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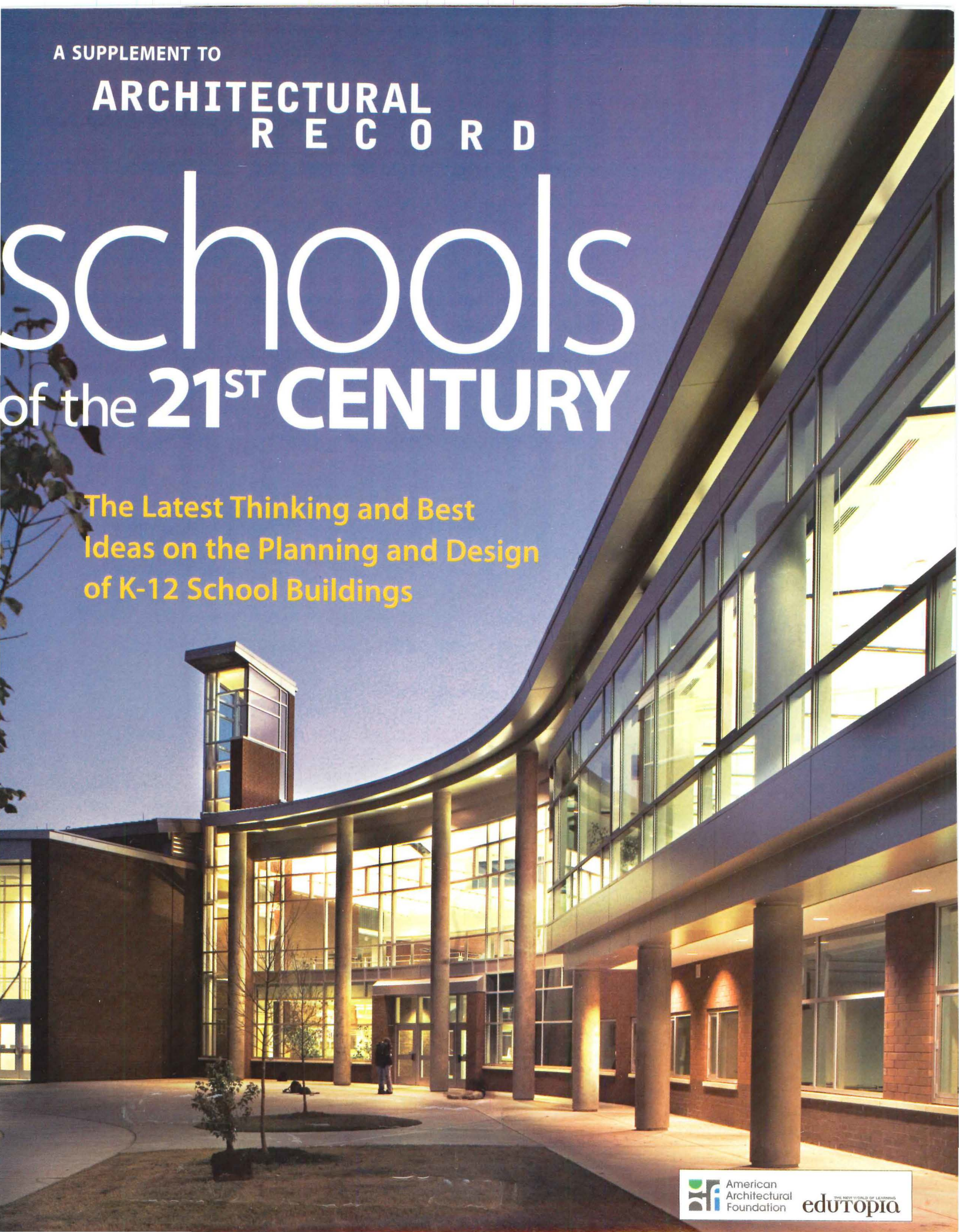
ARCHITECTURAL RECORD

schools of the 21ST CENTURY

The Latest Thinking and Best Ideas on the Planning and Design of K-12 School Buildings



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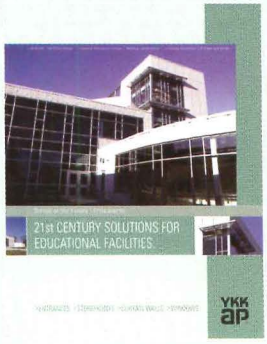

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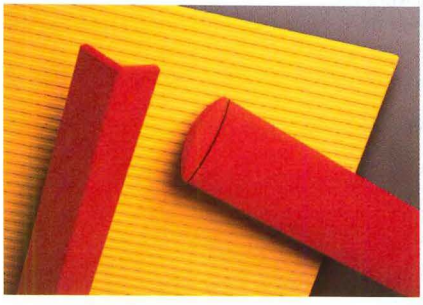

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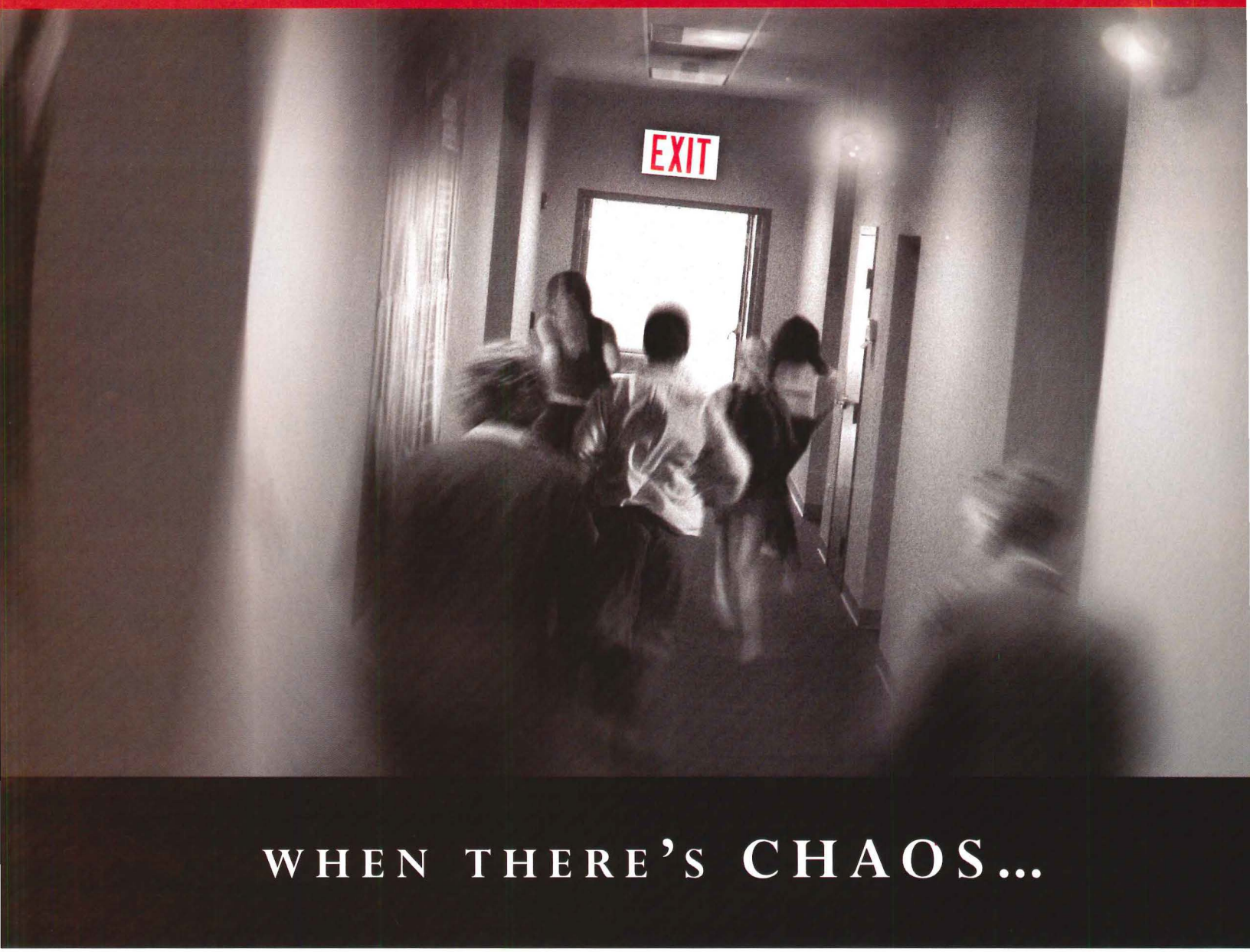

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Remember—It's All About the Kids

IF THERE'S A COPY OF SCHOOLS OF THE 21ST CENTURY **IN YOUR** hands right now, it is likely that you are among 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're a person who believes that it's all about the kids, and you care about the future of our children. You understand that the quality of our school buildings is directly related to the quality of the education we give them. Building materials, heating, and cooling affect their health, acoustics influence how much they understand, and proper lighting, of course, is crucial.

Early in 2006, we decided ARCHITECTURAL RECORD could help you make better school buildings by creating a publication that would inform you about new design and construction trends. We consulted many experts, commissioned and wrote articles, and partnered with the American Architectural Foundation (AAF), and the American Institute of Architects' Committee on Architecture for Education. We listened to the creative ideas of the publisher and editors of *Edutopia,* a magazine published by the George Lucas Educational Foundation. We were most proud to join Target as a presenting sponsor of a unique event created by the AAF, called the National School Design Institute (NSDI). It paired five teams of architects together with representatives of five school districts from across the nation. They worked together for 24 hours to find real solutions to some extremely tough design problems.

On the following pages you'll find articles about the NSDI, as well as high-performance school design, sustainability, and integrating IT into school buildings. We've presented case studies of six of the most interesting schools in the U.S. And, we've made places in this edition for the manufacturers who do the research and development of building products used in schools to tell their own stories.

On March 1, 2007 SCHOOLS OF THE 21ST CENTURY will be on the road. Join us in New Orleans for a free, half-day symposium on school design, the day before the American Association of School Administrators' National Conference on Education begins. Visit www.schoolsofthe21stcentury.com, for information on how to register.

It's always satisfying to put out publications that are truly valuable, and SCHOOLS OF THE 21ST CENTURY is one of them. Last year, the group that created it also produced 19 issues of RECORD and RECORD-related publications, several web sites, and put on a conference. The going sometimes got tough while we put this 20th publication to bed just before Christmas, but we gladly encouraged each other by saying, "Remember, it's all about the kids."

SCHOOLS OF THE 21ST CENTURY **publisher Laura Viscusi, and editor Charles Linn, FAIA**

On March 1, 2007, SCHOOLS OF THE 21ST CENTURY is on the road. Join us in New Orleans for our unique school design symposium.

www.schoolsofthe21stcentury.com

LAURA VISCUSI, Publisher

CHARLES LINN, FAIA, Editor

"A" is for Architecture

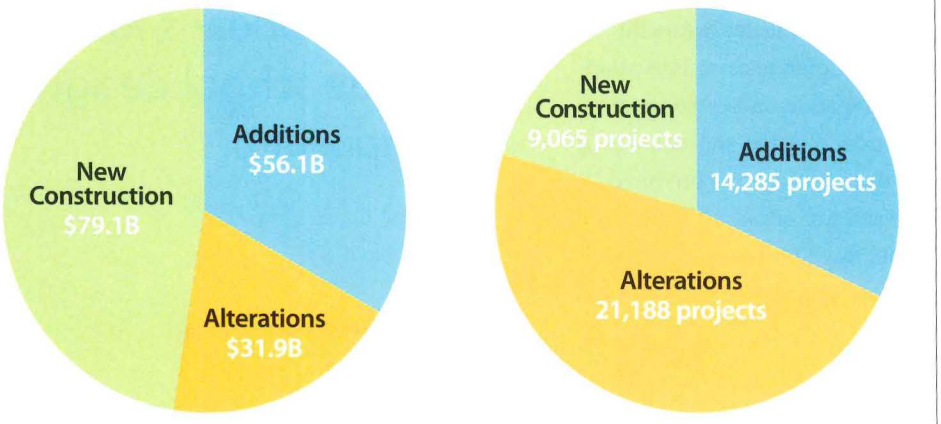
There are plenty of reasons to believe the next generation of schools will be the **best ever designed** BY CHARLES LINN, FAIA, AND JOANN GONCHAR, AIA

For almost sixty years, ever since the post-World War II Baby Boom created a classroom shortage of unprecedented proportions, school design has received a tremendous amount of attention within the architecture and education communities. So why, then, after decades of study, is there still no one "correct" way to design a school? One of many answers to this question is that architects, educators, and parents are by nature optimistic. Because they believe what they're doing for their children ought to be the best it can be, school design will always evolve.

Efficiency is probably the greatest enemy of innovation in school design, and changing what is known to be efficient—long corridors with classrooms on each side of them, for example—means that those who hold the purse strings must take chances. Unfortunately, it is notoriously difficult to definitively establish what makes any kind of environment successful. Anyone brave enough to add to this already challenging task by trying to demonstrate how an environment should be arranged to significantly enhance academic achievement has taken on one tough assignment. It isn't easy to convince a district to build a school so it can be used to study a hypothesis—good research takes years and there is always the chance that the results won't be as hoped. The urge to try new things, even if they are not costly, nearly always clashes with risk aversion.

The probability that established design practices will be overhauled is greatest when changes in social, technical, and environmental norms collide at a given point in time. This is such a moment. One catalyst for change is a new concern about the environmental impact of buildings. The need to make our schools sustainable and energy-efficient, and in turn more healthy places to occupy, is undeniable. This requires a rethinking of the design of the school building envelope, which materials are specified for it, and what its mechanical and lighting systems will be. Better alternatives are already in limited use, and their benefits are proven.

Another change is that advances in computer technology have occurred more rapidly than anyone could have ever imagined—the word "Internet" does not even appear in a book on school design ARCHITECTURAL RECORD published in 1993. Educators are always among the first to envision the ways in which technology can be used to teach children and to envision how space should be reconfigured to enhance the experience, and architects need to be attuned to their thinking.



Source: McGraw-Hill Construction Analytics 2007 Special Sector Study: Education

WHERE THE OPPORTUNITY IS

In recent years construction activity has been robust. According to McGraw-Hill Construction Analytics' *Special Sector Study: Education*, which will be released in January of 2007, in spite of a downturn early in the decade, between the beginning 2000 and the end of 2005 a total of 44,537 K-12 education projects broke ground with an associated construction cost of $167.1 billion. Of these projects 9,064 were new construction, costing $79.1 billion, while an additional 21,188 projects were alterations to existing structures,

Just-opened Sidwell Friends Middle School, in Washington, DC, is one of a new generation of sustainable schools. KieranTimberlake Associates is aiming for a LEED Platinum rating.

where no additional square footage was added, with a construction cost of $31.9 billion. And, during this period there were a total of 14,285 addition projects which cost $56.1 billion.

How much construction occurs in the future depends on two things: enrollment and funding. The National Center for Education Statistics (NCES) says that between 1990 and 2003 K-12 enrollment jumped by an impressive 18.4 percent over the previous 13-year period, and that's left a quarter of U.S. schools overcrowded, with enrollment averaging 5 percent over intended capacity. It only expects enrollment between 2003 and 2015 to grow by about 5.6 percent. Still, that is an increase of 3.1 million students. According to the *Special Sector Study*, "that figures to an additional 260,000 students each year. If the average class size is 25, the U.S. will need to build more than 10,000 K-12 classrooms each year just to keep up with enrollment growth."

This offers those responsible for school design a tremendous opportunity, especially in the area of building sustainable schools. About 65 percent of designers, contractors, and owners say they expect educational facilities to be the largest growth sector for sustainable construction, according to a *Green Building SmartMarket Report* published by McGraw-Hill Construction and produced in conjunction with the U.S. Green Building Council (USGBC). A similar report focusing only on the green school construction market is due out in the first quarter of 2007.

As part of this new interest in sustainability, the USGBC's Leadership in Energy and Environmental Design rating system, known as LEED, has emerged as a widely accepted standard for green building design. To date, the USGBC has certified about 30 schools under its LEED for New Construction (NC) system. Another 750 schools, representing about 27 million square feet, are in the pipeline for possible certification.

Undoubtedly, certification of schools will grow after release of a new version of LEED tailored specifically K-12 projects. The new system, slated for release in February, will look very much like the LEED NC product, but will be tweaked to address issues of particular importance in schools, such as children's sen-

Portable school buildings are a reality, and efforts to improve them have received a lot of attention. This design by Hord Coplan Macht, a Baltimore architecture firm, won an honorable mention in a competition sponsored by the Montgomery County Public Schools, in Maryland, the USGBC, and Council for Educational Facility Planners.

sitivity to chemicals, classroom acoustics, and mold prevention, says Lindsay Baker, USGBC LEED for Schools program coordinator.

Proponents of high-performance schools say that the greater first costs associated with building green are minimal, according to a new report released by Greg Kats, managing principal of Capital E, a green building energy technology consultancy. The study, which drew data from 30 green schools across the nation, found that the buildings cost less than 2 percent more than conventional schools, or an additional $3 per square foot, but provided savings more than 20 times as large (see table, right). The financial benefits quantified by the report included those that accrue directly to the school, such as lower energy and water cost, lowered teacher-turnover rates, and better occupant health. It also quantified benefits to the broader community, such as the savings associated with a reduction in required public infrastructure. It is hard to imagine that innovation in the design of sustainable schools should be thwarted by these practically negligible costs.

The design of sustainable portable classroom structures is also receiving a great deal of attention. The Modular Building Institute estimates that today approximately 300,000 modular classrooms are in use. They are a reality in a world where too often rapidly-shifting student demographics meet insufficient budgets and strict teacher-student-ratio regulations. The Baltimore architectural firm Hord Coplan Macht, was recently honored for its entry into a design competition for portable classrooms. Its concept for a transportable classroom has many options for wall infill panels, windows and doors, as well as sustainable features such as photovoltaic panels and a green roof.

Financial Benefits of Green Schools

Schools ($ per square foot)

Energy	$9
Emissions	$1
Water and Wastewater	$1
Increased Earnings	$49
Asthma Reduction	$3
Cold and Flu Reduction	$5
Teacher Retention	$4
Employment Impact	$2
TOTAL	**$74**
COST OF GREENING	**($3)**
NET FINANCIAL BENEFITS	**$71**

Greening America's Schools, Capital E, 2006

CHANGING THE DESIGN PARADIGM

In 1960, the American Association of School Administrators published, *Planning America's School Buildings*. Its authors take such a patronizing tone toward the desire of teachers (and similarly school board officials) to collaborate that it is painful to read. They wrote:

Unfortunately, all too often in past years teachers have wasted time set aside for educational planning in playing at being architect. Few teachers clearly visualize space and the implications of space. They were not trained to do this. In planning, therefore, teachers should do that part of the job they can do best—describing the teaching process—and leave to the architect the responsibility for designing space that will house these activitie now and in the future.

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Design for Learning Forum

Ten findings from the recent Design for Learning forum, held Last fall by the American Architecture Foundation:

- **REINVENT** the design process to allow for greater innovation.
- **DESIGN** with flexibility in mind: give teachers and students the freedom and space for greater creativity in the learning process.
- **RESPOND** more quickly to the ongoing paradigm change in teaching and learning.
- **CREATE** stronger links to education reformers seeking to close the achievement gap and design with 21st century skills in mind.
- **RECOGNIZE** the power of technology as well as its limits.
- **MAKE** the design process more inclusive: recognize the voice of students and the role of citizen designers.
- **DESIGN** for the Age Wave: recognize that in this era of life-long learning, millions of retiring baby-boomers will want to use schools facilities.
- **REBUILD** the connection between school and community: design the next generation of schools as community learning centers.
- **PROVIDE** school board members with a greater level of expertise and create a richer design matrix that moves school boards beyond the bottom line as the over-riding reason to choose one design over another.
- **INVEST** in research that links school design to student achievement including such indirect links as teacher retention, personalization, and conditions for learning.

By Kevin Sullivan. Kevin helped organize the recent Design for Learning Forum and is senior advisor to the American Architectural Foundation, the National Clearinghouse for Educational Facilities and the Knowledgeworks Foundation.

At an Alpine District prototype middle school in Utah, VCBO Architecture used upward-sliding glass doors to connect classrooms to a central collaboration area. Here, members of different classes work together.

This was not the only place where the AASA got it wrong. The book frequently refers to school buildings as "the school-plant," as if schools were factories where educated citizens were manufactured. Luckily, educators and designers are increasingly moving away from the factory model that defined K-12 facilities for most of the 20th century, toward buildings with highly flexible spaces intended to encourage collaboration and project-based learning.

In October, the American Architectural Foundation brought together more than 40 architects, educators, design experts, and students for a three-day "Design for Learning Forum" event in Minneapolis. They looked ahead to the future of school design with an emphasis on improving the link between design and student achievement. Attendees produced 10 key recommendations worth the notice of anyone planning a school construction project (see sidebar, left). They noted that the very definition of "school" is being called into question as the scope of the learning environment continues to expand. Participants recognized that in new, media-rich learning environments the school may become just one of many educational hubs as, students move in and out of the building with hand-held devices to learn anytime and anywhere.

But, as participants in this forum pointed out, there are still significant challenges to improving the design process. In many states opportunity to design great schools is currently thwarted by regulatory policies that can encourage the design of mediocre schools. Implementing reform is often difficult in a context of inappropriate standards, security consciousness, and stakeholders with conflicting agendas.

Nevertheless, there is much reason to be optimistic about the abilities of students, parents, teachers, architects, and school officials to take advantage of research—and personal experience—that shows just how strong the link between school design and student achievement really is. They also recognize that our nation's schools must serve multiple civic purposes, and act as centers of community. This is one place where the AASA's 1960 publication did get it right: "Schools of today must keep in tune with needs of our times and preserve the underlying values of American democracy." That is, educational facilities should demonstrate a commitment to active citizenship, diversity, equity, and access to new learning opportunities. ■

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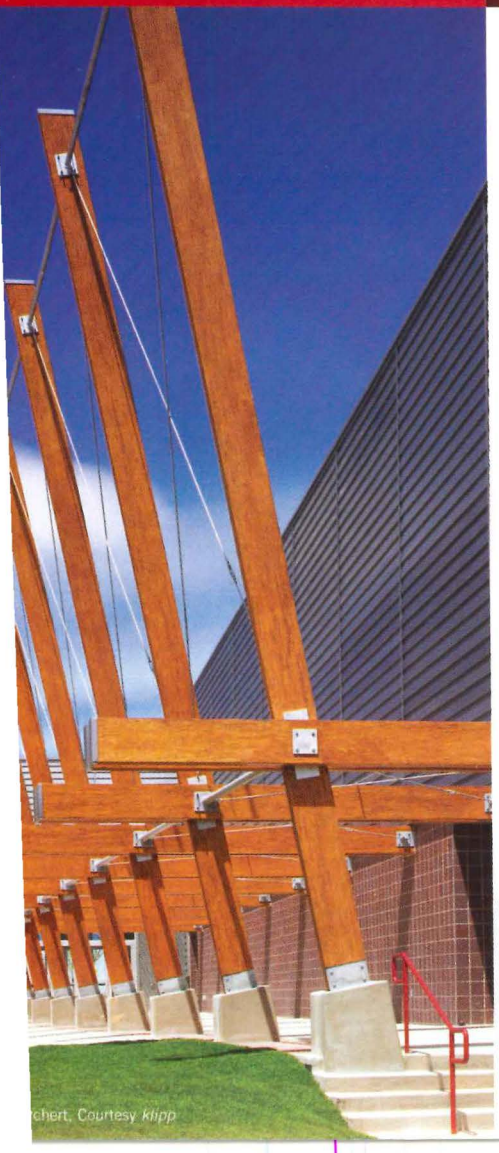
How will KIDS learn in the 21st century?



Every week, more than 59 million kids and adults

spend a big part of their days in our schools. Advances in technology, educational theory, and our understanding of how design supports student achievement all lead to new ways of imagining the places where our children learn. We also know that providing high-quality and healthy school facilities is an important component of student and teacher success. This is why the American Architectural Foundation, through its *Great Schools by Design* program, promotes collaboration, design excellence, and innovation in school design.

Our school design institutes, publications, videos, and forums provide community leaders, educators, and design professionals with a wealth of information to improve school facilities across the country. We are excited that Target has joined with us to help improve America's schools through its support of *Great Schools by Design*.

Help your community better meet the educational needs of the 21st century. Visit us at www.archfoundation.org

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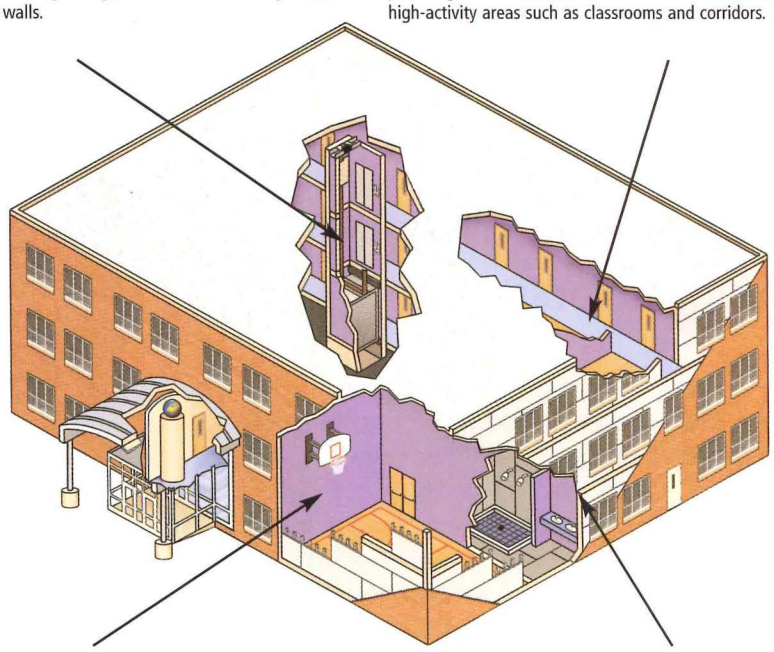

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No building product can be considered mold-proof, because mold can grow anywhere under the right conditions. Nothing can be done to eliminate mold spores, which occur naturally in our environment.

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The XP mold-resistant technology is an active process that chemically bonds an antimicrobial ingredient into the fibers of the face and back paper as the paper is produced at National Gypsum paper plants. The antimicrobial ingredient is not spray applied and cannot be rubbed or abraded off, and creates a panel that allows the same installation, finishing and decoration as standard wallboard. The active process neutralizes the organic food source in the paper, creating a modified paper-faced mold-resistant gypsum panel.

The XP family of mold-resistant products scores a 10 rating per ASTM standard D 3273, the best possible score for this test.

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PYRAN® fire-rated glass-ceramics deliver safety to schools

Safety in schools is everyone's concern. For fire-rated glazings requiring impact resistance, PYRAN® fire-rated glass-ceramics by SCHOTT are an ideal choice; they are wireless and offer a high degree of clarity, transmission and true color rendition. For safety-rated locations, they are available in a filmed and in a laminated format, which makes them ideal for use in locations such as door lites, transoms or sidelites and windows. Filmed and laminated PYRAN glass-ceramics are impact rated according to ANSI Z97.1 and CPSC 16CFR1201 (Categories I and II). All products are fire-rated up to 90 minutes with the hose stream test. In addition, PYRAN fire-rated glass-ceramics withstand thermal shock, are suited for use with standard fire-rated frames with the same rating, and conform to positive pressure test standards. SCHOTT has more than 25 years of fire-rated glazing experience, making PYRAN glass-ceramics a safe choice.

In addition to PYRAN fire-resistant glass-ceramics, the company participates in the architectural market with a wide variety of products including OKALUX light controlling insulated glass packages, AMIRAN® anti-reflective glass, decorative glass products and fiber optic and LED lighting, and many more. When it comes to special glass for architectural applications, SCHOTT is likely to have a product to meet your needs.

The SCHOTT Group focuses on a particular area in the world of glass: special glasses and glass-ceramics. Over 100 years ago, founding father Otto Schott discovered that the composition of glass could be varied and altered almost endlessly to produce properties that conform to clearly defined applications. Today, the SCHOTT Group that has evolved from Otto Schott's original "Glastechnisches Laboratorium," develops and produces special glass and glass-ceramics with chemical and physical properties adapted to a vast range of applications.

The international SCHOTT Group is technology-driven and sees its core purpose as the lasting improvement of living and working conditions through special glasses and materials, and providing high-tech solutions. Its main areas of focus are the architectural, automotive, aviation, electronics, home appliances, lighting, optics, ophthalmics, pharmaceutical and solar energy fields.

SCHOTT has a presence in close proximity to its customers through highly efficient production and sales companies in all of its major markets. It has more than 17,000 employees producing worldwide sales of approximately $2 billion. In North America, SCHOTT's holding companies, SCHOTT Corporation and its subsidiary SCHOTT North America, Inc. employ about 2,500 people in 16 operations.

