself set out to achieve LEED Platinum in addition to net-zero energy.

Strategies that worked with the school's environment were employed. For example, a radiant slab with concrete fill over an exposed metal EPIC deck cools the facility. The design reduces

the need for cooling enough that a cooling tower was used in place of an energy chiller. Climate conditions also allowed for a baseboard heating system.

LadyBird Johnson Middle School in Irving, Texas
Architect: Corgan Associates Inc.
Construction budget: $29,610,423
Cost per Square Foot: $194/square foot
Floor Area: 152,250 square feet
Roof Area: 111,306 square feet
Site Area: 17 acres
Climate Zone: 3A

- Scott Layne, assistant superintendent for Support Services, Irving Independent School District.slayne@irvingisd.net
- Susan Smith, AIA, LEED AP BD+C, vice president, Corgan Associates Inc. susan.smith@corgan.com
- Don Penn, president, Image Engineering Group (IEG). dpenn@iegltd.com
- Robert Frick, LEED AP, director of Education Division, IEG.
- rfrick@iegltd.com

Scheduled to open in August 2011, the new middle school will serve as Irving Independent School District's eighth middle school.

Incorporated into the main circulation spine of the school are four educational displays called "nodes." Each node is dedicated to a sustainable principle: solar, geothermal, wind and water conservation. Each node has three components: a graphic display where printed material can be displayed and easily changed, a digital display of four large touchscreen monitors that can display real-time data for all of the systems (as well as video or other data needed to support the curriculum), and a three-dimensional interactive display.

Building efficiencies and energy reduction are accomplished by a geothermal HVAC system, increased wall and roof insulation as well as insulation under the floor slab, due to the crawl space required by soil conditions. The electric plug load in the building has been reduced by half because of a district commitment to student laptops and wireless networking that allows for the elimination of all computer labs and banks of library computers.

LEADING THE WAY IN NET ZERO ENGINEERING

RichardsvilleElementary School in Bowling Green, Ky.
Architect: Sherman Carter Barnhart Architects
Construction budget: $12,160,000 for building; $2,766,664 for solar package and structure
Cost per Square Foot: $168.22/square foot. (Building); $206.50/square foot (building and solar package)
Floor Area: 72,285 square feet (77,466 square feet with exterior covered structured overhangs and outdoor classroom)
Roof Area: 47,442 square feet
Site Area: 10.2 acres
Climate Zone: 4

- Kenny Stanfield, AIA, LEED AP, principal in charge of the Education studio, Sherman Carter Barnhart's Louisville office. kstanfield@scbarchitects.com
- Ken Seibert, PE, LEED AP, president, CMTA Inc.kseibert@cmtaegrs.com
- Jay Wilson, energy manager, Warren County Public Schools. jay.wilson@warren.kyschools.us

A very compact, two-story building with a "doughnut" design helps to minimize the lighting energy intensity. Additionally, all first- and second-floor classrooms are daylit. The south facing classrooms included a 20-foot long by 20-inch high clerestory window located above the view window. An exterior light shelf shades the view glass and provides additional reflected light to the clerestory. A sloped ceiling helps project light toward the back of the classroom. To supplement the daylight strategy on the second floor, two tubular daylighting devices were located in the back of the classroom to help distribute the daylight evenly.

The building's climate required year-round heating and cooling. Therefore, it was decided early on that a high-performance envelope was necessary. Insulated concrete forms for both the perimeter and interior walls of the building were chosen. For the roof, six inches of polyisocyanurate insulation was selected in order to increase the roof R-value to 42.

Learn more about this NZE school at www.EDCmag.com/events/494

LEADING THE WAY IN NET ZERO ENGINEERING

SamuelBrighouse Elementary School in Vancouver, British Columbia, Canada

Architect: Busby Perkins and Will
Construction budget: $10.6 M (building)
Cost per Square Foot: $215 (building)
Floor Area: 4,600 m2 (49,515 square feet)
Roof Area: 4,085 m2 (43,975 square feet)
Site Area: 32,370 m2 (3.2 hectare)
Climate Zone: 5

- Robert Drew, MAIBC, LEED BD+C, associate principal and technical director, Perkins+Will's Vancouver Office.robert.drew@perkinswill.com
- Eric Thorliefson, P. Eng, manager of Facilities, Richmond School District, ethorleifson@sd38.bc.ca
- Jean-Sebastien Tessier, P.Eng, project manager and engineer, Cobalt Engineering LLP.jstessier@cobaltengineering.com
- Julie Verville, MAIBC, OAQ, LEED AP, architect, Perkins+Will's Vancouver office. julie.verville@perkinswill.com
- Robert Drew, MAIBC, LEED BD+C, associate principal and technical director for Perkins+Will's Vancouver Office.Robert.drew@perkinswill.com
- Russ Drinker, AIA, LEED AP, managing principal of the San Francisco Office for Perkins+Will.russ.drinker@perkinswill.com

This design explores a number of passive and active green strategies including daylighting, displacement ventilation, wood-frame construction, onsite stormwater retention, geo-exchange, green roofs and solar hot water heating. The long axis of the school is oriented east-west to best take advantage of passive strategies related to solar access and direction of prevailing winds.

Based on a study that collected information from hundreds of school across Canada, the design team was challenged to be as efficient as possible and is aggressively targeting an annual kilowatt usage between 60 and 70 kilowatt hours per square meter.

