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# Everybody's an expert, right?

#### ASK THE MAN ON THE STREET FOR AN OPINION ON HOW A

school building should be designed, and chances are, he will have one. That's to be expected, of course, since virtually everyone in our society went to school somewhere, and undoubtedly was changed, for better or worse, by the places where they learned. But, no, not everybody's an expert, and that's what makes weighing all of the options and opinions out there so difficult. What makes a school design enhance or detract from the learning experience, despite all of the attention that has been devoted to objectifying it, is anything but clear-cut.

That's why we created this second edition of our SCHOOLS OF THE 21ST CENTURY supplement to ARCHITECTURAL RECORD. If you received a copy of this magazine, that means we consider you one of America's most important school construction decision makers. You may be an architect, a school board member, an administrator, or a teacher, but certainly you are someone who cares about kids and their school buildings. Our intent is to bring you the information you need to understand current trends in educational building design and construction so you may improve *your* schools. We have gathered case studies from around the U.S., consulted with experts on sustainability, and trends such as the small schools movement. We have been greatly assisted in the preparation of the editorial by the American Architectural Foundation, as well as members of the American Institute of Architects' Committee on Architecture for Education. ARCHITECTURAL RECORD is published by McGraw-Hill Construction, and we have also benefitted from the support of McGraw-Hill Education, one of the world's leading producers of textbooks, assessment and instruction materials, and books for professionals.

On March 28, 2008, SCHOOLS OF THE 21ST CENTURY will be on the road. Join us in Orlando for a free, half-day symposium on school design. We'll have presentations—and great conversations—with some of the nation's leading experts on trends in school design, school construction spending, and sustainability. If you are interested in attending, please go to www.schoolsofthe21stcentury.com for details.

Want to be an expert on school design? We can't guarantee that our publication and symposium will make you one, but we hope we will get you close.



Charles Linn, FAIA, Editor, and Laura Viscusi, Publisher

On March 28, 2008, SCHOOLS OF THE 21ST CENTURY goes on the road. Join us in Orlando for our school design symposium.

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LAURA VISCUSI, PUBLISHER

Clar B.

CHARLES LINN, FAIA, Editor

## What's Small and Green?

If you said, "A less-crowded, more environmentally sustainable school building!" your answer would be correct.

**BY CHARLES LINN, FAIA** 

wo of the most important design trends to gain traction recently are that where facility size is concerned, smaller is better, and the second is that "green" schools aren't just a fad—their advantages are so striking that the practices that make them green will become standard in the years ahead. Not only are the energy efficiencies inarguable, but also there is early evidence that some of the improvements inherent in these buildings can help test scores and reduce absenteeism.

#### **ENROLLMENT DRIVES CONSTRUCTION**

As enrollments continue to climb the future will look bright for school construction. The National Center for Education Statistics says that 49.6 million students will be

enrolled in 97,000 public primary and secondary schools in the 2007-08 school year. In addition, 6.1 million students are enrolled in private schools, and 1.1 million are being home schooled. The Center also says that K-12 enrollments will grow by 3 million between 2005 and 2015. While robust, this does not quite keep up with growth experienced in the 1990s. Educational construction starts peaked in 2001 at 273 million square feet. However, in 2008, only 222 million square feet are anticipated, according to the *McGraw-Hill Construction 2008 Outlook* report. The current slowdown is due to turmoil in the housing market and weakness in the economy. But, with 300,000 new students enrolling each year, about 12,000 classrooms need to come on line annually. If the past is any indication, many of these classrooms will come from additions and alterations. McGraw-Hill Construction's figures say remodeling projects typically outpace new construction by a ratio of 4 to 1.

Mahlum Architects' Rosa Parks Elementary is a beautiful example of Redmond, Washington's commitment to small neighborhood schools.



The logic behind economies of scale, that it is cheaper to run one large institution than many small ones, seems unassailable. And yet, research indicates that the financial savings that were to come from consolidating small schools into large ones were often absorbed by the bureaucracies created to run them while leaving principals little decisionmaking authority. At the same time, the many benefits of small schools, such as the ability for students and teachers to work together closely, a sense of community that most children crave, and the active engagement of parents were lost in the shuffle. Unfortunately, it is still the case that even where school boards and administrators

> agree that building small from the ground up is the way to go, some states' policies hold back funding if proposed schools are too small. Florida and Vermont are two states that have reversed themselves and encourage small school buildings.

Where small schools are possible, the trend is to take the idea one step further. Long corridors are out, replaced by small learning communities within schools. Seattle-based Mahlum Architects used such an arrangement at Rosa





Parks Elementary School in Redmond, Washington. Each small learning community comprises four small classrooms grouped around a shared activity area. Classes can choose to work together or not, depending on the project. Glass sliding doors provide a connection between both types of spaces so that teachers can supervise both simultaneously. The arrangement is intended to allow interdisciplinary teaching and learning teams.

Another form of the school-within-aschool movement has large student bodies being separated into smaller ones, in both new and existing buildings and campuses. Even the change-challenged New York City Department of Education has opened an Office of Small Learning Communities. Its reform strategy includes breaking 60 large high schools into smaller ones, and replacing the lowest-performing, large high schools with 200 new, small, "academically rigorous" high schools. When small schools are created within large school buildings, it is desirable

## Rosa Parks Elementary's library shares light with the corridor. Each small learning community (plan) has four classrooms grouped around an activity area.

that schools be physically separate from each other, and some remodeling may be required to accomplish this. Students from all of the schools must have equal access to specialized shared facilities such as labs, gyms, and cafeterias, but this can often be accomplished through creative scheduling.

It is worth noting that school districts with large schools are under pressure to break them up simply because they are now competing with charter schools, which boast their small size as a major selling point. Few charter schools can afford fabulous facilities. However, their student-to-teacher ratios are often lower than those in public schools.

#### **GETTING GREEN**

Our parents always said that fresh air and sunshine are good for us, and it seems as if folks are lining up around the block to reaffirm the



#### First Floor

1 Classroom 2 Activity area 3 Kindergarten 4 Resource room 5 Commons 6 Gymnasium 7 Library

#### trends ESSAY





The most immediately measurable advantage to greening a school can be seen simply by scanning its generally lower-than-average utility bills. Special attention is paid to designing lighting and mechanical systems so that this can be done while improving occupant comfort. More research is needed to determine whether the health and productivity of students and faculty in green schools are improved over a control group. The advantages seem intuitively obvious: The use of non-toxic materials and better ventilation, for example, should improve air quality and reduce respiratory illnesses. If attendance improves, users will teach better and learn more.

Two recent developments are sure to stimulate interest in green schools. The first is the release in early 2007 of a version of the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) for Schools. LEED for Schools is not a means of evaluating schools that have already been built, but rather a method of guiding the





design and construction of new buildings. All LEED-rated schools incorporate sustainable design and construction attributes from the earliest stages of their design. These include energy and water efficiency, daylighting, alternative transportation options, and recycling. All LEED projects have their environmental systems fine-tuned after construction in a step called commissioning. But, for a school to earn a LEED rating, issues of particular importance in schools, such as children's sensitivity to chemicals, classroom acoustics, joint

Use the Web sites listed below to find out more about many of the topics discussed in this article.

McGraw-Hill Construction Publications<br/>construction.ecnext.com/coms2/analyticsNational Center for Educational Statistics<br/>nces.ed.govUSGBC LEED for Green Schools<br/>buildgreenschools.orgDollars & Sense I and II<br/>goodsmallschools.orgNew York City Office of Small<br/>Learning Communities<br/>www.nycslc.orgCharter Schools<br/>uscharterschools.org

The LEED-rated Thomas L. Wells School in Toronto uses daylighting, high-performance glazing, low-VOC finishes, high-efficiency boilers, and a heat recovery system to save energy. The diagram shows how the heating and ventilating system works.

use of facilities, and mold prevention must also be addressed. At the end of 2007, about 70 schools had attained LEED certification; about 500 more were seeking it.

The Thomas L. Wells School in Toronto, completed before LEED for Schools was introduced, received a Silver LEED–Canada New Construction rating. It has high-efficiency boilers, a heat recovery system, and highperformance glazing to cut energy use. Bart Sampson Neuert architects paid particular attention to air quality, and used low-VOC materials throughout the project. Finishes, such as porcelain tile flooring, that would not require stripping and waxing like standard vinyl composition tile, were chosen because cleaning chemicals are a major source of indoor air pollutants that can be harmful.

Yet another force that could have a profound influence on the greening of schools is that in early November of 2007, the Clinton Climate Initiative announced it was partnering with the USGBC and at least two dozen other organizations to start a green schools program, whose ambition is to make all American schools green within a generation. The program will help schools reduce energy consumption as well as educate a new generation of students about the effects that buildings have on the environment. Considering that the number of existing schools that need improvements to achieve such a goal likely exceeds 87,000, the challenge and the potential for positive change are both enormous.

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## Listening vs. Hearing

CEILING CHOICES THAT MAKE A DIFFERENCE TO A CHILD'S EDUCATION



Ecophon Gedina tiles uses high-density fiberglass to achieve a high sound absorption in quiet areas for improved student focus.

#### HE RENOWNED ACOUSTICAL SCIENTIST DAVID LUBMAN

is said to have once observed, "We put kids in classrooms where they can't hear, but we would never put them in a classroom with the lights turned off." This reference is to the startling lack of attention given to the acoustical design of classrooms over the last quarter century. The capacity to understand the teacher's words can be compromised by a concept as basic as where a child sits in the classroom. If the student sits in the front, the lesson is understandable. If he or she sits elsewhere, it is not. This inequity is compounded for students with special needs who are part of so many mainstream classrooms across America. These special needs may include children with hearing and speech impairments, learning disabilities, central auditory processing disorders and those for whom English is a second language. Even the temporary hearing loss that results from the common cold or an ear infection can have a substantial effect on a child's ability to hear the teacher on a particular day. The solution is simple: quiet classrooms. Unfortunately, achieving the solution is more complicated because of technical, financial and even political obstacles.

New to the quiet classroom movement is the U.S. Green Building Council. Their recently issued LEED® for Schools provides an acoustic element under "Indoor Environmental Quality." USGBC's reference to the landmark ANSI S12.60 2002 American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools may have a cumulative effect as more states mandate LEED® certification for public building projects.

CertainTeed Corporation is a part of Saint-Gobain Corporation, a world-wide sponsor of independent academic research on classroom acoustics. At CertainTeed Ceilings, the company feels it is their obligation to share their accumulated knowledge with stakeholders in this essential part of school design: architects, interior designers, school boards, acoustical consultants and parents. They recognize that only through public awareness will quiet classrooms become the norm rather than the exception.

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Pictured Above: The Houston Independent School District Administration Building in Houston, Texas. Here the Vision 60 System is used not only to protect lives and property, but to provide full vision and light into the stairwell enclosures on multiple floors.

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## **Competition Yields Insights**

Thoughtful "Redesign Your School" entries show what kids want in their schools. BY BARBARA J. SAFFIR

an boxy, boring schools that resemble prisons. Choose daylight over fluorescent lighting. Connect with the community. Go green. Those are some key messages high school students delivered in the first annual "Redesign Your School" contest sponsored by the American Architectural Foundation (AAF) and Target.

"Aesthetics really affect the mood and what you even think about a place," said Tyler Rush, the grand prize winner from Austin, Texas, who created the "Light + Nature School." A great school design, he said, "has the potential to make student performance better."

Some experts agree. That's one reason the AAF sponsored the national design competition, which is part of the its "Great Schools by Design" program to create innovative 21stcentury learning spaces and encourage students, educators, parents, designers, and the media to share ideas.

Ronald E. Bogle, the AAF's president and CEO, said the goal was not only to recognize the work of individuals, but to "add student voices" to the national dialogue on school design and to "harvest their ideas."

"This is a process we hope not only enriches students but enhances the design process," said Bogle, who is also a former school board member. Karen Casanova, senior specialist for community relations for





The idea that school buildings are often intimidating was a common theme, and Alice Cao's imaginative drawing of a school in a tree full of flowers even featured a welcome sign. Oscar Lucero built a model around an aquarium and photographed it as his entry. It was complete with lighting and model cars.

Target, says the company hopes the contest will "spark an outcry for better" school design. "We're passionate about education," she said. "We're passionate about design. This program unites the two."

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Free-flowing, organic forms characterized some winning entries, in particular those from Aaron Tobey (above). Drawings by Alixis Clark (upper right) and Tannie Duong (lower right) emphasized their desire for a strong connection between learning environments and the out-of-doors. Patcharin Saefrung's entry (below) was notable for its joyful expression of all the things school should be.







Their competition is the largest national design contest for high school students. It attracted a diverse mix of ninth through 12th graders, boys and girls from all over America. More than 5,000 initially registered online for the competition, which ran from March 1 to June 30. Then, 250 submitted projects. They competed for a top prize of a \$10,000 college scholarship and seven \$5,000 scholarships along with a trip to Washington, D.C., for the November 5th awards presentation. Twenty other finalists won \$100 Target department store gift cards.

"The finalists truly shook up our assumptions about what mattered most to students," said juror Daniel S. Friedman, FAIA, dean of College of Architecture and Urban Planning at the University of Washington in Seattle. "For example, an overwhelming number of entries proposed the integration of school and com-

#### **THE WINNERS**

The winners of the American Architectural Foundation's Redesign Your School competition came from many different cultural backgrounds. They are:

#### **Grand Prize Winner**

Tyler Rush, Westlake High School, Austin, Texas

#### **Finalists**

- Alice Cao, Thomas More Prep-Marian High School, Hays, Kansas
  Alixis Clark, Westwood High School, Austin, Texas
- Tannie Duong, La Quinta High School, Westminster, California
- Oscar Lucero, East Haven High School, East Haven, Connecticut and Educational Center for the Arts ACES, New Haven, Connecticut
- Irina Papuc, Woodstock High School, Woodstock, Illinois
- Patcharin Saefrung, San Jose High Academy, San Jose, California
- Aaron Tobey, Western Albemarle High School, Crozet, Virginia

munity programs; most incorporated sustainable technology."

The prize-winning projects and their presentations varied as much as the contestants. Two kids crafted colorful hand-drawn sketches with no architectural plans, while others submitted videos and professionally detailed designs. Some were super detailed with items such as an HVAC plan and color samples (beige "cornmeal" and pale-green "aloe vera").

All incorporated nature or green principles either literally or figuratively: from glass tables that doubled as fish ponds to outdoor lunch patios to waterless urinals to efficient classroom shapes based on a honeycomb's "hexagonal tessellation."

Several students created radial designs and curvy classrooms or corridors. Rectangles were rare. Others fashioned college-like campuses.

"There were a lot of kids who said 'I want a campus,' " said juror Carol

Rusche Bentel, FAIA, of Bentel and Bentel in Locust Valley, N.Y.

Her fellow juror Kerry Leonard, a principal of Chicago-based OWP/P architects, said: "What the students have told us is that they





Irina Papuc's design for a green school draws its inspiration from forms found in nature. The sophisticated design considers such issues as natural ventilation, security, photovoltaics, solar heating, and water conservation.

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#### REDESIGN YOUR SCHOOL COMPETITION

want places of learning where they feel welcome; they want personalized spaces and they want social spaces."

The winners were judged on creativity and their presentations. They could submit almost any type of work that fit into an 11-inch by 17-inch envelope, including sketches, computer-assisted drawings, videos, model photos or PowerPoint presentations.

In addition to their visual designs, they had to write up to 1,000 words explaining their ideas. They also had to address at least one of the AAF's eight "Principles of School Design." These are to design schools to support a variety of learning styles; enhance learning by integrating technology; support a small, neighborhood school culture; create schools as centers of community; engage the public in the planning process; make healthy, comfortable, and flexible learning spaces; and to consider nontraditional options for school facilities and classrooms.

The contest was divided into four geographical regions. Regional juries initially chose semifinalists. Then they sent those names to the final jury in Washington, D.C., in September. The six male and four female jurors (eight architects and two educators) selected one winner from each of the four regions and four others regardless of location. The grand prize winner was chosen from the eight finalists after an interview.

All the contestants said they wanted to improve their schools. As one student put it in his video: "It all comes down to one thing: learning. That's what it's all about."