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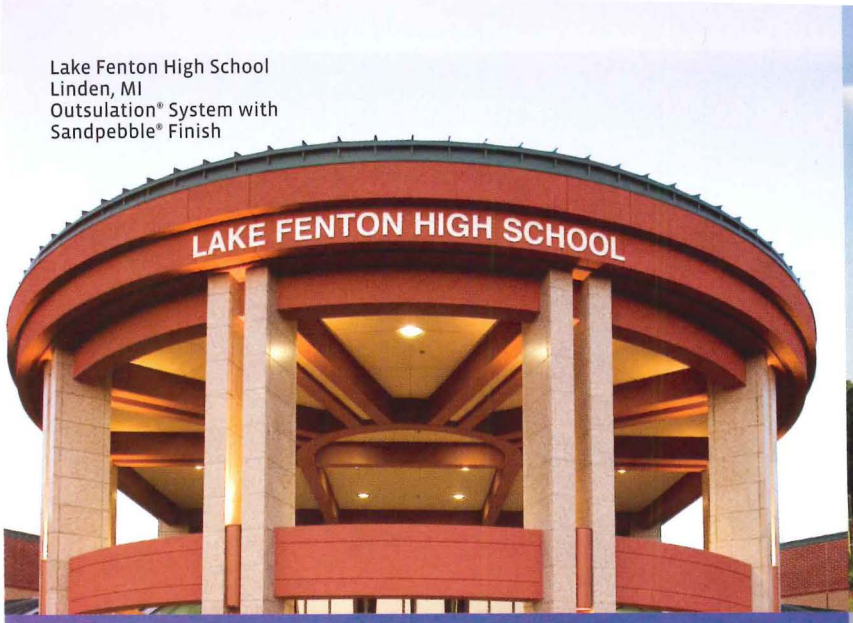

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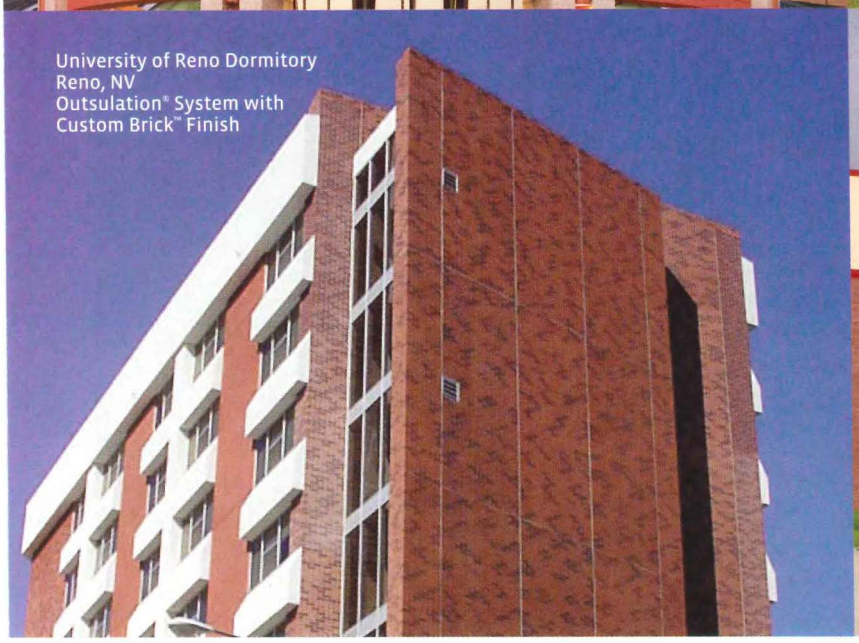

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Little Green Schoolhouses

The massive schools construction program currently underway provides a **once-in-a-generation opportunity** to create buildings that will influence the lives of students for decades to come BY DEANE EVANS, FAIA

High-performance schools—those that integrate the best in today's design strategies and building technologies—and can also referred to as "green" or "sustainable"—can help us make the most of the opportunity presented by today's massive school construction programs. What is a high-performance school? While there are many variations, in general high-performance schools are healthy, productive, and comfortable environments for students and teachers, that provide high levels of acoustic, thermal and visual comfort. Their windows and skylights admit generous amounts of daylight, and the buildings are safe and secure. There are other advantages. They are cost-effective to own and operate because they use durable products and systems. Their systems and materials are chosen using life-cycle cost analysis, rather than the cheapest first-cost. During design, energy analysis tools are used to optimize the building's performance, and after construction its equipment is "commissioned"—fine-tuned so it operates correctly. High-performance schools are available for use by non-students during hours when the school is not in operation, and community participation during design is encouraged.

These buildings also use highly-efficient heating, cooling, and lighting systems fueled by renewable sources where possible. Their site planning is environmentally responsive, controlling such things as glare from parking lot lights and stormwater runoff, and their plumbing systems make efficient use of water.

While creating a school that achieves all these performance objectives may sound challenging, it is actually very straightforward. It does, however, require an integrated, whole-building approach during the design process—an approach that establishes high performance as a top priority from the very beginning. Key systems and technologies—the "building blocks" of a high-performance school—must be considered holistically, and their selection is optimized based on their combined impact on the comfort and productivity of students and teachers. The result will be an entire facility that is optimized to achieve long-term value and and operational efficiency.

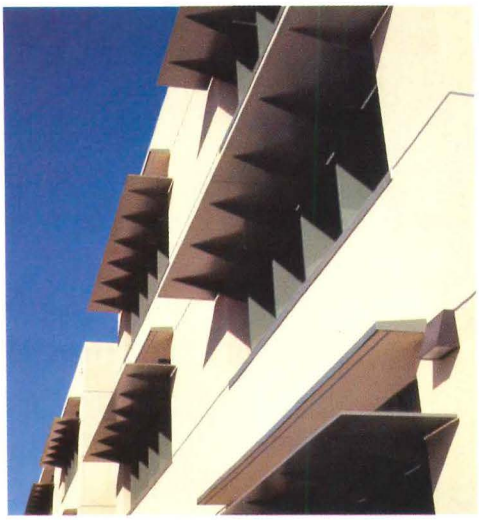
It is worth noting that high performance does not mean "high-tech." Optimizing a school's performance does require creative thinking and diligent management, but highly-complex systems or cutting-edge technologies are emphatically not required to create a high-performance facility.

Newark Science Park High School, recently opened by the architecture firm Einhorn Yaffee Prescott, in Newark, New Jersey, allows students to observe its sustainable features firsthand. These include photovoltaic panels, geothermal and energy-recovery systems.

HOW CAN I GET ONE?

The key to creating a high-performance school is to start out by making high performance a top priority for the project. There are many guidelines available for helping designers and educators achieve these objectives (a box on page 26 contains web links to these organizations as well, as others which are referred to in this article.) Of course, the design and construction process must be managed effectively. Luckily, there are two

Harley Ellis Deveraux, an architecture and engineering firm, and Greenworks Studio, a sustainable design consultant, recently completed Charles H. McKim Elementary, a CHPS school in Los Angeles.



Light shelves bounce light through short windows onto classroom ceilings, and shade the glass below.

solid process management strategies available as well. A school development team can use a rating system to help guide the design process, or it can use an interactive-management approach based on a series of questions asked at each stage of the design process, to keep the team constantly focused on the building blocks of a high-performance school. At the time this article was written, the best-known means for evaluating the performance of green buildings in general is the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Rating System. Its new LEED for Schools Rating System will be released in the spring of 2007. The "CHPS Criteria," produced by the Collaborative for High Performance Schools, also has an excellent assessment method. The best-known question-based system is contained in the "High Performance School Buildings Resource and Strategy Guide" published by the Sustainable Buildings Industry Council (SBIC). Whichever approach is used, the key is to set high performance as a critical goal early in the process, make sure that the design team has buy-in from key decisionmakers along the way, and that everyone stays committed.

BENEFITS

Does a high-performance school really make a difference—for students, teachers and the community? The answer is yes. SBIC and CHPS list the following key benefits for a high-performance school: better student performance; reduced operating costs; increased average daily attendance; better teacher satisfaction and retention, and reduced liability exposure. While all these benefits are important, the first two are worth special attention. A recent study commissioned by the National Clearinghouse for Educational Facilities concluded that, "School facilities affect learning. Spatial configurations, noise, heat, cold, light, and air quality obviously bear on students' and teachers' abilities to perform." In addition, a 2006 report from the National Research Council found that, "there is a robust body of evidence indicating that the health of children and adults can be affected by air quality in a school" and that, "Sufficient evidence exists to conclude that there is an association between decreased noise levels in schools and improvement in student performance."

Taken together, these studies point to at least one clear conclusion: school buildings matter. They are not merely settings in which teaching and learning take place, but are active variables in the process and can have positive, or negative, impacts on student performance. High-performance schools, by definition, seek to optimize systems with the greatest observed impacts on student and teacher performance: lighting and daylighting, indoor air quality, moisture control, and acoustic, visual and thermal comfort.

High-performance schools also make energy efficiency a high priority—and reduced energy use is one of the key ways to reduce a school's operating costs. Whether through conservation or the use of renewable energy strategies such as daylighting, photovoltaics or solar hot water, a high performance facility seeks to drive energy use as low as possible while still maintaining a high-quality learning environment. The U.S. Department of Energy estimates that, "New high-performance schools—designed to save energy and reduce environmental impact—can cost 50 percent less to operate than traditionally designed schools." This can mean substantial savings to a school's operating bottom line—and is another clear advantage of a high-performance facility.

DOES IT COST MORE?

There are actually two short answers to this question: "yes, but…" and "no, but…". The "yes, but" camp—reinforced by studies for the USGBC and the U.S. General Services Administration—holds that it does cost more to create a high performance "green" facility, but that these extra costs are quickly recouped by the benefits provided by the extra investment. According to a study by

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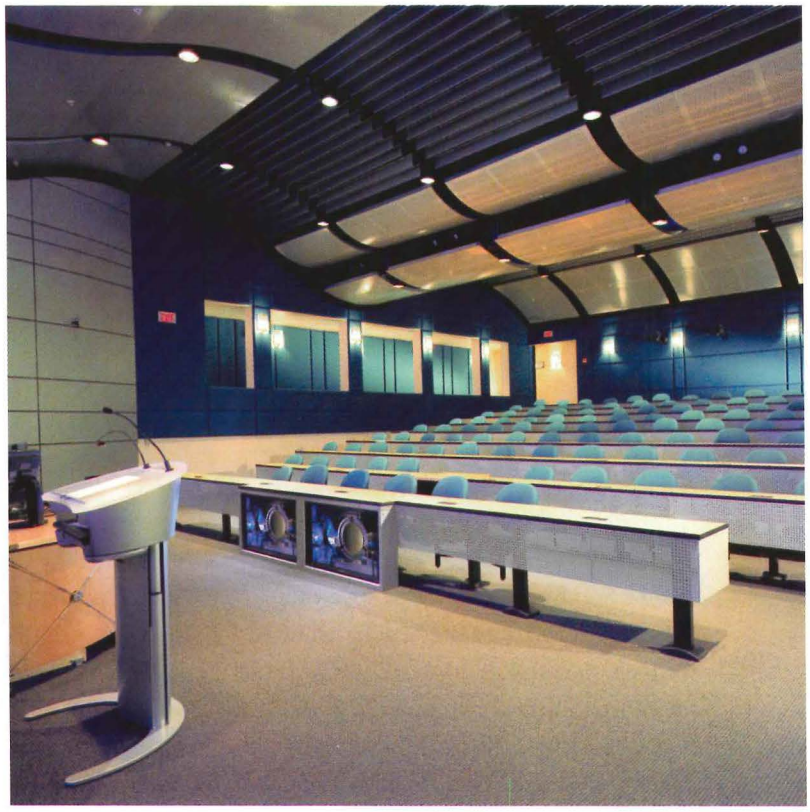

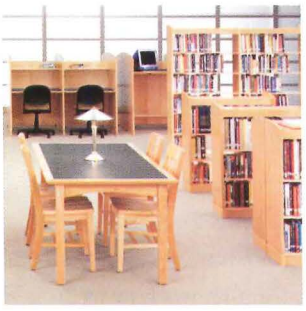

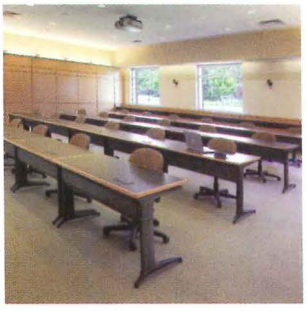

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WORKING FOR YOU

The architecture firm Innovative Design has used skylights in large rooms, such as this gymnasium at Heritage Middle School. Baffles block direct sunlight.

Innovative Design used a similar approach at Durant Road Middle School. Both schools are in the Wake County Public Schools System in Raleigh, North Carolina.

Greg Kats, et al. of Capital E, the school's energy savings alone will pay back an investment in high performance, while other benefits can increase this payback many times. Although the increases in first cost are real, varying from 0.6 percent for the USGBC's basic LEED certification to 6.5 percent for a LEED Platinum certification, it is clear that they pay for themselves quickly and provide lasting benefits for a facility over its lifetime.

The "no, but…" camp holds that once a design team knows how to do it, delivering a high-performance facility should not cost more, assuming that the budget is not artificially low to begin with. This opinion seems to be reinforced by a recent study by Davis Langdon, an international cost-estimating firm. Based on an analysis of the firm's comprehensive database of school costs, it appears that schools seeking LEED certification can be found across a wide spectrum of per-square-foot costs—from low to high. Schools not seeking LEED can also be found across the same spectrum. That means LEED schools can be achieved for the same costs as other schools, whether the other schools are inexpensive or expensive. Wherever one is on the cost spectrum, a high-performance facility should be deliverable. Whichever camp you are in, there are some key things to remember about the cost issue.

+ First costs trend lower with experience. As the team gets more knowledgeable and comfortable with high performance, they also become more efficient.
+ Life cycle costs are always lower in a high performance facility, so there's always (eventually) a net benefit for any additional investment that might be needed.
+ Mindset is critical. The more the team is committed to creating a high performance facility within an existing budget, the more likely they are to succeed.

NEXT STEPS

Every school building is a critical component of a quality education, lasting longer and affecting more students than any book, computer or white board ever will. A huge amount of new knowledge that has developed over the last decade gives us the ability to make these buildings, that are so important to the education of our children, into truly outstanding, high performance facilities—even on limited budgets. A great deal of this information is available on the Web and easy for everyone to access. All that remains is for us to use these tools as we go forward to make sure that every "School of the 21st Century" is a high-performance facility. ■

Deane Evans, FAIA, currently directs the Center for Architecture and Building Science Research at the New Jersey Institute of Technology. He also serves as vice-chair of the Sustainable Buildings Industry Council.

Kats, Greg et al. "National Review of Green Schools: Costs, Benefits, and Implications for Massachusetts," Massachusetts Technology Collaborative, December 2005. Download at: http://www.cap-e.com/ewebeditpro/items/O59F7707.pdf

Davis Langdon, Lisa Fay Mattiessen, Peter Morris "Costing Green: A Comprehensive Cost Database and Budgeting Methodology," July 2004. Download at: http://davislangdon-usa.com/Attachment%20Files/Research/costinggreen.pdf

Schneider, Mark. "Do School Facilities Affect Academic Outcomes?"National Clearinghouse for Educational Facilities; 2002. Download at: http://www.edfacilities.org/pubs/outcomes.pdf

Review and Assessment of Health and Productivity Benefits of Green Schools: An Interim Report, National Research Council, published by the National Academies Press, Washington, DC

"Our Schools are Failing Energy 101," U.S. Department of Energy, Energy Efficiency and Renewable Energy: www.eere.energy.gov/buildings/info/schools/index.html

For more information on high-performance schools and sustainable design see:

Collaborative for High Performance Schools: www.chps.net

Sustainable Buildings Industry Council: www.sbicouncil.org

U.S. Green Building Council: www.usgbc.org

U.S. Department of Energy: www.energysmartschools.gov

U.S. Department of Environmental Protection www.epa.gov/schools

High-performance School Design online training for architects and engineers: www.hpschooldesigntraining.com

Information on online daylighting design training programs is available at: www.daylightingtraining.org

A collection of resources on high-performance schools can be found here: www.highperformanceschools.org

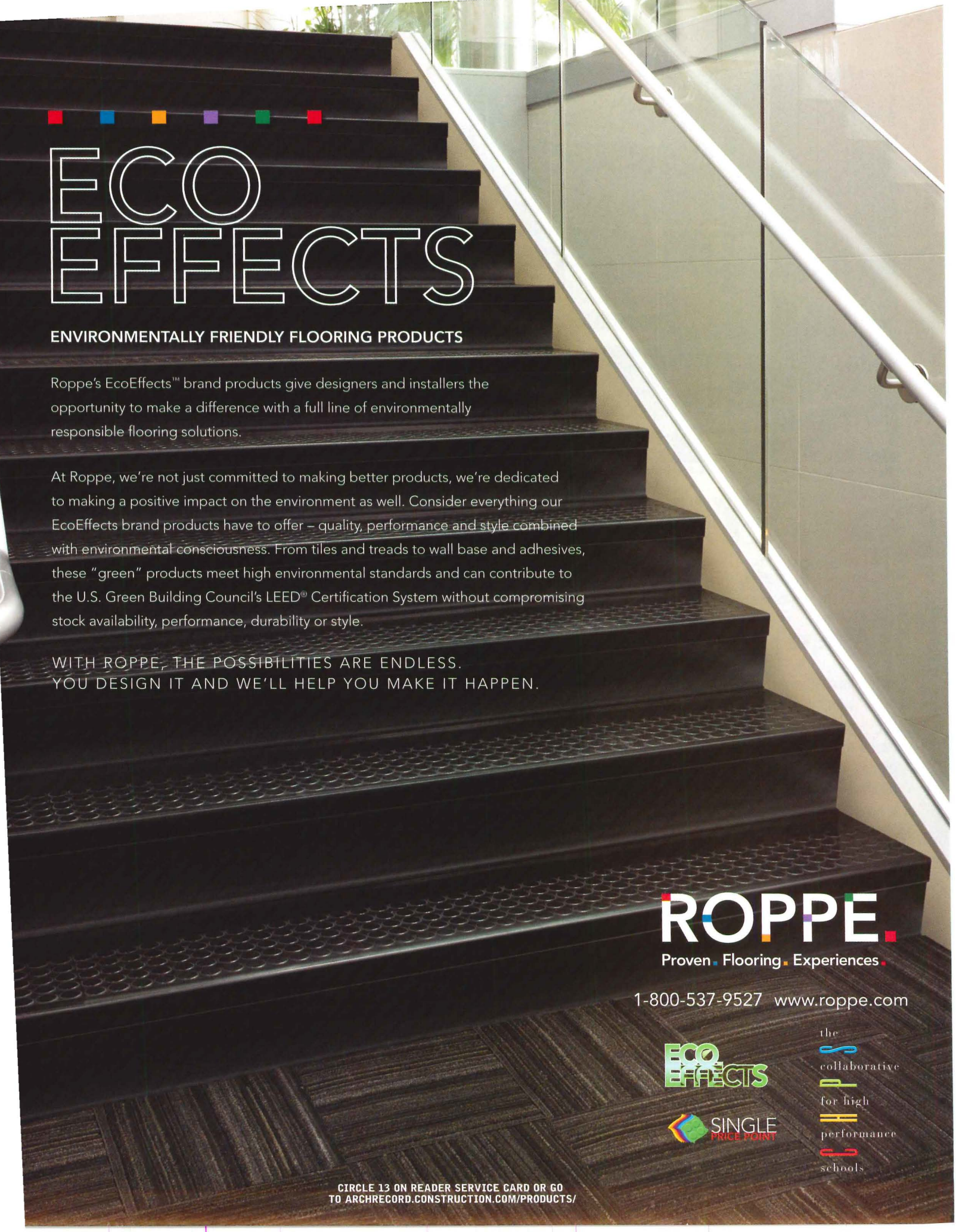
These organizations also offer resources to those who are interested in building high-performance schools:

U.S. Department of Energy: www.energysmartschools.gov

U.S. Department of Environmental Protection: www.epa.gov/schools

Sustainable Buildings Industry Council: www.sbicouncil.org

PHOTOGRAPHY: © MIKE NICKLAS (LEFT); ROBERT A. FLYNN (RIGHT)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Photographer: Steve Wolfe; Architect: Breslin Ridyard Fadero Architects; Electrical Engineer: Snyder Hoffman Associates

The Right Light For Learning Environments

A new perspective on design considerations for K-12 light control

The challenge of planning today's K-12 school buildings rests largely with the call for a multifunctional space. While the building has to provide an optimum learning environment for students, it also needs to be flexible, as many schools serve as venues for community groups, non-profit organizations, and adult education programs. In addition, the building must operate efficiently, using energy sparingly and leaving a minimal impact on the environment.

Light control can help meet all of those challenges. Here's how.

- Numerous studies indicate a direct correlation between good lighting and student performance. With student performance standards being set at an all-time high level, light control is integral to improving the learning environment. Also, teaching methods are evolving, requiring schools to have more flexible, multifunctional layouts.

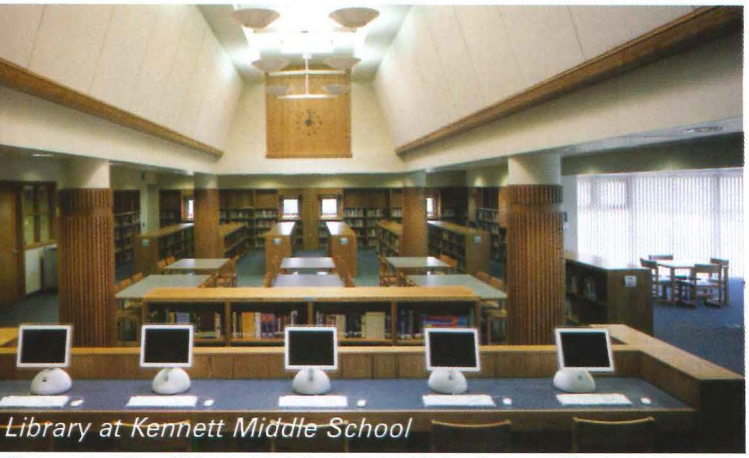
- Intuitive controls and lighting help the school function as an integral part of the surrounding community. The flexibility light controls offer helps present the school in exactly the right light for any situation, such as when it's used as a community center or polling place.

- Efficient light control offers a significant energy-saving opportunity. Even though most lighting in schools is energy-efficient fluorescent lighting, the number one source of electricity consumption in a school is lighting. In fact, schools spend more on energy than on textbooks, furniture, and new technology for learning combined. For many operating budgets, energy expenses are second only to payroll—and lighting is the largest electricity draw by far. Light control cuts energy use dramatically, and frees up those operating funds for something much more important—students.

To better understand how light control in a school contributes to creating the fully functional building, it's helpful to view the building as combination of four types of spaces: classrooms, multi-purpose administrative, and public.

Light control cuts energy use dramatically, and frees up those operating funds for something much more important—students.

Lutron Electronics Co., Inc. has developed technologies that serve t enhance light control in all of these spaces. These technologies combir automated control, daylight harvesting, and manual control to provic maximum energy savings while providing an unprecedented level control to teachers and administrators alike. Here's a look at the benef Lutron light control can provide for a K-12 school.


Library at Kennett Middle School

Photographer: Steve Wolfe; Architect: Breslin Ridyard Fadero Architects; Electrical Engineer: Consolidated Engineers

Light control in classrooms

Studies show proper lighting improves student attention spans, motivation, behavior, and test scores. In addition to improving student development, lighting is key to enhancing various activities within the classroom, such as general instruction, computer work, and video-media presentations. And that means today's classrooms have many diverse lighting needs. Classrooms require:

- A balanced environment that takes advantage of daylight, but evenly illuminates the space
- Control of the lighting to enhance the environment and meet the needs of different visual tasks
- Energy-efficient control that dims or turns off lighting when the space is vacant
- Simple, easy-to-use control

The Lutron solution for these requirements is Balance LC™, the only fluorescent light control system for classrooms that improves student performance and reduces energy costs. Utilizing building blocks from Lutron's EcoSystem™$_n$ technology, this new and innovative product is a combination of occupancy sensing, daylight harvesting, and manual control. It reduces electricity usage by taking advantage of natural light, gradually dimming lights in response to the amount of daylight in a classroom. Balance LC also automatically turns off the lights in unoccupied rooms for even greater savings. In addition, the Balance LC Teacher Control Station gives teachers the control they need to manage the classroom while providing the right light for any task.

Benefits of Balance LC include:

- Digitally addressable fluorescent dimming ballasts eliminate hard-wired control zones, reducing design time and installation costs.
- Occupancy sensors, daylight sensors, and wall controls are simple to install, connecting directly to the ballasts without interfaces.
- Ballasts can be independently programmed to respond to each sensor. This increases flexibility and control and eliminates additional components.
- Teachers have the control they need to adjust the light level for various tasks from the manual control wallstation. This means they can utilize varying light levels in several areas within the classroom, or change the light according to the subject, activity, or time of day. For example, a teacher can dim the lighting to focus the students' attention on an electronic white board, while still allowing the room to be bright enough for students to take notes and read clearly.
- Daylight sensors gradually adjust lights to evenly illuminate the classroom. This allows the teacher to teach without the added distraction of pronounced light changes. Since the daylight sensor takes advantage of natural light, the school saves energy without sacrificing student performance.
- Classrooms can be reconfigured without rewiring. Not having to rewire gives the school facility staff the ability to customize each classroom according to instructional requirements.


Computer classroom at Great Valley High School

Photographer: Paul S. Bartholomew; Architect: Breslin Ridyard Fadero Architects; Electrical Engineer: Consolidated Engineers

Classroom at Great Valley High School

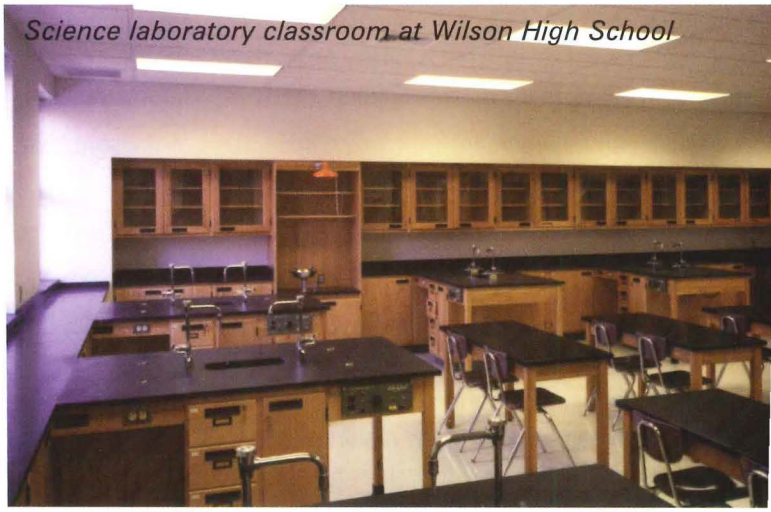
Photographer: Paul S. Bartholomew; Architect: Breslin Ridyard Fadero Architects; Electrical Engineer: Consolidated Engineers

Solar shading can also contribute to proper classroom lighting, as it eliminates glare on desks, chalkboards, and screens from direct, reflected, and diffused light. These shades also reduce UV exposure, protecting classroom interiors and teaching materials from harsh exposure to the sun. In addition, solar shades preserve outdoor views and exposure to light, which improve students' health, comfort, and satisfaction within their environment.

The Lutron solar shading solution is Sivoia QED™ (Quiet Electronic Drive). With Sivoia QED, teachers can easily control the shades from anywhere in the classroom using a keypad or infrared remote. Sivoia QED shades are available in a range of solar fabrics, including PVC-free and halogen-free, which don't release VOCs (volatile organic compounds); Trevira, which is naturally fire retardant; dual-sided, with light color on the outside to reflect the sun and dark color on the inside to allow for best views; and blackout, when total blackout conditions are needed.

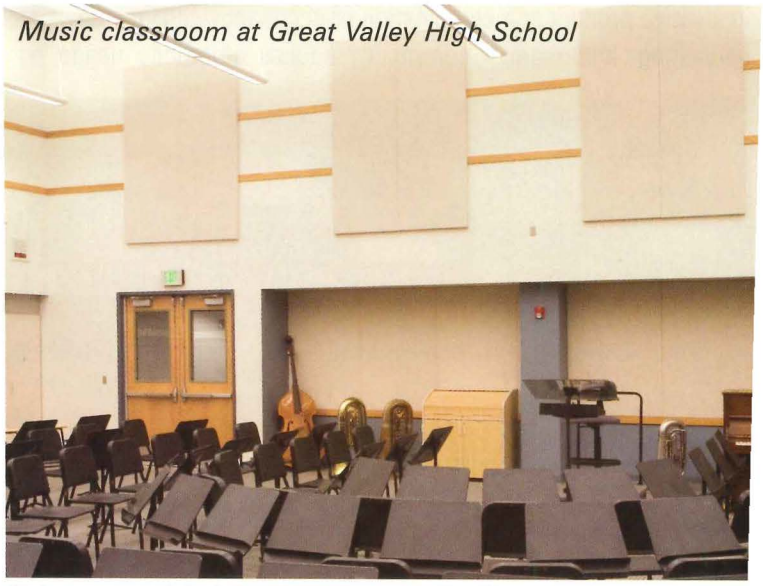
Benefits of Sivoia QED include:

- Precision control of shades at a near silent level, so teachers can control shades without distracting students from normal classroom activities.
- Integration with Lutron light control systems, giving teachers total control of both daylight and electric light for optimum teaching situations.
- Ability to interface with an astronomical timeclock that automatically adjusts shades based on the time of day, relative to sunrise and sunset. Interfacing with a timeclock allows daylight to be controlled without any effort on the part of the teacher.
- Ability to integrate with the building management system, so the facility manager has control over positioning the shades first thing in the morning and at the end of the day.



Science laboratory classroom at Wilson High School

Photographer: Steve Wolfe; Architect: Breslin Ridyard Fadero Architects; Electrical Engineer: Snyder Hoffman Associates



Music classroom at Great Valley High School

Photographer: Paul S. Bartholomew; Architect: Breslin Ridyard Fadero Architects; Electrical Engineer: Consolidated Engineers

Light control in multi-purpose spaces

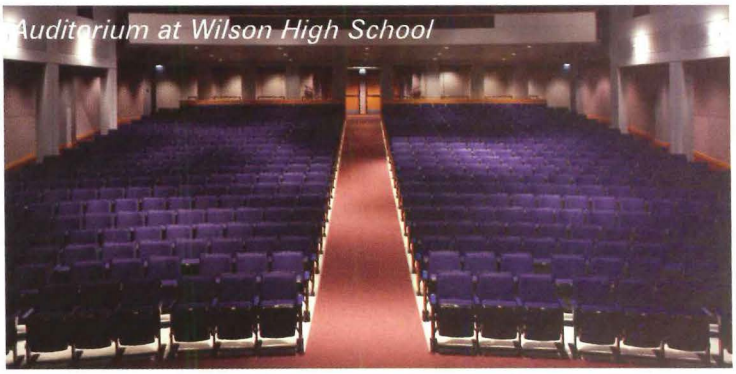
Multi-purpose spaces, such as the auditorium, gymnasium, and cafeteria, need light control systems that accommodate a variety of activities from assemblies, concerts, and school plays to extra-curricular activities within the community. The challenge here is that the same space that serves one purpose throughout the day may have very different needs during special events. Multi-purpose spaces require:

- Flexibility to meet the needs of different functions
- Control of architectural and theatrical lighting through one system
- Intuitive controls for the system's many users

The LCP128 SpecGrade™ system provides solutions for these multi-purpose spaces. This Lutron system provides the additional level of control needed to transform spaces into multimedia and theatrical venues that will meet the needs of the most demanding districts.

LCP128 SpecGrade benefits include:

- Built-in processor with LCD screen provides control for up to 128 zones and 500 programmable events. Being able to program such a large number of events and zones allows facility staff to set and save the correct lighting for different activities at one time. For example, if the gymnasium isn't used on weekend nights, staff can program the LCP panel to shut off all the lights in that space on those nights every week, ensuring energy savings.
- LCP128 integrates with DMX512 for simple control of normal lighting conditions, house lights, and theatrical control. This feature gives the user the ability to plug a stage board into the system and utilize stage lighting for special events without the school having to rent—or potentially purchase—an expensive theatrical light control system.
- LCP128 integrates with occupancy sensors to turn lights off in unoccupied spaces to save energy and increase efficiency.
- Universal dimming cards control any load type, reducing design time and simplifying installation.
- Backlit and engraveable buttons are easy to understand and use.