Sangre de Cristo School in Mosca, Colo.
Architect: klipp| Hutton
Construction budget: $17,400,000
Cost per Square Foot: $217/square foot
Floor Area: 80,025 square feet (main building)
Roof Area: 80,025 square feet
Site Area: 40 acres
Climate Zone: 6B

- Paul Hutton, AIA, LEED AP, principal/founder, Hutton Architecture Studio. phutton@huttonarch.com
- Brian Walsh, principal, Catalyst Planning Group.brian@catalystplanninggroup.com
- Pete Jefferson, principal in charge, M.E. GROUP's Denver office. pete.jefferson@megroup.com
- Mike Kosters, senior project manager, GE Johnson.kosters@gejohnson.com

In a harsh climate where there are 8,500 heating degree days and only 51 cooling degree days, a well-insulated building that makes use of passive solar strategies was necessary. The project used funding from Colorado's BEST Program, which stands for Building Excellent Schools Today. The BEST program is funded by the State of Colorado's land trust, which manages three million acres of land and four million acres of mineral rights, established by the Colorado State Legislature and the Colorado Department of Education in 2008. This program provides an annual amount of funding in the form of competitive grants to school districts and charter schools throughout the state.

HayesFreedom High Schoolin Camas, Wash.
Architect: Mahlum Architects
Construction budget: 3,800,000
Cost per Square Foot: $185
Floor Area: 20,500 square feet
Roof Area: 21,000 square feet
Site Area: 1 acre
Climate Zone: 4C

- Joren Bass, AIA, LEED AP, project architect, Mahlum.jbass@mahlum.com
- Heidi Rosenberg, Capital Facilities director, Camas School District. heidi.rosenberg@camas.wednet.edu
- Brian Butler, PE, LEED AP, associate/senior mechanical

engineer, Interface Engineering.BrianButler@interfaceeng.com
- David Chesely, PE, LEED AP, RCDD, associate principal/senior electrical engineer, Interface Engineering.davidc@interfaceeng.com

Named after a former graduate and founder of Earth Day, Denis Hayes, the focus of this school's alternative learning environment focuses on environmental stewardship. Its smaller footprint naturally lent itself to a green design. Student and faculty interest in sustainability features permitted the design team to forego active cooling systems and certain interior finishes, the funds for which were then diverted to upgrades to the sustainable features.

The engineering team was engaged early in the project to accurately inform the architects and owner of the different energy impacts certain decisions would have on the building. A bulletin board in the school's main hallway lists the energy used by each teacher and their classrooms, which promotes both competition to lower energy costs and responsible choices among the students.

NZE Consultants

- Peter Rumsey, principal/practicing engineer, Integral Group. prumsey@integralgroup.com

NZE consultants focus on designing a low energy building first so that photovoltaic systems are smaller and more affordable. Photovoltaic systems are then typically used to provide renewable energy to the building. Surprisingly, some school districts have been able to outright pay for these systems stating that it's easier to get construction dollars rather than operation dollars. Other districts, however, prefer to go with a power purchase agreement (PPA) in which a lease-type of arrangement is made where third-party providers of PV systems can claim the tax credits and the district doesn't have to pay for the PV system.

In addition to the above participants, other industry professionals contributed their expertise to the roundtable, including Rick Cantwell, PE, President/CEO, Odell International LLC, Huntersville, N.C. (cantwellr@odell-intl.com) and Tom Kubala, principal and the co-founder of The Kubala Washatko Architects Inc., Cedarburg, Wis. (tkubala@tkwa.com)

AEDG the Advanced Energy Design Guide

- Eric Bonnema, commercial buildings research engineer, National Renewable Energy Laboratory (NREL). eric.bonnema@nrel.gov

The ASHRAE Advanced Energy Design Guides (AEDGs) are a series of publications designed to provide recommendations for achieving energy savings over the minimum code requirements of ANSI/ASHRAE/IESNA Standard 90.1. The initial series of guides have an energy savings target of 30 percent, which is the first step in the process toward achieving a net-zero energy building, defined as a building that, on an annual basis, draws from outside resources equal or less energy than it provides using on-site renewable energy sources. Each 30% Guide addresses a specific building type. Additional guides for existing buildings and at 50 percent energy savings toward a net-zero energy building are also planned and currently in progress.

Collaborative for High Performance Schools (CHPS)

- Ed Wansing, Associate AIA, LEED AP BD+C, Technical Programs coordinator, Collaborative for High Performance Schools (CHPS). ewansing@chps.net

CHPS is a not-for-profit membership organization established to make schools better places to learn. The organization's first criteria was created after the original LEED criteria was completed, allowing many of the people who created that original criteria for office buildings was able to create criteria for schools. It started in California, with the California Energy Commission and the major California utilities.

The criteria are now in 11 different states, four of which are managed through the national office in California. Those criteria are California Colorado, Texas and Massachusetts. The Marin Country Day School is a CHPS designed project.

NREL

- Carrie Strahan, EIT, LEED AP BD+C, studio director, Sustainable Building Services, Architectural Energy Corporation's (AEC) San Francisco office. cstrahan@archenergy.com

To start, define as part of the sustainability goal-setting session, your team's definition of net-zero energy and/or other energy conservation goals. Grid neutral only considers electricity use, while net-zero energy (site or source) includes electricity and natural gas, and "carbon

neutral," offsets any carbon produced from the natural gas and electricity use of the buildings. Make sure to also define the boundaries of the goal and how the goal will be measured to confirm whether or not the goal has been met. As a recommended net-zero energy design tip, it would be useful to set up a matrix that identifies best practices for achieving net-zero energy and categorize them by climate and building program needs.

Transcript copyright, Bruce Haxton January 2011. This work may not be reproduced in whole or in part without written permission of Bruce Haxton. All rights reserved.

Bruce McLean Haxton, LEED AP, is a sustainable consulting architect with more than 30 years experience. He has authored more than 45 articles and research papers and has spoken at numerous world conferences on sustainable facility design, laboratory design and science park design.