Juror Cynthia Weese, FAIA, of Chicago's Weese Langley Weese, said a well-designed school is essential because it's "a critical place" for America's youngsters. As she put it: "It's their introduction to the world."

Barbara J. Saffir is a Fairfax, Va. freelance writer who covers architecture and design in the Washington, D.C. area.

#### **GRAND PRIZE WINNER'S SCHOOL LETS THE SUN SHINE IN**

Tyler J. Rush thinks school should be a happy place. But the Texas teen feels that schools' typical small, windowless rooms fail to evoke a feel-good vibe that encourages learning. So he designed the "Light + Nature School."

His ideal campus features asymmetrical buildings with "translucent, tensioned fabric" roofs to shine daylight throughout each space. Rush designed it to mimic the outdoors where he's happiest—tromping through the woods, frolicking in the river or just chilling out under the sun.

"The school is centered around an outdoor courtyard, which acts as a natural interaction space for students," he said. It's "a new, healthy way to look at school design centered around nature."

Most of the eleven angular buildings on his campus boast massive windows. The photovoltaic-powered building is a community resource with a shared stadium, fitness center, cafe, and 24-hour library. He clustered class areas by subject to create a "small school culture" so kids can learn in cozy groups. His wireless, high-tech campus relies on laptop computers more than books. Rush said he was inspired by Frank Lloyd Wright's Taliesin

West and the Denver International Airport.

He wowed the jury with his presentation. "Holy cow," said one juror as he opened the spiral bound notebook with its 15 pages of professional-looking drawings. Ron Bogle, president and CEO of the American Architectural Foundation, later said that Rush "had a welldeveloped philosophy about his concept" and he "expressed it with a tremendous amount of sophistication."

Rush created his project with Google's "SketchUp" software. It took "many, many late nights," he said.

Born in San Jose, California, Rush moved to







Austin when he was five. His mom, Terri, is a former interior designer. Dad, Ira, is a computer engineer. When he's not hanging outdoors, the 18-year-old is strumming a guitar.

Rush started getting hooked on architecture after his parents built two customdesigned houses. Last summer he interned at an architectural firm and enrolled in a twoweek exploratory course at Clemson University. Now he's engaged in a mentoring program with an architect at Westlake High School. Next stop: architecture school. The high school senior is now working on his college applications. — Barbara J. Saffir

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## **Classroom Acoustics**

Enhancing the learning environment through better speech intelligibility.



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#### classroom acoustics

On any given school day, thousands of students across the country are unable to understand 25 to 30 percent of what's said in their classroom.

The reason: excessive noise and reverberation within the classroom interferes with their ability to clearly hear their teacher.

The result: a decreased level of concentration, an increased level of stress, and an overall reduction in the level of learning.

Considering that the primary mode of teaching involves speech and listening, is it any wonder that good speech intelligibility is required in classrooms?

#### Acoustic environment

The quality of the acoustic environment in a classroom is vital to all students because all need to understand the teacher, but it is of particular importance to students who have hearing impairments or learning disorders; to very young students with limited vocabularies; to students for whom English is a second language; and to students with a temporary hearing loss due to illness such as a head cold.

To help remedy problems caused by inadequate acoustic design, the American National Standards Institute (ANSI) approved ANSI Standard S12.60 for Classroom Acoustics.

Titled "Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools," the standard provides an enhanced learning environment for students and teachers alike by improving the conditions for good speech intelligibility.

#### ANSI Standard S12.60

ANSI Standard S12.60 addresses both the issues of reverberation time and of background noise as they affect speech intelligibility by setting maximum permissible levels on each.

Under the standard, the maximum acceptable reverberation time in unoccupied but furnished classrooms with volumes up to 10,000 cubic feet is 0.6 seconds, and 0.7 seconds for classrooms between 10,000 and 20,000 cubic feet. Reverberation time is the time required for sound reflections within a room, such as from a loud hand clap, to become inaudible.



The maximum acceptable background noise allowed in these classrooms is 35 decibels (dBA). By comparison, the loudness of a normal face-to-face conversation is about 60 dBA.

These acoustical performance requirements apply to the design and construction of new classrooms of small-to-moderate size, and, as far as is practical, to the renovation of existing classrooms.

At the present time, the ANSI standard is voluntary unless referenced by a code, ordinance or regulation. Individual school districts, for example, may require compliance with the standard as part of their construction documents for new schools.

#### **New classrooms**

ANSI Standard S12.60 is a performance specification in that it states desired results but not how to attain them. However, it does include a number of appendices that are prescriptive in nature, with specific design suggestions, including choice of materials.

Designing a classroom to meet the acoustical requirements of the standard is neither difficult nor costly. The key is to include acoustic concerns early in the planning and design stages. With this in mind, general guidelines are described below.

**Reverberation time.** For any given room, reverberation time decreases as additional sound absorptive materials are added in the space. Both the amount of sound absorptive materials and its location in the space are important considerations that affect the quality of sound within the room.

- For classrooms with ceiling heights of approximately 10 feet, place most, if not all, of the sound-absorbing material on the ceiling. This is usually the easiest and lowest cost solution. For best results, choose an acoustical ceiling panel that has a Noise Reduction Coefficient (NRC) rating of at least 0.70.
- For rooms with ceilings between 12 and 14 feet high, it may be advantageous to place some of the absorptive material on the walls as well as on the ceiling.
- For ceiling heights 15 feet or over, it is usually necessary to utilize wall absorption. Acoustical wall treatments usually consist of 3/4" to 1" thick mineral fiber or fiberglass backer board with a vinyl or fabric covering.
- If there is no possibility of acoustical wall treatment, try to ensure that three-dimensional furnishings such as bookshelves are distributed around the room to diffuse sound reflections, thereby reducing the possibility of echoes.

Carpeting may also help reduce reverberation, but not as much as a good acoustical ceiling because most commercial carpeting is generally a poor absorber (NRC of 0.25 or lower). However, carpeting can help reduce background noise caused by the sound of people walking, and desk and chair shuffling.

Figures #1 and #2 show the difference in sound paths in a classroom that is not acoustically treated compared to one that is.

**Background Noise.** There are many sources of background noise that may intrude into a room. How these are handled depends of the path the noise takes in entering the room. The primary contributors to background noise are described below.

Noise Traveling Through the Plenum. Some rooms are constructed with walls that are only as high as the suspended ceiling, rather than extending all the way up to the roof or floor deck above. As a result, noise from an adjacent room can



Figure 1: Black arrows represent direct sound with a clear path from teacher to student. Red arrows represent reflected sound. Note the many red arrows which indicate the longer, more indirect path taken to reach the student.

ACOUSTICALLY TREATED CLASSBOOM



Figure 2: The addition of sound absorbing materials reduces late arriving reflected sound, lowers reverberation time and improves speech intelligibility.

penetrate the ceiling plane and move unimpeded throughout the ceiling plenum. Some portion of this plenum noise will pass back down through the ceiling into adjoining rooms, thereby adding to the background noise in each room. To help reduce plenum noise intrusion:

- Choose an acoustical ceiling panel that has a Ceiling Attenuation Class (CAC) rating of 35 or higher.
- Backload the suspended ceiling with R-11 fiberglass building insulation batts.
- Install a gypsum board plenum barrier between adjacent rooms, being sure to seal all penetrations such as pipes, ducts, cable runs, etc.

Noise Traveling Through the Walls. Years ago, interior school walls were built of brick or concrete block, so intrusion of sound through a partition wall was not much of a problem. Today, noise intrusion must be addressed because most walls are constructed using metal studs with a layer of gypsum wallboard on each side.

According to the ANSI standard, the minimum Sound Transmission Class (STC) rating of a wall separating two adjacent classrooms is 50. To achieve this rating and reduce noise transmission between rooms:

- Add R-11 fiberglass insulation in the cavity between the gypsum board layers.
- Add a second layer of gypsum board to each side.
- Seal all gaps between the walls and the floor and ceiling.
- Seal any openings in the wall such as piping, electrical outlets, and HVAC registers.

**HVAC Noise.** The main source of background noise in classrooms is usually the heating, ventilation and cooling (HVAC) system. A centralized system is usually much quieter than window or room units which usually contain high velocity fans that are very loud and difficult to treat with sound absorbing materials in the room. To help reduce HVAC noise:

- Locate air handlers and rooftop mechanical equipment away from critical listening spaces such as classrooms.
- Locate the equipment over spaces that are inherently noisy, such as corridors, cafeterias and gymnasiums.
- Position units over hallways and then run ducts to nearby classrooms.

#### **Existing classrooms**

A classroom designed without regard to good acoustics will often include a high ceiling of plaster or gypsum board; masonry or gypsum board walls; and a hardwood or tile floor.

Unfortunately, numerous classrooms fitting this description were built in the days before sensitivity to acoustical needs. In such a classroom, long reverberation times tend to destroy speech intelligibility, especially for younger children.

Acoustical problems in existing classrooms can be solved, but the options are often limited. This is because little can be done to change the architectural infrastructure or HVAC system without great expense. Consequently, the most common and affordable solution is to control reverberation through the addition of sound absorptive materials. To improve the acoustical environment of an existing classroom:

- Install a suspended acoustical ceiling in a classroom that does not have one.
- If an acoustical ceiling is already in the room, replace panels that have a low NRC (0.50 or lower) with panels that have a higher NRC (0.70 or higher).
- Add acoustical wall treatments and "space absorbers" (baffles).
- Add carpeting.
- Seal as many openings in the common walls as possible.
- Add a second pane of glass with an air gap to the windows, if possible, to help block exterior noise.
- Install vibration isolators under HVAC equipment, and silencers in the ductwork.

Solutions such as these do not add significantly to the construction cost of a new building. It is when they are included as part of a retrofit that additive costs usually apply.

#### **Quiet classrooms**

The need for good classroom acoustics and the methods for attaining them have been known for decades. However, in the absence of a standard, far too many schools have been built with little or no concern for good hearing.

The establishment of ANSI S12.60 fills that void by providing clear design goals for both school planners and administrators. It also raises awareness of the learning problems associated with poor acoustics and, hopefully, eventually eliminates design problems from being repeated as new schools are built.

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#### Resources

The information on classroom acoustics and ANSI Standard S12.60 has been provided by Armstrong Ceiling Systems. There are additional resources available to you to meet your needs. They include:

- Classroom Acoustics CEU course at armstrong.com/ceu
- Online Reverberation Tool at armstrong.com/schools
- Reverberation Calculations through TechLine<sup>™</sup> at 1-877-ARMSTRONG
- Reverberation Calculation Form at armstrong.com/schools
- "Classroom Acoustics, a resource for creating learning environments with desirable listening conditions;" Acoustical Society of America, asa@aip.org
- Vour Armstrong Ceiling Systems representative at 1-877-ARMSTRONG

#### **Case Study**

An evaluation conducted by Dr. Kenneth Roy, senior principal research scientist for Armstrong Building Products, demonstrates the difference a high performance acoustical ceiling can make in a classroom renovation.

The acoustic test took place in a sixth grade classroom at the Robert E. Lamberton Public School in Philadelphia, PA. Built in 1949, the 24'x44'x11' classroom had a sprayapplied 1/2" fiber-on-plaster ceiling, concrete block walls, and a vinyl tile floor. The NRC of the existing ceiling was estimated to be approximately 0.25.

The reverberation time in the existing room was 1.1 seconds averaged over the frequency range specified by ANSI S12.60, far exceeding the maximum acceptable reverberation time of 0.6 seconds.

An Armstrong School Zone<sup>\*\*</sup> Fine Fissured suspended ceiling with an NRC of 0.70 was then installed. This ceiling is designed specifically for educational facilities and features more uniform sound absorption than most conventional ceiling panels commonly used in these applications. Following the change in ceilings, measurements were re-taken and the average reverberation time was now 0.56 seconds, within the acceptable limit.

#### **Reverberation Calculator**

To help demonstrate the beneficial effect of acoustical treatment in a classroom, Armstrong Ceilings has developed a web-based, interactive Reverberation Calculator that allows users to hear the difference in sound quality both before and after treatment. It will even provide recommendations for a new space or an upgrade to an existing space.

To access the calculator, simply log on to armstrong.com/schools and follow the prompts regarding a description of the space and its surface materials. The



program will first calculate the current reverberation time and allow users to hear the quality of the sound. Following selection of acoustical treatment options, the program will then allow users to hear the difference in sound quality with lowered reverberation time.



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A member of the Pella family of companies, EFCO is headquartered in Monett, Missouri, where they provide careers for more than 1,600 employees.

In business for more than 50 years, EFCO is known for their long-standing commitment to innovation, efficiency, expressive design and a level of quality unsurpassed in the industry.

Since their inception, they have grown into a leading manufacturer of architectural aluminum window, curtain wall, storefront and entrance systems for commercial architectural applications. Their products can be found in everything from sports arenas, shopping malls and government office buildings to high-rise residential and commercial buildings.

However, it's the hundreds of schools and collegiate building projects across the country that makes them most proud.

#### >>> ELECTIVES:

For customers, educational institutions especially, EFCO's vertically integrated manufacturing helps ensure design solutions that are both innovative and sensible. For EFCO, it's precisely what makes them a leader in commercial- and architectural-grade products. > Windows. EFCO manufactures more than 25 aluminum window systems, all of which meet AAMA performance standards. And the company provides them in all the applications that ensure they'll meet clients' demands: hung, projected, sliding and special-purpose.

They can also custom-design, engineer and fabricate windows to meet any project's specifications. Additionally, their Trim-All® system is designed for restoration or replacement applications, such as the one recently completed at Carver High School in Atlanta. Their exterior panning frames and interior trims snap into place over existing wood or steel frames making for easy installation and immediate energy savings. > *Curtain wall*. EFCO manufactures curtain wall systems in a variety of depths, profiles and finishes. Their systems meet key specifications for resistance to air, water and impact, as



PERFORMING ARTS BUILDING: Texas A&M Corpus Christi Campus, Corpus Christi, Tx.

well as modern expectations for sustainability and structural and thermal performance.

As you can see from Texas A&M's Performing Arts building, which utilizes EFCO's E-Wall, that variety allows the company to offer a comprehensive, cutting-edge line that combines design and performance.

Their E-Wall reduces labor time and costs, because its moldedcorner silicone gasket means there are no internal joint seals, mullion plugs, pressure plates or snap-on covers.

> Entrances and storefronts. EFCO has entrance and storefront systems that meet the unique needs of schools and universities ---such as the system at Ozark Technical Community College in Springfield, Missouri. Specifiers are consistently impressed by the sheer variety of EFCO's products and their durability, versatility, low maintenance and unequaled quality.



OZARK COMMUNITY COLLEGE: Richwood Valley Campus, Ozark, Mo.

The company's entrances are designed to integrate easily with their entire family of storefronts. Available for the full spectrum of applications and requirements, EFCO entrances and storefronts provide reliable air, water, thermal perform-

**EFCO's vertically** integrated manufacturing helps ensure design solutions that are both innovative and sensible

ance, along with maximized security-important advantages for busy schools and university buildings.

With EFCO, you get all the choices that ensure an expressive design, while they deliver quick fabrication—in the shop or in the field.

#### >>> "GREEN" CLASSROOMS:

At EFCO, they understand the need to provide long-term, energy-efficient and earth-friendly options that help keep operations costs down. In fact, EFCO has lessened the environmental impact of their products in a number of ways: > Recyclable materials. EFCO offers a product line comprised largely of glass and aluminum-two of the world's most abundant recyclable materials. Recycled aluminum is identical to smelted aluminum and is an extremely effective building material. Plus, it only takes a small fraction of energy to produce and is easily recycled.



#### EFCO offers a number of products that withstand severe weather and massive force

> Thermal innovation. Many EFCO products save energy by incorporating their E-Strut<sup>®</sup> technology for thermal isolators. In addition, a new pultruded process supports their fiberglass E-Shield<sup>™</sup> window. North Dakota State University is just

one example of an educational institution that has utilized this cost-saving advantage.

> *Reduced VOCs*. The company's Ultrapon<sup>™</sup> and Ultraflur<sup>™</sup> painted-finish systems contain high solids, which decrease the pounds of Volatile Organic Compounds (VOCs) per gallon of paint without sacrificing performance.