Photographer: Steve Wolfe; Architect: Breslin Ridyard Fadero Architects; Electrical Engineer: Snyder Hoffman Associates

otographer: Steve Wolfe; Architect: Breslin Ridyard Fadero Architects; Electrical Engineer: Snyder Hoffman Associates

Photographer: Paul S. Bartholomew; Architect: Breslin Ridyard Fadero Architects; Electrical Engineer: Consolidated Engineers

Light control in administrative spaces

Like many office spaces, school administration spaces require light control that offers comfort and convenience—increasing employee productivity—while saving energy. Lighting flexibility is also important in these spaces, as office arrangements may change or employees may work after hours. Administrative spaces require:

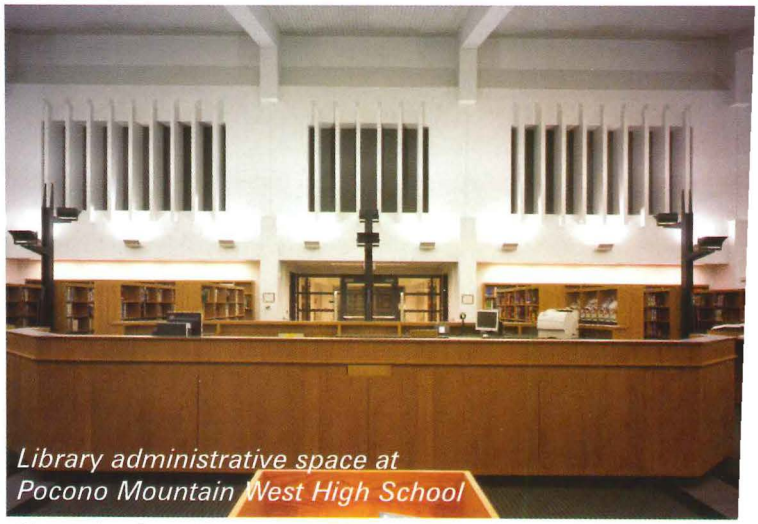
- Proper task lighting and glare reduction
- Lights that dim automatically to take advantage of available daylight
- Lighting that can be programmed to turn off at a certain time of day
- Lights that turn off when a space is unoccupied
- Lighting that can be integrated with the security system

Here, EcoSystem by Lutron is the solution that will meet the needs of these spaces. EcoSystem provides occupancy sensing, daylight harvesting, and personal control to improve employee productivity while maximizing energy savings.

EcoSystem benefits include:

- Digitally addressable fluorescent dimming ballasts that eliminate hard-wired control zones, reducing design time and installation costs.
- Occupancy sensors, daylight sensors, and wall controls that are simple to install—connecting directly to the ballasts without interfaces.
- Spaces can be reconfigured or renovated without rewiring.
- Daylight sensors gradually adjust the lighting to take advantage of available daylight.
- Occupancy sensors turn on the lights when the space is occupied and turn them off when vacant to maximize energy savings.

Photographer: Paul S. Bartholomew; Architect: Breslin Ridyard Fadero Architects; Electrical Engineer: Consolidated Engineers



Photographer: Steve Wolfe; Architect: Breslin Ridyard Fadero Architects; Electrical Engineer: Snyder Hoffman Associates

Courtyard at Great Valley High School

Photographer: Paul S. Bartholomew; Architect: Breslin Ridyard Fadero Architects; Electrical Engineer: Consolidated Engineers

Light control in public spaces

Public spaces in a school have a unique set of aesthetic and security needs that require support from the light system. These spaces include corridors, lobbies, restrooms, parking areas, athletic fields, and stadiums. Aesthetically, lighting enhances a school's appearance, which is a source of pride for the students and the community. Lighting should also integrate with the security system to increase the safety of the environment. Public spaces require:

- Event and scene lighting that is programmable and manually adjustable
- Lights that operate only when they are needed in order to save energy
- Lights that turn off in unoccupied spaces
- Illumination of exit routes during emergencies
- Adequate lighting during power outages

The Lutron Softswitch family of solutions—specifically, Softswitch128™—works directly with occupancy control, scheduled control, and manual control to meet a school district's needs for public spaces.

Softswitch128 benefits include:

- Patented Softswitch relays are tested and rated to last 1,000,000 cycles to provide ultimate durability and control. This will significantly reduce time and money spent on maintenance for years to come.
- Up to 500 events can be scheduled for a specific time of day or sunrise/sunset through the astronomical timeclock. Facility staff can program lighting to turn on at sunrise during the work week so that early-arriving students and faculty enter a brightly lit parking lot. They can also program lights to turn off when facilities aren't in use. For example, stadium field lighting can be programmed to turn off a certain amount of time after an event ends.
- Communication with BMS, security, or HVAC for greater building-wide control. Integration with multiple systems allows facility staff to control different areas of the building from one central panel. This can cut down on maintenance time and costs and also can lead to increased security.

Hallway at Pocono Mountain West High School

Photographer: Steve Wolfe; Architect: Breslin Ridyard Fadero Architects; Electrical Engineer: Snyder Hoffman Associates

- System programming is made simple through a built-in processor that provides full control of up to 8 remote panels and 128 zones through an easy-to-understand LCD screen at one convenient location.
- Zones can be controlled individually or in groups for greater flexibility and energy savings.

Providing school solutions

While student performance is the most important consideration in designing appropriate lighting for a school, energy efficiency and flexibility are essential, as well. Lutron provides solutions that create a better learning environment, as well as meet the needs of every space and function within a school. To learn more about Balance LC, EcoSystem, LCP128 SpecGrade, and Softswitch128, and make the best decision for your school project, contact the Lutron K-12 Solutions Team at 1.877.2LUTRON, ext 234.

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Sivoia QED™

The Sivoia QED™ (Quiet Electronic Drive) family of controllable shading products includes roller shades, Roman shades, and drapery track systems. All systems operate with ultra-quiet precision, low-voltage drives and offer many options for fabrics and controls. Sivoia QED gives schools a custom-built shading system with various configurations and fabrics, ideally suited to cafeterias, auditoriums, or classrooms.

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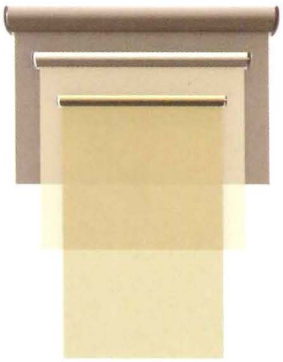

EcoSystem™

EcoSystem™ is a revolutionary fluorescent lighting control system that integrates personal control, daylight sensing, and occupancy sensing with a network of digitally addressable dimming ballasts. The easy-to-install and easy-to-use system cuts the energy usage of a school dramatically and gives teachers an unprecedented level of control over the lighting within the classroom.

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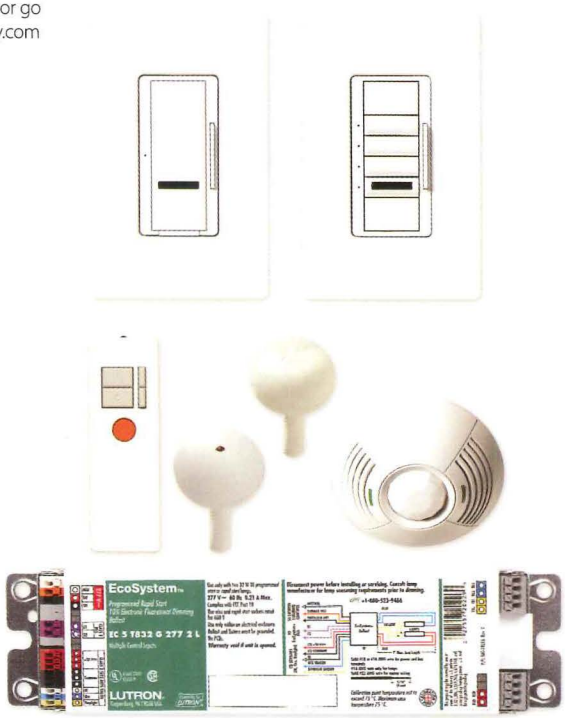

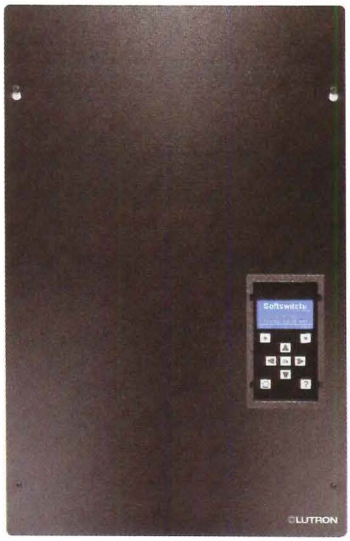

Softswitch128™ and LCP128™ SpecGrade

The Lutron Softswitch128™ switching solution contains patented relays with an average rated life of more than one million cycles, significantly reducing the cost of maintenance for schools. Pre-assembled and pre-tested panels can arrive with or without circuit breakers to achieve the most economical installation, and each has an LCD programmer for easy setup.

LCP128™ SpecGrade integrates all the lights in a multi-purpose space into one simple system. Lighting can be controlled automatically based on time of day, room occupancy, and available daylight–or they can be adjusted manually with wall controls. For auditoriums, LCP128 SpecGrade features lamp noise suppression and easy integration with stage lighting consoles.

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Occupancy Sensors

Lighting can account for up to 50% of a school's total energy use. Many rooms remain unoccupied with the lights on for 40% to 70% of the daily operating hours, wasting energy and money. Lutron's full line of occupancy sensors automates the switching or dimming of the lights, reducing the energy wasted in unoccupied rooms.

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Lutron EcoSystem™ | light control solution

The only fluorescent light control solution that makes it easy to save energy, and gives teachers complete control of their classroom lighting.

"We really took the time to select the best technology for our classroom renovation, and we chose EcoSystem from Lutron."

Jeff Choma, Manager of Mechanical and Electrical Systems
Georgian College, Ontario, Canada

What Jeff says about EcoSystem:	The technology behind it:
Improved classroom control - "EcoSystem allows the instructors to use the lighting to their advantage to help the students learn."	• Addressable fixtures can be regrouped to optimize the lighting for any instructional tool or teaching style.
Maximum energy savings - "Daylight harvesting, occupancy sensing and manual control make the classroom an efficient learning environment."	• Every lighting fixture is a connection point for sensors and controls.
Flexibility - "As the school's needs grow and change, EcoSystem allows the lighting to change with them."	• A wireless PDA-style programmer changes the lighting configuration easily.
World-class quality and service - "Lutron simply has the best product and support."	• Lowest field return rate in the industry • 100% end-of-line factory testing • Factory service, start-up, and training

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at **www.ecosystemlightcontrol.com**.
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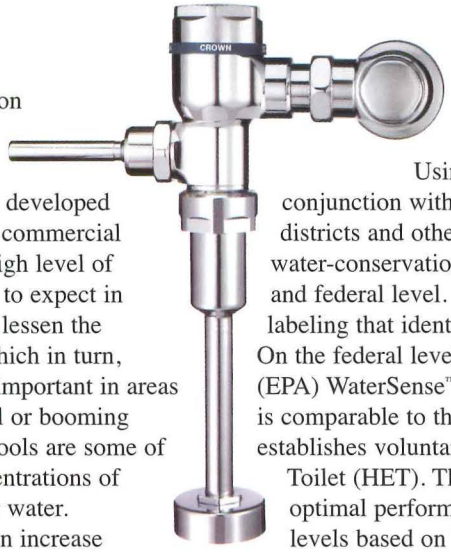
Maximizing **Water Conservation** and **Hygiene** in School Design



Sloan Valve Company is helping education facilities do more with less – again.

To help minimize the effect of an increasing demand for water, Sloan has developed innovative products that reduce consumption of commercial plumbing fixtures and continue to provide the high level of performance educational institutions have come to expect in recent years. As a result, Sloan has been able to lessen the impact a school has on its local environment, which in turn, allows communities to grow. This is especially important in areas facing prolonged regional drought, urban sprawl or booming populations because, in many communities, schools are some of the largest facilities and house the highest concentrations of daytime population, creating a huge demand for water. Even in regions with abundant water supplies, an increase in demand stresses local capacity, resulting in more expensive water.

Sloan – THE Leader in Water Conservation Since 1906

Since the invention of the Royal® Flushometer 100 years ago, Sloan Valve Company has been at the forefront of water conservation. Just as Flushometers replaced overhead tank toilets to become the industry standard, ultra-low-consumption products – and in some cases, zero-consumption fixtures – will become the gold standard.

Using its leadership position and working in conjunction with construction associations, municipal water districts and other stakeholders, Sloan is helping develop water-conservation standards that are feasible at the local, state and federal level. One new conservation effort is product labeling that identifies both performance and flush volume. On the federal level, the Environmental Protection Agency's (EPA) WaterSense™ water efficiency labeling program, which is comparable to the successful ENERGY STAR® program, establishes voluntary specification criteria for a High Efficiency Toilet (HET). The program includes a standard to ensure optimal performance in addition to maximum consumption levels based on Uniform North American Requirements (UNAR), which includes a soybean mixed media extraction test.

As defined, an HET fixture has an effective flush volume that does not exceed 1.28 gpf/4.8 Lpf. Further, for fixtures to qualify for the product-labeling program, a performance standard requires a minimum extraction of 350 grams of soybean media. The fixtures must also meet applicable sections of ASME A112.19.2-2003, A112.19.5-2005 and A112.19.14-2001.

South Forsyth High School Saves with Waterfree Urinals

Waterfree Urinals Now in All District Specs

Forsyth County School District engineer George Petty was faced with a weekly bill of $7,500 for pumping the septic fields at a single location when he decided that enough was enough.

"South Forsyth High School was on a septic system, and we were having trouble because the field could not take the liquid," said Petty. "We were pumping three times a week, 10,000 gallons each time at $0.25 a gallon."

Petty decided that a wholesale retrofit of the school's "regular" urinals with waterfree models was the best way to address the situation. "We changed out all of the urinals in the South Forsyth High School – 50 in total," Petty said.

Like traditional urinals, waterfree models connect to a drainline to transport waste to the main sewer, but only after it travels through a cartridge that acts as a funnel, allowing liquid from the bowl to flow into the filtering cartridge that holds a biodegradable sealant liquid.

Petty explained that waterfree urinals made sense for the water-conscious school district. "We have 'low-flow everything' – faucets with 0.5 gallon per minute aerators, and of course, the waterfree urinals. We're looking to save water wherever we can."

The success of waterfree urinals at South Forsyth High School gained the attention of other educators in the area. "I've had several administrators ask about them and I tell them we've had no problems at all. I definitely recommend them – and I have to several school systems," Petty said.

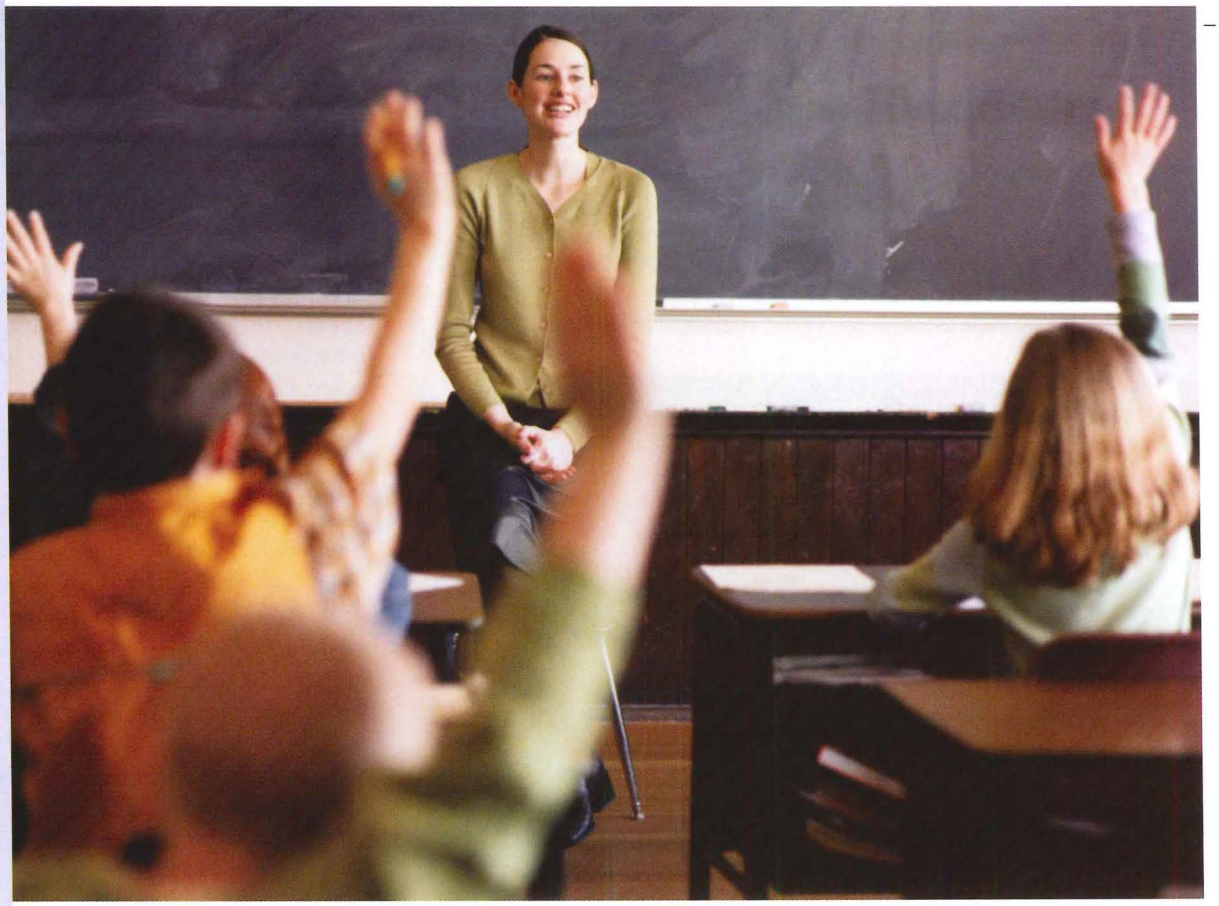
To keep pace with the population growth in greater Atlanta, the Forsyth County School District is now building three new schools. "Those buildings will also have waterfree urinals," said Petty. "In fact, waterfree urinals are now specified in all of our construction documents. They are the accepted standard."

Although the labeling program is currently a residential program, these high standards are an excellent benchmark and will ultimately be applied to commercial fixtures, which you would find in school applications.

Conserving Water is Critical

The California Urban Water Conservation Council (CUWCC) published a comprehensive analysis of water needs in a December 2005 draft report to the EPA titled, "Alliance for Water Efficiency: Issues & Options." The report cited a 1997 study that calculated an investment need of $280 billion for drinking-water infrastructure and an updated wastewater system during the next 20 years. A subsequent EPA Gap Analysis report in 2002 identified capital investment needs of $274 billion for the drinking water infrastructure and $388 billion for wastewater utilities investment through 2019. Projections by the EPA show gaps of $102 billion and $122 billion, respectively, between necessary investments and current levels of revenue to upgrade these systems. These statistics underscore the need for new water-conservation technologies to be implemented on a wide-scale basis.

Fortunately, it has been proven that reductions in water demand can lead to deferral or downsizing of water-supply and wastewater capital projects. Recognizing the impact that can be made at the local level, the goal of the CUWCC is to organize the involvement of water-conservation stakeholders and to develop plumbing-fixture standards that could evolve toward even more efficient



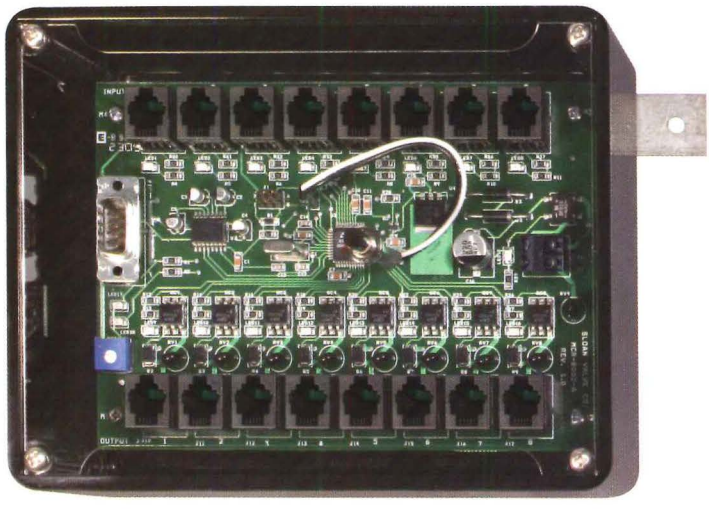
products. The CUWCC cites examples of technology currently available on the market, including 0.5 gpf urinals, which if required more frequently at the local level, would significantly decrease indoor water consumption throughout the country.

Installation of other water-conservation products, such as waterfree urinals, 0.5 gpf flush urinals, 1.0 gpf/3.8 Lpf pressure-assist toilets and dual-flush technology for both tank and Flushometer applications, are additional solutions that can make a significant local impact.

Sloan's High-Tech Solution

Along with its full line of low-consumption products, Sloan also pioneered other, more advanced means for controlling water consumption in schools. Its Programmed Water Technologies (PWT®) division, a manufacturer of networked water-control systems, allows administrators to control operation of any toilet, sink or shower within a facility. Instead of allowing students to flow water at will, school officials control consumption by setting parameters. These parameters can be placed on individual fixtures or an entire area, such as locker rooms, depending on the concern at any given school. Similarly, showers and faucets cannot be left running because the system controls the duration of water flow, as well as the permissible hours of operation.

Sloan's PWT networked water-control systems enable administrators to remotely monitor and control select plumbing fixtures in a facility, either in real time or on an automatic, pre-selected basis, using either a central station computer or a hand-held Palm® device. Any fixture within the networked system can be shut down immediately for emergencies or maintenance.



Initial Cost vs. Life-Cycle Cost

A recent presentation by Harvey M. Bernstein, Vice President, Industry Analytics, Alliances & Strategic Initiatives, McGraw-Hill Construction, states that building owners can expect an average operating cost decrease of 8 to 9 percent when applying green building tactics and that the educational sector is expected to have the largest growth – 65 percent – in green building compared to all others in the market.

With the average age of U.S. schools reaching 40 years and high increases in both K-12 and college construction projected, the educational sector will be looked at as the example to teach the rest of the building industry about the benefits of green building. Bernstein's report also quantifies water reductions up to 30 percent and overall annual utility cost savings of 20 to 40 percent for new facilities and 20 to 30 percent for renovations.

These figures suggest that the building industry is short-changing itself by putting more emphasis on initial cost than on life-cycle cost, which is the factor most important to school districts. Manual faucets, for example, will be "a cheaper quote" when trying to secure a contract. However, specifying touchless sensor-operated faucets with 0.5-gpm aerators is the more fiscally conservative choice over the life of the building, which on average is 42 years for U.S. schools.

The obvious benefit of touchless faucets is increased hygiene (see sidebar Please Don't Pass the Salt) but water savings and decreased sewage rates are how electronic faucets close the cost gap on their manual counterparts in just a short time. Designed to operate for a pre-set amount of time when a user's hands are in the "active area" that triggers the sensor to allow water flow, touchless faucets use significantly less water than manual units. That's because manual faucets in school restrooms usually are left running while a person lathers and dries their hands, as opposed to sensor-operated faucets that turn off during this stage. This is an immediate advantage for water savings.

What This Means to the Architect

Unlike previous generations, new water-conserving products have had extensive field evaluations, which will prove invaluable for architect specifications. They should reduce the fear of unfounded manufacturer claims, ensure customer satisfaction, and provide a feeling of confidence in today's advancing technological solutions for water conservation.

For example, Waterfree urinals have been in use for the past 15 years throughout the world. Half-gallon urinals have been available for the past 18 years. Fractional flush urinals, also called High Efficiency Urinals (HEU), have been around for decades. In fact, Sloan Valve Company has been making this type of product for Naval applications for more than 50 years. For water closets, dual-flush technology has been available for over 10 years and 1.0-gallon pressure-assist units have been available for more than six years.

Whether your interest is meeting local codes, reducing construction costs and impact fees, or promoting LEED® initiatives, Sloan Valve Company is meeting these needs for the "now" generation of water-consuming products.

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Please Don't Pass the Salt

Because touching contaminated surfaces transfers germs, it takes only one person to expose the rest of their cafeteria companions to whatever may be on their hands after a trip to the bathroom.

Although handwashing is cited by most authorities, including the Centers for Disease Control and Prevention, as the single-most effective means to avoid illness, touching contaminated plumbing fixtures when washing is just like forsaking the task completely. Touchless plumbing fixtures, therefore, are the most effective products to install to ensure a healthy, hygienic environment.

"Sensor-operated plumbing fixtures interrupt the transfer of disease. If you don't have to touch anything, you can't pick up germs," says Dr. Charles Gerba, a professor for the University of Arizona Department of Soil, Water and Environmental Science. "Toilets with auto flushers, faucets that turn on and off themselves, I think they're a great way to prevent the spread of the Norwalk Virus, dysentery and other illnesses."

Gerba's research of restrooms unearthed many interesting – and some obvious – facts about hygiene and methods to promote it in a facility. For example, the regular use of disinfectants keeps a restroom cleaner. Gerba further explains that disinfectants have a residual effect: the fixture stays cleaner throughout the day, not just after initial cleaning.

"And surprisingly, the dirtiest area in the bathroom, as far as germs are concerned, is the sink itself. Most specifically, the handles to the faucet tap have many germs on them," says Dr. Gerba. "That's because when you wash, bacteria is shed from the hands and collects in the damp sink area, which is a perfect breeding ground for more germs. That's why touchless fixtures are needed in restrooms."

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Education, Unplugged

In some cases, the difficulties of hardwiring old schools can be eased by portable devices and **digitally based curricula** BY RUSSELL FORTMEYER

Few doubted that the wireless technology revolution would have an impact on K-12 education, but when third graders start turning in homework using personal digital assistants (PDAs), we know we've made a quantum leap from the era of chalk and blackboard.

The days are long gone when school computers were rare, mysterious, cranky objects, rolled around on carts from classroom to classroom. Now, the most-wired schools give their students their own computers, assign them homework on-line, and teach them to do show-and-tell using Microsoft PowerPoint. Teachers who use PDAs in their classrooms can assess student work instantaneously, electronically backing up a student's grade, and sharing it with parents, counselors, and the school district.

Ironically, the freedom offered by the move of instruction into wireless cyberspace doesn't solve the sometimes daunting problems of real space—upgrading the design of network-ready classrooms, installing communications closets for servers, and, even in the burgeoning wireless age, creating the pathways needed for cabling systems.

Robert Bogan, a consultant with Technology Plus in Aurora, Colorado, considers finding those pathways the most difficult aspect of retrofitting older schools with new cables and network systems. In many schools, concrete block walls pose particular difficulties, since architects typically dislike surface-mounted conduit and block walls can't be opened like conventionally framed drywall. That can be remediated to some degree by routing computer networks, cable television, security, voice, and audio-visual systems on a CAT 6 cable (CAT 6 cable is the wire typically used in networks to connect computers, servers, routers, and other devices) since each system's unit acts as its own internet address. Bogan says, however, that full integration can be a tough sell with school districts accustomed to keeping systems separate. And wireless technology, though it gives students and teachers vastly increased flexibility, isn't a cure-all, Bogan points out. "Even with a wireless data system, you still need to provide cable for all those other systems."

The Denver School of Science & Technology has a wireless network, which allows students to access servers throughout the school. A glass-enclosed server room is located behind the staircase.

INFRASTRUCTURE ISN'T EASY

While working at Swanson Rink, an engineering firm in Denver, Bogan installed both wireless (Wi-Fi) and hard-wired systems at the Denver School of Science & Technology, a school in which technology is showcased rather than hidden, with exposed cable trays in the open ceilings and a glass-enclosed server room. "Having both systems is more expensive," he says, "but you have to provide wireless because everyone uses it." In addition, for high schools offering courses that

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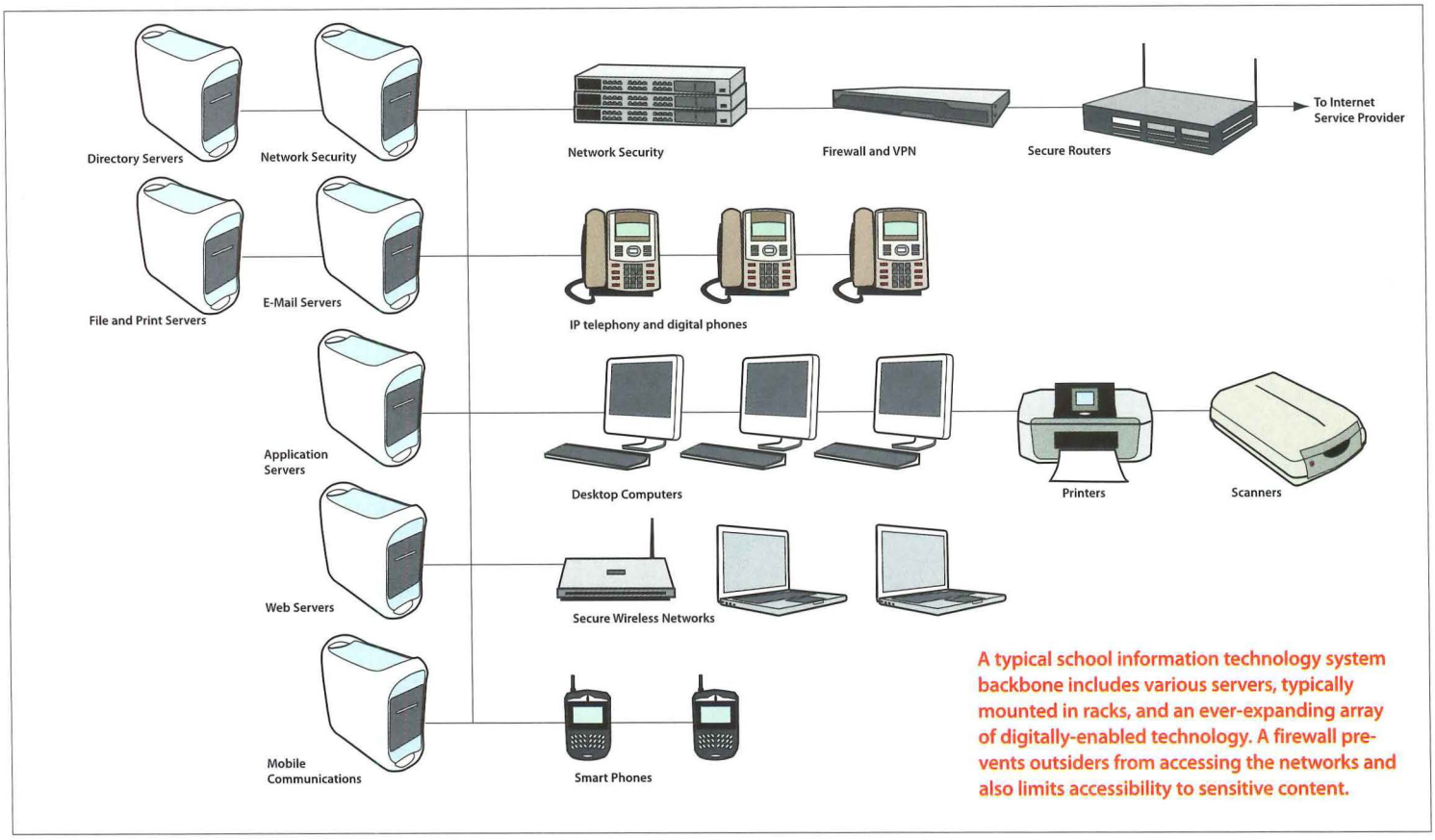

A typical school information technology system backbone includes various servers, typically mounted in racks, and an ever-expanding array of digitally-enabled technology. A firewall prevents outsiders from accessing the networks and also limits accessibility to sensitive content.

depend on bandwidth-hogging software like AutoDesk's AutoCAD, hard-wired networks are mandatory. More common in schools are classrooms where computers are used mainly for accessing the Internet, which is easily accommodated on a wireless network.

In new school construction, it's easier to accommodate leading-edge technology, as was the case in Denver. But in older buildings consultants like Bogan find themselves cramming server racks into unused custodial closets or carving out extra space in administrative offices. Reusing existing cable is rarely an option, according to Bogan, since gauging length, quality, and condition is more time-consuming and expensive than pulling new wire. New closets need additional cooling to handle electronics-generated heat loads, as well as electrical receptacles. Upgrading a school's electrical power system to meet the needs of the computer age can present space issues, as well as large costs for service size increases, transformers, and panelboards. Giving a laptop to each student is easier than ensuring each classroom has the electrical capacity to power them; one advantage of issuing PDAs is that multiple units can be charged off of one receptacle plug. Some schools have even provided dedicated closets intended just for charging laptops.

THE FIREWALL FACTOR

Portable technology, however, brings its own security issues. Mario Sanchez, a technology consultant with Los Angeles-based EQ International (part of RTKL Architects), says that as schools establish virtual private networks (VPNs) to allow students' laptops to access school networks from home, care should be given to implement appropriate security through smart cards or thumbprint identification to ensure computers are used only by the students. "You can install software to automatically lock down a laptop if a student stops attending school," Sanchez says. With encryption software, automatically updated Internet filtering, and stronger firewalls, he says, the concerns that outsiders might access wireless networks or students could download inappropriate material are lessened considerably.

There are also security concerns with power outages and emergencies. Sanchez says that rack-mounted, uninterruptible power sources are commonly only sufficient to allow for server shutdown, not continuous use of the network. Schools typically provide power backup only for telecommunications systems. But backing up servers makes loss of data due to a power loss less of a problem. And, the drop in digital storage costs has made the idea of backing up a student's entire academic career less far-fetched than it once would have been. Why would anyone bother with a CD, Sanchez asks, when server-based storage provides security and continuity between grades.

THE BIG PICTURE ON SMALL DEVICES

While going to Wi-Fi-enabled laptops and PDAs may help to ease the problems of adding cable to older buildings, school technology administrators say infrastructure

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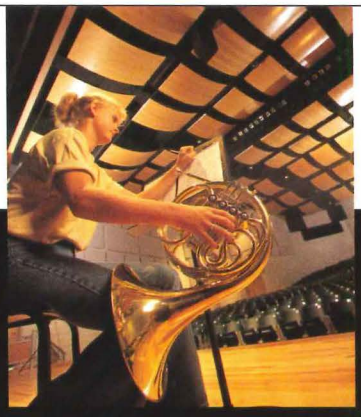
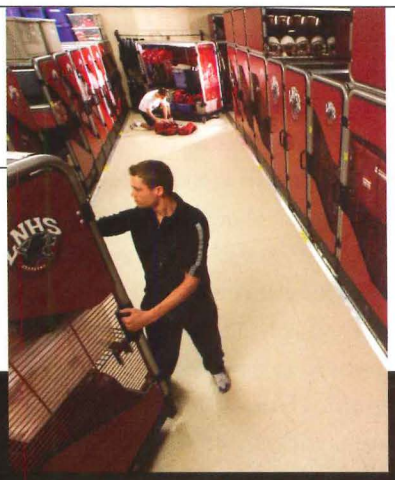
Style. *Composition.* **Harmony.**





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Palm's Treo (left) is viewed by many as the future of technology for schools, giving students access to the Internet at any time. The company's PalmOne device (right) is already used by schools nationwide.

upgrades are useless without a comprehensive e-learning plan. That can mean anything from curricula changes in specific subjects to offering a high school diploma program solely via website. For example, introducing PDAs into a science lab means students can connect them to probes for testing things like the PH level of a river. At Littleton, Colorado schools, the district implemented a web-based learning program to help students with special circumstances complete their high school coursework. Using a well-known platform software called Blackboard K-12 Starter Edition, Littleton offers a wide selection of classes students access on-line or at a computer lab set up at the city's Arapahoe Community College. Course content is provided by www.class.com, but the district could use its own class materials eventually. The program is tailored to help students transition either directly to jobs or to classes at Arapahoe. David Yaskin, a vice president with Washington D.C.-based Blackboard, says the program's ability to expand instruction—using discussion forums, parental involvement, and additional resources—has been a boon to high schools.

Melinda Ness, Littleton's coordinator for gifted and talented students, says the district hopes the pilot Blackboard program could be expanded to offer professional development courses for teachers, a common feature for other districts. Blackboard has been implemented in nearly 1,200 K-12 schools, many of which rely on the web for offering specialized classes for students in isolated locations. Students in some Alaskan districts, for example, can access Advanced Placement courses through Blackboard without resorting to the previous vogue in distance learning that relied on expensive and complicated teleconferencing facilities and instructor availability. And with Blackboard, like other web-based programs, assessment is instant and can be shared with a wider community of teachers, parents, administrators, and fellow students.

TECH TRANSPARENCY

"With Blackboard, we can track what students are doing, what assignments they are missing, and keep our finger on the pulse of where they are in the course," Ness says. While parents haven't been provided access to the site yet, the Littleton district's own website allows them to see their student's grades.

Although Littleton helped pay for its program by partnering with the community college, schools can apply for a grant for such initiatives through the U.S. Department of Education's Star Schools program, begun in 2000. Star Schools, which requires a matching funds commitment from the schools, encourages schools to develop distance learning programs and offers funding for equipment, facilities, coursework, and support staff (see www.ed.gov).

Technology consultants and administrators almost uniformly point to so-called smartphones as the next wave in education. Like Palm's Treo and other such devices, smartphones would allow students total connectivity while combining nearly every function they might use: phone, e-mail, and the Internet. Some school administrators already rely on smartphones to augment their work. If a principal catches a student wandering the halls during class, a quick name check on a smartphone—one that is Internet-enabled and connected to the school's student database—could pull up the student's photograph, class schedule, tardiness record, and parent's e-mail address. Cutting class now has its digital risks. ■

Russell Fortmeyer is an New York City-based electrical engineer, and a freelance writer for *Edutopia*, which provided this article for SCHOOLS OF THE 21ST CENTURY.

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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.

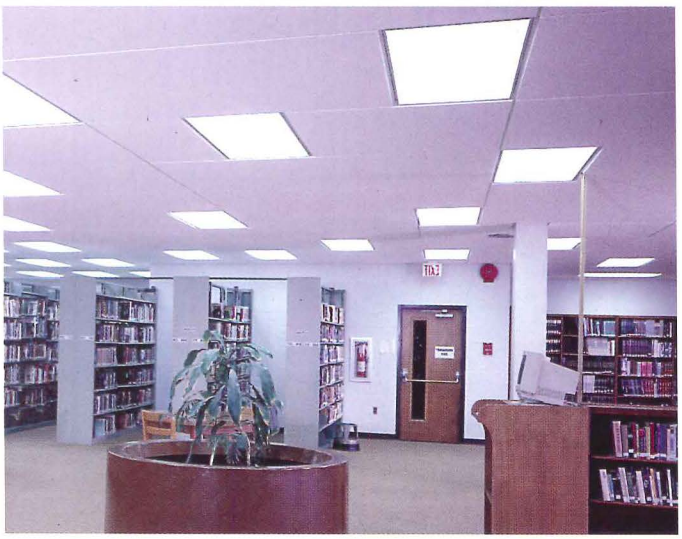
To help remedy problems caused by inadequate acoustic design, the American National Standards Institute (ANSI) approved ANSI Standard S12.60 for Classroom Acoustics.

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 15 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 over 15 feet, 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

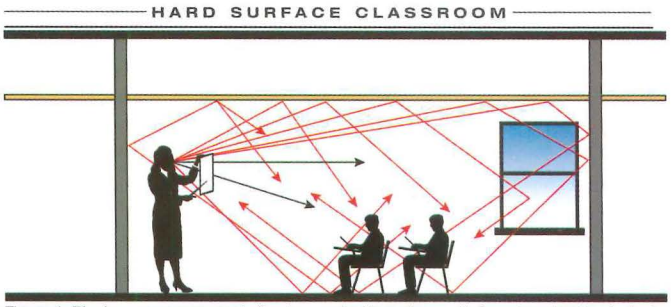


Figure 1: Black arrows represent direct sound with a clear path from teacher to student. Red arrows represent reflected sound. Note the many red arrows which indicate the longer, more indirect path taken to reach the student.

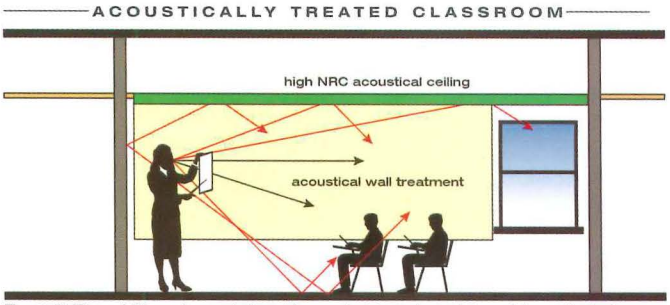


Figure 2: The addition of sound absorbing materials reduces late arriving reflected sound, lowers reverberation time and improves speech intelligibility.

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 since these units 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.

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
- Reverberation Calculations through TechLine™ 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
- Your 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.

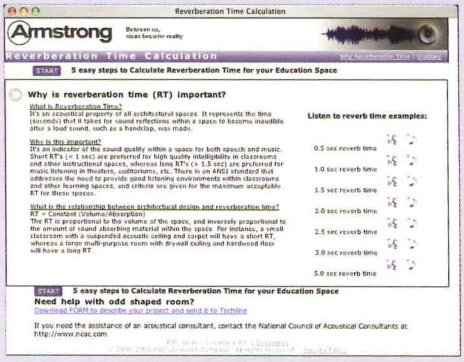
The acoustic test took place in a sixth grade classroom at the Robert E. Lamberton Public School in Philadelphia, PA. Built in 1949, the 24'x44'x11' classroom had a spray-applied 1/2" fiber-on-plaster ceiling, concrete block walls, and a vinyl tile floor. The NRC of the existing ceiling was estimated 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™ 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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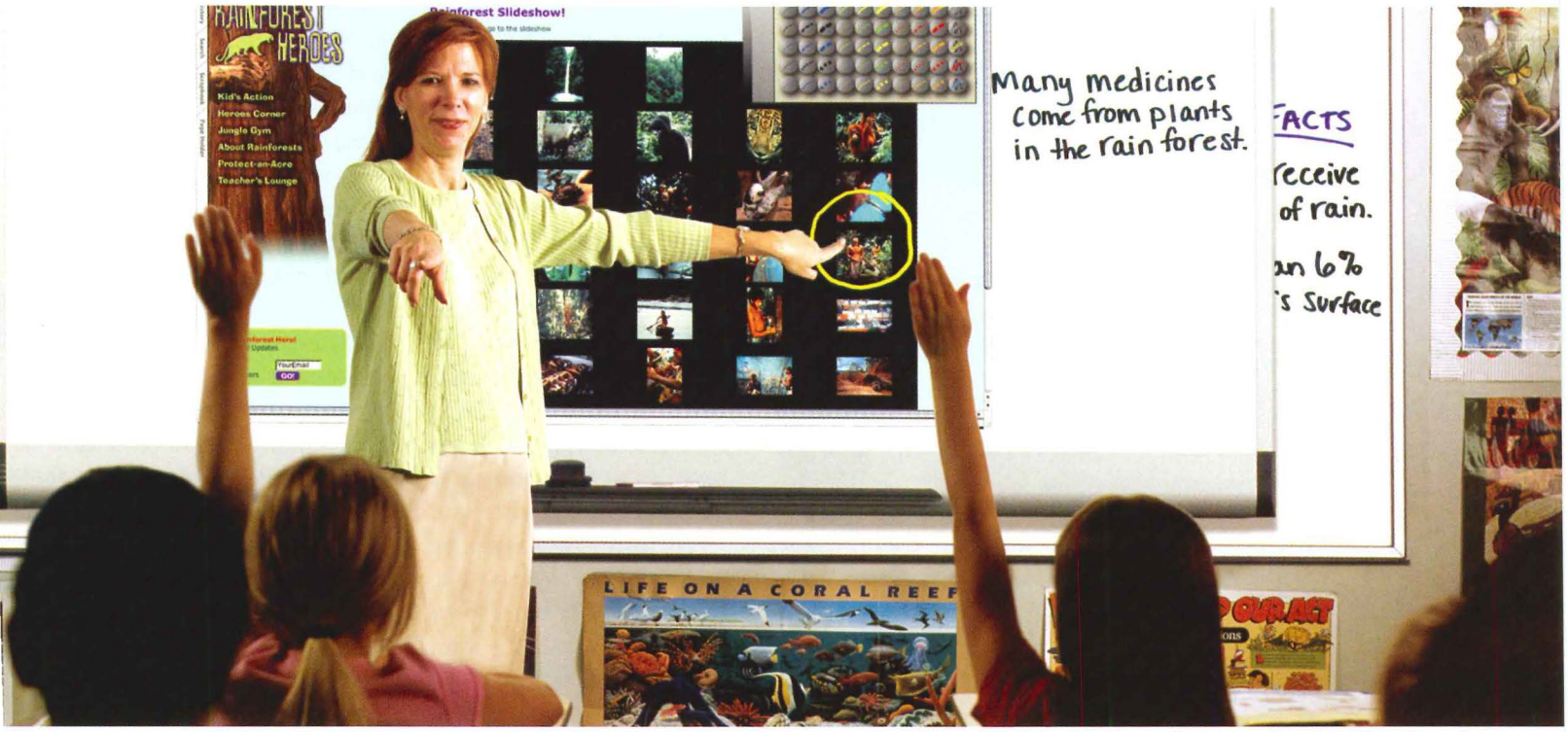
The ABC's of Teaching Generations Y and Z

Interactive learning environments for a new world of tech-savvy students



All photos courtesy of: PolyVision Corporation

Transforming today's technologically savvy students into tomorrow's workforce has triggered a revamping of traditional approaches to pedagogy in the United States. These changes span the entire spectrum of education delivery from curriculum content and teacher resources to the architecture of the classroom.

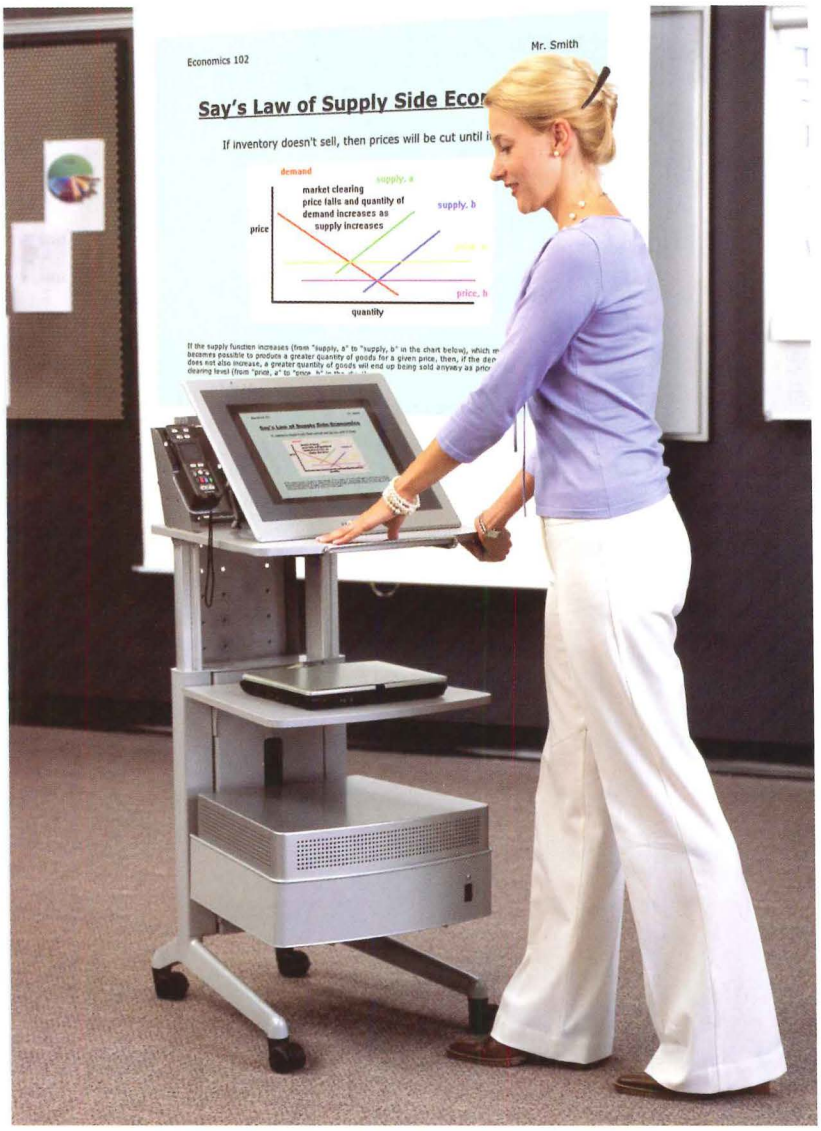
Securing America's standing in the global marketplace is fueling the public education overhaul. Officials of commerce, government, and education concur that the ability of the country's citizens to thrive and maintain world leadership depends on a strong knowledge-based economy.

Today's workers, however, are lagging behind in the current business arena and lack the necessary skills demanded by the expanding global market. "There is a growing mismatch between the new jobs being created and the skills of our nation's workforce…we have an education and skills gap," U.S. Labor Secretary Elaine L. Chao said in her May 2006 remarks to the Economic Club of America.

Closing the skills gap by expanding curricula is a primary goal of educators, and developing teaching techniques that appeal to a tech-savvy generation is on the critical path. "Twenty-first century students demand access to interactive tools and resources that engage their minds and their imaginations," says Mike Dunn, President and Chief Executive Officer of Suwanee, Georgia-based PolyVision. "Frankly, it is the only world they know." PolyVision, a subsidiary of Steelcase, designs, manufactures, and installs an array of technology and traditional visual display products for newly constructed and renovated preK-12 and secondary educational institutions worldwide.

The core courses for baby boomers—reading, writing, and arithmetic—and the cluster of subjects that sustained generation X (language arts, math, science, civics, history, economics, art, and geography) are no longer adequate on their own. Expanded curricula now encompass global awareness, finance and economics, business and entrepreneurial literacy, health and wellness literacy, and information and media literacy. Developing critical thinking and problem solving skills that will foster life-long learning habits is emphasized, too, along with communication, creativity, innovation, and contextual learning.

> *...developing teaching techniques that appeal to a tech-savvy generation is on the critical path.*



Nevertheless, new, supplemental curricula presented in an old way will not engage the active minds of the digital generation. Nearly every aspect of the lives of today's students is impacted by technology and offers them a modicum of control. They meet friends in online chat rooms and text message via cell phones. Favorite music tracks download to iPods and interactive computer games are portable.

As students, these tech-savvy consumers will neither passively ingest information nor respond well to static materials as the only method of delivering the curriculum. "Students are accustomed to interactive multimedia in their daily lives and not only expect to receive information by means of multimedia tools, but engage more within the classroom when these tools are used," according to Kimberly Quinn, Business Development Director for the Education Market at PolyVision.

There are numerous options available today to convey material in the classroom–interactive whiteboards, digital cameras, MP3 players, and extensive hardware and software choices are now part of the teaching toolbox, alongside textbooks. Educators seek a variety of tools to help their students meet and exceed state standards and they want to be able to customize their tool set to achieve a delivery method that is best for them and for their students.

When it comes to incorporating technology in the classroom, however, success depends upon adoption of the technology products themselves–and all solutions are not created equal. "Technology should be an enabler, only," says Dunn. "It's important to avoid getting trapped by an offer of proprietary software that looks very enticing, but unknowingly commits a school or district to a de facto standard, limiting creativity and flexibility." To facilitate successful adoption, and become integrated into the collective resources of today's educators, technology products must provide ease of use, open architecture, and allow for the development of teacher inspired content.

PolyVision's technology products are one example of the options available to the teaching community. These products allow teachers to engage students in an interactive multimedia learning environment without requiring an additional investment of time to learn proprietary software. Products with features as diverse as the Walk-and-Talk™ family of interactive solutions can easily be used with only the knowledge of a classroom computer and projector. The Walk-and-Talk interactive whiteboard, for example, brings the digital world into the classroom, supplementing textbooks and existing teaching tools with digital information and images. Teachers and students can display and interact with information; as well as revise, save, and print anything written or projected on the board. As teachers' technological acumen increases, or if they are already technically inclined, they can add additional tools and resources that are tied to specific content areas to use with the Walk-and-Talk interactive solutions.

The array of PolyVision's technology-based teaching tools available for the modern classroom complements and facilitates currently employed teaching methods. For example, the twenty-first century teacher likes to move about the room and utilize the entire teaching space rather than remain tethered to a traditional whiteboard at the front of the class. Combinations of PolyVision's interactive products such as the Walk-and-Talk or TS Series interactive whiteboards, along with tackable surfaces and traditional markerboards, allow learning to take place in a 360-degree environment while affording teachers freedom of movement and students the freedom to collaborate in a visual way.

Today's teacher also needs to transition quickly from one subject or lesson to the next. "PolyVision's products streamline the process, maximizing efficiency and learning outcomes," Quinn says. The timesaving Walk-and-Talk Lightning™

interactive whiteboards are calibration-free, eliminating the need to calibrate the board before use, and like all products in the Walk-and-Talk line, embrace open-architecture software. This allows teachers to use any third-party software, thus capitalizing on district-wide software licensing investments, or hardware perhipherals. In addition, PolyVision's Walk-and-Talk Adjustable Height Stand on wheels is an accessory for the Walk-and-Talk interactive whiteboards that allows for mobility within the room and between rooms.

PolyVision's interactive products not only support modern teaching styles, but also buttress new curriculum. While cumulative scientific data tying technology tools and resources to student achievement is a work in progress, initial anecdotal assessments and the research that does exist suggest that benefits of interactive tools increase student engagement and enhance the learning process.

For example, interactive whiteboards actually promote global awareness by enabling collaboration and interaction across the globe. Students and teachers are no longer limited to the resources in their local area, but via the worldwide web gain access to unlimited online resources, connecting with people and information around the world.

PolyVision products also facilitate the use of visual representation with Java applets, supporting mini-lessons taught within a block schedule at the high school level. These mini-lessons, focusing on tactile, visual, and auditory learning as well as critical thinking, accommodate multiple learning styles and intelligences, i.e.,verbal, quantitative, spatial, musical, kinesthetic, interpersonal and intrapersonal.

In advancing the campaign for twenty-first century pedagogy, policy makers and educators are tweaking policies, rewriting standards and assessment guidelines, expanding curricula, and studying best practices. One element of this campaign is the United States Department of Education's 2001 No Child Left Behind Initiative, requiring every pupil to perform at grade level or better in reading and math by 2014. Annual mandatory testing is required in grades 3-8 and once again in high school. Opponents of the Initiative reason that expecting all students to do equally well in every subject is unrealistic and unnecessary.

Critics notwithstanding, Education Secretary Margaret Spellings says the nation is improving in language arts skills at the elementary school level. "Since No Child Left Behind, more reading progress has been made in five years than in the previous 28 years combined," Spellings wrote in a November 2006 article in the *Wisconsin State Journal.* Congressional reauthorization is required for the Initiative to continue.

For their part in achieving twenty-first century educational goals, architects are designing more functional educational facilities. PolyVision's products (downloadable CAD drawings and specifications available online), support this added functionality, bringing an integrated, interactive learning environment to teachers and students.

PolyVision's entire educational product line, including interactive whiteboards, interactive panels, cordless lecterns, image capturing systems, traditional whiteboards and tackboards, casework, and table and bench systems is described at PolyVision.com.

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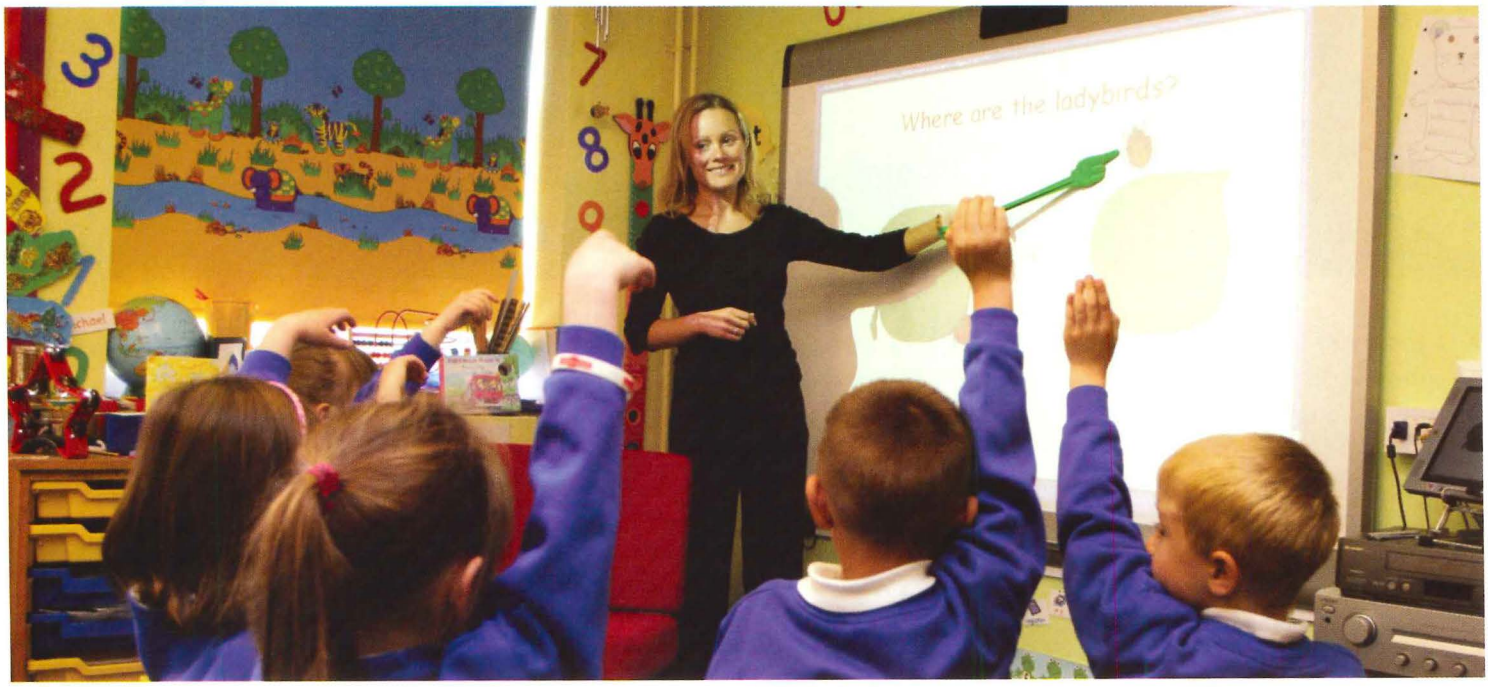


Delivering High-performance Classrooms

Enhancing learning conditions while keeping budgets in check

All photos courtesy of: Trane/Getty Images

Approximately 55 million American students are at risk to be affected by environmental factors in the classroom. These factors include noise, glare, mildew, lack of fresh air, and temperatures that are either too hot or too cold.

An October 2006 study, "Greening America's Schools," evaluated 30 environmentally responsible schools in 10 states from 2001-2006. The evaluation included actual building performance data, architectural modeling, engineering estimates, and existing research. Co-sponsors of the study included the American Federation of Teachers, the American Institute of Architects, the American Lung Association, the Federation of American Scientists, and the U.S. Green Building Council.

The report recommends alleviating environmental problems that hinder learning by creating "green" schools, i.e., buildings designed to be healthy, energy efficient, and sustainable.

However, building environmentally sound schools must be cost effective for school districts. Fortunately, it can be. Green building strategies, such as incorporating a well-designed heating, ventilation and air-conditioning (HVAC) system, tightly integrated with controls and other building systems that are designed to provide a high-performance environment, can help meet schools' cost, performance and classroom environment goals.

For example, in addition to correcting indoor environmental concerns that may be affecting student performance, well-designed and integrated HVAC systems can help

schools recoup or partially offset green building costs by creating savings elsewhere, such as in reduced energy costs or the lower price of code compliance.

In fact, over the building's life cycle, the financial benefits of green building can be as much as 20 times greater than the initial cost premium. The report estimates that within 10 years, over $20 billion can be saved in energy costs alone. This can be done by greening the nation's schools, with the average school realizing a 33 percent annual reduction in energy bills, all while increasing student performance.

Creating a High-performance Classroom

Designers and builders have the opportunity to impact an entire school's effectiveness by creating a classroom environment built for success.

Well-designed HVAC systems that are tightly integrated with other systems in the building are key components of green school buildings. High-performance HVAC systems allow teachers and students to perform better in the classroom by creating a healthier and more comfortable learning environment.

This is evidenced by higher test scores, according to the "Greening of America's Schools" report. Although limited funds sometimes relegate basic systems like ventilation to the bottom of schools' budget priorities, properly functioning, effective HVAC systems are actually a front line defense against a host of indoor environmental woes, such as poor Indoor Air Quality (IAQ) and acoustics that actually hinder the learning process.

{ High-performance HVAC systems allow teachers and students to perform better in the classroom by creating a healthier and more comfortable learning environment.