> Anodizing finishes. When producing EFCO's Class I anodic finish, they filter the water and chemicals used in this process. As a result, a "cake" of aluminum hydroxide is made—and then reclaimed and sold to processors to produce alumina.

#### >>> KEEPING KIDS SAFE:

While the company hopes they are never needed, EFCO offers a number of products that withstand severe weather and massive force. These products are specifically designed to keep students safe.

After all, schools in coastal regions like Florida's Gibbs High School are susceptible to some of the country's most extreme weather. And with the potential for man-made disasters, whether intentional or accidental, safety is a critical consideration wherever a school building is constructed.

To ensure that their impact-resistant products withstand extreme conditions—whatever the cause—EFCO maintains extensive R&D and laboratory testing facilities to make certain their products meet and exceed standards even before they're independently tested. They also apply their own expertise before outside verification. For instance, their engineers and researchers develop and test their Impact Grade products in EFCO facilities.



GIBBS HIGH SCHOOL: St. Petersburg, Fla.



> Making the Grade. EFCO recognizes and works toward all the accepted standards for impact resistance:

• *Impact Grade.* Products are manufactured in accordance with Miami-Dade and ASTM 1996 & 1886, which have been adopted along much of America's eastern coastline.

• *Blast Grade.* Designed to help ensure that a building and its occupants survive an explosion, products are tested to ASTM 1642-03.

• *Ballistic Grade*. Tested to UL 752, products provide superior resistance to projectiles of various shapes and sizes—a particularly important feature for educational institutions that face a variety of threats daily.

• *Hurricane Grade.* Manufactured and tested to comply with Dade County Hurricane Code, EFCO's products are designed to preserve structural integrity, keeping roofs and walls intact and preventing the intrusion of damaging winds and windborne objects.

Their products also undergo missile-impact testing, which measures structural performance against high-velocity windborne projectiles.

From research and development to manufacturing and testing, EFCO applies the knowledge and dedication of experienced professionals. This attention to detail ensures security and peace of mind.

With EFCO, you have a single source for products and information that help you meet regulatory standards. And

you have the confidence that your building will help protect the students inside it.

#### >>> EXCELLING IN THE CLASSROOM AND BEYOND:

For EFCO, success and growth are what happens when you spend decades working with your customers to meet their needs.

Their products are designed with students' well-being in mind. From maximized natural lighting that enhances the learning atmosphere to ventilation capacity that further ensures health and safety. And they address all of today's security, energy and environmental challenges.

Throughout their history, EFCO has set high standards and then met them all—with their industry-best windows, curtain wall, storefronts and entrances and more.

The company looks forward to continuing to work hand-in-hand with the educational community, offering products that meet your needs as they strive together to build and improve America's schools well into the 21st century.

#### **EFCO Corporation** Visit us online at efcocorp.com or call us toll-free at 1(800) 221-4169.



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## What Color is Your Whiteboard?

ENVIRONMENTALLY RESPONSIBLE COMMUNICATION PRODUCTS BRING SUSTAINABILITY TO EDUCATIONAL SETTINGS



#### **NVIRONMENTAL CONSIDERATIONS HAVE NEVER PLAYED**

a more important role in new school construction and refurbishing than today. Every year, more and more green schools are built, saving energy, reducing environmental contaminants, and keeping our children healthy. The Council of Educational Facility Planners International estimates that schools will spend \$5.3 billion on green building by 2010, a rapid growth from almost nonexistence a few years ago.<sup>1</sup>

There is incredible momentum to this important work, as evidenced at Greenbuild International Conference and Expo held in November 2007. Greenbuild experienced record attendance, with the keynote speech given by former President Bill Clinton, urging conference attendees to spread the word about the economic benefits of sustainable design. The green movement is further supported by an increasing number of green school initiatives, such as the Collaborative for High Performance Schools (CHPS), which works to design, build and operate a new generation of schools that are efficient, green, healthy learning environments for children and helps facilitate and inspire change towards more environmentally responsible planning, design, maintenance and operation of our educational system.

According to the U.S. Environmental Protection Agency (EPA), 20% of the U.S. population, approximately 55 million people, spend a majority of their time in more than 120,000 schools. Roughly half of these schools have indoor air quality problems, which pose a health risk to children and educators. Indoors, products and materials release volatile chemicals and particles into the air that may negatively affect human health. The EPA, the American Lung Association, and the World Health Organization view indoor air pollution as one of the greatest risks to human health.<sup>2</sup>

Children are at greater risk of developing health problems due to poor indoor air quality because they are still growing and are more vulnerable to hazardous environmental exposures. Indoor pollutants such as certain Volatile Organic Compounds (VOCs), pesticides, and allergens are more harmful to younger generations;<sup>3</sup> asthma, for example, is the leading cause of school absences and results in 14 million missed school days each year.<sup>4</sup>

Whether it's reducing the ecological footprint by using greener materials, or ensuring a healthy classroom for our children, the environment is a key consideration for architects, designers, and specifiers involved in the construction of today's schools.

Supporting sustainability in the classroom, PolyVision®, A Steelcase Company and the world leader in visual communication products, has stepped up to take the role of leader in the industry with regard to environmental stewardship. With a key focus on the K-12 market, PolyVision recognizes that architects, specifiers, school administrators and parents alike are all concerned about the quality of indoor air as well as reducing the ecological footprint wherever possible. As schools are being built or refurbished, each party needs to explore and understand the impact that each product selection will have on the air, environment and most importantly, the health of our children. Studies show that as schools are better lit and better ventilated, attendance improves—which means better students, and smarter kids!<sup>5</sup> "PolyVision believes everyone has a duty to be environmentally responsible," says Mike Dunn, President and CEO of PolyVision Corporation. "We are dedicated to taking the lead in the development and distribution of products that comply with both the spirit of the world's evolving ecological interests and the requirements of today's classrooms and work spaces."

Architects face many challenges when building green schools and sustainable buildings. The best remedy is accurate information and viable options. There are many choices today in the category of visual communication products, however, PolyVision offers a unique combination of leading-edge and environmentally responsible solutions from the simplest traditional whiteboard to sophisticated collaboration tools.



PolyVision believes that sustainability is an important business practice in today's global economy. In late 2004, the company set out to develop an environmentally responsible version of their  $P^3$  ceramicsteel<sup>®</sup>, the world's best-selling writing surface for whiteboards and chalkboards.

During the development of this new technology, they were determined to create products that complied with both the spirit of the world's evolving ecological interests and the requirements of today's workplace. It was critical that there be no difference in the look, feel, or use to the end user, which included the following characteristics:

- > Virtually indestructible surface
- > Product protected for life (PolyVision's Forever Warranty)
- > Non-porous surface that erases easily without "ghosting"
- > Allows for smoother writing and superior visibility
- > Magnetic
- Resistant to stains, scratches, bacteria, fire, chemicals, and graffiti



The result of this development process was  $e^3$  environmental ceramicsteel<sup>TM</sup> writing surface, which offers the same features as the  $P^3$  ceramicsteel surface, but with a more environmentally responsible composition: the total amount of heavy metals (cadmium, mercury, hexavalent chromium, and lead) contained in  $e^{3TM}$  is less than 0.1%; the surface is free of arsenic and antimony and contains no VOCs. In addition, the steel core is made from a minimum of 30% post-consumer and post-industrial waste and the surface is 99% recyclable.

The company began to scrutinize the entire supply chain and, from their key learnings, developed eVision<sup>™</sup>, their corporate environmental policy. Following the eVision principles, their Production, Supply Chain, and Research and Development teams continually evaluate alternate resources and process improvements for new and existing products. This cycle of continual improvement has enabled PolyVision to capitalize on technology and material efficiency to reduce their environmental footprint while developing products that advance human health, social responsibility, and economic success.

To validate PolyVision's product development and to help customers assess environmental merits, the company researched available environmental standards worldwide and selected two third-party certification programs that were most applicable to their goals and product offering.

*e<sup>3</sup> environmental ceramicsteel* surface is the first and only writing surface to receive International Cradle to Cradle<sup>SM</sup> Silver certification, awarded by McDonough Braungart Design Chemistry (MBDC). Cradle to Cradle certification focuses on the characteristics of sustainable materials, products, and systems and places a major emphasis on the human and ecological health impacts of a product's ingredients, as well as on the ability of that product to be truly recycled or safely composted. "PolyVision continues to demonstrate a true commitment to the Cradle to Cradle design concept through its material choices, product designs and advanced manufacturing processes," said William McDonough, architect, designer and co-founder of McDonough Braungart Design Chemistry.

In addition, the company's marker and tack board range has earned GREENGUARD Indoor Air Quality® and the more rigorous GREENGUARD for Children and Schools<sup>SM</sup> certifications, assuring specifiers and consumers that the products they select support healthy indoor air quality and do not emit harmful chemicals. Products that have Cradle to Cradle and GREENGUARD certification may also contribute to LEED® Innovation in Design credit.





PolyVision's environmental commitment extends to its technology portfolio of products, which also meets the strict standards for content pursuant to Reduction of Hazardous Substances (RoHS). Compliance with RoHS assures customers that heavy metals and other substances of concern have been eliminated from RoHS-certified products.

"PolyVision is dedicated to setting an example with the development and distribution of products that meet evolving ecological needs," says Mike Dunn. "We are proud to be at the forefront of environmental stewardship and are committed to developing products that enable more ecologically responsible work practices and healthier work and learning environments."

This commitment to environmental responsibility and stewardship has positioned the company as the industry leader, proving that innovation and sustainability not only go hand-in-hand, but are a vital part of responsible business practice in the modern marketplace. ■

- Bonda, Penny. "The Proliferation of Green Schools: A Very Good Thing." Interior Design, August 2006. http://www.interiordesign.net/GreenZoneNews/ CA6471311.html? subhead=Features
- <sup>2,3</sup> GREENGUARD Environmental Institute, 2007. http://www.greenguard.org
- <sup>4</sup> National Geographic. "Green Guide Top 10 Healthiest Schools." July-August 2006.
- <sup>5</sup> Kats, Gregory. "Greening America's Schools, Costs and Benefits." October 2006. p. 10

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Purdue University has installed Sloan's UPPERCUT<sup>®</sup> dual-flush Flushometers in two administrative buildings on the West Lafayette, Ind., campus.

#### LOAN VALVE COMPANY, THE WORLD'S LEADING

manufacturer of water-efficient plumbing systems, offers a complete line-up of products for the education market.

For school restrooms and locker rooms, Sloan emphasizes water and energy efficiency with products such as its Sloan SOLIS® solar-powered faucet and other 0.5 gallon-per-minute sensor-operated faucets; low-consumption and water-saver Flushometers; SloanStone® solid-surface lavatory systems, which

come in numerous colors and configurations; UPPERCUT<sup>®</sup>, the first commercially available dual-flush technology; Waterfree Urinals; 1.0-gallon FLUSHMATE<sup>®</sup> pressure-assist technology; SMOOTH<sup>®</sup> retrofit kits for converting manual Flushometers to electronic operation; self-cleaning Act-O-Matic<sup>®</sup> showerheads; and energy-efficient, ultra-fast XLerator<sup>®</sup> Hand Dryers.

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- > Sloan ECOS™, the industry's first electronic dual-flush Flushometer
- Sloan Graywater System that collects water that flows down sinks and reuses it for flushing

Sloan also addresses the plumbing needs of specialty areas in educational facilities. Choices include hand-washing sinks with sensor-operated gooseneck faucets in a number of spout options for classroom, foodservice, laboratory or medical needs.

Areas that are prone to vandalism or misuse could benefit from Sloan Monitored Systems, which enable centralized or remote monitoring and control of plumbing fixture usage. Administrators can pre-set usage parameters for toilets, sinks or showers, or turn off/on water as needed for maintenance, emergencies or seasonal facility shutdowns.

Sloan is committed to sustainability not only in what products it manufactures, but also in how it manufactures. The U.S. Environmental Protection Agency recently awarded Sloan with its Green Power Leadership Award, recognizing Sloan for how it offsets 100% of the energy used in its Franklin Park, IL, headquarters and manufacturing facility with clean, renewable wind energy.

Sloan's corporate mission toward sustainability also includes other initiatives, such as installing more energy-efficient lighting, which will significantly reduce its carbon footprint. Sustainability is also reflected in Sloan's material choices: about 89% of a Sloan Flushometer is made from brass casting alloy, 99% of which is from recycled sources and the Flushometer is completely recyclable or reusable in remodel projects.

Sloan is proud that it can provide commercial, industrial and institutional facilities worldwide with long-lasting, reliable plumbing products that help them reduce their water consumption without compromising performance.

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#### **CTS REVIEWED:**

elving, p-lam clad wall mounted

#### **IENCIES & NOTES:**

om 247 pantry: sinks were mound d to be covered by woodworker and of base cabinet. The panel was he plumber could install the sir not be reinstalled because it y in the base cabinet which proviall at the right. The bottom er smaining 6" distance to pane. ge to the drywall (of which the of the panel, the base cabinet en

g a 1/4" chip off the lower left-hand control of the lower left stands of the lower left stands of the lower left.

om 247 pantry: There was a 5-1/2" apron below the counter top at nk opening. The left end abutted the base cabinet which provides ft side of the sink opening; the right end abutted drywall. The was fastened at either end using screws and a segment of metal . The fastening at the right end of the apron had failed, probably use there was no stud or blocking in the wall to receive the instalscrews. This caused the right front edge of the counter top to dip, there was no other wall cleat to support the counter top's right As a result, the counter top separated from the wall-attached end n 1/8+ at the front edge, with that gap tapering to "0" where it



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WOODWORK

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Published by the Architectural Woodwork Institute since 1961, the QSI is the authoritative reference for fine interior architectural woodwork recognized as a unified North American standard. Now in its 8th edition, the QSI contains 685 pages of standards demonstrated by technical and design illustrations. It covers architectural woodwork from raw lumber and veneer through factory finishing and installation.

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• **Peace of Mind.** During inspection, the QCP representative, an industry expert, conducts a complimentary review of shop drawings to confirm they meet all specifications and quality standard requirements, significantly reducing the possibility of non-compliant work.

To locate a participating QCP architectural woodwork manufacturer, visit www.awiqcp.org and use the "Find a Certified Firm/Project" feature. You'll find over 453 QCP participants throughout the United States, Canada and several foreign countries.



AMERICAN ARCHITECTURAL FOUNDATION





44 St. Paul's Episcopal School NEW ORLEANS, LOUISIANA

# No One-Size-Fits-

The American Architectural Foundation's second National School Design Institute gathered surprising solutions to building design problems faced by school districts across the country.

#### **BY CHARLES LINN, FAIA**



hat if you had the opportunity to have two top schooldesign architects spend 24 hours

doing nothing but working with you on the redesign of one of your district's schools? No doubt you would bring the most vexing problem you had, and work as hard as possible to solve it.

Such was the case with four school districts from across America who were selected to participate in the American Architectural Foundation's second National School Design Institute (NSDI) in Washington, D.C., this past September. It is part of the AAF's Great Schools by Design program. Its objective is to show that architecture and design can improve the quality of peoples' lives. Target was the AAF's presenting sponsor for the event.

The format for the NSDI—several intense, tightly scheduled design sessions followed by a presentation of the results of the work—is known as a "charrette" in architectural circles. These particular charrettes demanded that teams—consisting of teachers, principals, district facilities managers; architects already working for the districts; plus two resource architects who had not previously worked with them—focus quickly on the analysis of the problem and its solution. The purpose of the NSDI is not only to help a few school districts work on their problems, but also to gain an understanding of how other school districts across the country could address similar problems.

Of all the schools that participated this year, St. Paul's Episcopal Church and School in New Orleans might have the most unique circumstances. A levee collapse after Hurricane Katrina left its 3-acre campus 5 feet underwater for several weeks. In the two years since this happened, the school has made a remarkable recovery. It is up and running, however, with half the students it once had. This gives St. Paul's an opportunity that few have: to completely rethink not just the way its buildings are organized, but also how well the structures support their educational programs. But they must act guickly, since they need to enroll more students in order to regain financial health. The master plans created by architects Chris Graae, AIA,



48 Jefferson High School PORTLAND PUBLIC SCHOOLS, PORTLAND, OREGON



52 Thomas Jefferson High School for Science and Technology, FAIRFAX COUNTY PUBLIC SCHOOLS, FAIRFAX, VIRGINIA



56 Cleveland High School ST. LOUIS PUBLIC SCHOOLS, ST. LOUIS, MISSOURI

# All Solutions

and Steve Crane, AIA, truly reflect the courage, vision, and passion for rebirth brought by the St. Paul's team.