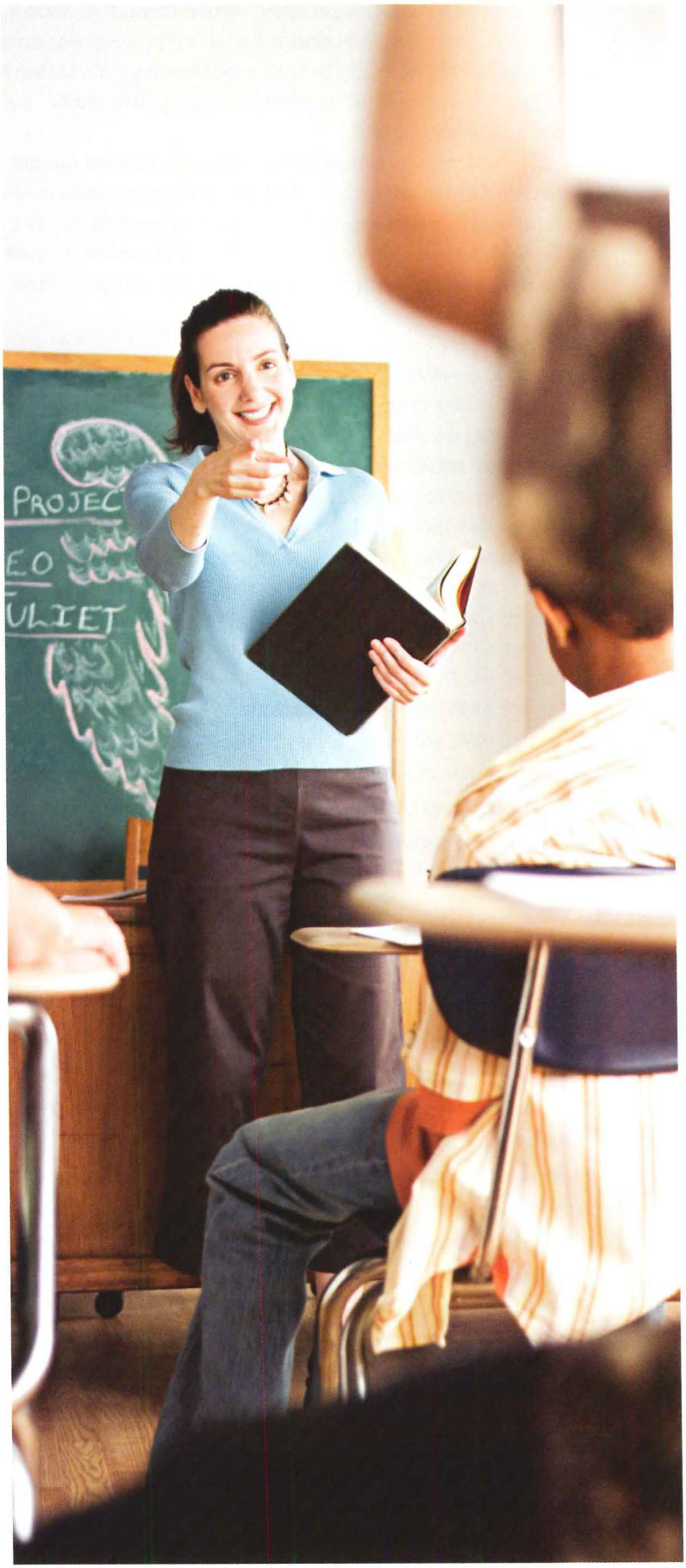
Indoor Air Quality is measure of the health and comfort of the air inside buildings. Proper IAQ, which includes a room's temperature, humidity, air purity, and carbon dioxide levels, leads to healthier students and teachers, better learning conditions, and a longer building life. However, the IAQ in many schools is far from high-quality. In a recent Trane survey of 180 teachers and administrators, 20 percent of the respondents said poor IAQ is a serious problem in their classrooms.

Schools have four times as many occupants per square foot as offices, and they contain a host of pollution sources, including lab chemicals, cleaning supplies, chalk dust, and molds. Inadequate ventilation results in the build-up of contaminants, including CO2, which can cause drowsiness and reduce a child's ability to concentrate.

In addition, the U.S. Environmental Protection Agency (EPA) states that asthma is the leading chronic illness causing school absenteeism, accounting for more than 10 million missed school days per year in the United States.

Acoustics and general noise levels also play a vital role in K-12 education. Experts assert that as many as one-third of students miss up to 33 percent of the classroom content, according to a 2002 article by "School Construction News Online." This is because children, as inexperienced listeners, require a higher level of acoustic quality than adults.

Speaker-to-listener distance also plays a role in whether a person hears a speaker with ease. As the distance between speaker and listener increases, the loudness of the signal, and therefore the signal-to-noise ratio, decreases. When audibility of words is reduced by 50 percent, it is generally discernible to adults, but mostly unclear to children.



"In conditions where adults can just barely understand most of the words spoken ... children 5 to 7 years of age can understand almost nothing, even when words are familiar," according to a 2003 article on Sound in the Classroom, "Why Children Need Quiet," published in the American Society of Heating, Refrigeration, and Air Conditioning Engineers' magazine.

Acoustics have proven to be such a crucial factor in a successful education, the American National Standards Institute (ANSI) and the Acoustical Society of America recently partnered to develop a standard for classroom acoustical design. Free copies of the new ANSI Acoustical Performance Criteria, Design Requirements and Guidelines for Schools are available at **http://asastore.aip.org/** through a sponsorship with Trane and others.

HVAC Systems for Successful Schools

High-performance HVAC systems can significantly improve factors such as IAQ and acoustics, but in order to design an HVAC system for the best possible classroom environment, designers must first understand each school's unique needs: Will this school have sound sensitive areas? What acoustic issues need to be overcome in the classrooms? Are wall penetrations a serious maintenance concern in this climate? (Is the area prone to hurricanes or blizzards?) Will you use water-cooled or air-cooled chillers? (Air-cooled chillers result in lower maintenance costs and are prepackaged for easier design and installation. Water-cooled chillers are more energy efficient and equipment life is longer.) Do utility rates for this district provide incentive cooling during off-peak hours? Is thermal ice storage a consideration? Are there utility incentives for equipment efficiency? How will you integrate the HVAC system into the building's overall systems for the highest-possible performance?

A number of HVAC system options exist, allowing designers latitude in creating the ideal system for each school's needs. For example, some HVAC systems commonly utilized in schools include wall units, packaged rooftop units, classroom air conditions, central air, and water source heat pumps.

A number of HVAC system options exist, allowing designers latitude in creating the ideal system for each school's needs.

Wall units contain everything needed to cool, heat, filter and move air contained in a single package, and they are less expensive to purchase and install. However, self-contained packaged units may offer limited humidity control in humid or semi-humid climates.

Rooftop units offer another self-contained option. The HVAC industry is constantly working to offer designers and school administrators better options for creating healthy, productive classroom environments. Trane, for example, recently introduced the 15 SEER high-efficiency Precedent™, a rooftop unit that can help effectively control humidity while lowering in-room noise levels. In addition, the 15 SEER Precedent is 15 percent more efficient than typical classroom packaged systems–offering schools an energy efficient HVAC solution.

Another option is central air conditioning, which can create an exceptional indoor environment, given the right location and controls. Central air does, however, require a higher capital cost and significant architectural consideration to ensure the system's proper fit in the building.

Industry Issues

Trane is a leader in the construction community, providing HVAC equipment, installation and maintenance services in markets throughout the United States for over 75 years. Through our company's leadership in industry associations, our institutional knowledge buttressed by a strong team of professionals, and our knowledge of issues affecting the industry, Trane has identified the following key issues that will impact the design and construction of educational facilities in the United States in the twenty-first century:

Leadership in Energy and Environmental Design (LEED)

The Leadership in Energy and Environmental Design (LEED) initiative of the Washington, D.C.-based U.S. Green Buildings Council provides standards for developing sustainable, environmentally sound building projects and a nationally accepted system for rating the design, construction, and operation of high-performance "green" buildings. LEED promotes a whole-building approach to sustainability and evaluates building projects in five key areas: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. To gain certification, a project must first be registered with the U.S. Green Buildings Council. Projects then are awarded certification based on the number of credits accumulated - Certified (26-32), Silver (33-38), Gold (39-51), or Platinum (52-69). Trane's classroom comfort products generate a minimum of 27 points. Standards have been adopted for numerous project types. The Council is currently developing LEED standards specifically for schools to service the pre-K-12 and secondary education market. Trane is a national sponsor of the USGBC's LEED for Schools workshops and information sessions.

U.S. Environmental Protection Agency Energy Star

The United States Environmental Protection Agency offers the Energy Star Award to the top 25% of the nation's schools for excellence in energy efficiency and conservation. Benefits of participating in the program include: incentives for energy efficiency and conservation, assistance to the architect and the school in data collection and evaluation, sharing of energy efficient design practices, access to funding sources, and life cycle cost analysis.

ASHRAE Standard 90.1-2004 and ASHRAE Standard 62.1-2004

The ASHRAE Standard 90.1-2004 code that details energy efficiency standards for HVAC systems is the document on which the LEED criteria is based. Consequently, these criteria are being incorporated into the building codes of many states throughout the country. Trane is intimately familiar with the code requirements.

The ASHRAE Standard 62.1-2004 regulation outlines acceptable indoor air quality standards, and provides guidance for contaminant source control, adequate ventilation, proper construction and start up, and operation and maintenance of high performing heating, ventilation, and air-conditioning systems appropriate for green architecture. Trane has a thorough knowledge of these preferred standards, and understands the goals of the design recommendations.

In addition to equipment, designers must also consider controls. The best equipment available will only operate as well as the control systems tell it to. As the "brains" of the mechanical system, controls coordinate how all the different pieces interact with each other and with the building's occupants.

Today's building automation systems (BAS) have "intelligent" calendars that can handle recurring events, holidays, special events, etc. In addition, BAS can calculate when the system needs to start, based on actual indoor and outdoor conditions, as well as maintain proper pressure, temperature and humidity inside a building.

Underlying all of these considerations should be an understanding of goals for the building's capital costs, life cycle, energy efficiency and costs, and equipment maintenance budgets. More than $268 billion is needed for construction and repairs of existing K-12 schools, according to the National Education Association (part of total estimated nationwide cost of repairing, renovating, or building school facilities, and installing modern educational technology: $322 billion).

As a result, it is critical for school officials to preserve their assets whether with new construction, an addition or renovation. By designing high-performance HVAC systems with integrated controls, designers can offer schools better systems that are more easily and cost-effectively maintained, leading not only to improved IAQ and acoustics, but also to increased property longevity and energy efficiency.

Energy costs are a major factor in many school budgets. In most school districts, utilities are the second largest expense after salaries, according to Energy Smart Schools, part of the U.S. Department of Energy's "Rebuild America" campaign. However, the same study cites that schools can achieve up to 25 percent savings through energy improvements.

Several design strategies can be used to conserve or lower energy use. For example, properly incorporating daylighting into a building will not only cut on electric lighting use, it also lowers the heat produced in those rooms, thus lowering the cooling requirements. Using a building-wide controls strategy, it is possible to monitor room occupancy, and provide only the necessary lighting and room conditioning.

In addition, school designers can make use of design and modeling tools such as TRACE™ 700 which can model various building alternatives to optimize comfort and energy efficiency–customized for a given climate. The Trane Acoustics Program (TAP) can be used to analyze various sound paths allowing the designer to choose specific equipment and building components that meet the school's acoustical goals.

The considerations for designing the best possible learning environment are many, and extremely complex, but the options available within the industry give designers the opportunity to make often simple alterations that can greatly improve a school's success. Consult an HVAC design expert in the early stages of development for assistance in creating the best possible design. And above all, keep in mind the ultimate goal: creating an HVAC system and school building that can make all the difference in a student's education and life.

Trane, the air conditioning systems and services business of American Standard Companies, is a leading global provider of indoor comfort systems and comprehensive facility solutions. Its offerings include energy-efficient heating, ventilating and air conditioning systems, service and parts support, advanced building controls and financing solutions. Each Trane system is designed to meet the specific needs of customers who want heating, cooling, dehumidifying and air cleaning systems for residential, commercial, institutional and industrial applications.

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Photo courtesy PhotoDisc

PRECAST CONCRETE GETS HIGH MARKS For K-12 Schools

Architectural and structural precast concrete components can accelerate construction time, reduce overall costs, provide the high-quality, classical look that school districts seek and contribute to sustainable development

School administrators and designers are recognizing the numerous advantages that precast concrete architectural panels and structural systems can offer K-12 school projects. Precast buildings can greatly accelerate construction time to meet tight occupancy deadlines; provide competitive construction costs with significantly reduced lifecycle costs; and provide a variety of architectural finishes to blend with a campus' institutional look or create a cutting-edge modern style.

Precast Components Aid Innovation

Nowhere is the recognition of these benefits more apparent than in Greenville County, S.C., where the school district used innovative financing and construction methods to undertake a comprehensive $1-billion rebuilding and expansion program. The program, scheduled for completion in 2008, involves renovation, expansion and new construction of 70 schools to better serve the district's 71,000 students.

Such a dynamic plan required a thorough examination of new technologies, designs and materials. As a result, the program is using more than 1 million square feet of precast concrete insulated wall panels.

Photo courtesy AltusGroup

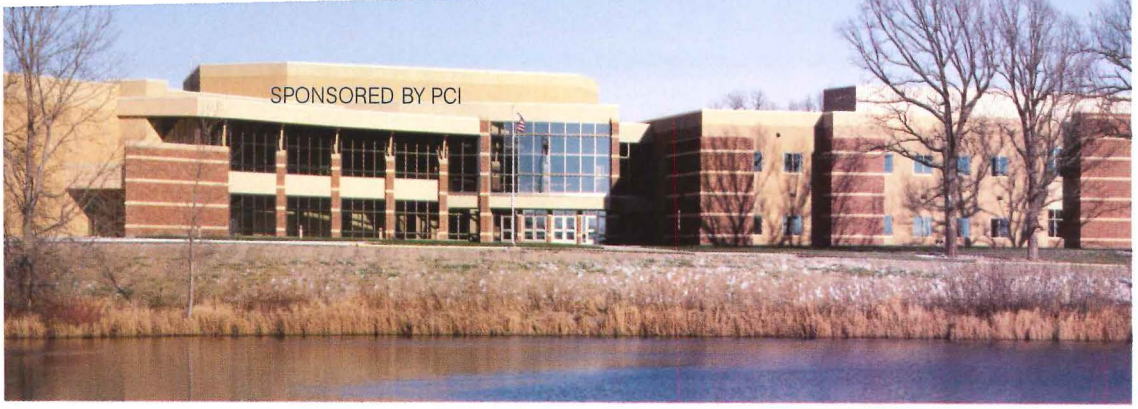
More than 1 million square feet of precast concrete insulated wall panels are helping to create new schools in a $1-billion rebuilding and expansion program in Greenville, S.C. The panels feature a layer of R-11 insulation sandwiched between two layers of concrete.

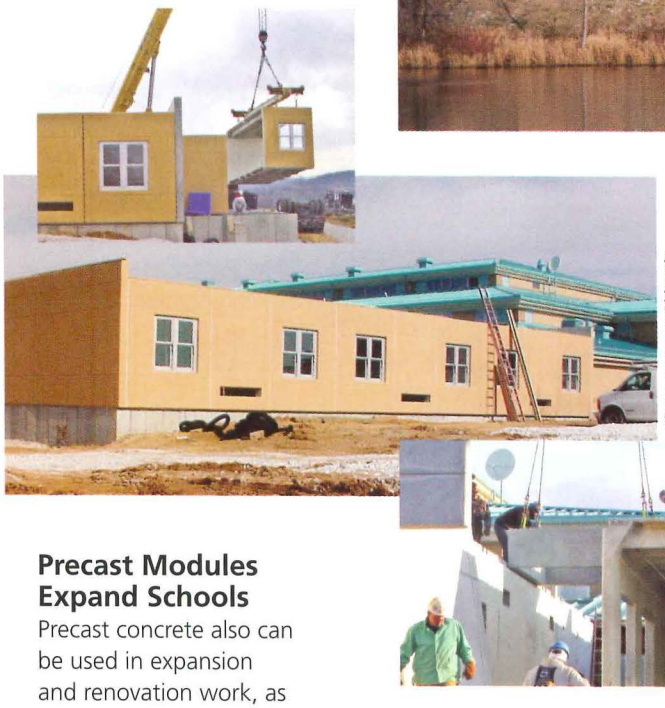
The panels feature a layer of R-11 insulation sandwiched between two layers of concrete. The inner layer forms the school's interior wall and provides thermal mass to help reduce energy costs, while the exterior of each panel serves as the architectural façade.

Two innovative methods were used on different schools to connect the inner and outer wythes of concrete, making the panels nonconductive so they provided a continuous insulation profile. As a result, walls won't generate hot or cold spots along the perimeter, producing a more comfortable and energy-efficient school. Additionally, electrical conduit and switch boxes were cast into the wall panels, eliminating some on-site construction time.

Multistory wall panels were used in both load-bearing and nonload-bearing applications in the district, with a range of aesthetic designs. Integrally cast thin-set brick provided a traditional masonry look, appropriate community scale and a higher performance wall system than traditional construction techniques. Designers combined this system with sandblasted textures, reveals, medallions and pigmented concrete mixes.

The high school in Albert Lea, Minn., features architectural precast concrete panels, 42-inch double tees and hollow-core plank. The materials allowed construction to continue through the winter, helping to meet the schedule and budget.





Photos courtesy Oldcastle

Pennsylvania's Downingtown School District is using 15 precast concrete modules to create classrooms for an expansion that will replace modular trailers. The modules arrive at the site ready to be hooked into mechanical systems.

Precast Modules Expand Schools

Precast concrete also can be used in expansion and renovation work, as indicated by Pennsylvania's Downingtown School District, which embarked on an upgrade program in early 2006. One project features an addition constructed from precast concrete modular classrooms, replacing modular trailers. The 5,500-square-foot expansion contains five 900-square-foot classrooms with a connecting corridor that features three skylights.

The project used 15 precast concrete modules, delivered to the site with a painted exterior on the precast wall panels and roof slabs. Administrators decided on the precast concrete modules because they wanted a facility with structural integrity and a long life span that could meet a tight deadline.

These projects are but two examples of the ways precast concrete components are helping school districts meet construction challenges nationwide. Literally hundreds of schools every year specify PCI-certified precast concrete components.

Components Aid Design Economy

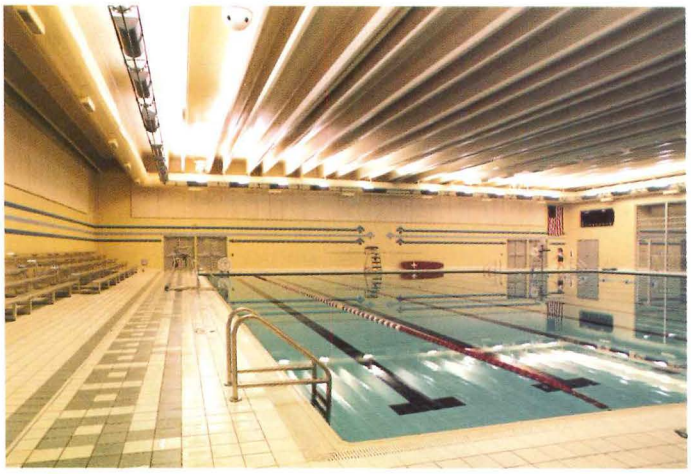
A number of precast concrete components are used in school projects, and they offer a "kit of parts" capability that allows them to be used in a variety of ways. The most commonly used types of precast concrete components are:

- Wall panels, either nonload- or load-bearing, often with an interior (sandwiched) layer of insulation.
- Hollow-core and double-tee floor/ceiling/roofing panels.
- Columns and beams, often used in large-volume assembly areas (gymnasiums, theaters, cafeterias) to accommodate the longer spans required.

Even more advantages are achieved when the components are combined in a total-precast concrete system, which integrates the building's structural frame with the architectural façade and thermal envelope.

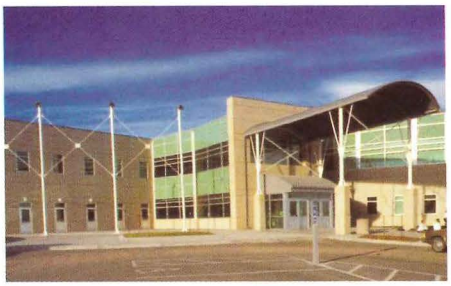
Why Precast Concrete:

- Speed of construction that accelerates construction schedules and provides early dry-in for interior trades.
- A cost-effective system that reduces capital costs and provides long-term lifecycle savings.
- Multiple architectural finishes that offer versatile aesthetics.
- Sustainable and integrated holistic design that provides a thermally efficient building envelope that is environmentally friendly, provides strong acoustical control and contributes to a healthier indoor environment by creating no off-gassing and providing no food source for mold or mildew.
- Safe school design that is storm and fire resistant and can meet any location's seismic requirements.



The 90,000-square-foot Seymour High School Athletic & Aquatic Center in Seymour, Wis., features an all-precast design that takes advantage of 100-foot-long precast double tees to span the pool.

Photo courtesy of Don F. Wong



Precast concrete panels can provide a traditional brick appearance or a more contemporary look, as seen here at Columbine High School in Columbine, Colo.

First-Cost and Lifecycle Cost Effectiveness

Precast concrete components save money in many ways, both for capital construction budgets and long-term operational needs. Savings include costs often hidden within the overall construction budget and create advantages that continue throughout the building's lifecycle.

Precast concrete is prefabricated at off-site manufacturing facilities, providing more quality control with fewer required site inspections. Construction of integrated precast elements eliminates months from the construction schedule, resulting in less time to carry financial bonds, lower contractor overhead costs and risk, elimination of expenses for masonry scaffolding, site storage and site waste, and reduced subcontractor costs due to a greater level of responsibility being given to a single-source supplier.

A total precast concrete system can help reduce insurance costs due to its inherent fire and storm resistance. It also saves cost and offers environmental friendliness by combining several components into a single panelized system. Combining the savings from the construction budget with those in the long-term operating budgets produces a dramatic advantage. A precast concrete system is estimated to save between 5 and 8 percent of overall costs during the school's lifetime compared to a masonry building.

Precast Accelerates Schedules

School buildings are complex projects, with a wide range of programmatic needs and active community involvement. That combination creates a tight restraint on construction schedules, as the facility must be ready when the fall school bell rings—and it's ringing earlier than ever. Precast concrete components can accelerate the construction schedule to ensure early delays don't impact the final deadline.

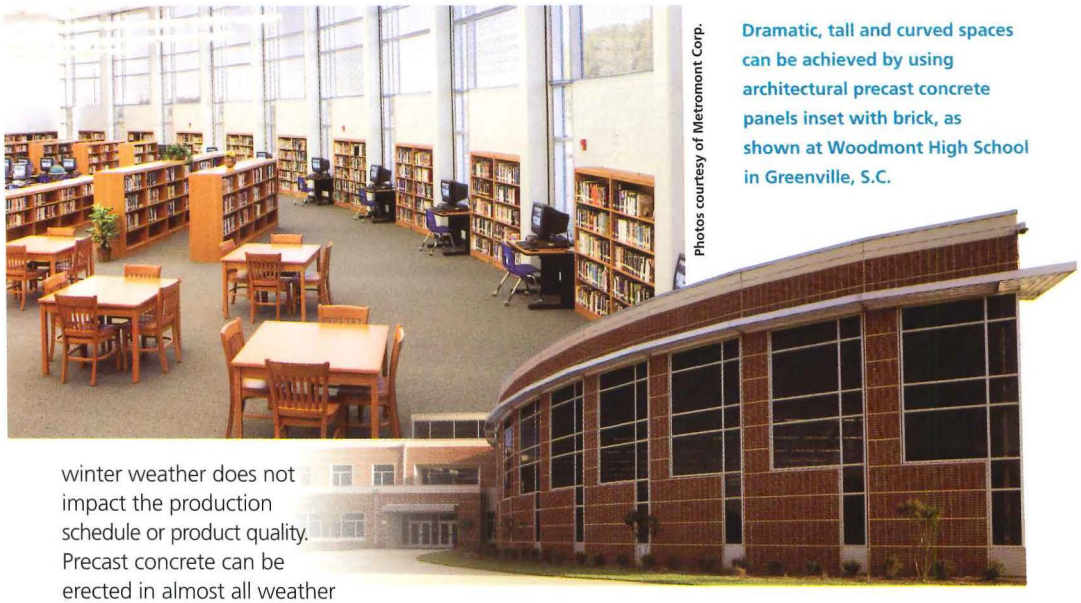
For instance, it takes significantly less time to design a precast concrete school than one built of masonry, due to the lessened detail required for precast's panelized system and the ability to quickly replicate components for each floor or wing. Precast manufacturers offer a high degree of engineering expertise and design assistance to speed the process further.

Prefabrication allows components to be manufactured early in the construction process with just-in-time delivery to the construction site to accelerate construction sequencing. Fabrication can occur while permitting, site prep and foundation work progress, giving contractors a significant head start before the site is available. Once the foundation is complete, precast components typically can begin erection immediately. And, as the single-source supplier for a large portion of the structural system and building envelope, precasters can help to maintain the critical-path schedule.

Because precast components are fabricated under factory-controlled conditions, adverse

Photo courtesy Metromont Corp.

Thin brick can be embedded in architectural precast panels to create a masonry look without requiring the scheduling, cost, as seen at Monaview Elementary School in Greenville, S.C.



Photos courtesy of Metromont Corp.

Dramatic, tall and curved spaces can be achieved by using architectural precast concrete panels inset with brick, as shown at Woodmont High School in Greenville, S.C.

winter weather does not impact the production schedule or product quality. Precast concrete can be erected in almost all weather conditions, eliminating unknown factors and ensuring tight timetables will be met.

Precast concrete insulated sandwich panels create a finished interior wall that avoids the time and cost of insulating, fire-proofing, furring and drywalling. The wall is highly durable and vandal-resistant, making it an ideal option, especially in high-use areas such as gymnasiums and pools.

Precast's just-in-time delivery and its array of efficiencies creates a speed advantage that grows throughout the construction process, saving costs and meeting deadlines. The use of precast concrete has been estimated to cut one third from the required timetable.

Aesthetic Diversity Expands Options

Some school administrators want their facilities to project a strong, secure image featuring a traditional appearance that incorporates such materials as brick or limestone. Others need the school to blend with existing campus buildings or the neighborhood. Still others want a cutting-edge style that looks to the future. Precast concrete components can be designed to respond to each of these needs in a cost-

Using embedded thin-brick technology on precast's panelized systems can create the traditional masonry look that many school districts seek while providing higher performance benefits that typical masonry can't provide. Precast inset brick panels eliminate months of on-site labor needed for laid-up brick while removing several trades from the site. It ensures a high-quality, even appearance and limits the need for on-site inspections.

Precast concrete panels offer variety in color, form and texture. They interface smoothly with glass and other materials. Precasters' capability to tint concrete and provide numerous surface treatments within one panel creates unlimited design aesthetics. Special mixes and finish techniques are used to mimic limestone, granite and other materials. The finishes are produced more economically than real stone can be purchased, and the panels can be erected much quicker. Form liners can replicate textures such as cut stone or slate.

Sustainable Design Accomplished

As educators and stewards of their communities, school administrators want

environmental impact while providing comfortable and healthy buildings in which to learn and work. Precast concrete systems can help achieve those goals while maintaining a budget that may not allow for "green" building extras.

Precast concrete contributes to sustainable practices by incorporating integrated design, using materials efficiently and reducing construction waste, site disturbance and noise. Using precast concrete can help meet minimum energy requirements, optimize energy performance, and increase the life of a building. The constituents of concrete can be recycled materials and precast concrete itself can be recycled. Precast concrete and its constituents are usually available locally.

Precast concrete panels offer high durability, which means fewer chemicals are needed to keep it clean and maintained. Insulated sandwich wall panels provide high energy efficiency. And precast's thermal mass helps minimize energy consumption naturally, offering a concrete advantage that drops right to the bottom line. This is especially

such as gyms and pools. Stored thermal energy helps reduce HVAC usage when the school is unoccupied for long periods without risking mold growth. And, precast concrete includes no chemicals that provide off-gassing, and thus contribute to a healthier indoor air quality.

Precast concrete systems provide sustainable-design attributes that are recognized by the Leadership in Energy & Environmental Design (LEED) green-building rating program administered by the U.S. Green Building Council. Appropriate use of precast concrete can help a building earn up to 27 LEED points (26 are required for certification).

Administrators should be certain that designers specify that products are PCI-certified. PCI-Member precast plants meet a stringent quality-control program encompassing the plant, materials and personnel.

Whether a capital program involves expansion of a single school or construction of multiple campuses, precast concrete provides benefits to contribute to its success. Its ability to be cost-effective, accelerate construction schedules, achieve aesthetic goals and provide sustainable development make it a strong choice for every school project.

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Charrettes Get

BY CHARLES LINN, FAIA

Here's what was learned when five school districts got together with 10 architects and worked for 24 hours to solve some very difficult design problems.

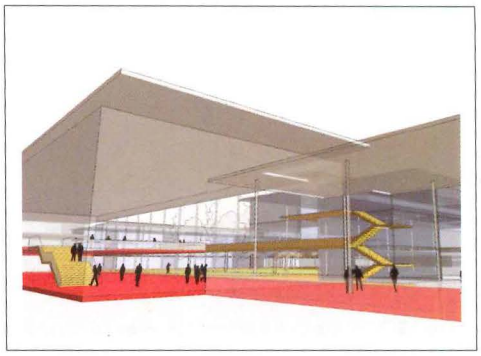
The American Architectural Foundation has made excellence in the design of schools a cornerstone in its mission to educate the public about the power of architecture to improve the quality of peoples' lives. On several occasions in the last few years, Ron Bogle, the AAF's president and CEO, has invited school design experts to join educators in the foundation's Great Schools By Design program to establish design principles that will ensure schools of the future take advantage of everything known about the relationship between school design and student achievement.

Last fall, the AAF and two presenting sponsors, Target and ARCHITECTURAL RECORD, held an entirely new kind of event: the National School Design Institute. Rather than simply discussing design problems in the abstract, representatives from five very different school districts and their architects were invited to bring the plans for a school they were at work on to a two-day meeting. Each district was paired with a resource team made up of two school-design architects with whom they had never worked before. They were given 24 hours to make a new assessment of each district's existing design.

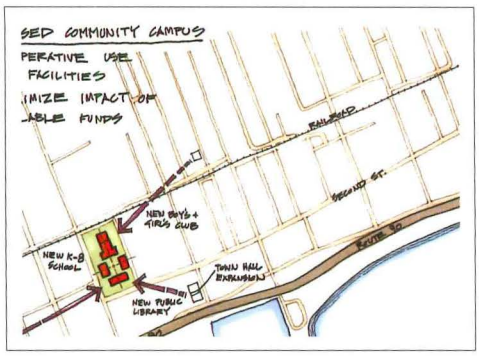
The 10 architects who were asked to be resource team members came from across the U.S. The American Institute of Architects' Committee on Architecture for Education (CAE) helped select them on the basis of their ability to work collaboratively, their proficiency in design and presentation skills, and because they have successfully participated in some of the school design competitions held each year. CAE chair Kerry Leonard, AIA, and the AAF's Nancy Sussman helped organize the event.

There were two goals for this unique gathering. The first was to see if, by taking a fresh look at several very specific design problems, larger lessons applicable to other districts across the nation could be taken away. In every case they could. Although there are thousands of school districts out there, many have problems in common. For example, almost every district has buildings which are functionally obsolete but must be reused or patched together for a few more

74 **A New High School**
NATRONA COUNTY SCHOOL DISTRICT
NATRONA COUNTY, WYOMING



76 **Central High School**
CARROLL COUNTY SCHOOL DISTRICT
CARROLL COUNTY, GEORGIA



80 **Community Campus Plan**
PASS CHRISTIAN SCHOOL DISTRICT
PASS CHRISTIAN, MISSISSIPPI

Results

years. Teams from Buffalo and Georgia both brought projects with these characteristics. Few schools face the challenges of officials from Pass Christian, Mississippi, whose schools were completely destroyed by Hurricane Katrina, yet much can be learned as they rebuild with few resources. A team from Los Angeles found themselves redesigning a project that was ready to break ground. It happens. The group from Wyoming got to do what everybody wishes they could do, exploring what it would be like to start anew. The following pages show the solutions the School Design Institute came up with, the design processes they used, and the lessons they learned.

The second goal was to introduce to the school districts' representatives the idea of the "charrette," and to see if guidelines for these events could be developed by observing what happened at this event. For readers who have never heard of a charrette before, architects use the term to describe work sessions in which a design problem is intensively attacked by its stakeholders over a short period of time, sometimes for a day or two, sometimes for just a few hours. Hopefully, with decision makers present, and preconceptions thrown aside, an ingenious, creative solution will emerge.

All design exercises are hard, but charrettes can be much more so. The short period of time involved creates stress, and personalities can play a part in whether the exercise is a success. Without a doubt, the hardest part is to get the people who are the ultimate decision makers to the table—mostly because they "don't have time." Yet, people who try doing a charrette often find that a few hours at the table can produce results that their staff and consultants might spend *months* of trial and error trying to achieve. The groups who attended this event did a fantastic amount of work in 24 hours, came away with fresh, workable ideas, and said they would do it again.

The charrette process can be used by anyone to tackle all kinds of problems, not just architectural ones. The sidebar at the right shows what we learned about doing them successfully at this event. It is an excellent starting point for those who want to give it a try. ■

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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, students, 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 few 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 email.
5. Ideally, allow two days with no more than 6 hours each day for the design charrette to occur. A deadline for formal presentation to a larger group at the end tends to force the team to come to a solution.
6. It's a good idea to hire consultants from "out of town." They come to the activity without preconceptions, and they aren't likely to play politics because they'll be appearing before the board interviewing for work later.
7. Abandon all preconceptions. Groups should be open to all possibilities. In particular, don't get hung up on 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. Start with a well-defined design problem. Vague problems tend to produce results which are hard to implement.

AMERICAN ARCHITECTURAL FOUNDATION

NATIONAL SCHOOL DESIGN INSTITUTE

South Los Angeles High School No. 3

Los Angeles USD, Los Angeles, California

An unexpected environmental analysis, and new district enrollment projections, sent an already-completed design back to the drawing board.

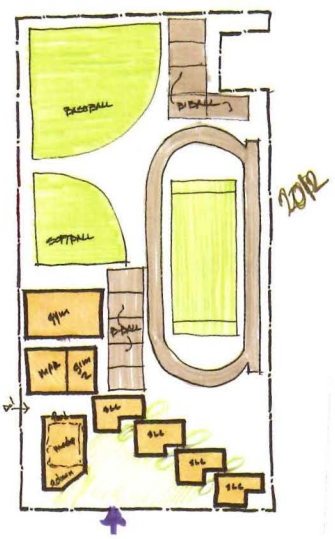
WITH 13,000 BUILDINGS AND A STUDENT POPULATION OF 712,000 THE Los Angeles Unified School District is very large and its challenges are complex. Its New Construction Program is valued at over $19 billion and it will deliver 150 new schools by 2012. This major multi-year capital-improvement program is intended to achieve several goals, including the relief of overcrowding, elimination of involuntary busing, and the return of all students to a traditional two-semester calendar. Ideally, every student should attend a neighborhood school with small learning communities within it. This year alone, Los Angeles Unified School District (LAUSD) will open 13 new schools to provide over 67,000 new classroom seats. This brings to 65 the total number of new schools opened in recent years. Last year, LAUSD opened the first new comprehensive high school built in Los Angeles since 1971. South Los Angeles is an economically-depressed area that is the home to numerous overcrowded existing public schools. Over 86 percent of students in this area participate in a free- or reduced-cost lunch program, and over 37 percent of them are English-language learners.

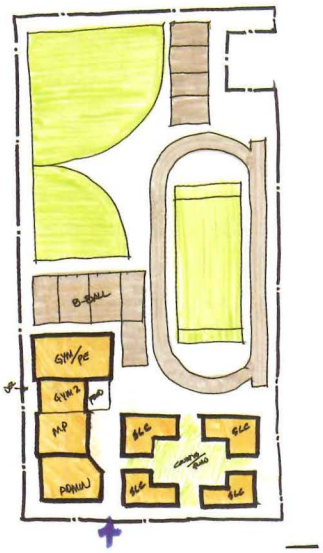
PROBLEM STATEMENT

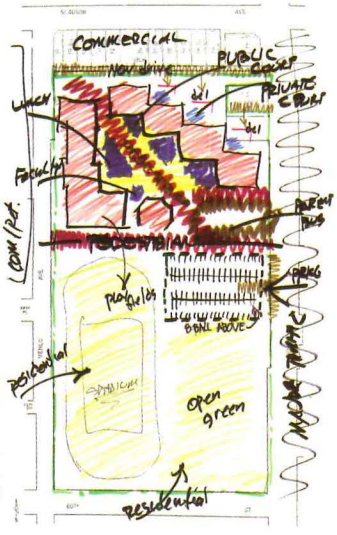
The LAUSD representatives brought the design of South Los Angeles High School No. 3 (HS No. 3)to the National School Design Institute charrette. It is a 1,215 seat, two-semester high school that was planned to

Site Analysis

The north half of the site (upper portion of plan) is in a commercial zone; the south half is residential. The team decided the fields should also serve as a park, and reversed their positions in the last scheme at far right.





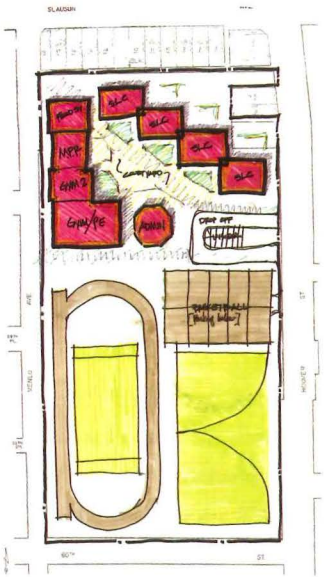


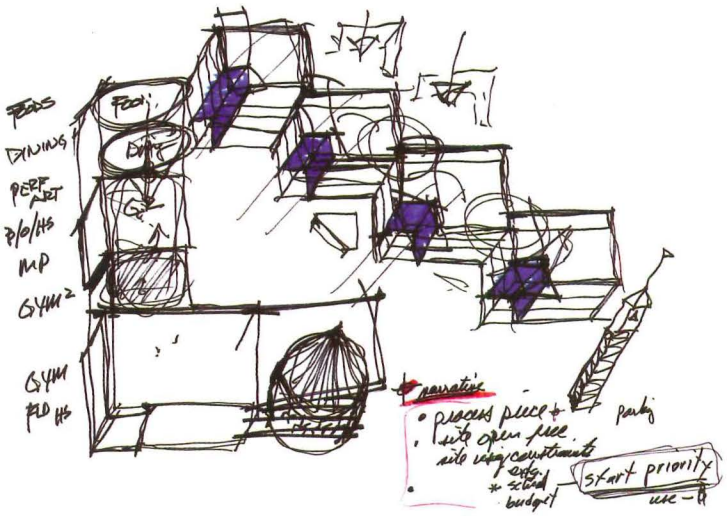
Seated: Steve Crane, FAIA, VCBO Architecture, and Amy Yurko, Brain Spaces. Standing: Ellis Kaufman, director of small learning communities, Facilities Services Division, LAUSD; John Nichols, AIA, Principal, HMC Architects; Guy Mehula, chief facilities executive, LAUSD; Edwin J. Van Ginkel, senior development manager, Facilities Services Division, LAUSD.

relieve severe crowding at Manual Arts High School, which was built in 1910 and has an enrollment of 4,100 students. HS No. 3's design featured three small learning communities with contiguous clusters of classrooms and satellite administrative offices. The project, as planned, would have been constructed on an 8-acre site with approximately 146,000 square feet of building area, excluding the parking garage. The total project budget was nearly $90 million. The school's opening was planned for the fall of 2009, and its construction documents were complete.

However, during the environmental clearance and due-diligence investigations, unexpected soil and groundwater contamination was discovered on two acres at the northernmost portion of the site, where the LAUSD had intended to build. The extent of the contamination required the reworking of the entire project.

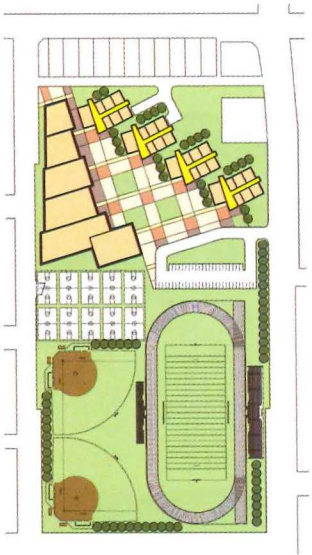
At the same time, a second new high school project, known as South Region High School No. 10, was also planned to further relieve overcrowding at Manual Arts High. South Region No. 10 is a two-semester, 2,025 seat school planned for a 2011 opening. This

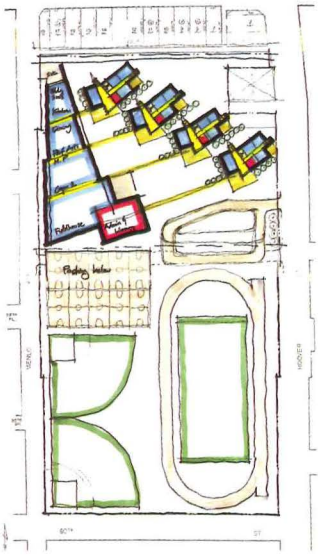


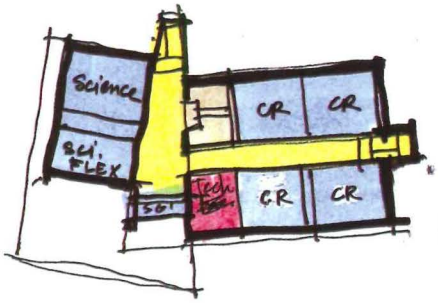


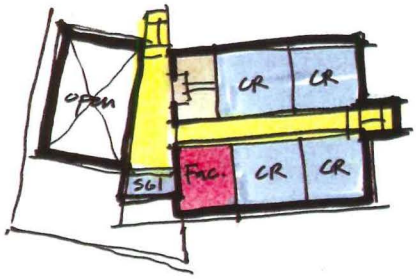
Massing Studies

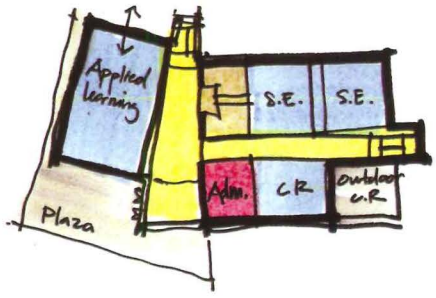
After refining the site plan, the team studied the relationship of the gym, performing arts, food service, and administration buildings to the four small learning communities. The shape of courtyard was an important topic of discussion.

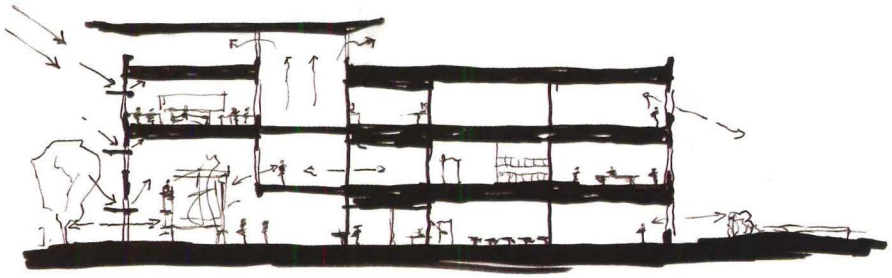


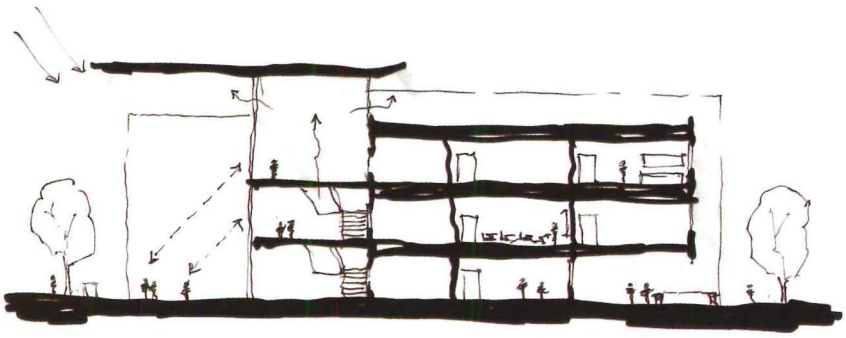












Refined Scheme

Studies on the previous pages led to a refined, feasible site plan. Parking for 200 cars is located beneath elevated basketball courts; a drop-off loop between the track and SLCs allows site access. The original SLC plans were good: each has six classrooms and labs (in blue) per floor, however, the shape of the SLCs was refined to enhance passive ventilation and daylighting by reshaping circulation paths and lobbies (in yellow).

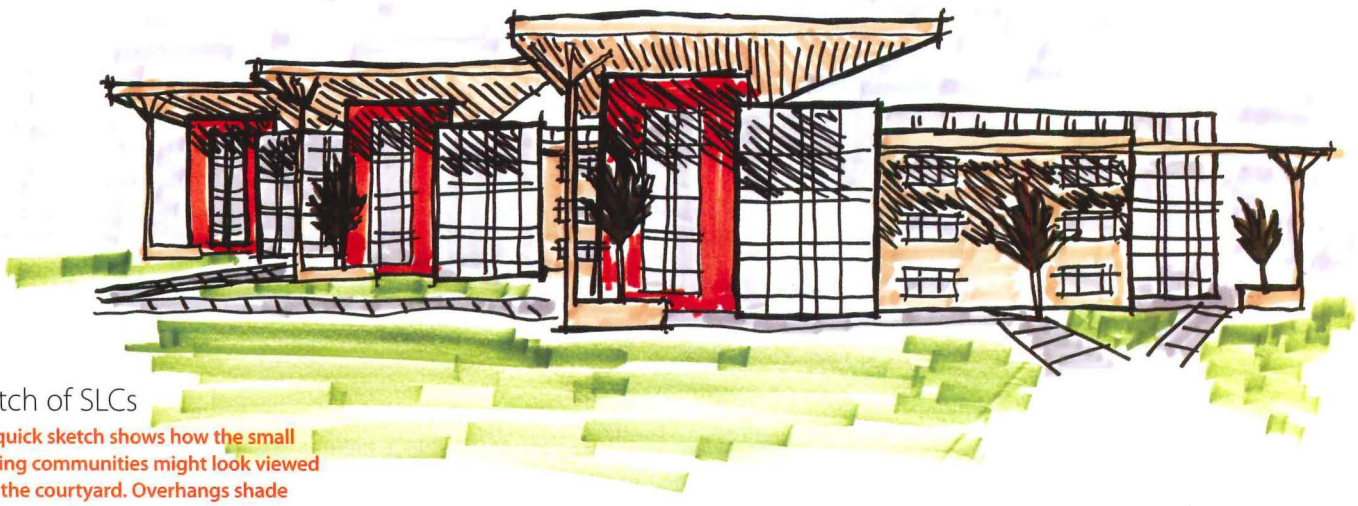
project would feature four small learning communities. The total project budget for this 75 classroom, 192,663 square-foot high school was $186.5 million, and site selection was due to begin.

Due to both the unforeseen environmental challenges on HS No. 3's site, and recently updated enrollment projections, the district is considering combining the HS No. 3 and HS No. 10 projects into a single 2,025 seat, two-semester high school project on the No. 3 site. This would largely achieve the LAUSD's objective of returning all students in the area to a neighborhood school on a two-semester traditional academic calendar. The contaminated portion of the site would not be acquired, but the entire site would have to be expanded to a total of 15 acres.

The challenge for the charrette was to determine whether the completed construction documents for HS No. 3 could be amended to add an additional 800 seats of capacity to the 1,215 seat design, or if LAUSD should start a new design for the project.

SOLUTION

As the design process evolved, it became apparent the problem would have to be tackled more as a site analysis than through the redesign of the buildings. Several site plans the group worked out are shown on the prev



Sketch of SLCs

This quick sketch shows how the small learning communities might look viewed from the courtyard. Overhangs shade large areas of glass.

ous two pages, and one can see the evolution of the scheme the group settled on there.

The site is rectangular in shape, with its long axis oriented to the north and south, and is bordered on its east, south, and west sides by through-streets. In its earliest iterations, the buildings were located on the south end of the site. Under the redesign, it made more sense to locate the athletic fields in a park-like setting within the residential area at the south site, so they function as a neighborhood amenity. The school buildings are located in the northern end of the site amongst commercial buildings, but face the courtyard at the interior of the site, instead of the surrounding streets.

Finding enough room on the site to accommodate parking for 200 cars was also a challenge. The program calls for 10 basketball courts, which the team placed on slabs supported by columns so that parking could be placed beneath them. The buildings are arranged around a central courtyard which is accessed via a driveway loop that gives access to a visitor parking lot and drop-off area.

The original design demonstrated LAUSD's commitment to small learning communities (SLCs). At the charrette, a variety of diagrams were developed to show how the small learning community buildings originally designed for High School No. 3 could in fact be utilized with the newly developed site-scheme, although the new program for 2,025 seats requires four SLCs instead of the three originally utilized. The multiuse areas needed include: a field house, two gyms, a performing arts space, and dining and food service. The central plaza includes spaces for group study as well as niches and alcoves for socializing. Outdoor dining is located adjacent to the servery; performance spaces are adjacent to the theater, and presentation/collaboration spaces are next to the SLCs.

The SLCs are the central component of the facilities program. The first completed design had resolved design issues and was based on many hours of committee input. The design team utilized this previous effort and found that its design and resolution of spatial adjacencies worked very well with the selected site scheme, although they did experiment with its circulation patterns. The four SLCs can be arranged as separate individual buildings, or arranged with connecting nodes for common spaces and vertical circulation. Staggering the SLCs provides shaded work areas and direct access to labs. The programmatic needs of different SLCs could be met by adding floors as needed. The final staggered scheme provides ideal solar orientation for daylighting (see sections, opposite page), an improvement over the original design. ■

LESSONS LEARNED

+ Support from neighbors in residential areas surrounding the proposed new site is important. Delays may compromise this support.
+ Any new design for schools should consider community pride and joint-use opportunities.
+ The site strategy places exterior amenities such as the track, courts, and fields so they are easily accessible to the adjacent residential neighborhood.
+ The design takes advantage of small learning communities' strengths. There is good separation between small schools, more areas for projects and collaborative opportunities, and more opportunities for interaction between students and school staff.
+ Getting the most recent enrollment projections is crucial for accurate planning and design.
+ Environmental assessments and due diligence should take place early in the design process.

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School of Entrepreneurship

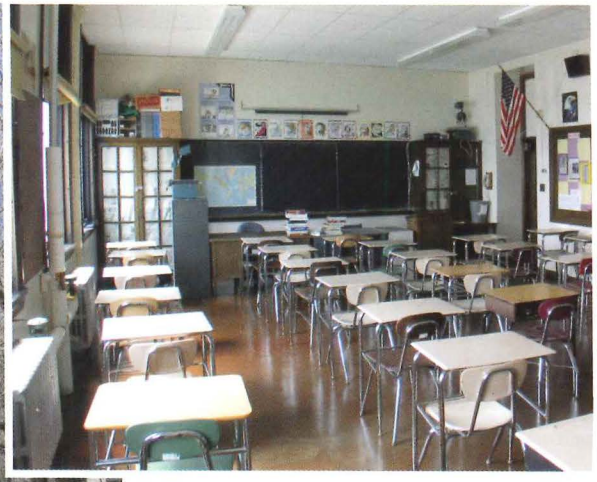
Buffalo School District, Buffalo, New York

The School of Entrepreneurship is part of a plan to create schools that will provide Buffalo students the skills they need to start their own small businesses.

BUFFALO IS A CITY OF 300,000, DOWN FROM A PEAK OF ALMOST 600,000 in 1950, due to the erosion of its industrial economy. The Buffalo Public Schools have 37,000 students, a number that has been decreasing due to both general population decline and a rise in the number of charter schools. In 2005 the new superintendent of schools, Dr. James A. Williams, introduced a plan for increasing student achievement, with the ultimate goal of a 100 percent graduation rate for Buffalo students. He led development of a three-year academic achievement plan to strengthen reading and mathematics instruction. As part of this plan, he is implementing a high school reform initiative that addresses both the structure and curriculum of district high schools.

THE CHALLENGE

Working with local community leaders, Williams identified small business creation, not the return of large industry, as critical to the economic future of the city. He directed his staff to begin looking at creating a small school for entrepreneurship to be housed at Riverside High School, a 1930s building along the Niagara River. The renovation of this school is scheduled to be part of the Joint Schools Construction



Analyzing Riverside High School

This high school, if properly maintained, could be in use for 100 years or more. But, updating buildings so they can be used for programs like the School of Entrepreneurship requires careful analysis and creativity.

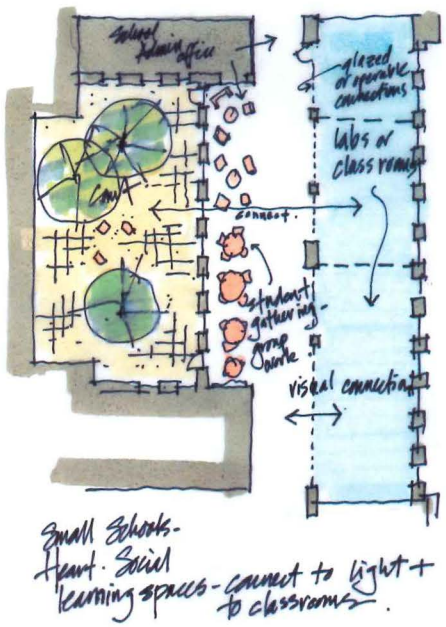
Standing from left to right, Buffalo School District superintendent James A. Williams, Ed.D; Donald Gray, AIA, Wendell Duchscherer Architects and Engineers; Philip Lewis, AIA, HMFH Architects, Donna M. Brown, director of community outreach, LP Ciminelli, Inc. Seated: Amber Dixon, executive director for project initiatives Buffalo School District; Ann Schopf, AIA, Mahlum Architects.

Project, a $1 billion, state-supported initiative to rebuild Buffalo's aging schools.

Buffalo had already developed a draft plan for the School of Entrepreneurship program and the initial design drawings for the renovation of Riverside High School. The task presented at the National School Design Institute (NSDI) charrette was to design this small, specialized learning environment to coexist within the larger building.

THE SOLUTION

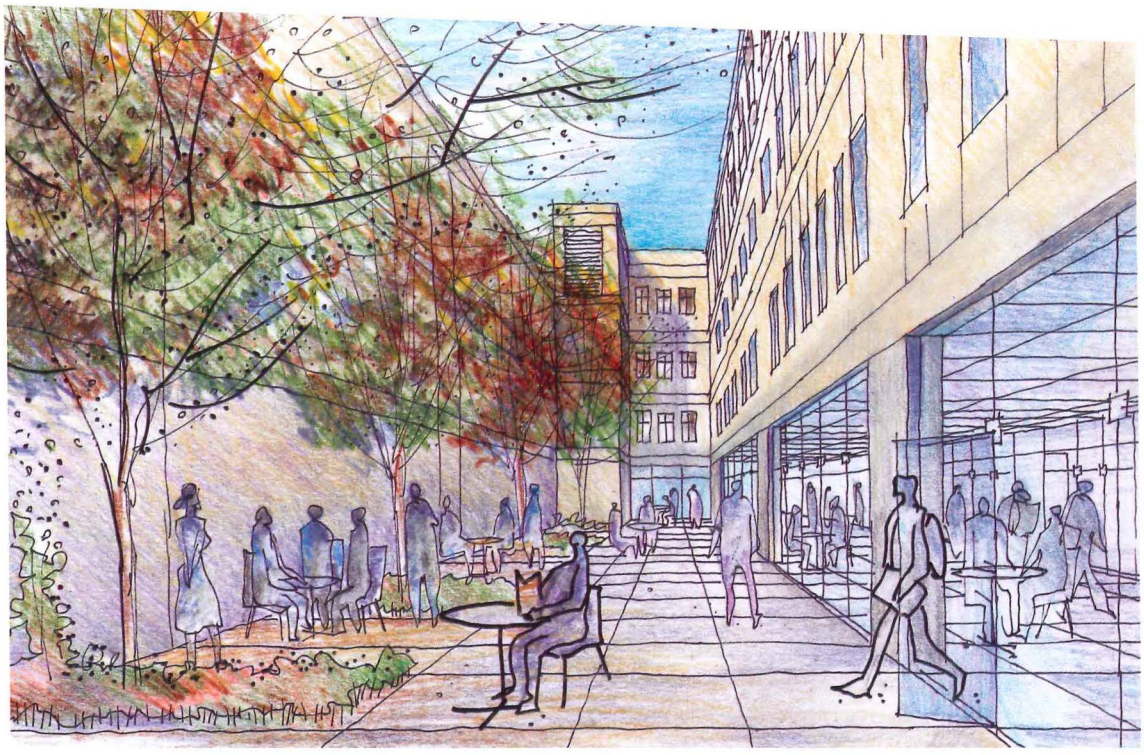
The 80-year old Riverside High School, an urban, four-story school slated for $30 to $40 million worth of renovation is to house small academies of learning for 900 students. A completed schematic design showed the renovation would comply with the educational needs of the district and also conform to the NY State Historic Preservation Office requirements. As part of this work, an addition was planned on the south side of the building to accommodate team lockers, public restrooms, and training rooms in support of the athletic program. The NSDI charrette team was charged with making one of these small academies into an entrepreneurial business program featuring incubator labs that would create relevance in learning for students. The concept is committed to incorporating business expertise into the academic program, with the goal to assist in improving the economy of the area by producing expertise for small business development. Here, in partnership with community business people and local universities, students will put into practice what they are learning in the classroom by establishing and operating start-up businesses to provide goods and services to the school and the neighborhood.



Indoor/Outdoor Connection

This sketch shows the relationship between classrooms and a breakout space for interaction and study. A sense of openness was important here.

During the course of the charrette, issues around building security, accessibility, and zoning surfaced when discussions revealed the building would be in use 12 hours a day. This presented a problem because the old school simply did not lend itself to closing off areas not in use. Dr. Williams suggested that the vision be altered from a single, small school focused on entrepreneurial business, to a whole building approach that would contain three academies, each with its own entrepreneurial focus. This satisfied the need to create a sense of direction for the program,



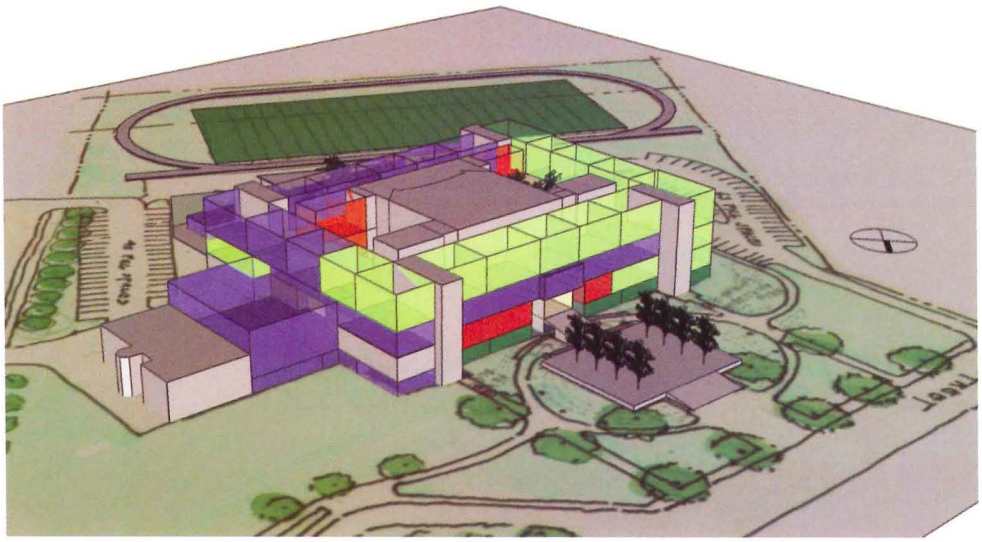
Sketches

This sketch shows how one of the school's existing lightwells could be made into a breakout and study area. The architects suggested using walls made of glass (below) to maintain openness and distribute daylight throughout the building.

creating a clearer vision for the entire school, while preserving the educational advantages of the small, focused learning environment. The entire building would be operational from 8:00 a.m. to 8:00 p.m. so entrepreneurship could be supported holistically.

The four-story school had recent renovations to its third-floor library and fourth-floor science labs, and these needed to be retained for budgetary reasons. This physical constraint, along with the distribution of available space on each floor, began to drive the placement of the academic areas of each entrepreneurial academy. A quick analysis showed that each of the three top floors could share space with one communal function, but also contain the required dedicated learning and support spaces for one individual academy, reinforcing community and identity. To create strong community partnerships with the incubator spaces, and to tie the program into the business community, it was determined that the incubator labs for all the academies be located together on the lowest level of the school, highly visible to each other and easily accessible to the community. In doing so, the floor could be a synergistic and experimental environment for learning.

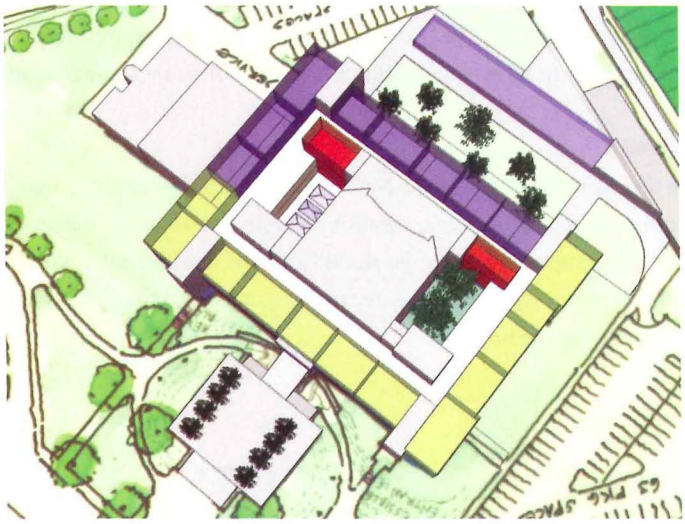
The historic building, again, posed some challenges. The main entrance to the school is accessed via an exterior monumental stair that rises up an entire floor, bypassing the lowest level, to a main entry above. The lowest level is very close to existing grade with access to daylight on all sides. In addition, two light wells provide daylight into



Conceptual Diagrams Show Spatial Relationships

The light-green blocks on the diagrams (above and below) represent the three entrepreneurial academies. The violet blocks show shared spaces such as the gym. The red zones are offices, and gray indicates service areas. The paths that are elliptical in the plans are gradually sloped to allow access by handicapped persons.

the core of the building down to this level. Handicapped access to the entire school was through a small side door from an adjacent parking lot. If the incubator level was to provide links to community, its accessibility and visibility had to be improved. While the monumental entrance to the floor above remains operational, a new handicap accessible main entrance path will wrap around and enter below the grand stair. In addition, both floors will be tied together by a pair of flanking double-height spaces providing unity, light, and importance to the visitors' introduction to the school at both levels.