Many cities have old high school buildings that suffer from poor maintenance, and with configurations that no longer work. Built for a few thousand students, many are now attended by just a few hundred. Two districts brought this scenario to the NSDI and got very different kinds of advice. Representatives from the Portland Public Schools in Oregon presented Jefferson High School. Insensitive additions have transformed this once-magnificent structure into a rabbit warren of disconnected rooms completely unsuited for the small learning academies that have been formed to serve its student body. And the school's site did not allow it to take advantage of its adjacency to a community college across the street. The district agreed with architects Pat Bosch and Paul Winslow, FAIA, that the best solution would be to demolish the school and rebuild a campus of small buildings.

Representatives from St. Louis Public Schools working with Amy Yurko, AIA, and James Hoagland, AIA, found the opposite. The district's currently-closed Cleveland High School should definitely be saved, and could likely be configured to accommodate theme-based small learning communities.

Fairfax County Public Schools' team brought Thomas Jefferson High School and a problem that plagues many districts: what to do with a spread out, single-story,1960sera high school that is bursting at the seams? John Pfluger, AIA, and Laura Wernick, AIA, helped them determine that selective demolition and a multistory addition would work. Their solution emphasized science labs and social-learning spaces.

The charrette process used at the NSDI is one that can yield fantastic results in a short time, although some groups are better at it than others. Readers who have never been involved in one may find our guidelines (below) to be of assistance. ■

#### **TRY THIS AT HOME**

Steps for a successful charrette

- 1 Hire one or two school-design consultants who are experienced in the charrette process to lead the exercise.
- 2 All of the people who have an interest in the outcome should be represented. This could include community leaders, politicians, school board officials, principals, the architect currently working on the problem, and the district's facilities people.
- 3 Include high-ranking officials who have decision-making power. When high-ranking officials are involved in the charrette process, they can grant permissions and give approvals that might otherwise be unthinkable or impossible to gain later.
- 4 Locate the charrette where there will be minimal disruptions. Block off a period of time when the stakeholders have little choice but to participate in the process. There should be limited access to telephones, PDAs, and e-mail.
- 5 Allow two days with no more than six hours each day for the design charrette to occur. After that, a formal presentation of the results to a larger group tends to force the team to come to a conclusion.
- 6 It's a good idea to hire consultants from "out of town." They come to the activity without baggage or preconceptions; they aren't likely to compromise because they will appear before the school district to interview for work later.
- 7 Abandon all preconceptions. Groups should be open to all possibilities. In particular, don't get hung up on the budget.
- 8 No one should pull rank. Frequently one or two people take over the charrette. The student's input is just as important as the superintendent's.
- 9 Come with a well-defined design problem. Open-ended problems tend not to yield useful results.

#### AMERICAN ARCHITECTURAL FOUNDATION NATIONAL SCHOOL DESIGN INSTITUTE

### St. Paul's Episcopal School New Orleans, Louisiana

ST. PAUL'S EPISCOPAL SCHOOL AND CHURCH ARE LOCATED IN THE HEART OF

The staff of a destroyed school used the charrette to reconsider its master plan and the organization of their classroom buildings.

Lakeview, a neighborhood in northwest New Orleans. In August of 2005, Hurricane Katrina collapsed a section of the 17th Street Canal levee near St. Paul's, and Lakeview became one of the most severely devastated sections of the city. Seventy percent of the families and faculty lost everything in the flood. The neighborhood is now showing signs of renewal, although the return of infrastructure, businesses, and services has been slow. Only 40 percent of the residential community around the school has returned. The current enrollment numbers allow for a comfortable existence in the present building configuration, however, student enrollment is now about half of what it was before the storm, as is the size of the faculty. The school will not survive unless it returns to full enrollment.

#### THE CHALLENGE

In 2005, St. Paul's had 260 students and a reputation for excellence in general academics. It also was known for its science, arts, and community-outreach programs. The campus was made up of six buildings, a play area, and parking lot, and it stretched across three acres. Of the original buildings, two for the primary





The photo above of the sanctuary at St. Paul's Church was taken about eight weeks after the storm. The photo at left shows what St. Paul's Episcopal School looked like five days after Hurricane Katrina.



grades were renovated and reopened in the fall of 2006. A third building, designed to house the youngest students, was restored and opened in the fall of 2007.

#### **THE SOLUTION**

"Come hell or high water" and "the little school that could" became the themes for the new St. Paul's Episcopal School, and the mission of the school is equally ambitious—to create a learning environment where students are positioned to be global citizens and stewards of both the earth and each other through innovations in both the learning environment and curriculum. The core would be teaching the connection and impact positively or negatively—that each person can have on our environment, our community, and the world beyond.

After articulating this lofty goal, participants of the charrette began to recognize that realizing it demanded an unrestricted rethinking of both the layout of the campus and the way the buildings are organized. The group began with an analysis of the conditions and usage of the campus and its assets before and after Katrina.

The site analysis revealed several problems that are not uncommon among campuses that have grown up over time. The school's entrance was obscured from the street and unwelcoming. Within the site, vehicular circulation conflicted with pedestrian traffic. There was a need for a central gathering space, and a central campus arrival, drop-off, and distribution point. In addition, outdoor spaces were not being fully utilized or oriented to surrounding buildings. And finally, the buildings that still existed were oriented in The St. Paul's team, clockwise from left: Chris Graae, AIA, Cox Graae + Spack Architects; Rebecca Buras, St. Paul's business and project manager; Joy Tessman, curriculum specialist; Margaret Kirn, junior warden of the vestry, St. Paul's Episcopal Church; Merry Sorrells, head of school; Steve Crane, FAIA, VCBO Architecture. Not pictured: Reverend Will Hood

allowing the construction of a bright, welcoming central lobby in the main school building. A bridge would connect the interior circulation paths through this central space at the second floor of the main school building; it would overlook the new lobby. Reconfiguration of second floor classroom spaces would better accommodate the school's new educational program.

A proposed second-phase development plan suggested ideas for subsequent development and campus expansion. These included acquisition of the northeast quarter of the block where the campus is located, exploration of a public/private partnership for a performing arts center that did not exist in the area. Vehicular circulation would be relo-

During the charrette, "come hell or high water" and "the little school that could" became themes for the new St. Paul's Episcopal School.

such a way that future development opportunities were impeded.

The first master plan that was developed explored the first of a multi-phased expansion of the campus. Various parts included the replacement of a damaged two-story classroom building adapted from a house with new state-of-the-art science center that would transparently express its purpose at an important corner of the site. The vehicle circulation and student dropoff point would be relocated, cated to the perimeter of the site to promote a safe and cohesive campus center.

The surface parking lot would be replaced with a more efficient, expanded multistory parking garage. Finally, the one-story early education building that was recently constructed, but not master planned, would be replaced with a new multi-story academic building. One of the new plans offered ideas of how St. Paul's environmental orientation might be integrated into the site and buildings. Its new buildings



#### Master plans

The plan at left examined existing conditions at the site. Below it, Master Plan I looks at new traffic patterns and short-term needs. Master Plan II looks at possible long-range plans, including acquisition of new property. Below are three of five plans that resulted from a detailed examination of how the halves of the main school building, rendered in ochre, might be reorganized to reflect the school's educational programs.











**LESSONS LEARNED** 

- Faith, persistence, and perseverance are keys to success for any group that has suffered serious losses.
- A shift in purpose from simply restoring school buildings as quickly as possible to helping to restore the community is a holistic solution beneficial to all.
- + Creating a plan that features community use of spaces and facilities will enhance the design.
- To gain support from the stakeholders, it is imperative to bring all constituents, including community members, into the master planning process.
- + Dare to dream, and then work to fit that dream into the realistic parameters.
- Networking and collaboration are keys to designing the ideal project.
- The charrette process is greatly aided by gathering as much information as possible.
  Building code and zoning information, documentation, and evaluation of existing conditions, existing plans, even real estate appraisals can be helpful.
- Once a master plan is developed, incrementally phased improvements can be made intelligently. The plan should include a detailed program of present and future requirements.
- Though there was an urgency to rebuild and reopen the school, great benefit would have been derived from a master planning-phase prior to the new construction.

The green sheet: a sustainability master plan This axonometric shows the overall site layout, including many of the proposed sustainability features.



should embody LEED Silver-level high-performance building standards in design and materials specifications, expressing energy efficient systems architecturally to promote learning and understanding. Many ideas were explored, including the incorporation of onsite storm water management principles; the use of geothermal well fields to support heat pump systems; use of wind and solar power, natural ventilation, and daylighting; rainwater collection and graywater recycling; trash and materials recycling; reduction of runoff and heat island effects through the use of permeable pathway systems, and green landscapes; highly reflective and green roofs; and a living outdoor classroom and lab to promote understanding of indigenous plants and food crops.

As the charrette drew to a close, the school's short-term needs, long-term master planning, and concept-design goals were all summed up in a series of drawings and bullet points. St. Paul's representatives believe the work done at the charrette will help inform their constituents, so all may move forward in their quest to revitalize their campus and engage their community.

Solutions for securing the future of St. Paul's will have to come from within. The future of the school, the neighborhood, and the city are interwoven. It is through this interconnection that the solution for St. Paul's is to be found. The school is looking to the future with a bold vision for the study of the sciences that will incorporate the highest standards of sustainable "green" planning and design, along with a comprehensive curriculum incorporating study of environmental issues at every grade level. Now, having been through Katrina, students throughout the region seem to have a unique sensitivity to environmental issues and their impact on daily life. This rebuilding plan will give all of the students in this area the opportunity for innovative learning, which may well provide the basis for them to create real-world solutions in the future.

#### The cornerstone: a science center Below are quick sketches of a new science center at the corner of the site. It would demonstrate the school's dedication to innovation and sustainability.

(1)



#### AMERICAN ARCHITECTURAL FOUNDATION NATIONAL SCHOOL DESIGN INSTITUTE

## Jefferson High School Portland Public Schools, Portland, Oregon

Some vintage school buildings aren't worth saving, even if the history and tradition that surround them are.

**PORTLAND PUBLIC SCHOOLS IS THE LARGEST SCHOOL DISTRICT IN THE PACIFIC** Northwest. Eighty-five percent of all students within its boundaries attend public schools, and its current enrollment is about 46,000. Over the past 10 years, funding has declined dramatically, enrollment has contracted, and educational quality has slid downhill, particularly at the high school level. To address these issues, the school board and superintendent have worked to stabilize funding and began to realign educational programs to improve results. They closed schools and began re-evaluating their remaining facilities. The district has a total of 96 school buildings, with an average age of 62 years. Most facilities are in need of modernization, repair, or replacement. Jefferson High School, in particular, is one that deserves significant attention. The district has only constructed two new schools in the past 30 years.

#### THE CHALLENGE

To lift the human spirit is a goal that transcends ethnicity, social class, and personal history. Jefferson High School has the potential to recreate its previous luster as a school known for both academics and athletics. Enrollment once reached over 3,000 students; today it has fewer than 700. Students come from ethnically



#### Proud Jefferson High School

Jefferson High was built in 1909 and was home to many championship athletic teams, such as this feisty group of sluggers photographed back in 1916.



JHS team from left: John Weekes, AIA, Dull Olson Weekes Architects; Justin Devers, facilities, PPS; Pat Bosch, Perkins + Will; John Wilhelmi, director of high schools; Cynthia Harris, principal, Jefferson High; Algie Gatewood, president, Portland Community College; Paul Winslow, FAIA, Orcutt/Winslow, Cathy Mincberg, COO, PPS



Once-glorious Jefferson High School is not what it used to be. Its hip roof was removed, and its beautiful brickwork covered with paint and plaster.

diverse backgrounds, and most are from lowincome households. The building, which was once a handsome and impressive facility that showed the prominence that education held in the community, is no longer functional.

Discussion of the current condition of the buildings on the campus revealed that repair and refurbishment is difficult. Although the building is safe for use, the presence of asbestos in its building materials makes even the most minor repairs and improvements cost prohibitive. Additions have created a maze of corridors. Further, the original glorious building had been amputated by the removal of sections of the original hipped roof, which adds to the utilitarian feel of the campus. Furthermore, the campus's playing fields are split by the building, causing difficulties in managing safety.

On the bright side, several improvements in the organization of the school are already underway. First, it has initiated four academies: Arts and Technology, Science and Technology, the Young Men's Academy, and the Young Women's Academy. The Young Women's Academy is located at a separate site, but it would be preferable for all to be together. A major advantage the school has is that it is adjacent to one of Portland Community College's campuses and an elementary school. There are many advantages to having a K-14 continuum, and the opportunity for students from Jefferson to earn college and high school credit concurrently.

#### Existing site

A football field separates Jefferson High School from the Portland Community College campus.



#### THE SOLUTION

While modernization was considered briefly, the charrette team quickly came to the conclusion that the best option was to replace Jefferson with a series of new buildings. One building would accommodate each of the four academies that have been established, a key principle for the organization of the new campus. Each academy needs to have a sense of autonomy, including a separate entrance, but some functions, such as an auditorium and administration, would be shared.

As conceived, interaction between academies would be limited. This requirement led the team to organize the academy buildings on an open green space, like a mall. To optimize solar orientation for daylighting, classroom blocks were oriented on an east-west axis, creating individualized courtyards between the building blocks.

The auditorium and administration functions would be in a new a facility that would occupy the site across the street from the Portland Community College campus. This



#### LESSONS LEARNED

- Schools can create community centers with appropriate partners and gain community support.
- A community and a city's identity can be restored if schools can make appropriate public partnerships, as well as provide academic curricula that supports and enhances, the community's future.
- Schools with K-12 programs that allow partnerships with colleges are more successful in retention and enrollment.
   Long-term road maps allow students to develop loyalty, and that kind of commitment reinforces the success of a school.
- A school must have a "brand," both as an academic and a community center. Students and communities identify with "lconic" schools.
- Creative business partnerships allow schools to minimize the cost of infrastructure and their physical plant. Allowing fields to be shared by others may provide opportunities for schools to generate revenue.
- Schools that are arranged into individual, specialized academies often have better security than large schools and and can become localized centers of excellence.
- School buildings with a prolonged history of neglect fall into a pattern that will not allow for their preservation in the long term. Failing to preserve buildings that have community and architectural value results in a social cost.
- + It is often better to start over than to try and save buildings that are functionally obsolete.



#### A new campus

Four academies organized around a mall would share an entry building for the administrative offices, auditorium, retail, cafeteria, and other spaces.

building was conceptualized as having many purposes, among them being that it needed to be not just a school building but a point of connection to the community.

Many members of the community are reluctant to give up the old building because its long and glorious tradition symbolizes not just the history of the school, but of the neighborhood as well. Creating a means of carrying these memories forward was essential to the new complex. The charrette team decided that one way of doing this would be to create a "Jeff Wall." It would house trophies and memorabilia from the past, and represent expectations for the future. It was further proposed that an image of the original Jefferson High School would be etched into the second floor glazing of the administration building and would face the street.

The Jeff Wall concept became a central organizing feature around which the building housing the administrative offices, library and media center, food service, and gymnasium could be designed, and connected to the community and community college. Because public/private partnerships have become important ways of helping offset costs, it was visualized that the first floor of the administration building could house a Starbuck's or



#### Linking the past to the future

The main administration building acts as a gateway to the new campus. A central element would be the "Jeff Wall," a collection of trophies and memorabilia that honor the neighborhood and the original high school building. A proposed bridge would connect the school with Portland Community College across the street that runs in front of the site.

other vendor, or even a community-service function such as a low-cost medical clinic. A bridge over the street to the community college would act as a physical connection, and classrooms built next to it would allow the college extra capacity as well as provide meeting space for the community's use.

The charrette team did not want to stop

there, and also began reviewing how the nearby elementary school could be rebuilt on nearby unused property owned by Portland Public Schools. Such an addition would complete the group's vision of an educational experience that begins in kindergarten and proceeds through community college on a single site.