At the lower level, the design solution provides a series of flexible lab spaces organized along the building's perimeter, capitalizing on the abundant daylight with continuous visual links into the labs from the corridors.

Also at this level, the bottoms of the light wells are enlivened; one is landscaped to provide an attractive focal point around a student gathering/break-out space. The other becomes a skylit focal point for food service.

The team decided that by locating casual seating and display areas near the two light wells a focal point at each of the school's four levels would be created. Students using these spaces can be supervised because administrative and counseling offices have been dispersed throughout the building.

Enlarged athletic fields make use of abandoned railroad right-of-way, and are rotated away from the building, in order to space for a new detached sports pavilion while respecting the symmetry of the existing school. The pavilion creates a protected south-facing terrace that will support exterior dining and concessions. A new parking lot will support service, staff and special events. ■

LESSONS LEARNED

School construction projects can often reach far beyond their primary purpose, which is providing space for students to learn

+ School construction projects provide an opportunity for the community to assist in moving both the school district and the region forward. Each brick laid represents a building block for both the school and the region's future.
+ Local business leaders and higher education institutions offer schools a valuable source of information and resources.
+ School construction projects stimulate the local economy. In fact, significant district projects often are the largest scale construction effort in their immediate community.
+ Students benefit from educational activities that weave real life learning into the curriculum. The incubator labs are seen as springboards to economic development in the region.
+ Everyone benefits when students gain skills that match local economic needs. School academic and construction programs can work in concert to create both employment training and career opportunities to students.

The wisdom behind reusing historic school buildings

+ An opportunity exists to bridge the proud past of these schools with a vision for the future and to acknowledge the achievements and traditions valued by the alumni while sowing the seeds for the next generation of graduates.
+ Opportunities exist for utilizing historic schools, many of which have superior daylight and ventilation characteristics, for delivering education within smaller communities of learning.
+ Providing accessibility for all, in a gracious and inviting manner, is one key element to transforming our historic schools into resources for our communities.

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NATIONAL SCHOOL DESIGN INSTITUTE

A New High School

Natrona County School District
Natrona County, Wyoming

The opportunity to design a new high school completely from scratch allowed this team to challenge itself.

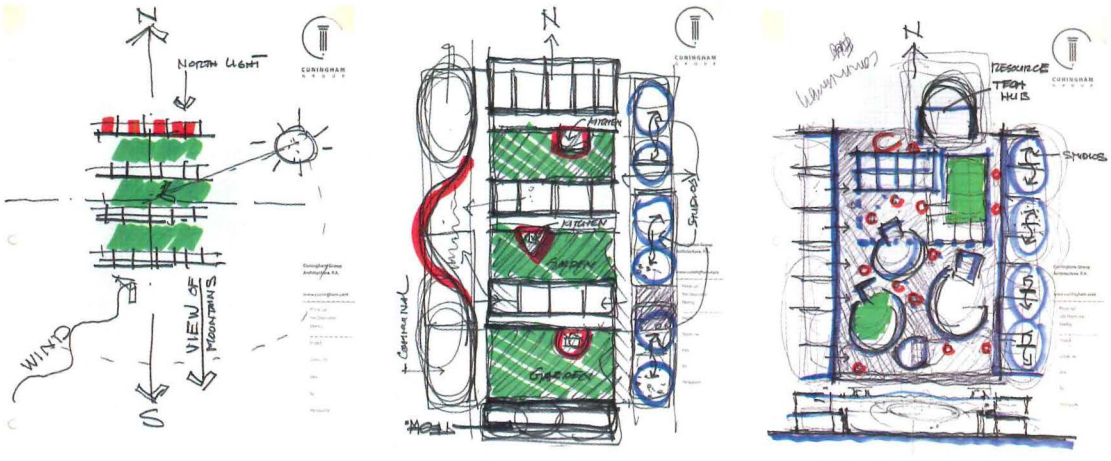
THE NATRONA COUNTY SCHOOL DISTRICT IS BIG. IT COVERS 5,340 SQUARE miles including the city of Casper, Wyoming, and eight other towns. Eleven thousand, five hundred students are enrolled in the district, which includes four high schools, seven middle schools, and 27 elementary schools. Many estimate that the greater Casper area will reach a population of 100,000 for the 2010 census. The district is planning three major high school projects in the next five years: a new high school for 1,000 to 1,200 students; and the renovation or replacement of two high schools for 1,000 to 1,200 students each. All of these projects are in a facility plan approved by the State of Wyoming with an investment of more than $100 million over five to seven years. The need for the new high school results from a system-wide grade reconfiguration effort. Currently ninth grade is in junior high, but the district intends to transition to grades 9 to 12 for high schools. The two existing schools are currently overcapacity—adding the ninth grade is what drives the need for an additional high school, not a surge in student population.

THE CHALLENGE

The challenge the district brought to the National School Design Institute was the design of the new high school. A requirement is that the design last for 30 years, but allow for the quick and efficient reconfiguring of most of the facility's spaces. The design should support a collaborative culture—incorporating ideas from dialogue with current and past students—regarding educational focus, challenges of student engagement, and how to encourage academic rigor.

Process Sketches

The team started with an environmental analysis (left) and proceeded on to a functional analysis (center) before settling on a semicircular nodes housing specific functions set inside a courtyard (right).



Seated: Linda Nix, Natrona County School Board; John Pfluger, Cuningham Group Architecture. Standing: NCSB superintendent Jim Lowham; Trung Le, AIA, OWP/P Architects; Mark Antrim, associate superintendent, Facilities and Technology, and Dennis E. Bay, facilities planner/construction manager, both of the Natrona County School Board.

LESSONS LEARNED

In this spirit of collaboration, the team's discussions yielded some very interesting and exciting approaches to transform the traditional high school into an interactive and multidimensional space.

+ The long corridor should be supplanted by a central, indoor courtyard space where meaningful discussion and collaboration can occur.
+ Nodes containing various functions can be used to break up such an area and soften the noise within the courtyard.
+ Flexibility can be obtained by designing nodes to contain small learning communities suited to different learning styles.
+ Learning occurs best when information is integrated into an individual's knowledge base.
+ Inspiration can come from the most remote or unexpected places.
+ Buildings should be oriented to take advantage of views, daylighting, and natural ventilation.

The district is especially interested in design concepts which embed the social and technological culture that today's students require to be engaged in learning. The district has a high level of concern about student engagement, and seeks to understand and incorporate design that better address the interest and needs of the students.

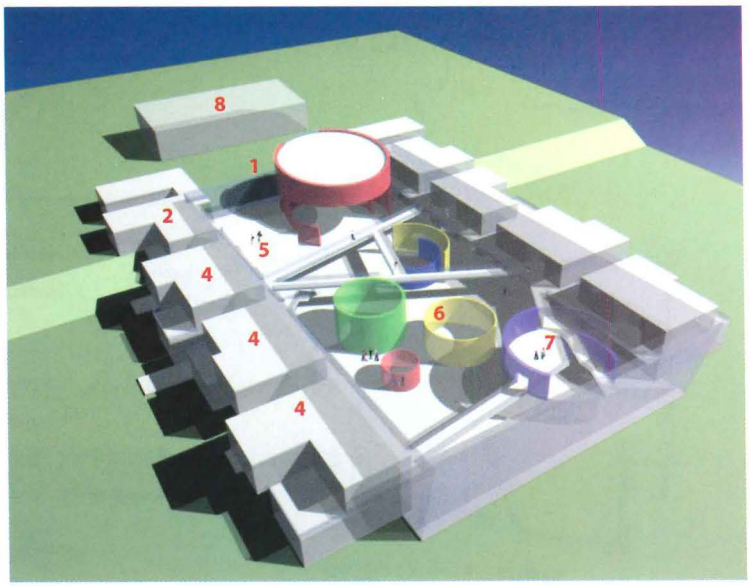
Representatives from NCSD have visited many schools in the region. Generally speaking, they found new schools to be not unlike schools built 30 to 50 years ago. Their ambition is, instead, to transform learning spaces and instructional strategies to better engage all students in collaborative learning processes.

THE SOLUTION

The Natrona County team determined that the best schools function somewhat like a "kitchen table," that is, that they contain spaces which create common ground and drive collaboration. As Superintendent Jim Lowham put it, "As we gathered around our 'kitchen table,' we dined on courses of deconstruction and assembly. Most notably, we addressed the most important task of helping our students discover and nurture their calling through the alignment of state-of-the art learning spaces with educational programs."

Recognizing that meaningful human interaction plays a fundamental role in cognitive development, the team decided to reenvision the traditional school hallway. The group believes that long hallways can be isolating and as such do not support this kind of learning, so they were left out of the design. As a result, a generous and dynamic courtyard space emerged. Current technology, such as wireless access, is central to the plan, and the courtyard could provide a wide variety of informal learning opportunities. Just as the group met at a "kitchen table" for this charrette, this central space serves to encourage students to engage in their own "table talk" to collaborate on projects, discuss global issues or take a break from a busy day.

To help break up the volume and soften acoustical implications of this open plan, colorful, circular nodes are located throughout the courtyard. Each node is flexible and adaptable to the students' diverse range of learning styles, like a small learning community. The commons and library each anchor the ends of the courtyard. Other nodes interspersed throughout the space can serve as "rental" spaces for independent student research, interior classrooms or student teacher gathering spaces. With the nodes in place, the "in-between" spaces come alive. These spaces are like connective tissues that weave together the various small learning communities and the classroom areas on the sides of the community space. Learning occurs best when information is integrated into an individual's knowledge base, and therefore, our design provides appropriate support structures or "scaffolding" to facilitate the subsequent stage of development, which include flexible and adaptable spaces to meet diverse learning styles and ever-changing technology. ■



Solution Diagram

Learning studios would enclose a central courtyard filled with colorful nodes. These would house the commons, library, and community spaces.

1 Entrance
2 Commons/Cafeteria
3 Administration
4 Learning Studio
5 Performance Space
6 Cross-curriculum Clusters
7 Library
8 Athletics

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NATIONAL SCHOOL DESIGN INSTITUTE

Central High School

Carroll County Schools
Carroll County, Georgia

Here's what can happen when a district must replace an obsolete school, and building elsewhere is not an option.

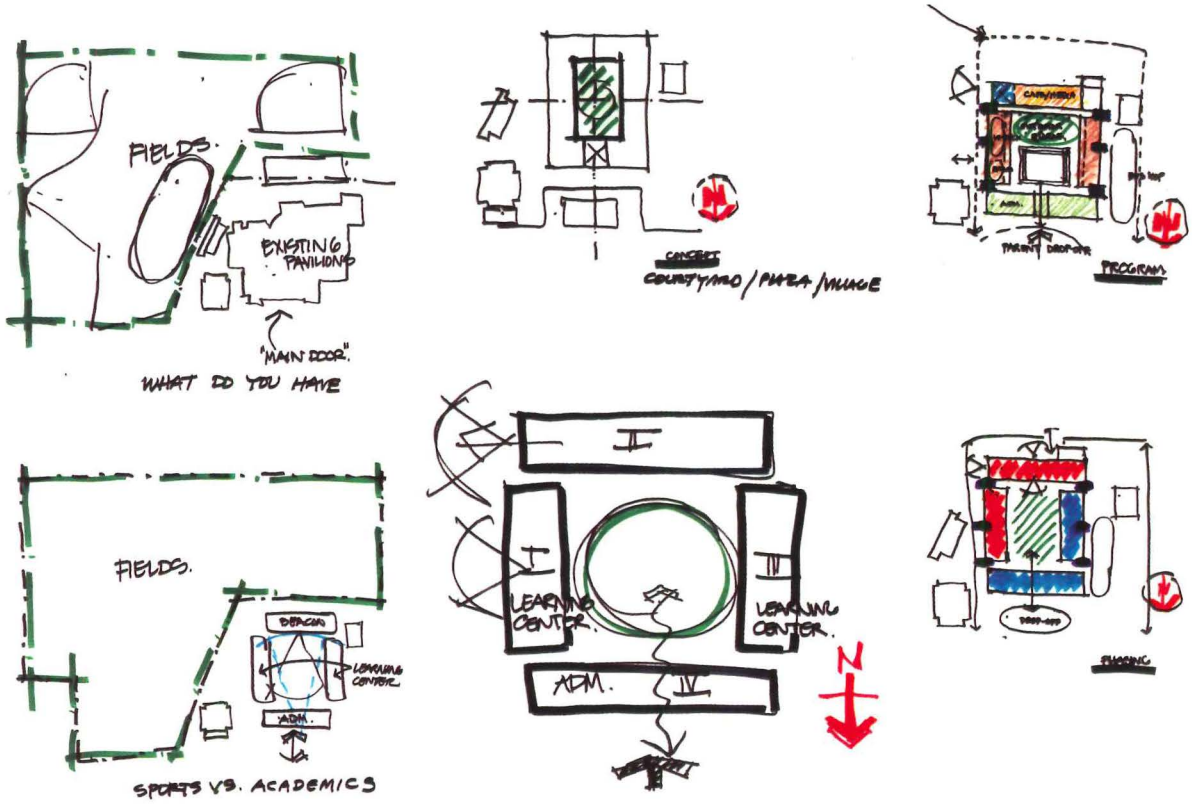
CARROLL COUNTY SCHOOLS IS A FAST-GROWING SCHOOL DISTRICT about 50 miles west of Atlanta. The County currently serves 15,000 students at 24 schools that vary in age and quality. The student population grew 5 percent between the 2005 and 2006 school years, which presents the district with many challenges in planning for and meeting Carroll County students' facility needs.

THE CHALLENGE

The needs of one of Carroll County Schools' campuses, Central High School, typify those of many high schools in the U.S. It currently supports 1,500 students and is expected to grow to 1,800 in the coming years. It is located adjacent to a retail center and a highway that connects the county to Atlanta. Educationally, the success of students varies. It has a strong sense of tradition, and the community expects

Process

The Carroll County team started by evaluating the existing site plan (near right), and eventually developed zones arranged around a courtyard as a solution, further refining them as they went along. At that point they began testing their solution in section and axonometric drawings (opposite page).

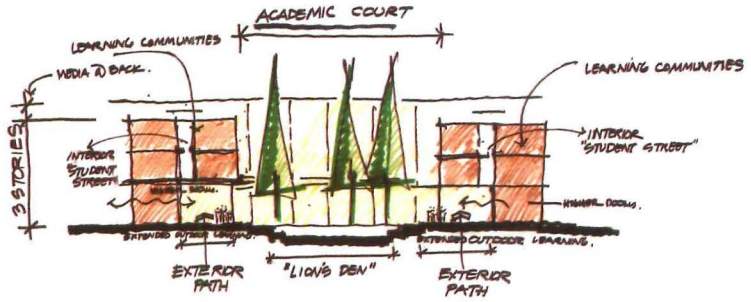


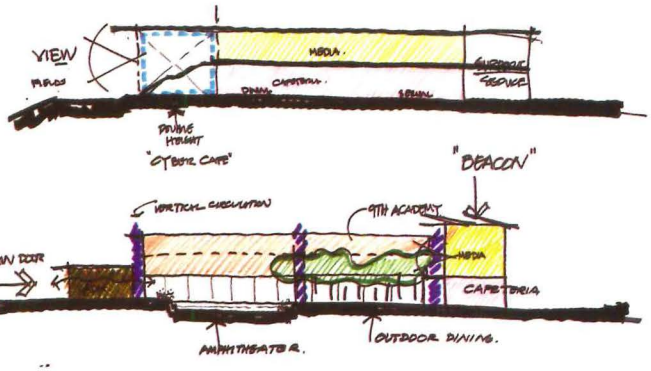
Seated: Stephen M. McCune, AIA, Southern A&E; Pat Bosch, Perkins+Will; CCS superintendent John Zaune. Standing: David Goldberg, CCS facilities development officer; Roy Denney, Southern A&E; John Weekes, AIA, Dull Olson Weekes Architects

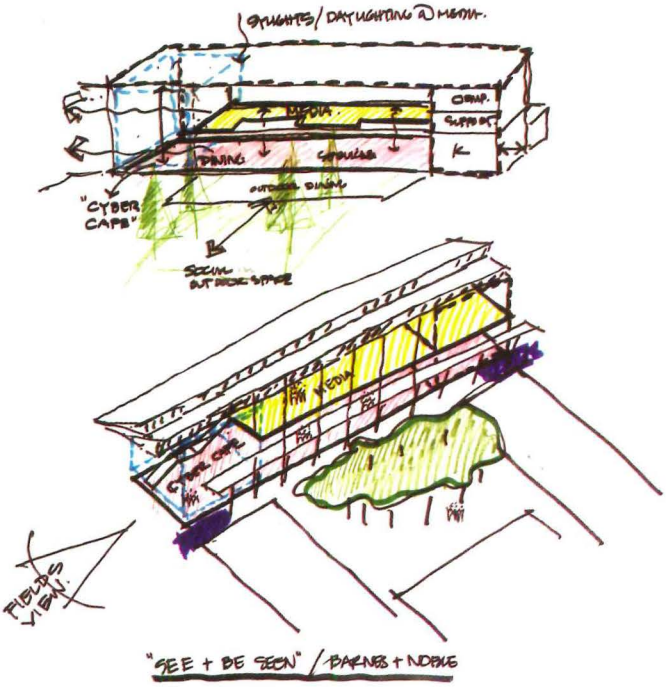
academic rigor. However, as is typical of most U.S. high schools, 30 percent of students do not graduate, and many of its educational programs appeal only to a small fraction of those who do attend.

Over the life of the school, the community has donated $10 million to upgrade the athletic venues. But, the buildings that house the school are old and need functional upgrades, and are in fact, overshadowed by the higher-quality athletic facilities. The school district has considered replacing Central. Because of substantial volunteer investments in the athletic fields, the limited availability of land in the area, and tight economic resources, the school district had determined that improving Central by a phased demolition and replacement of the existing buildings provided the greatest opportunity for success. The hope is that this renewal would substantially improve the attitude, capabilities, and educational opportunities of Central's students, as well as elevating the character and atmosphere of the campus to convey educational excellence, innovation, and tradition.

An initial architectural study by the school district indicated that demolition of existing campus buildings and their replacement would need to be implemented in phases. That study proposed that a series of two-story classroom blocks be placed in rows behind a combination administration and library building that would demarcate the front of the campus. The initial development would consist of a two-story, ninth-grade academy located in available open space on the south end of the campus, with future classroom buildings replacing existing facilities over time. The main gym and athletic fields would remain as they were.







SOLUTION STATEMENT

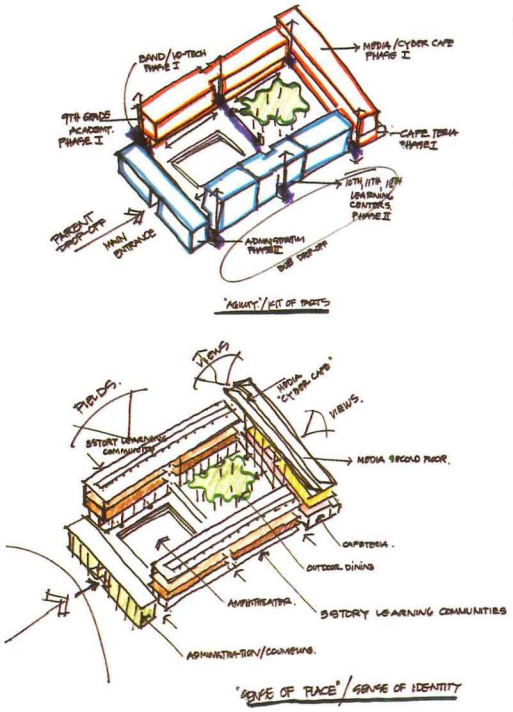
At the charrette, the resource team architects' discussions with Carroll County Schools Superintendent John Zaune revealed that the original architectural concepts did not address certain requirements and expectations needed to create a functional educational program. Based on these conversations a set of vision-based planning principals was established, and a new campus plan was developed from these.

At a conceptual level, the new campus plan for Central High School is based on a series of building blocks. These compact blocks are envisioned to be three stories high to minimize the footprint of the entire building, and reduce the impacts of phased demolition/rebuilding cycles. The smaller building footprints also create expanded opportunities to develop exterior learning and gathering places.

At another level, a series of planning patterns were identified for the campus. These patterns are intended to support the educational program by informing the organization and relationship of the building blocks and defining the nature of space within each of them. Overall, the utilization of "building blocks" and "planning patterns" created a "kit of parts" with which a new campus master plan was developed.

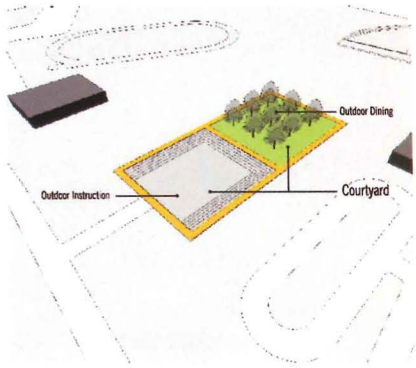
Solution I.

These building blocks test circulation concepts, construction phasing, and double-check view corridors.

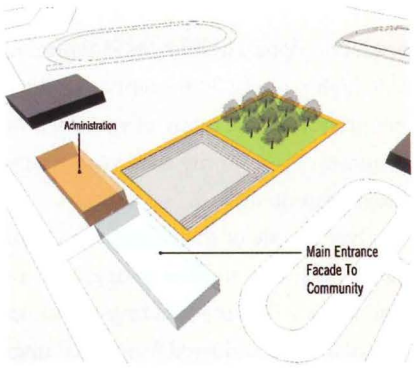


Solution II.

The phases for Central High's reconstruction are separated into layers below, and shown as a volume diagram on the opposite page.

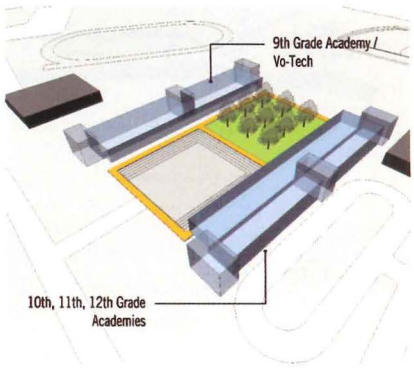


SENSE OF PLACE



SENSE OF IDENTITY

SENSE OF COMMUNITY



A PLACE TO LEARN

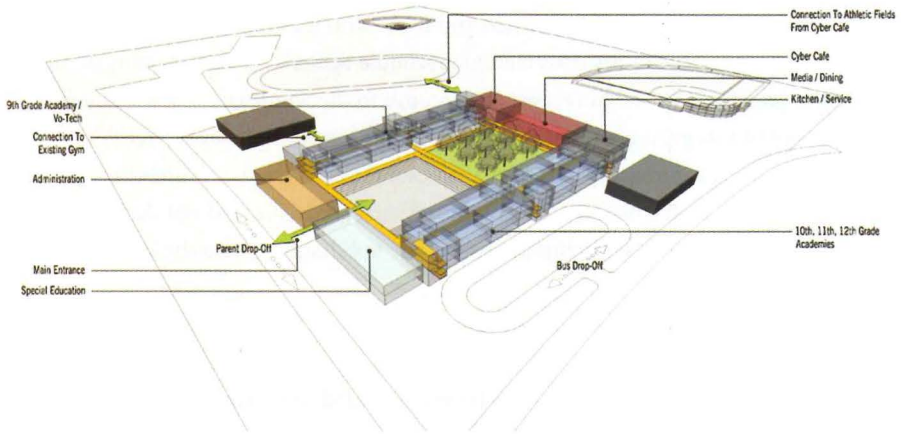
Student Centered	Create a place that focuses on the whole student.
Collegiality	Create an environment of learning and support.
Hierarchy / Order	Establish levels of importance, strength, and significance.
Connections	Create and support connections between students, teachers, parents, community.
Inside/Out	Expand teaching and learning opportunities by utilizing the entire campus rather than just interiors of buildings.
Agility	Create an environment that can adjust to changes.
Variety	Create dynamic and diverse spatial sizes, groupings, organizational arrangements, functional capabilities, and aesthetic possibilities throughout the school.
Layers	Create a physical environment that grows out of the site both horizontally and vertically in nature.
Transformation	Create an environment that elevates and focuses teaching / learning on the future.

Carroll County Schools officials, their architects and the NSDI's resource team had well-defined objectives.

The proposed new campus places building blocks around a central courtyard. Students enter the courtyard through the main entry, which is divided into two zones: an active learning area called the Lion's Den, and a passive landscape area adjacent to the media and cafeteria block. This building block is envisioned as the beacon for the campus. The cafeteria is three stories in height, starting on the main level, and is capable of being expanded into the courtyard later. The library is to "encounter the cafeteria" in a new social and dynamic three-story space, similar to a "cyber cafe." It will have access to the playing fields, courtyards, allow for views during the day, and serve as a community center at night. Two learning blocks bind the courtyard on its east and west ends. These learning blocks contain a new ninth-grade academy, professional technical programs, and learning spaces for grades 10 through 12. Rather then understanding these blocks as classroom buildings, they are envisioned as centers of learning. They are agile in nature, and capable of accommodating a variety of activities and teaching-learning needs on their three levels. Further, it is envisioned that the facility will be interconnected vertically with multi-story volumes, circulation pathways, and extended learning areas. ■

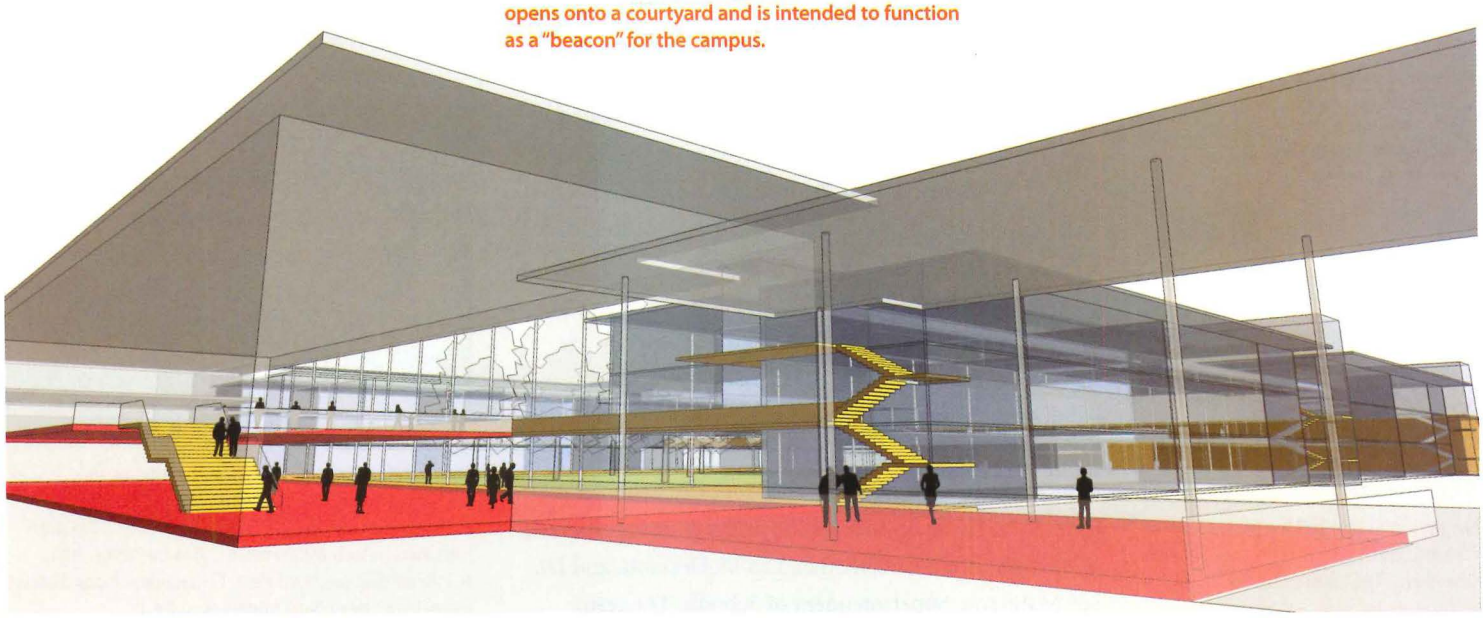
LESSONS LEARNED

+ **Suspend certainty. What would you accomplish if you knew you could not fail?**
+ **Focus on the intellectual, physical, and social needs of students.**
+ **Establish a clear vision.**
+ **Allow the "Aha!" moment to emerge.**
+ **Avoid "What is." Focus on "What is possible!"**
+ **Participation by an expanded group of patrons, educators, community, and students creates ownership of the solution.**
+ **Responding to the needs of parents, students, teachers, and community results in more meaningful solutions.**
+ **Create "culture change" by redefining the physical nature of traditional learning environments.**



Interior Concept

The three-story media center and cafeteria (below) opens onto a courtyard and is intended to function as a "beacon" for the campus.



AMERICAN ARCHITECTURAL FOUNDATION

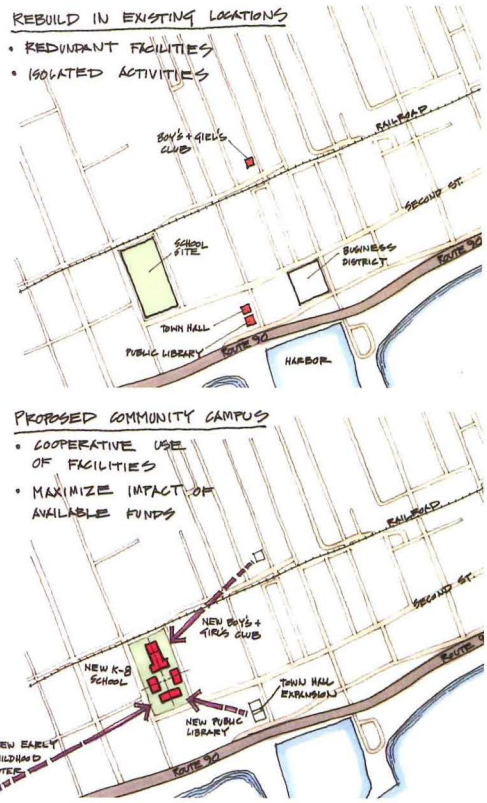
NATIONAL SCHOOL DESIGN INSTITUTE

Community Campus Plan

Pass Christian School District
Pass Christian, Mississippi

A new education center will make the most of scarce post-Katrina resources

PASS CHRISTIAN IS A COMMUNITY ON THE GULF COAST JUST EAST OF ST. LOUIS Bay. It is about 30 miles of east the Louisiana border, and 30 miles west of Gulfport. Its population is about 3,200, about half what it was before it was destroyed by Hurricane Katrina. A 14-acre site one block from the Gulf of Mississippi will hold the children of Pass Christian and those who teach them. The site once held the "old high school" which was, most recently, Pass Christian Middle School. All that remains of that building are floor slabs, and the grand live oaks that refused to succumb to the winds and water of the hurricane. These oaks and the history of this proud community make this site appropriate for the teaching of children. Pass Christian is a community of people who care for each other, and choose to work together to rebuild. Although Katrina tore this community to shreds, it could not destroy the heart of these people. They will fight to rebuild not just the buildings but also the soul of their community, known as "The Pass."