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#### AMERICAN ARCHITECTURAL FOUNDATION



### Thomas Jefferson High School for Science and Technology Fairfax County Public Schools, Fairfax, Virginia

An imaginative<br/>approach to<br/>updating a 45-<br/>year-old building<br/>will accommodate<br/>the unique needs<br/>of exceptionally<br/>bright students.FAIscho<br/>on to<br/>on to<br/>this<br/>chai<br/>place

#### FAIRFAX COUNTY PUBLIC SCHOOLS SERVE ABOUT 165,000 STUDENTS IN 197

schools. The system is nationally recognized for academic excellence. Ninety-two percent of its graduates go on to postsecondary education, and Newsweek recently listed FCPS high schools in the top 3 percent of public high schools in the nation. This was based on the Challenge Index, which measures a school's effort to challenge students. Thomas Jefferson High School for Science and Technology (TJHS) is one of its show-places. It offers college preparatory programs emphasizing the sciences, mathematics, and technology and serves students from the region. Seventy-five percent of them are Fairfax County residents as required by its charter, and the rest come from surrounding areas. Students are selected through a competitive application and admissions process. TJHS has the only "magnet program" in Fairfax County.

#### THE CHALLENGE

There are several ways in which TJHS's building is deficient. One is that the current facility has a capacity of 1,600, but enrollment is growing toward 2,000. Twenty-five "learning cottages" are used to house classes out-

Existing plan This sketch shows how TJHS is laid out. The different "lounges" indicate space that has been taken over by different grades so they have a places to study and socialize. A new design would allow these activities to be grouped in a centralized location.





Fairfax team members left to right, Richard Moniuszko, deputy superintendent; Evan Glazer, principal; Geoff Lewis, AIA, community representative; Laura Wernick, AIA, HMFH Architects; Jack Dale, assistant superintendent; John Pfluger, AIA, Cuningham Group Architecture; Dave Printz, coordinator FCPS capital projects.





side the main building, separating students and teachers from their peers. A second issue is that students at TJHS need a central area to support students' informal interactions. They socialize, eat, teach each other, and learn everywhere in the building, often at inconvenient hallway intersections, and even spread

themselves across the floors of the corridors. There is a need for interdisciplinary incubator spaces that would allow teachers from different subject areas to help students see how the cross-pollination of ideas can be used to generate innovative and multidimensional solutions to difficult problems.

Finally, the building does not present visitors with an image of the school's unique mission, that is, to be a technology school that is a living body of inquiry that supports the skills and values essential to critical inquiry and research, problem solving, intellectual curiosity, and social responsibility.

#### Program diagram to plan Program diagram Here, the program is placed over the existing floor-This diagram gives a simpli-STANDARD plan in order for the team to start exploring the ways fied layout of some of the the building might be reorganized. activities that need to be accommodated by the remodeled school building. MULTIDISCIPLINARY LEARNING -CRS/LABS PROFE ROOM SUPPORT SPACE MULT ENIO SOCIAL EARNING CORE RESEARCH OPEN SPACE FOR EATING LIBRARY LOUNGES/STUD PROJECT COAM SENIOR' RESEARCH

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#### Solution perspectives

The new addition takes the form of a central wing that runs through the middle of the existing building. It has three parts 1 Senior Research Center 2 Social Learning Core 3 Interdisciplinary Center. Perspectives show the Research Center (below) and the social learning core (bottom).





#### SOLUTION

Early diagrams captured what the school needed most, and that is an area for social learning. TJHS's culture comes from its highly motivated, high-initiative students. Here, the entire building is a place for studying and learning. Rather than forcing students to meet in narrow corridors or confining the library within four walls or separating eating from learning, all of these social learning activities need to be intertwined in a single, centrally located area within the building. The team's most important decision was to create a central wing as a social learning core for the entire school, with student lounges, the cafeteria and the library.

Gradually, other programmatic requirements became clear. Each senior at the high school takes on a major research project often in conjunction with a local government or private research facility. New and shared space is required for these research labs so large and small projects can be built. This lab needs to be transparent so students and visitors alike will pass it and constantly be aware of the innovative projects underway. At the charrette, a new three-story senior research center began to take shape at the main entrance of the building, with labs opening into large project spaces.

Another need is a place for multi-disciplinary learning programs within the school to support the interweaving of disciplines across the curricula. That area of the building had to have dedicated space designed to bring specific, yet disparate learning environments into close proximity to one another and needed a loose configuration of shared large and small group instruction spaces, lab spaces, project rooms, and associated support areas for equipment.

The final piece of the puzzle was the budget. Because a budget for the project had already been established, the team was determined to retain the strengths of the existing

#### LESSONS LEARNED

facility while not shortchanging the requirements of the proposed addition.

The solution was to demolish the center of the existing building, the library, and the planetarium. In their place a single new structure would be built, extending from the front place here but without walls. The space would open out into two courtyards, and connect easily with all the other parts of the school. The Multi-disciplinary Center would extend from the Social Learning Core toward the back of the site. A new entrance to the

### Since the budget had already been established for the project, the team was determined to maintain the strengths of the existing building without shortchanging the proposed addition.

through the middle and out the rear. In the center of this structure would be the wideopen, multilevel Social Learning Core, a space where students would mingle, eat, study, and carry out many of their daily school activities. The normal library functions would take school and the Senior Research Center would extend from the Social Learning Core toward the front of the site. This new addition would create a new face for the school, be cost-effective to create, and cause minimal disturbance to ongoing programs within the building.

- + A balance has to be maintained, reflecting the importance of having new facilities that enhance, support, and show off the uniqueness of the school and students.
- + During a charrette, everyone must be mindful of the very real budget constraints, yet continue to be creative.
- + Keeping construction systems simple can help keep costs down.
- Budgets need to be realistic so the amount of money allocated for construction actually yields the space the school needs to operate.
- Priorities may need to be re-examined as a project goes forward. The charrette helped establish that allowing visitors to view the research and how the students operate within the learning environment was imperative.
- + One potential strategy for this school would be to create inexpensive, large-bay space that then could be outfitted through research grants or foundation money.
- Budgets should be flexible, so that as design goes on money can be allocated where needed, either to new construction or renovation.



#### The Core

TJHS students learn so much from each other that the Social Learning Core can function as a lounge-like classroom.

#### AMERICAN ARCHITECTURAL FOUNDATION NATIONAL SCHOOL DESIGN INSTITUTE

### Cleveland High School St. Louis Public Schools, St. Louis, Missouri

Demolition of this historic high school is out of the question. But it could be reused for small learning communities.

**ST. LOUIS HAS MANY THINGS GOING FOR IT, BUT ALSO FACES SOME ENORMOUS** challenges. The population losses suffered by the city since World War II have stabilized. The downtown is undergoing a renaissance, a new baseball stadium was completed recently, and new housing is being constructed there. In spite of these successes, the St. Louis Public Schools system has continued to decline. The number of students in the system during the 2006-07 school year was 32,700, and will likely drop to 30,000 this school year. The coming years will bring more challenges as 11,000 charter school seats become available. The challenges of preserving Cleveland High School's building, which is a community icon, are representative of those faced by many urban school districts.

#### THE CHALLENGE

Cleveland High School is a historic landmark building, designed in 1915 by St. Louis architect William Butts Ittner. The building is one of two comprehensive high schools in South St. Louis and has capacity for 1,000 students. It was closed in June of 2006 due to severe maintenance issues as well as declining enroll-



Cleveland High School was built in 1915 and graduated 91 classes before closing due to declining enrollment and severe maintenance problems. However, all agreed that demolishing the building would create unacceptable losses.



Cleveland High School team, clockwise from left: Debra Irwin, executive director, Dutchtown South Community Corporation; Roger CayCe, executive director of facilities management, building commissioner; Deanna Anderson, assistant superintendent of operations; Amy Yurko, AIA, Brain Spaces; James Hoagland, AIA, JCJ Architecture

ments throughout the district. The district spends \$5,800 per month to keep the building open and prevent further deterioration. However, there is a recognition among the various stakeholders that Cleveland is an important historic landmark and cannot be demolished—its loss would hurt local businesses and cause conditions in the neighborhood to decline.

#### **THE SOLUTION**

The district representatives and resource team members explored many options during the charrette. A key starting point was the establishment of the idea that neighborhood representatives and the school district both favor renovation of the school for continued reuse as a comprehensive high school. And, in the process of rethinking the school, the needs of the community will be considered to determine the potential for opening up the building for its use. Hopefully, renovating the building would help re-grow enrollment. The thrust of the planning is to preserve the building as a learning facility in order to safeguard it as a center of the community.

One option is that with district-wide downsizing occurring, parts of the central administration could be relocated here. Other options include creating multiple, public-pri-



ing addition, a field house which is detached from the school and connected only by a single corridor. The original architecture essentially remains intact. Exterior light comes into nearly every teaching space through the building's geometry and its thoughtfully located light wells. Ceilings are high, corridors are wide, and finishes are durable. Deferred maintenance appears to be the key culprit for the building's physical challenges.

The most logical direction for the team was to explore the idea of approaching the building's renewal by using small learning communities (SLCs). One thing that makes this feasible is that specialty spaces such as those for art, technical education, performance, music, and physical education are appropriately spaced throughout the existing building, and the building's grand theater is centrally located. SLCs are helpful in encour-

### Maintenance at the shuttered school costs \$5,800 per month, yet its demolition would be an unacceptable loss for the neighborhood.

vate partnerships to fund a collaborative renovation process, with a well-defined academic program that would re-establish the ROTC program formerly based at the school. A career education component that could include culinary arts, entrepreneurial training, or adult education, might also be appropriate.

One thing that Cleveland High School has going for it is that it only includes one build-

aging students to be connected to their school, engaged in their work, and encouraged to develop skills necessary for their continuing success in life. A real-world, activitybased curriculum could support these students in smaller, perhaps theme-based learning communities. For example, the applied learning components of a health-and-humanservices-themed curriculum could be sup-

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#### Process

**Diagrams were used** to explore the feasibility of breaking **Cleveland into SLCs.** 1 A general plan shows the school's layout. 2 A stacking diagram shows how different SLCs might be distributed over this four story building. 3 Applied learning labs can be placed at the four corners of the building. 4 Sections illustrate how lightwells could serve as SLC commons. 5 Four learning-lab types were developed.



**1** EXISTING PLAN



**3** LEARNING LAB LAYOUTS



**5** APPLIED LEARNING LABS





**4** SECTIONS THROUGH LIGHTWELLS

#### **LESSONS LEARNED**

CAF

- + Academic needs/requirements can and should influence space planning.
- + Buildings that were well-planned when new can be transformed to meet the needs of future generations, regardless of how old they are.
- + The benefits of multiplexing a building into SLCs can be equally achieved even when some facilities are shared and common to all.
- + Connections within and between the site and the surrounding communities should be developed and leveraged to benefit all stakeholders.
- + School buildings have strong cultural, sentimental, and aesthetic value, which can be leveraged to strengthen relationships between past and future stakeholders.

ported in the spaces previously occupied by the home economics and lap-pool facilities, in addition to the nearby classrooms. Or, an engineering-and-industrial-technologythemed curriculum could be supported in the spaces previously occupied by the wood shop and drafting classrooms.

The existing building was surprisingly well suited to be transformed into relatively autonomous SLCs. Collections of general classrooms can take advantage of their proximity to specialty learning areas and, together with administrative spaces, form each SLC. The building's lightwells can be enclosed using skylights so the space beneath them can be used to provide a student commons for each SLC.

The resource team worked with the district representatives to define the key elements to be included in each SLC and which functions and spaces could or should be shared by all of them. To provide focus, leadership, and personalization, each SLC should include administrators, counselors, support facilities, and student social space in addition to classrooms. And, they should be connected to a collection of hands-on learning environments where the ideas and concepts of the core curriculum can be applied to real-life projects and experiences. Shared areas include support spaces such as the cafeteria, physical education, theater, library, and some centralized offices.

In addition to the building, the charrette team also drafted a reorganization of the site. Current plans include enlarging the football field to support soccer and a surrounding track. Parking on the urban site is minimal and contributes to traffic congestion in and around the school. The new solution the team proposed would close the street that currently separates the building and field while providing additional on-site parking.

This solution seeks to transform the function of the school while protecting its historical and sentimental value. It seeks to provide a venue for the celebration of learning and the success of its students. ■

#### Sketches

An existing daylit room that is currently in ruins could be renovated into an art studio (right), and enclosing lightwells (below) would provide an open, airy feel to the new, small learning communities.







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INC.

# Modular Buildings Mean Optimal Learning



**CCORDING TO McGRAW-HILL CONSTRUCTION, U.S.** schools project to spend more than \$162 billion on facilities construction over the next three years. While it may take another decade or so before sustainable designs are fully adopted, some industry leaders are making "green" buildings and classrooms a priority for the coming school year.

Unfortunately though, sustainable design practices often take a back seat to budget realities because many school business officials are unfamiliar with green building methods. The common misconception is that they represent more expensive facility investments. While initial costs may, in fact, exceed traditional buildings, the long-term benefits and cost savings in ongoing operations are certainly recognized. In some cases, districts are able to apply tax credits to help balance some of the additional up front costs. More and more school districts are beginning to recognize the benefits of building green in an effort to create more effective and cost-efficient learning environments, understanding the relationship between physical surroundings, student health, and academic performance. One survey conducted by *School Planning & Management* magazine reports that 87% of executives at organizations involved with "green" K-12 facilities believe that community image is enhanced when sustainable design is incorporated into schools. Approximately 70% of these executives perceive benefits, including reduced student absenteeism and improved ability to attract and retain teachers.

The modular building industry has taken notice of the upswing in progressive building methods and looks to aid school districts in understanding what "green" means and how to introduce environmentally conscious concepts into school systems nationwide.

Industry leader Williams Scotsman, a leading provider of modular space solutions, is one of the first to incorporate sustainable design technology into its plans for future classroom products. In fact, Williams Scotsman has been working closely with the Baltimore-based architectural firm Hord Coplan Macht to develop environmentally friendly mobile and modular classroom designs.

Thousands of educational institutions throughout North America have called upon Williams Scotsman to provide reliable relocatable and permanent modular buildings when their school systems need additional space. Currently, the company is committed to anticipate the influence that sustainable design will have on modular classrooms of the future. The company's unique approach harmonizes new technology and design concepts with long-term economies to ultimately create optimal learning environments at reasonable lifecycle costs for school systems.

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– Rolf K. Haarstad, AIA, LEED, AP Principal and Vice President for Hord | Coplan | Macht



The population growth rate for U.S. youth ages 5 to 19 continues to climb, creating a significant impact on the educational system. How do school administrators meet the challenge of too many students, not enough classrooms, higher accountability standards, and tighter budgets? Add one more factor: the demand for more sustainable and environmentally conscious buildings. Think modular. The inherent flexibility of modular building technologies paired with its fast-track timeline make it a perfect solution for kids that need



a safe and clean classroom today - not two years from now. Is modular green? Yes, modular construction is more environmentally friendly because it is assembled in a factory and shipped to a job site. The result: less site disturbance, decreased construction time, reduced construction material waste, and increased recycling. Williams Scotsman is teaming with the architectural firm of Hord I Coplan I Macht to explore "greener" possibilities. The challenge: design and produce a modular unit that will balance sustainable design technology and materials with affordable and well-designed classrooms. Williams Scotsman has been responding to the needs of the educational market for over fifty years. An international company with local expertise delivered through a network of 86 offices, Williams Scotsman provides premier quality and service.



Sectors Expected to Have the Most Green Building Activity



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> Services. Umicore publishes standard specifications and CAD details on its website and on the Sweets website, as well. Umicore technical experts are on hand to work closely with architects and project managers to assist in proper detailing for the projects. ■

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#### >>> ENHANCE DESIGN FLEXIBILITY AND BEAUTY

In addition to its natural beauty, wood enables a high degree of design freedom. With the wide variability in sizes of spaces required in schools—from classrooms to gyms —wood framing can be adapted throughout. For designs using multiple, smaller-size buildings, architecturally interesting structures also can be built less expensively.

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Framers installing TJL<sup>m</sup> Open-Web trusses on West Adams Preparatory High School, part of the Los Angeles Unified School District



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NEW PRODUCTS ALLOW ARCHITECTS AND DESIGNERS TO USE **GLASS THROUGHOUT SCHOOLS** 



### Pilkington Pyrostop"

### **OR DECADES, POLISHED WIRED GLASS WAS THE ONLY**

fire-rated glazing product available for blocking the spread of flames and smoke. While it serves this purpose well, it can be broken relatively easily in the course of everyday usesuch as is common in busy school hallways and classrooms. Because of the potential for injury from snags in broken wiredglass, in recent years, building codes have eliminated its use in hazardous locations such as doors, sidelites and openings near the floor. Fortunately, advances in materials have created new options that allow architects and designers to incorporate fire-rated glass that is impact-resistant, and does not have the institutional look of wired glass.

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Transparent and wireless, ceramic glass offers a distinct aesthetic advantage. It comes in a range of make-ups that can provide many different characteristics, including fire ratings up to three hours, high-impact safety ratings (up to CPSC 16CFR1201, Category II), and sound reduction. Ceramic glass can also be beveled, etched

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# CASE STUDY

# Textbook Cases

Five very different schools offer lessons in building with students and the environment in mind. BY JOANN GONCHAR, AIA



ince you've already perused some of the pages of SCHOOLS OF THE 21ST CENTURY, you already know that sustainable design is an undeniable trend in K-12

facilities. You've already read how districts around the country are going green in an effort to lower energy and operational costs, improve teacher satisfaction, and raise student achievement. But, you haven't yet had the opportunity for an in-depth look at completed schools that employ high-performance strategies.

So, on the pages that follow, we provide an examination of five, very different, recently opened schools. Three of the schools-Rosa Parks School, in Portland, Oregon; Tarkington School of Excellence, in Chicago; and Fossil Ridge High School, in Fort Collins, Colorado—have already achieved, or are well on their way toward achieving, Leadership in Energy and Environmental Design (LEED) certification. The LEED rating system has become a nationally accepted tool for evaluating the environmental performance of buildings since it was launched by the U.S. Green Building Council roughly a decade ago. But so far, only about 70 schools nationwide have achieved certification.

Regardless of their LEED status, the case study schools included here all have environmental agendas. For example, all of the featured projects, to varying degrees, were driven by the goal of maximizing daylight for classroom illumination—a practice that should save energy and provide spaces conducive to learning. The plan of one of the schools, North Central Junior High School in North Liberty, Iowa, even mimics the path of the sun.

And, each of the schools, in its own way, establishes a strong connection between building and context. For the designers of the North Hills Campus of the Winchester Thurston School, tying the school to its former horse farm site near Pittsburgh meant a domestically scaled architecture with generous windows providing students with views of the still almost rural setting.

While talking to the educators who occupy these facilities every day, we discovered that many of the buildings' high-tech and high-performance features also serve to instill in students an awareness of their surroundings. Photovoltaic panels, light shelves, green roofs, and bioswales can help students better understand the built environment while instilling in them a sense of stewardship for the natural one.



80 Tarkington School of Excellence, Chicago OWP/P, WARMAN OLSEN WARMAN



88 Winchester Thurston School, Allison Park, Pennsylvania BOHLIN CYWINSKI JACKSON



Rosa Parks School, Portland, Oregon DULL OLSON WEEKES ARCHITECTS

76



86 North Central Junior High, North Liberty, Iowa NEUMANN MONSON ARCHITECTS



90 Fossil Ridge High School, Fort Collins, Colorado RB+B ARCHITECTS

# CASE STUDY Rosa Parks School

### CREDITS

OWNER: N4C-New Columbia Community Campus Corporation

ARCHITECT: Dull Olson Weekes Architects—John Weekes, AIA, partner-in-charge; Karina Ruiz, AIA, project architect; Mathew Braun, Barry Deister, Brian Greenwood, Thea Wayburn, Michael Monnier, John Schupp, Pamela Brown, design team

CONSULTANTS: KPFF (civil); ABHT (structural); Mazzetti & Associates (mechanical & plumbing); Reyes Engineering (electrical); Atlas (landscape architecture); SSA (acoustics); Walsh Construction (general contractor)

### SOURCES

MASONRY: Mutual Materials CURTAIN WALL: Kawneer Storefront ACOUSTICAL CEILINGS: Celotex PAINTS AND STAINS: Sherwin Williams (interior); Tnemec (exterior) RESILIENT FLOORING: Forbo CARPET: Shaw

# A Successful Partnership

Multiple players work together to create an environmentally sustainable school with a strong community focus.

### **BY B.J. NOVITSKI**



team of architects and educators in Portland, Oregon tackled an ambitious set of academic, social, and sustainable goals with limited resources and have reaffirmed that

the whole can be greater than the sum of the parts. By combining the programmatic needs of several institutions and cooperatively sharing spaces and financing, they have produced a gem of a school for 550 kindergarten through 6th grade students living in the recently redeveloped New Columbia subsidized housing complex. A collaborative team, led by Dull Olson Weekes Architects (DOWA), along with the Portland Public School District, the city's housing authority, and the local Boys & Girls Club, designed the \$13-million Rosa Parks School.

The school is unusual in its configuration of four multigrade "learning neighborhoods," each including five classrooms clustered around a commons area. This configuration supports educational collaboration, according to Tamala Newsome, the school's principal. Teachers use the common space for group activities and presentations by visiting specialists. "As creative as teachers can be, that's what we use it for," she says.

Perhaps more unusual is the degree of collaboration between school and community. John Weekes,



### First Floor

1 General classroom 2 Collaborative classroom 3 Media center 4 Literacy center 5 Family resource center 6 Administration 7 Commons 8 Kitchen 9 Art 10 Technology 11 Music 12 Multipurpose 13 Media 14 Learning center 15 Teen lounge 16 Weight room



AIA, DOWA principal, and Karina Ruiz, AIA, project architect, worked with the client team to figure out how to share costs by sharing spaces. "It was an interesting challenge," recalls Weekes, "because there wasn't an institutional history of approaching projects this way." Newsome agrees: "At first, everyone was protecting their turf, reluctant to share. But then we realized we had a lot in common."

The result is a pair of connected buildings, totaling 67,000 square feet, with the school to the south. To the north is the Boys & Girls Club, where activities continue after school and during the summer. Art, music, computer, and food-service rooms are housed in the club building but shared by the school. Prominently anchoring the school's entry lobby is a family resource center that offers technical and educational support to parents. All the project collaborators recognized the center's importance, says Ruiz. "In order for this project to succeed at the desired level, we knew we needed to provide support services for the child, the family, and the community."

The school/club site is part of the New Columbia Community Campus, with a new On the west facade (above), direct sunlight is blocked by sunscreens that are offset from and parallel to the plane of the windows. A sundial is incorporated into the paving pattern of a courtyard (below) to help students better understand the role that orientation plays in building performance.



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### CASE STUDY Rosa Parks School

Anchoring the school's entry lobby (right) is a family resource center. The grounds include a stormwater detention feature (foreground, below), as well as three 30-foot-deep dry wells. Retained runoff gradually leaches into the water table rather than flowing into the municipal stormwater system.





gym shared by school, club, and the city's Parks and Recreation department. An existing gym is currently under renovation and will serve as a community center for all groups. By eliminating redundant spaces, the cooperating institutions nearly halved construction costs. An umbrella nonprofit corporation manages the partners' agreements and responsibilities.

The collaborative planning and design process produced an environmentally friendly building, one that earned a Gold rating, the second highest possible under the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program. LEED provides a benchmark for evaluating a building's performance in areas such as site development, energy efficiency, and indoor air quality.

The most visibly "green" aspect of Rosa Parks School is its celebration of daylight. Site constraints mandated a less-than-ideal northsouth configuration, but window treatments maximize usable daylight while minimizing unwanted heat gain and glare. On the east facade, horizontal, exterior sunscreens, along with interior light shelves reflect daylight deep into the spaces. On the west, direct sunlight is blocked by sunscreens that are offset from and parallel to the plane of the windows. Interior glazing between classrooms and collaborative spaces enable daylight sharing. The system includes sensors that switch off electric lights under the right conditions. Principal Newsome enthuses about the effect:



"Even in the winter, the school feels bright, open, and airy."

The building's "displacement ventilation" mechanical system is energy-efficient and provides good indoor air quality. It introduces high volumes of 65-to-68-degree air at floor level. The air rises on warming and is expelled, minimizing redistribution of pollutants. For heating, a high-efficiency condensing boiler feeds perimeter radiators. Rosa Parks needs no connection to the city's stormwater grid since runoff collects in dry wells and gradually leaches into the water table. These features and a demonstration photovoltaic system play a role in the school's environmental curriculum.

To crown the school's other measures of success, it received the Richard Riley Award through a joint program of the American Architectural Foundation and Knowledge-Works Foundation that recognizes design and educational excellence in schools that serve as centers of their communities.

B.J. Novitski, the former managing editor of *Architecture Week*, is a freelance writer based in Eugene, Oregon.

Interior glazing allows daylight sharing between a general classroom (above) and an adjacent collaborative area. The Boys & Girls Club (right) connected to Rosa Parks, offers after-school and summer programs. **Club facilities such as** spaces for art, music, and computer instruction are used by the student body during regular school hours.



### CASE STUDY Tarkington School of Excellence

# **Standout Student**

In an ethnically diverse neighborhood, Chicago builds a school that sets the standard for those that follow.

### **BY DAVID SOKOL**



mentation. At that point, the city's Public Building Commission takes over, commissioning the remaining drawings and subsequent project management to an architect of record. Trung Le, AIA, design director of OWP/P's education group, explains that this unique protocol allows Chicago to hire smaller design firms while maintaining the consistent quality and speed that comes from a longstanding clientarchitect relationship.

In this role, OWP/P has been involved in several new-build projects, including the Tarkington School of Excellence, which opened in the fall of 2005 in an ethnically diverse neighborhood in Chicago's



PHOTOGRAPHY: © JAMES STEINKAMP



The result of a collaboration between Chicago Public Schools and the city's Park District, Tarkington sits on a generous 10-acre parcel in Marquette Park.

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### Tarkington School of Excellence CASE STUD

### Kit of Parts

- Core academic areas
- Building services
- Library/media
- Administration/student services
- Food services
- Circulation Green roof



### First Floor

1 Entry lobby 2 Administration 3 Gymnasium 4 Multipurpose room 5 Science classroom 6 Cafeteria 7 Building services



### Second Floor

1 Library 2 General classroom 3 Multipurpose room 4 Science classroom 5 Building services



Third Floor

1 Green roof 2 General classroom 3 Student services 4 Arts 5 Building services

### CREDITS

**OWNER:** Chicago Public Schools

ARCHITECT: OWP/P (managing design architect)—Richard H. Dewar, AIA, principal-in-charge; Helen Fantini, AIA, project manager; Trung Le, AIA, design director; Elias Vavaroutsos, AIA, project designer. Warman Olsen Warman (architect-of-record)

**CONSULTANTS: Rubinos Mesia** (structural); Soodan & Associates (civil); George Sollitt Construction (general contractor)

### SOURCES

**STONE:** Indiana Limestone **BUILT-UP ROOFING: Johns Manville GREEN ROOF: American Hydrotech** DOORS AND DOOR FRAMES: Ceco CABINETWORK AND MILLWORK: **TMI Systems** 



"We want to make sure these buildings are significant and add something to the fabric of the neighborhood," says Trung Le of OWP/P about the firm's prototype designs for Chicago Public Schools.

southwest quadrant. Indeed, the managing architect has helped the district cope with a growing student population in an efficient way: With Tarkington and similar K-8 schools, Le and his team start with a group of standard components, including common spaces like a gymnasium, dining facilities, library and administrative areas, and a number of classrooms that correspond with a locality's demographics. Then these components are arranged, typically linearly or in a Lshape, so that the school best suits its site.

"We want to make sure the buildings are significant and add something to the fabric of the neighborhood," Le says of the kits of parts, which the CPS dubs "prototypes." But, "the opportunity for creating a building with an intimate connection to the community is limited," he adds candidly. "The timeline is fast, and maintaining equity from one community to the next is important politically in a city where cultural and racial division is still visible."

Although OWP/P has found its creative hands tied somewhat by the universality of the prototype, that model has grown increasingly sophisticated in recent years. Most significantly, just as Tarkington was under development, Mayor Richard Daley ordered CPS to collaborate with the Chicago Park District on building new schools on parkland to ensure that the facilities would be located more centrally within existing neighborhoods. Moreover, in his ongoing effort to make Chicago one of the most ecologically responsible cities in the nation, Daley required that Tarkington be the first school in the district to be certified under the Leadership in Energy and Environmental Design (LEED) rating system. Created by the U.S. Green Building Council, LEED provides standards for evaluating a building's environmental performance. Certification is pending, and all subsequent new Chicago schools must surmount this bar.

To erect Tarkington School of Excellence, the district acquired 9.82 acres of Marquette Park, replacing a mid-century administrative building on site with the 134,000-square-foot school for 1,000 students. Warman Olsen Warman is the architect of record.

Ostensibly, Tarkington follows an established pattern. The building assumes a truncated L-shaped footprint, with community spaces radiating from a central two-story atrium. In a

### CASE STUDY Tarkington School of Excellence

About a third of Tarkington's roof is covered with vegetation. This feature has a number of environmental benefits, including reduction of stormwater runoff. The planted roof absorbs and retains rain water, allowing much of it to evapotranspire. nod to neighborhood context, Tarkington's exterior is composed of an offset brick pattern to reflect the brick and limestone articulation of the bungalows that face it; the library, immediately adjacent to the entrance, stands out from the facade, announcing its importance and reaching out toward daylight. Le also notes that Tarkington includes a full competition gymnasium, unlike other K-8 athletic spaces, thanks to the new collaboration with the park district. In order to compensate the community for its loss of parkland, at night the school is open to the public, offering classes in yoga, fitness, and dance.

The obligation to embrace sustainability simply reinforced a values system that OWP/P had implemented from the outset of its tenure. Like previous schools, Tarkington runs along an east-west access to minimize hardto-control morning and afternoon sunshine, and large expanses of glass replace traditional punched openings and increase diffuse interior daylight. Tarkington's terrazzo floors include recycled glass, and the wood used in its atrium lobby ceiling, library, and gym floor comes from sustainably managed forests. The mayor's mandate also allowed OWP/P to introduce a sedum roof. But "LEED's biggest impact was on how the general contractor built the building," says Le. "The contractor recycled a majority of construction waste instead of dumping it somewhere," he says.

Certainly, there is a sense that with Tarkington, CPS is catching up to principles





Interior finishes in the daylight-filled, doublestory lobby (above) include terrazzo floors with recycled glass and wood from sustainably managed forests. As part of Chicago Public Schools' arrangement with the Park District, the gymnasium (right) is open to the community after school hours. Here, classes in yoga, fitness, and dance are offered to the public.

long held by OWP/P. Despite its foresight, the firm is not resting on its laurels now. Le says that his design team continues to innovate within the managing-architect paradigm. And, while concurrent projects such as Albany Park Multicultural Elementary School and the forthcoming Miles Davis Elementary School will likely achieve LEED certification at the minimum level, he predicts that subsequent projects will aspire to higher ratings.

David Sokol is a New York–based design writer and frequent contributor to ARCHITECTURAL RECORD.



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# CASE STUDY North Central Junior High School

### CREDITS

OWNER: Iowa City Community School District

ARCHITECT: Neumann Monson Architects—Kevin Monson, AIA, principal-in-charge; Chris DeGroot, AIA, project architect; Tim Schroeder, AIA, design architect; Emily Kellenberger, interior designer

CONSULTANTS: Farris Engineering (mechanical/electrical); M2B (structural); MMS Consultants (civil/landscape); The Weidt Group (daylighting); Conlon Construction (general contractor)

### SOURCES

MASONRY: Glen-Gery Brick; Ochs Brick Co.

ALUMINUM WINDOWS: Moduline Window Systems

SUNSCREENS: ASCA Inc.

PAINTS AND STAINS: Pittsburgh Paints

PLASTIC LAMINATE: Nevamar

**CARPET: J&J Commercial** 

Section A-A

# Letting the Sun Shine In

Neumann Monson Architects builds on its experience with daylighting and on a long-standing relationship with a client.

### **BY DAVID SOKOL**

he Iowa City Community School District has a star pupil in Neumann Monson Architects. The local firm not only earned commissions to design a trio of schools funded by a \$39 mil-

lion bond issue approved in 2003, but it also initiated an effort to make the facilities exemplars of performance and sustainability. The most recently completed building, the 600-student North Central Junior High, best realizes that independent study.

Because of a conviction that sustainable design "improves people's performance through healthier environments," the design team took a particular interest in deploying the U.S. Department of Energy's (DOE) high-performance guidelines, according to Kevin Monson, AIA, Neumann Monson president. And when the architects presented the district and its facility advisory council with DOE statistics, as well as the results of a 1999 study by energy consultant Heschong Mahone Group linking classroom daylight levels with test scores, the clients quickly embraced the designers' sustainable agenda. As a result, Neumann Monson's Elizabeth Tate High School and Van Allen Elementary School, both opened in 2005, feature generous north-facing light monitors; Van Allen, which shares a 60-acre site with North Central, was also the first school in the state to earn certification, under the Leadership in Energy and Environmental Design (LEED) rating system. The program, administered by the U.S. Green Building Council, provides standards for evaluating performance in areas such as energy and water use, indoor air quality, and recycled content in building materials.

North Central Junior High, which opened for the 2006–2007 school year, refines the principles Neumann Monson had realized in the Tate and Van Allen projects. The 4<sup>1</sup>/<sub>2</sub>-foot-tall light monitors that run the length of each classroom, for example, are placed in closer proximity to classroom walls than at Van Allen. By doing so, the architects were able to



1 Commons 2 Gymnasium 3 Cafeteria 4 Library





reduce structural reinforcement without sacrificing light penetration.

The 82,000-square-foot building's southern elevation also bolsters Neumann Monson's embrace of the sun. While aluminum canopies shade the windows, these elements also extend into the interior as light shelves, reflecting light streaming from the upper portion of the windows into rooms. Moreover, the building plan here extends in a broad arc. "Programmatically, it allowed us to have different-sized classrooms in a tight envelope," Monson says, "and it is representative of the [path of the] sun."

The building's reliance on daylighting reduced the heat gain associated with electric lighting, allowing designers to specify a smaller and less costly mechanical system. The strategy helped keep the construction budget at an economical \$104 per square foot, and should also provide low operational costs, Monson says.

North Central reveals its sustainability mission at every turn. The building's signature is its southern elevation, featuring striations of bricks acquired from local production facilities' overruns; students similarly enjoy views of bioswales and natural wetlands as they move through the school everyday. Less apparent but equally important measures include 88 geothermal wells and, another Iowa first, pervious-concrete parking lots to reduce toxic stormwater runoff. Only an inquisitive student sleuth will find them all.

Shading devices and light shelves on south-facing windows bounce daylight deep into the interior.





# CASE STUDY Winchester Thurston School

### CREDITS

OWNER: Winchester Thurston School

ARCHITECT: Bohlin Cywinski Jackson—Jon C. Jackson, AIA, principal-in-charge; C. Roxanne Sherbeck, AIA, lead designer

CONSULTANTS: Dotter Engineering, Structural Engineering Corporation, Konefal & Company (structural); P.L. Frank (mechanical); Caplan Engineering, Hornfeck Engineering (electrical); L.D. Astorino (m/e/p); Dodson Engineering (mechanical/plumbing)

### SOURCES

VINYL SIDING: Mitten Inc.

ASPHALT ROOFING SHINGLES: Certainteed Corp.

**ROOF DECK: Tectum Inc.** 

WINDOWS: Andersen

GYMNASIUM WOOD FLOOR: Horner Flooring Company

PLUMBING FIXTURES: American Standard; Sloan Valve; Chicago Faucets; Geberit

### Floor Plan

- 1 Office 2 Catering
- **3** Multipurpose room
- 4 Storage 5 Music 6 Art
- 7 Fifth grade 8 Fourth grade
- 9 Third grade 10 Second
- grade 11 Science 12 Outdoor center 13 Dock 14 Pond

# **A Welcoming Environment**

Designers create a cozy complex in tune with a school's educational philosophy and its bucolic site.

### **BY ALEX BOZIKOVIC**

he independent Winchester Thurston School has roots in central Pittsburgh that go back to the 1880s. But by the 1980s, many potential students were living in the suburbs. The school's

North Hills Campus was created to serve as a feeder school for its urban counterpart. Through a 20-year collaboration with the Pittsburgh office of architecture firm Bohlin Cywinski Jackson, the campus has developed its own architectural identity, bringing domestic forms and materials into the context of a small school.

Built on a former horse farm in the town of Allison Park, the 16,000-square-foot complex began in 1988 with a single classroom building and the adaptive reuse of two existing outbuildings. The most recent third phase of renovations, completed in fall 2005, reconfigured the original classroom structure and added a second major building to the site: known as the Campus Center, it contains a multipurpose room and specialized classrooms for art and music.

The buildings' exteriors employ a historicist vocabulary of materials and forms. The familiar gabled roofs, blue clapboard siding, and white trim fit their context and made the inexpensive project easier to build, says BCJ's Roxanne Sherbeck, AIA, the campus's lead designer for all three phases. But "there was also a philosophical interest," she says. "Because it was a sort of transition for kids from home to school in town, we tried to make it both familiar and workable as a school building."

Nancy Rogers, the director of the campus, says

A slightly irregular geometry stimulates students' thinking, the designers say.







the informal design matches the "learner-centered" teaching philosophy of North Hills, which serves students from pre-kindergarten to fifth grade. "It doesn't have an institutional feel," she says. "It's very welcoming." Rogers, who has been at the campus since it opened in 1988, says the 96 students are also well served by a "child-focused," contemporary interior with nooks ideal for reading and conversation and irregularly shaped classrooms. As Sherbeck explains, these elements are designed to add character and also to stimulate critical thinking, one of the school's core values. Exposed beams in one corridor of the main building remind students "not to take [the structure] for granted," she says.

As for the individual classrooms, Sherbeck

says that the school and designers opted for less order than would be typical. "The geometry is less regular, and more flowing. We've shaved corners here or there and focused windows in unexpected ways."

In fact, daylighting and exterior views are a crucial part of the design. The original classroom building now accommodates six grade level classrooms, a science room, and the media center. Almost all of these spaces overlook a pond and have southern exposures, partly shaded by a strategic arrangement of trellises. Each classroom also has its own heat pump with separate controls for added energy efficiency.

Windows are often placed at children's eye level, and Rogers says this helps establish an

ecological awareness, which the school takes seriously. The campus was intended to take full advantage of its semi-rural setting, and indeed one of the old outbuildings has been transformed into an environmental laboratory. "There's a lot of emphasis on being part of a real world," Sherbeck says, "as opposed to an abstract educational conception."

Toronto-based Alex Bozikovic is a design columnist at *The Globe and Mail* and a contributor to Architectural Record.

As part of the most recent phase of construction, the campus's original classroom building (below left) has been reconfigured, and now contains mostly grade level classrooms. The new Campus Center includes a multipurpose room and provides spaces for instruction in art (directly below) and music.





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# CASE STUDY Fossil Ridge High School

### CREDITS

### **OWNER:** Poudre School District

ARCHITECT: RB+B Architects— George A. Brelig, AIA, design principal; Corky Bradley, AIA, project architect; Matt Arabasz, AIA, job captain

CONSULTANTS: JVA Engineering (structural); CEI (electrical); MKK Engineering (mechanical); BHA Design (landscape); Nolte & Associates (civil); ATS&R (programming); ACODA/SM&W (theater & acoustical); EMC Engineers (energy modeling); ENSAR Group (daylighting); AEC (commissioning); Haselden Construction (general contractor)

### SOURCES

MASONRY: Claylite; Interstate Brick SKYLIGHTS: Solatube International RESILIENT FLOORING: Armstrong

AUDITORIUM SEATING: Irwin Seating Company

LIGHTING CONTROLS: Watt Stopper/ Legrand

PLUMBING FIXTURES: Kohler; Elkay; Chicago Faucets

# **Building as Teaching Tool**

Intimate and flexible learning environments within a larger footprint encourage creativity and collaboration, among both teachers and students. BY B.J. NOVITSKI



he Poudre School District in Fort Collins, Colorado, gave a tough assignment to RB+B Architects: build a 1,800-student high school, taking advantage of an economy of scale,

but at the same time, design a facility that would allow faculty to provide students with the personalized education more common in smaller schools. District administrators also asked designers to integrate energy efficiency measures in order to significantly reduce utility bills, without adding to the initial construction cost. Now, three years after the completion of construction, the grades are in and, by all accounts, the architects get an A for Fossil Ridge High School.

RB+B and a committee of educators developed the idea of one 300,000-square-foot, \$38.5 million building containing three separate "learning communities." Each of three wings in the north half of the school operates as a semi-autonomous institution for 600 students, with its own core curriculum, student work areas, and administration. Specialty courses, such as music, are taught outside the smaller communities. South of the three wings are a







Site Plan 1 High school 2 Student parking 3 Faculty parking 4 Future expansion 5 Planned public park



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large, daylight-filled media center; physical education facilities; and spaces for the visual and performing arts.

Social studies teacher Tara Rigby is delighted with how the unusual configuration is working. She reports a strong sense of community among the students. Teachers also benefit, she points out. Instead of being "pigeon-holed in a social studies wing," Rigby works as part of an interdisciplinary team that encourages creativity in teaching. In one example of collaboration, history and literature classes examine the same period in history at the same time.

Rigby is also the faculty sponsor of the school's environmental club. These students

are passionate activists, she says, and their focus is their immediate surroundings. Fossil Ridge High School was one of the first schools to receive a Silver rating from the U.S. Green Building Council. This Leadership in Energy and Environmental Design (LEED) designation has become a coveted certification for sustainability. To qualify, the building must be energy efficient, conserve water, have good indoor air quality, and contain recycled materials. Club members are experts in the building's green features, and they give technical tours to visitors and their fellow students. On a typical tour, the students might explain the daylighting strategy, the east- and west-facing windows canted to the north to reduce solar



### CASE STUDY Fossil Ridge High School

heat gain, the heat-recovery wheels, or the ice storage system that cools the building while shifting 40 percent of electrical demand to off-peak hours. They might point out the photovoltaic panels at the front entrance or the xeriscaping that helps to conserve water. During much of the daytime, electric lights are unnecessary, and students and teachers are learning to avoid turning them on as a matter of habit. Rigby reports that the club members are thrilled to have this opportunity for direct environmental involvement.

### Sustainable design is more than a list of features. How components and systems work with a building's configuration and orientation is key.

Some of these young enthusiasts may pursue architectural careers. If they do, they'll learn that sustainable design is more complex than a list of features. How components and systems work together with the shape and siting of the building is key. Indeed, it's generally understood that a commitment to LEED must precede any design work. But the owner did not formally adopt LEED guidelines until the architects were well into design development, according to Quinton "Corky" Bradley, RB+B project architect.

The relatively late decision to pursue LEED certification was not a drawback, however, because the district and the design team had already decided that the building's environmental performance would be a top priority. "We never shifted gears. We had always had our eyes on building the best building we could," Bradley recalls. "First get the exterior

The photovoltaic panels (left) form a canopy over the main entry and announce the school's environmental agenda. Horizontal shading devices over classroom windows (below) balance the need for views and daylight, and protect against heat gain.







Daylighting is an important aspect of the design of Fossil Ridge, both for its classrooms and its shared spaces, such as the media center (left) and the commons area (below).

envelope right, then specify the best equipment and controls, and never forget it's all about delivering quality education," he advises.

Another Fort Collins high school of the same size, five years older, serves as an energy-consumption benchmark. In a recent fivemonth winter period, the cost of Fossil Ridge's natural gas and electricity was less than 60 percent that of the older school's. Despite this success, there's room for improvement. Both Rigby and Bradley comment that if they could do it over again, they would simplify the complex lighting system. The daylighting is beautiful, but some teachers have complained that they need more local control to darken rooms for presentations. Otherwise, Rigby wouldn't change a thing. Even the environmental club members who don't become architects, she predicts, will become influential: "The things they learn here will be beneficial when they enter the workforce," she says. "They will provide another voice advocating the importance of green design to their employers and people around them, now that they have seen firsthand what can be accomplished."







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# **Sunpower for Schoolkids**

A PV system can supply some of the energy your school needs, but may be even better as a teacher of physics, energy, and sustainability concepts.

# **BY DEANE EVANS, FAIA**

very day, the sun bathes the earth with enormous amounts of free energy—enough in one minute to meet the world's current energy needs for an entire year! Schools are

beginning to harness this limitless natural resource as a way to meet their energy needs and provide educational opportunities for their students in the process.

Photovoltaics are one solution. PV systems convert sunlight into electricity—one of the most elegant and environmentally benign ways to produce power. This article explores how teachers, administrators and facility managers are beginning to look for ways to produce their own power.

# WHAT ARE PHOTOVOLTAICS?

In 1839, French scientist Edmund Becquerel observed the photoelectric effect—when a current could be measured across an electrode suspended in a solution exposed to light. And, in 1921, Albert Einstein won the Nobel Prize for his theories explaining the photoelectric effect. The photoelectric effect was not put to work until 1954, when Bell Laboratories created the silicon photovoltaic

Architects who wish to read this article for AIA Continuing Education learning units can do so at construction.com/CE/. cell-the first cell able to convert enough of the sun's energy to power electrical equipment. Given a large boost by the space program, development of PV cells has proceeded uninterrupted since they were first manufactured, with conversion efficiencies (how much solar energy is converted to electrical energy) increasing from 4 percent for Bell Labs' first prototype to more than 50 percent for the specialized prototypes of today. More common for building applications are overall PV system efficiencies of 12 to 17 percent depending on the type of solar cells and system technology used.

# **HOW DOES PV WORK?**

When sunlight strikes a PV cell, electrons are dislodged

and gathered by wires attached to the cell to form an electric current. This basic action simple, quiet, non-polluting, and requiring no moving parts—is at the core of every PV system. Cells may be more effective in areas like the Southwest, with a lot of clear, sunny days, but they will still provide substantial





DiNisco Design Partnership designed the Holten-Richmond Middle School in Danvers, Massachusetts, where the PV panels do double duty: They produce electricity while shading the windows from direct sunlight.

amounts of power in areas like the Northwest, with more overcast days.

Since most cells are relatively small, typically from <sup>1</sup>/<sub>2</sub> inch to 4 inches on a side. They produce very little power, and need to be electrically connected to other cells to increase energy output to levels appropriate for building applications. These collections of PV cells, referred to as "modules," are what we typically see on the roofs of buildings. They are typically 2-to-4 feet by 4-to-6 feet in size. Modules are typically connected to each other to form PV "arrays," which can range in size from one or two modules to several thousand, depending on the power output desired. School projects in the U.S. have used various sizes, from small arrays—from 1 or 2 modules for demonstration purposes—up to the array on the three buildings that make up a high school in Bayonne, New Jersey, that has more than 5,000 modules and supplies a substantial portion of the school's electricity.

A functioning PV system also needs an inverter to convert the direct-current (DC)

power generated by the modules into alternating current (AC) that can be used in the school. Wiring is needed to connect everything together, and some form of mounting system is necessary to attach the

Ford, Fairwell, Mills & Gatch Architects designed the independent Willow School in Gladstone, New Jersey. Its PV panels are mounted unobtrusively atop the building's dormers. array to the roof, wall, or grounds of the school. The mounting system can be fixed at a set angle or track the sun throughout the day. This can substantially increase the energy output of the array, but at a considerable cost.

# WHERE DOES THE ENERGY GO?

PV systems are either stand-alone or gridconnected. The electricity from a stand-alone system is either used as it is produced or stored in batteries. In grid-connected systems, power generated by the array is used to supplement power supplied by the electric utility. When the modules don't provide enough electricity, the utility supplements the array. When the modules provide more than is needed, the excess is fed back into the power





grid and the school's electric meter runs backwards. In these situations-in the 35 states that allow it-the school sells electricity back to the utility. This can be particularly important during "peak" periods of energy demand, when the utilities charge higher rates. These periods often coincide with times when the output from the PV array is also at its highest. If the school is getting maximum energy from its array at these times, it is buying less of the expensive "peak" energy from the utility. For most schools, a grid-connected system makes the most sense, especially (as is usually the case) when the PV array is not large enough to meet all the electricity needs of the facility. In special circumstances-for example, when a school is a designated place of refuge during emergencies-batteries can be added to a grid-connected system to store electricity when the utility grid is down.

# **PV ON—AND IN—THE ARCHITECTURE**

The most common application of photovoltaic systems in buildings is the one we're most familiar with: an array mounted on the roof of a facility, facing south and tilted to take maximum advantage of the sun. Because schools typically have large expanses of roof area, such systems make a lot of sense for both new and existing construction, especially for larger arrays.

To mount PV arrays on schools, a number of different approaches can be used. In facilities with sloped roofs that face south (or slightly east or west of south), modules can be attached directly to the sloped roof with rails or some other form of bracket system. In schools with flat roofs, some form of frame system is typically used to hold the modules at the correct angle to maximize sun exposure. Ballasted systems are relatively new. They allow a PV array to simply lie down on the flat roof without the need for mechanical fasteners between the roof and the ballasted modules. This makes installation much sim-



pler and avoids the multiple roof penetrations of a frame system.

In new construction, photovoltaic systems can actually be incorporated as substitutes for other building systems, such as roofs, atriums, canopies. Such an approach—referred to as "building integrated photovoltaics" (BIPV) can result in first-cost savings, since the PV system isn't being added to an existing building component but is simply replacing it. The system can also be financed as part of the entire building, rather than as an "add-on."

While this sounds good in principle, BIPV systems are still relatively rare, especially in the schools market, and high-profile examples like the atrium glazing for the Tiger Woods Learning Center are exceptional.

# **THE UPSIDES OF PV IN SCHOOLS**

There are three types of benefits to incorporating some form of PV into a school facility: environmental, educational, and economic. By using the sun's energy to create electricity, PV systems offset the need for electricity created by the burning of fossil fuels. As one of the most benign forms of energy production available, PV provides clear and compelling environmental benefits. From an educational perspective, the photoelectric effect is an elegant and scientifically compelling phenomenon. It is intriguing to children and adults alike and lends itself easily to being used as a teaching tool. It is for this reason that several states and/or local utilities have initiated demonstration programs to install small PV arrays on schools, primarily for educational purposes.

Madison Gas and Electric in Madison, Wisconsin, for example, has funded PV arrays on 10 high schools as part of its "Solar in Schools" program. The arrays are modestly sized—roughly eight modules each, producing 2.4 kilowatts (kW) of peak power, and are designed primarily as teaching tools. The utility installed monitoring equipment in each school so that students can keep track of the output, and it developed a comprehensive "solar curriculum" that students and teachers can use to optimize the learning experience

# **PV AND LEED**

The recently released LEED for Schools "On-Site Renewable Energy" credit awards up to three points for incorporating renewable energy technologies, including PV, into a school. One point is awarded for supplying 2.5 percent of the building's annual energy cost through renewables, two points for 7.5 percent, and three points for 12.5 percent.

# GOOD BUILDINGS FIRST, PV SECOND

Installing photovoltaics should not be considered the only or even the first step a school takes to reduce its energy usage. Improving the building envelope, taking maximum advantage of daylighting, incorporating high performance (and "right-sized") HVAC systems will all have a far greater impact on reducing a school's energy costs than adding PV. The best approach is to drive the building's energy use down as far as possible first, then try to meet the energy "load" that remains with photovoltaics. offered by the system. Similar programs, such as New York State's "School Power Naturally" and Pacific Gas and Electric's "Solar Schools" program, have been or are being implemented across the country. Clearly, the educational benefits—scientific, environmental, and social—of PV systems are a compelling justification for incorporating them into schools.

# **ECONOMIC BENEFITS**

The economics of PV are a little more complex. PV power is still not cheap, especially relative to other sources of electricity in the U.S. Even though costs have come way downfrom \$80 per watt in 1973 to as low as \$3 per watt today-amortized over a 20 year period, the cost of generating one kilowatt hour of power from photovoltaics is still as much as four times greater in some parts of the country than the cost of buying that kilowatt hour from the local utility. And while the price per watt for PV is expected to continue its downward trend, the fact remains that it is difficult to justify the cost of PV in schools based on energy economics alone. However, there are a variety of federal, state, and local incentive/rebate programs across the country that are helping to "buy down" the costs of PV installations for schools. Some of these are demonstration programs, such as the Wisconsin "Solar in Schools" initiative, that fund very modest PV arrays primarily for educational purposes. Others, like New York's Energy \$mart program or the California Solar



Lick-Wilmerding High School in San Francisco (above) by Pfau Architecture has roof-mounted arrays. The Tiger Woods Learning Center (right) in Anaheim has building-integrated photovoltaics in its curtain wall, designed by Solar Design

Initiative, are more substantial and can help defray the costs of installing much larger systems. While the school district still needs to provide some of the funding through combinations of rebates and other incentives, they can often cover substantial portions of the upfront investment—as much as 70 percent in New York's case.

All the energy savings go to the school, and it can really add up over the minimum 25-year life of a PV system. As a consequence, it definitely pays to check out any and all locally available incentive programs that could help defray the cost of a PV installation. In addition to rebates, some states are exploring innovative ways of financing PV installations. New Jersey, for example, is looking at Solar Renewable Energy Certificates (SRECs) as an alternative to rebates. SRECs would be issued to PV system owners, such as school districts, for every kilowatt hour produced by one of their PV systems. The SRECs that a district or individual school receives can be



sold to utilities, who are required by state regulations to either produce or purchase a specified amount of electricity from renewable sources each year. Usually a utility commission or similar body sets the prices and maintains the stability of the market. The revenue generated by the SREC sales can then be used to pay off the cost of the installation.

While new and still evolving, the SREC approach allows a school district to finance the entire cost of a PV system out of projected savings, rather than receive a rebate for only a portion of the system. This can be the difference between a go and a no-go decision on PV and is definitely worth investigating in jurisdictions that support SRECs. Third party financing may also be available.

# **THE BOTTOM LINE**

The bottom line on PV in schools is that where jurisdictions support demonstration programs, putting them in is a no-brainer. The installation won't meet much of the school's electrical load, but it will be a great-and inspirational-teaching tool. In jurisdictions that provide some form of subsidy for larger installations-those intended to significantly reduce energy use in the school-it will depend on the economics of the situation: the level and type of support provided, the amount of investment (if any) that the school is expected to provide, any regulatory restrictions that may apply, etc. In some areas, substantial PV arrays make a great deal of sense: The program in New Jersey, for example, is currently oversubscribed with a substantial waiting list. In others, even when the incentives are reasonably high, the installation may simply not "pencil out." In areas without any subsidy, the argument for PV is much harder to make. To the extent possible, a school should try to incorporate a demonstration scale array (2 kW or so) as a teaching tool, but from what school officials across the country seem to be saying, even this is an expensive "extra" to add to a school budget-for either modernization or new construction.

The best advice? If at all possible, go for it, at least at the demonstration scale. If some form of rebate, incentive, or financing is available, install the largest array you can afford—it will continue to provide energy and education benefits for a long time to come. In any case, don't think of PV as a substitute for good, basic, energy-efficient design and construction. Energy conservation should always precede on-site, renewable energy production.

Deane Evans, FAIA, is director of the Center for Architecture and Building Science Research at the New Jersey Institute of Technology.

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# RESOURCES

# Architect's Homework

Read up on novel school designs that break through limitations of tradition and embrace the ever-changing needs of students in the 21st century.

# **BY REBECCA WARD**



Designing the Sustainable School By Alan Ford Australia: The Images Publishing Group, 2007, 256 pages, \$60

This compilation of more than 40 international case studies commemorates sustainable design that considers not only eco-friendly features, but also the quality of a child's academic experience. Ford has collected an intriguing array of green school designs that range from a three-room schoolhouse in Gando, Boulgou, Burkina Faso, to a 2,500-student high school in California. Each selected design embodies Ford's vision for the future of sustainable academic design: "Imagine a school where the indoor air

quality reduced the risk of exposure to disease, where the acoustics were such that learning was enhanced, where the quality of the finishes and architecture made you feel welcomed, where test scores improved," he writes.

The selected case studies demonstrate how acoustics, visual comfort, light, and color perception have been incorporated into environmentally mindful designs for schools. Images, floor renderings, and elevations give the reader a spatial sense of each project.

In the foreword, S. Richard Fedrizzi, president, CEO & founding chairman of the U.S. Green Building Council states, "Every morning we send our children to school to learn, to explore, and to imagine—but we send them to buildings that are more like prisons than schools." This book is a celebration of the imaginative architects and educators across the globe who are breaking through the limitations of traditional school design to incorporate green innovation that harmonizes with principles of creative design for spaces of learning.

# A Design Manual: Schools and Kindergartens By Mark Dudek Berlin: Birkhäuser, 2007, 255 pages,

\$129



Mark Dudek suggests that in order to respond to the everchanging future and the needs of students, contemporary school design ought to be visionary. This "vision thing," he says, is vital to the development of educational theories, which, he argues, should be the shaping force behind the architecture of school design. He briefly expounds upon the evolving theories of education and design by exploring historical paradigms, educational systems, schools and their place in the community, and school typologies.

Experts in the academic design sphere have contributed brief chapters that follow Dudek's remarks. Specific elements that can enhance academic spaces, such as spatial configurations, acoustics, lighting, sustainability, outdoor spaces, and renovation, are illustrated. The book is then divided into five sections, each featuring international case studies that range from nurseries and kindergartens to academies and vocational schools. These case studies include a brief description of the design scheme, images, often in color, renderings of the floor plans and elevations, and charts containing information about the architect, students, and building details. With more than 80 case studies that range from a kindergarten in China to a charter school in the South Bronx to



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# RESOURCES

a business academy in London, this book provides a comprehensive look into recent developments of what Mark Dudek terms "pedagogic visions."

The Language of School DesignBy Prakash Nair & Randall FieldingDesignShare, Inc: 2005, 118 pages,\$35.

DestanShare The Language of School Design							
Design Patterns for 21st Century Schools							
Prakosh Nelr & Kondell Fielding							

The authors have attempted to "dejargonize" school design for educators and architects by creating a new vocabulary. Inspired by Christopher Alexander's influential 1977 book, A Pattern Language, in which recurring elements of architecture are classified into patterns, the authors have created new terminology for academic design composed of 25 "patterns" that range from "Welcoming Entry" to "Flexible Spaces." The spatial, psychological, and physiological aspects of each pattern, and their relationship to spaces of learning, are demonstrated through case studies of contemporary school design.

Of particular interest is the authors' exploration of spaces

encouraged by educator and author, David Thornburg. Thornburg identifies storytelling, peer learning, and independent study as a vital balance to education. Nair and Fielding propose that school design should support such teaching techniques. Photographs and text illustrate classrooms that support such spaces, examples of what the authors have termed "Campfire Space," "Watering Hole Space," and "Cave Space."

The authors conclude that they have "provided compelling evidence that there are certain healthy ways in which we can approach the design of school facilities." But this statement reads unfulfilled—the book lacks follow-up on the effect the featured schools has had on student performance. Yet the authors make a good point: There is a lack of novelty in incorporating best-practice principles into contemporary school design, and with this book, architects, academic administrators, and educators have a starting point to discuss solutions that can bridge this chasm.

# A Sense of Entry: Designing the Welcoming School

*By Alan Ford and Paul Hutton, text by Jennifer Seward* Australia: The Images Publishing Group, 2007, 160 pages, \$45

In the introduction, authors and architects Alan Ford and Paul Hutton admit, "When designing schools we did not necessarily set



out to feature the entrances." However, they continue, 17 of their firm's academic projects demonstrate exemplary entryways that embody basic principles of design that have been influential over the centuries.

After providing a history of the entryways of iconic structures such as the Parthenon, the Taj Mahal, the 1958 Seagram Office Building, and the Walt Disney Concert Hall, the authors demonstrate their theory by looking at successful entryways of schools, including some of their own. A brief text introduces each of their projects, describing the elements of design they believe are vital to a welcoming entryway: "identity"-telling the building's story, "wayfinding"helping users understand where the main entrance is, "influence of streets"-the school's relationship to the surrounding area, and "procession"-creating layers of entrance that transition users from exterior to interior spaces.

A plethora of photographs, many taken by the authors, illustrate each story. ■

Rebecca Ward is a freelance writer and teacher based in New York City.

# FAVORITE ONLINE RESOURCES

The number of online resources available online free of charge to those who are interested in school design is truly astonishing. Here are some favorites we find ourselves referring to frequently. —The Editors

- The American Architectural Foundation's Web site has a number of pamphlets that summarize the results gained during activities held as a part of its Great Schools By Design program. To see them, click on the "publications" tab at www.archfoundation.org.
- The Collaborative for High Performance Schools Web site presents a tremendous amount of information about the importance of water, energy, and natural resources conservation, and how to achieve it. Its six-volume Best Practices Manual and other publications are available at www.chps.net.
- The National Clearinghouse for Educational Facilities has nearly 50 free school-facilities publications available for download at its Web site. They cover everything from construction supervision to renovating facilities. These are available at www.edfacilities.org/pubs/.
- The resources section of the 21st Century School Fund focuses on urban public schools. Its Web site has many school design reports, transcripts of public testimony, and an archive of the Better Buildings Better Schools newsletter. To find them, click on the publications tab at www.21csf.org.
- The U.S. Department of Energy's Energysmart Schools Web site has resources that make a persuasive case for energy efficiency in schools. For information on planning, financing, design, and operations and maintenance, see "how to" guides at www.energysmartschools.gov.

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Stadium Savers provides an economical and proven alternative for achieving stadium seating tiers in an existing or new building. Stacked Geofoam blocks and Stadium Savers metal risers provide stable formwork for concrete seating platforms. The system is lightweight, easy to install, and is custom cut at the factory to suit straight, curved, or segmented seating layouts. 616-785-5598 www.stadiumsavers.com



direct/indirect

**Area of Rescue Communications** 

direct

# Lam Lighting

Luxxtra FL can light a gymnasium, cafeteria or multipurpose room using 1 watt or less of energy per square foot. Fluorescent lamping offers better color rendering than HID lamping, instant on, multiple level switching, dimming, emergency battery capability and 20,000 hours of lamp life. For a typical gymnasium lighting layout go to their website and check out Luxxtra FL in the Pendant section. www.LamLighting.com



Circle 166

# Circle 165

# **Grandstands, Bleachers & Stadium Seating**



Imaginative design and dedicated customer service have made Sturdisteel one of the leading sources for stadium seating in the country. Quality is based on their commitment to research, design, engineer, fabricate and install the finest seating available. Sturdisteel Permanent Grandstands set the standard in outdoor seating. Designed and constructed to withstand daily use, regardless of weather conditions, size of crowds, or special uses. Sturdisteel provides top-quality features at a cost that will fit your budget. 254-857-3744 www.sturdisteel.com

Circle 163

Circle 162

# **Elegant Outdoor Sconces**



# Hunza Lighting USA

Hunza offers a choice of two Pillar Lites designed to light both upwards and downwards on an exterior wall or pillar. The standard Pillar uses twin MR16 lamps while the Euro Pillar offers distinctive, machined styling and more compact dimensions with two MR11 lamps. 310-560-7310 www.hunzausa.com

Circle 164

# **Barrier Cate Operators**



# FAAC International, Inc.

Housing Devices, Inc.

Compliant with all IBC/ADA and NFPA

codes, their Area of Rescue systems pro-

vide two-way hands-free communication

between remote stations on each floor

and a central panel for anyone who

needs assistance. Automatic-dialing to

off-site monitoring is available for unat-

tended systems. They offer the most ADA accessible activation from their 3-

in. Diameter "Push for Help" ™ Button

that protrudes -in. from their rugged 16

gauge, stainless- steel, vandal-proof

plate. All lettering is engraved rather

than stenciled to avoid inevitable wearing off. Systems are expandable. 800-392-5200 www.housingdevices.com

FAAC is the world's largest specialized manufacturer of hydraulic operators for barrier, slide and swing gate systems. Barrier features include 100% continuous duty operation, the ability to raise beams up to 23-ft., and control panels with full system compatibility. Highspeed and economy models available. Visit their web site for brochures and specs. 800-221-8278 www.faacusa.com

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