Site Analysis

Original plans called for replacement facilities to be rebuilt throughout Pass Christian. This would have created redundancies that wasted resources.

THE CHALLENGE

A new K-8 school in design development for the site was expected to replace an elementary and middle school destroyed by the hurricane. The proposed "learning village," included six academic houses with shared space for administration, dining, and a media center. It was projected to accommodate 750 to 800 students initially, and 1,000 at some time in the future. Unfortunately, the design was 10,000 square feet over FEMA's allowances, meaning that federal funding might only cover construction of two of the six academies. A local bond issue to make up the difference was not feasible. This shortfall lead the team to completely reevaluate this approach to the design of the school.

Seated: Tom Blurock, FAIA, Thomas Blurock Architects; Gary Bailey, AIA, JBHM Architects. Standing: Meridith Bang, K-5 principal; Christian Pass Mayor Leo McDermott; Jim LaPosta, AIA, JCJ Architecture, and Pass Christian school district superintendent Sue Matheson, Ed.D.

THE SOLUTION

The opportunity provided by the massive rebuilding of Pass Christian following Hurricane Katrina led the team to a discussion of the number and type of community buildings that were to be replaced. A serious discussion of alternatives was made possible by the presence at the charrette of the Mayor of Pass Christian, Leo McDermott, and Dr. Sue Matheson, Superintendent of Schools. The team

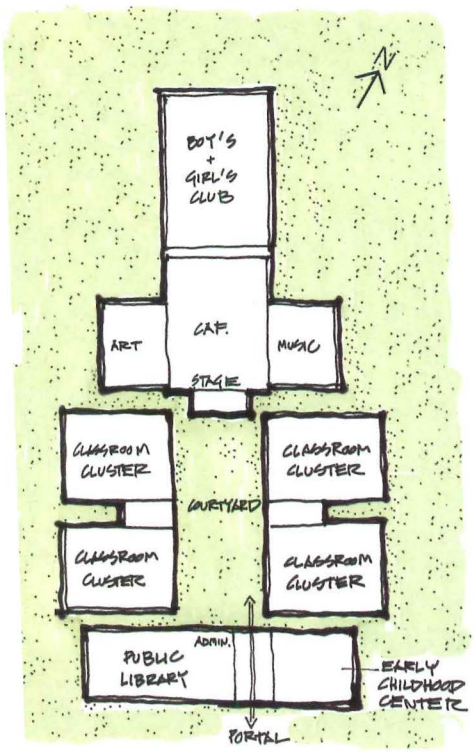
quickly agreed that while plans to build the school should be retained, the best way to resolve the budget issues was to combine other facilities on the site to create a community complex with "critical mass." Such a place would become a symbol of the town's rebirth, leverage funding, and free other land for expanded facilities elsewhere.

One commodity in short supply in post-Katrina Pass Christian is buildable land. New FEMA maps placed much of the southern portion of The Pass below flood elevation and made its use for public buildings problematic and expensive. The school site was an exception and one of the few high spots in the immediate area.

A comparison of the school's program with needed community facilities led to some obvious connections. The school had proposed a combined gymnasium-performance space. This was clearly a significant expenditure of funds for a space that, when combined,

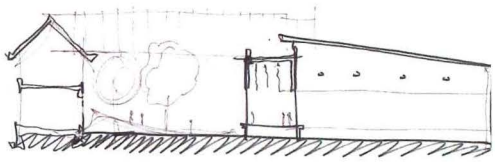
Proposed Community Campus Plan

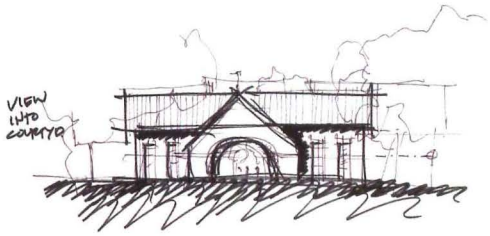
Placing the K-8 school, town library, Boys & Girls Club, and preschool together really leverages scarce resources.



Quick Sketches

While the primary focus of the Pass Christian team was site planning, the architects took time to create these sketches of what the complex could be like, including its ceremonial-arch entry .





would not perform either function particularly well. At the same time, Pass Christian's Boys & Girls Club of America had recently received a large grant from the nation of Qatar, and was planning to rebuild its destroyed facility on a former school site below the new flood elevation. Relocating the club to the school's site could provide the school with a double gymnasium, and allow the club to redirect its funds from sitework to construction of its building. It was also possible that the proximity and availability of the school's kitchen, cafeteria, and classrooms might allow the club to offer additional programs.

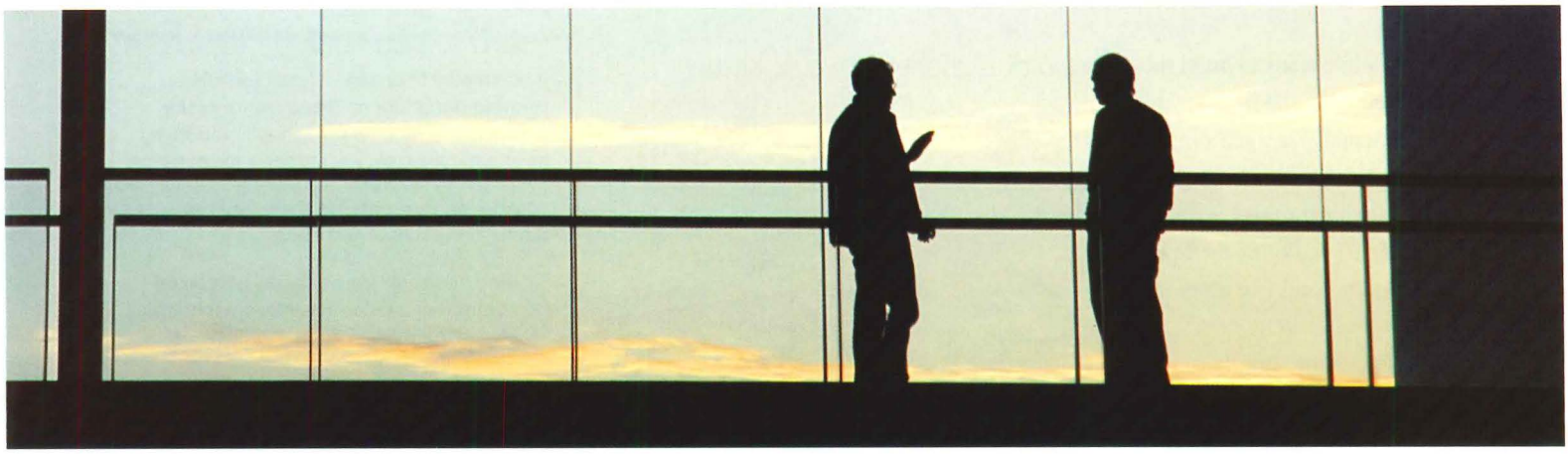
The town's library was also heavily damaged in the storm and in need of complete restoration. Prior to the storm, the library was located within the town hall, which led to crowded conditions for both facilities. Moving the library to the school site would provide the town hall with breathing room, and reduce the need for the school to fund a school library. Collateral benefits included greater opportunities for intergenerational learning and convenience for after-school library programs.

The final change the resource team recommended was the inclusion of an new early childhood education center. The Chevron Corporation had offered to construct this facility if the town provided the site. The addition of the preschool facility to the K-8 school, public library, and Boys & Girls Club site, meant that the community complex could serve birth-age children up to senior adults.

The final site plan the team developed places the Boys & Girls Club on the north portion of the site, replacing the previously proposed school gym. The town library occupies the southwest corner of the site, a location that allows a civic face and separate parking, while providing direct access for students from the school's central courtyard. The early childhood center was proposed for the southeastern corner of the property. The courtyard itself was replanned so it is now a large civic space, with access from the street through a ceremonial arch. A performance space was added to the redesigned cafeteria-auditorium at the site's north end. ■

LESSONS LEARNED

+ **It is essential to engage all decision makers creating the solution. The presence of the mayor, superintendent of schools, and their architect at the table was crucial to the outcome.**
+ **Look for opportunities to share facilities between the school and community.**
+ **Funding may come from a variety of sources; Pass Christian's solution leverages monies from FEMA, and grants from Qatar and Chevron.**
+ **Evaluate the operating hours and program needs of combined civic facilities. The school and Boys & Girls Club, for example, operate during offsetting times making joint-use easier.**
+ **The best solutions provide advantages to all stakeholders. The Boys & Girls Club provided a gym to the school, while the school offered it access to a performing space, kitchen, and dining facilities. Moving the library provided the school with a resource while opening up space at the town hall.**
+ **Each activity in a school does not necessarily need its own space; combine uses if appropriate.**
+ **Consider outdoor space as if it is another room in the school; design it to be usable as a gathering or performance space.**
+ **Learning space can be developed like office space; it can be cost-effective to construct it as "core-and-shell" and allow it to be finished later as it needed and budgets allow.**



All photos courtesy of: EFCO Corporation

Fenestration Innovations

Window solutions for a new generation of schools

LEARNING FROM EXPERIENCE

The drive to bring American schools up to date with the challenges and opportunities of the 21st century inspires innovators in every category and segment of the industry. For decades, one such innovator, EFCO Corporation, has counted schools among its highest priorities. As a premier single-source supplier of commercial architectural fenestration solutions, the company has met the evolving demands of all types of schools—public and private, elementary through post-secondary. This required a broad understanding of the educational institution: where it's headed, how it works, who's leading its development, how it's funded, and much more.

With years of experience in helping make schools the best they can be, EFCO has an understanding of the situations facing educational institutions. This understanding has led to a streamlined process with efficient value-added products. For example, one way to deliver better quality at a lower cost is to specify EFCO factory-sealed windows, as opposed to windows glazed in the field. This can help glaziers do their job more efficiently, by eliminating expense and labor normally required for installation.

> *...the challenge is to find ways to enhance the energy efficiency, sustainability, security, and value of the final products.*

By choosing high-quality EFCO solutions, schools are investing in overall value—the kind of products that offer long-term freedom from leakage, degradation of components, warping, and other problems that result in service call-backs and maintenance hassles. As school designers continue to develop higher-performance facilities—and higher expectations of the manufacturers that supply them—the challenge is to find ways to enhance the energy efficiency, sustainability, security, and value of the final products. Meeting the demands of the educational institution with a diverse array of innovative products and confidence-building services must be a major focus for the industry.

Gibbs HS: Smart Moves for Today's Schools

New facilities and existing schools alike can benefit from the latest innovations. Administrators in Saint Petersburg, FL made extensive use of these ideas when they chose EFCO windows, entrances, curtain wall, and storefront to upgrade the city's Gibbs High School. Because the school is also a designated hurricane shelter for Pinellas County, the project required that all products installed must meet the Large Missile Test set forth in the Miami-Dade Building Code. EFCO impact-resistant products met the specifications and provided new aesthetic appeal, strength, and efficiency to the facility's fenestration systems.

Gibbs High School, Saint Petersburg, Florida

KEEP UP THE GOOD WORK

Designers need no longer discuss sustainable building in hypothetical terms. The demand is real and now is the time to create a built environment that fulfills the needs of today's occupants and conserves the resources of generations to come.

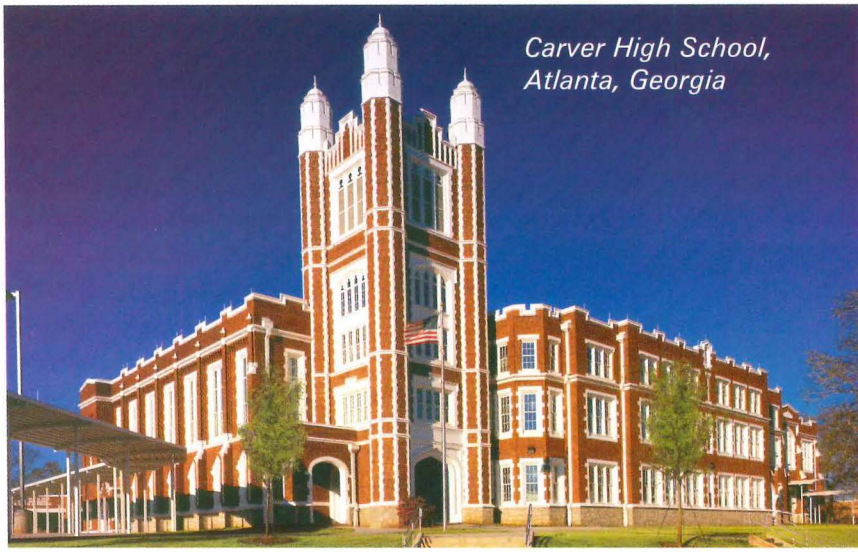
Through more stringent energy codes, green building initiatives, LEED Certification, and any number of other environmentally focused programs, public and private partners in the industry have begun to establish a lasting framework for sustainable design. EFCO Corporation offers tremendous experience in developing high-quality, durable, energy-efficient fenestration systems, and the company is proud to join the dialogue that brings the knowledge, expertise, and experience of manufacturers together with the perspectives of governments, architects, contractors, building owners, and consumers. Together, these stakeholders will establish a recognized system of best practices—a clear, mutual understanding of how we will move forward with this crucial work.

Measured Progress: Tested & Proven

Here's where schools get an indication of how well their lessons have been learned. Measured Progress handles scoring for the SAT test, the standard accepted by nearly every college in America and taken by more than two million students every year.

Fenestration by EFCO Corporation—including Series 402 (NT) and Series 403 (T) storefront, along with Series D500 swing entrance doors—helped make sure facilities at the Measured Progress office park lived up to high standards, as well. These products provided the project with strength, versatility, and the enhanced energy performance so important to applications in northern environments.

Measured Progress, Dover, New Hampshire


Carver High School, Atlanta, Georgia

LESSONS IN VERSATILITY

If you find it challenging to keep up with construction technology costs, think about how school boards and administrators must feel. By the time they've been through the process of developing a budget, passing a bond issue, getting the project designed, and starting construction, the costs originally assumed may be years behind reality.

Faced with such a discrepancy, school districts might have to resort to "building less of a building" or seeking out lower-priced, lower-quality suppliers. It isn't necessary to lower the expectations of what a project can achieve, however, as long as you utilize the resources and the expertise to provide efficient solutions that bring the finished facility much closer to the original vision.

Through experience with projects like Atlanta's Carver High School, EFCO has shown that it can help designers and building owners meet the practical and financial challenges that inevitably arise. In the case of Carver, they not only found a way to maintain the aesthetic integrity of the historic facility while working within the constraints of a tight budget, but also helped make the design of the project's new buildings compatible with the classic appeal of the renovated ones.

As schools continue to struggle with keeping their facilities on pace with the growth of their responsibilities, EFCO Corporation continues to work with them to maximize the performance of their buildings and the value they receive for their investments. For the sake of the students and the communities they represent, many schools are learning they need settle for nothing less.

Carver HS: Atlanta School Renovators Earn Extra Credit

When Carver High School got set to renovate the historic Leete Hall to host students participating in its innovative "small schools" program, the work hit a snag. Renovators called on EFCO Corporation to help salvage the assignment. Preserving the original profiles of the building's windows using conventional wood framing would far exceed the project's strict budget. However, using the versatile EFCO Trim-All™ panning system, which can be installed from inside the structure (eliminating costly, time-consuming scaffolding and staging on site), crews were able to complete the entire job in ten weeks. Carver High School did more than salvage Leete Hall's historic appearance—it improved its performance, enhanced its compatibility with the campus's new buildings, and made it a showpiece for Atlanta Public Schools.

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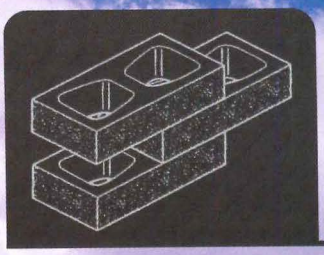

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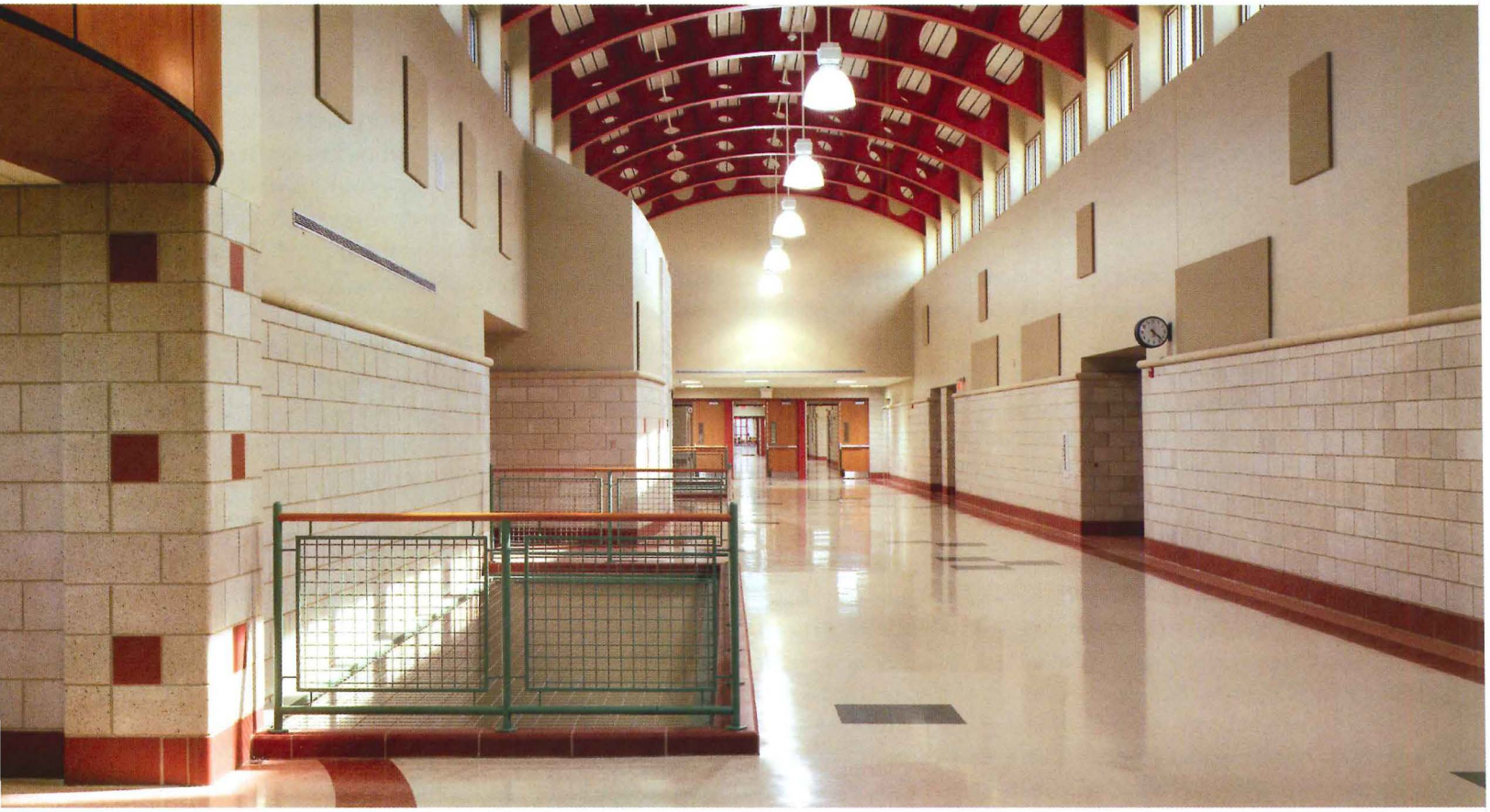

Photos courtesy of: Oldcastle Architectural, Inc.

When it comes to the appearance and structural integrity of a building, few materials offer the versatility and long-term durability of concrete masonry. Today's architectural block is manufactured in state-of-the-art facilities using technology that didn't exist a few short years ago. The result is a dazzling selection of sizes, shapes, textures and colors that provide the architect with a pallet of unlimited design options.

Committed to Education

With national capabilities and local presence, Oldcastle's commitment to customer service and satisfaction of educational facilities assures a level of service no supplier can match.

Moving Forward. Oldcastle Architectural streamlines your building projects by offering the largest selection of masonry and hardscape products throughout North America. A single point of contact within Oldcastle guides you through a multitude of design options, keeps your colors and textures consistent, and provides the highest quality products available. As the only national producer of masonry products, Oldcastle streamlines your bidding process and ensures you get the right product and the best service. And as the industry leader, Oldcastle offers more architectural options and a pipeline of new products to make every project a success.

Getting You to Green.

As the major manufacturer of concrete masonry products, Oldcastle has taken a leadership role in the development of innovative and environmentally friendly masonry solutions. As a responsible member of the U.S. Green Building Council (USGBC), Oldcastle is proud to provide products supporting your green building efforts. Their extensive offering of masonry products enables architects and building owners to work toward obtaining LEED certification. Many of Oldcastle's masonry products feature recycled content, either recycled aggregates or cement replacements, or save energy in completed structures, due to unique and efficient insulation methods.The company is constantly developing new products that facilitate green design, sustainability and lower life cycle building costs.

When it comes to the appearance and structural integrity of a building, few materials offer the versatility and long-term durability of concrete masonry.

Oldcastle Architectural Products—Benefits to Schools

Used in educational facilities throughout the U.S., Oldcastle products are high-quality premium architectural masonry units in custom colors, shapes and sizes that you won't find elsewhere. They contribute to a sustainable environment in several ways:

- **Low Life Cycle Costs** Oldcastle products are virtually maintenance free—there is no need to paint or refinish architectural masonry. Their strutural integrity and unmatched durability mean they last the life of your school building. In addition, they are naturally resistant to the abundant playful energy found in school children.
- **Reduced Energy Consumption** Masonry's high thermal mass walls have a significant impact in reducing energy consumption. The Integra and NRG insulated concrete masonry wall systems offer both high thermal mass and high R-values.
- **Better Air Quality** Unlike other products that tend to foster mold growth, architectural masonry is not a mold food source. This reduces the opportunity for mold growth, which in turn promotes cleanliness and good indoor air quality.
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- **Stormwater Management** Drain Stone and Turf Stone permeable paver systems help to collect, store and treat stormwater run-off in a more effective manner.

Smart Products for Education

Oldcastle carries a range of products tailor made for today's active educational environments.

Quik Brik—The Cost-Effective Alternative to Traditional Clay Brick

Quik Brik is a structural concrete masonry veneer that stands alone without structural backup. With the rich look of traditional brick, Quik Brik offers fast one-step installation, nationwide color consistency and variety, conformance to national building code requirements, fire resistance and energy efficiency with insulation and grouting options. Quik Brik is fade resistant and super strong—it actually exceeds ASTM C-90 requirements for compressive strength and absorption. And because Quik Brik features hollow cores, loose-fill or foamed insulation can be used to increase R-values for energy efficient walls that meet Model Energy Codes. Control Brik is the next generation Quik Brik. Control Brik improves Quik Brik's natural water resistance, further reducing your school's mold growth potential.

Glazed Concrete Masonry Units–The Perfect Choice for Schools

Available with recycled content, glazed concrete masonry units possess the beauty of glazed tile and the integrity and durability of concrete masonry. Exceptionally resistant to staining, abrasion, impact and chemicals, glazed concrete masonry is the ideal sustainable choice for any education facility. The glazed units are virtually impenetrable to graffiti, spray paint, permanent markers, grease and crayon. Mold and moisture resistant, glazed concrete masonry is USDA approved for sanitary and clean room environments.

Ground Face Concrete Masonry Units–Accentuating Natural Beauty

Ground face units (Verastone® recycled ground face, Verastone® Plus recycled, filled and polished face, Trendstone® ground face and Trendstone Plus® filled and polished face) are ground to expose the variegated colors of the natural aggregates. The pores and interstices of the filled and polished units are filled with a cementitious grout and the exposed faces are polished to exhibit a smooth terrazzo-like finish. A factory-applied clear satin gloss acrylic applied to these ground face units provides an extra dose of moisture resistance.

Insulated Concrete Masonry Units–Conserving Energy

Integra and NRG insulated concrete masonry wall systems offer exceptional energy performance due to their high thermal mass and high R-values (R-14 to R-19). Integra is used widely in the southwest and Gulf coast states while NRG is prevalent in the northeast and Great Lake states.

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Permeable Paver Systems–Managing & Filtering Stormwater

Drain Stone and Turf Stone permeable paver systems can help you manage today's stormwater runoff. How we choose to manage storm runoff today will affect the delicate ecosystems in our lakes, rivers, streams and bays tomorrow. Our Drain Stone system pulls water into the soil, reducing storm water damage and recharging ground water aquifers. The Turf Stone system allows rainwater to be filtered back into the soil naturally and gradually, resulting in the control and stabilization of soil erosion. The eco-friendly design of Turf Stone allows greenery to grow right through it, creating a highly unique hardscape design that works with the natural beauty of the land.

Web Site Links

To learn more about Oldcastle Architectural, their companies and products please visit:

Oldcastle Architectural	www.Oldcastle.com/architectural.htm
Quik Brik	www.Quik-Brik.com
Integra	www.IntegraWall.com
NRG	www.AdvancedConcreteTechnology.com
Glazed and Ground Face Units	www.Trenwyth.com
Permeable Paver Systems	www.Belgard.biz

About Oldcastle Architectural, Oldcastle Inc., and CRH plc

In North America, Oldcastle operates two divisions.

Oldcastle Materials is a leading U.S. producer of construction aggregates, asphalt and ready mix concrete with its companies organized in four major regional groups in New York/New Jersey, New England, Central states and Western states.

Oldcastle Products and Distribution comprises four strategic product groups:

- Oldcastle Architectural, which produces a broad range of masonry, Do It Yourself and professional hardscape products, packaged concrete mixes and decorative lawn and garden products.
- Oldcastle Precast, which manufactures concrete structures and pipes for power distribution, telecommunication systems, and drainage.
- Oldcastle Glass, which fabricates architectural glass systems for commercial and residential construction and refurbishment.
- Oldcastle Distribution is a specialty distributor of roofing and siding and insulation materials and interior building products.

Oldcastle Architectural operates as a "federation of companies," each of which retains its local identity and autonomy while leveraging the financial strength, best practice and purchasing power of a larger group. Oldcastle Architectural companies operate in more than 190 locations in 35 states and 2 Canadian provinces with a combined 7,000 employees.

Oldcastle Architectural is at the head of the class as a one-stop source for masonry and hardscape products. Oldcastle Architectural is part of Oldcastle, Inc. the North American arm of CRH plc. CRH plc is a major international producer of construction materials and building products with worldwide sales in excess of $11 billion. One of the world's top five building materials suppliers, CRH focuses on three closely related core businesses: primary materials, value-added building products and specialty building materials distribution. CRH operates more than 1,600 locations in 23 countries and employs 54,000 people. CRH established its North American presence as Oldcastle, Inc. in 1978 with the purchase of Utah's Amcor Masonry Products.

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Phone: 770-804-3363
E-mail: sales@oldcastleapg.com
www.oldcastle.com/architectural.htm

Oldcastle® Architectural

Education is as important to us as it is to you.

Meeting the floorcovering demands of school environments since 1967, Tandus develops "products with a purpose". We believe everyone has a part to play in creating a safe and healthy environment for schoolchildren to learn. We take pride in our part to inspire imagination and enhance learning with products that are design friendly, budget conscious, and environmentally responsible, which benefits us all.

In keeping with our mission, we created the only type of floorcovering that provides a wall-to-wall barrier against contaminates and moisture flowing through the backing and seams called Vinyl Cushion Tufted Textile (VCTT), or by our brand name, Powerbond®.

Flooring is our business. School design is yours. Working together with educators, we can create beautiful environments where our children can thrive and learn.

For additional information or a VCTT demonstration, contact your local sales representative at 800.248.2878.

Tandus®

Monterey C&A Crossley

800.248.2878

tandus.com

TANDUS. ONE COMPANY. MANY SOLUTIONS.

- Products with a Purpose
- Aesthetics
- Innovation
- Technology
- Sustainability

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Products with a Purpose:
Powerbond RS® - Vinyl Cushion Tufted Textile (VCTT)

Powerbond RS is vinyl cushion flooring in six-foot widths with a permanent wear layer of tufted textile. Powerbond RS is the only soft-surface flooring that is VCTT. This ensures that all components are properly balanced to create a product that has been shown to perform for over 35 years in school environments without failure.

SURFACE: Most types of hard surface flooring require multiple applications of a topically applied finish, called a wear layer, to protect the product. The wear-layer of Powerbond RS is permanent and not topically applied.

CONSTRUCTION: The wear layer of Powerbond RS is permanently fused to the cushion backing under heat and pressure.

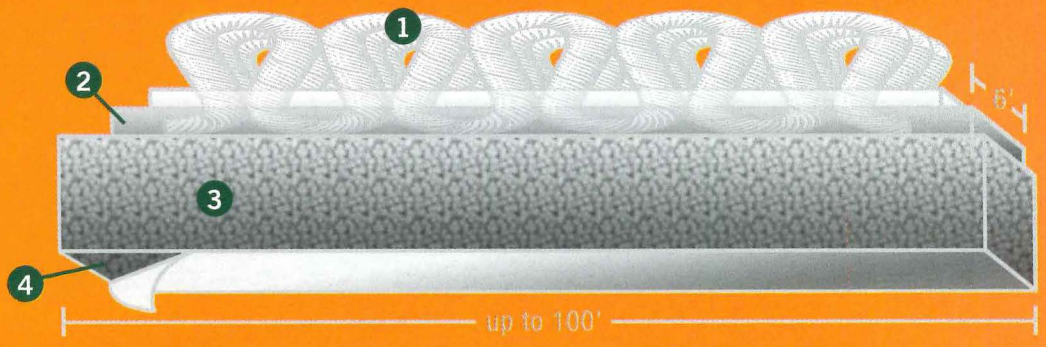
BACKING: Powerbond RS has a closed cell vinyl cushion, which creates a 100% moisture barrier and wall-to-wall protection from microbial growth, spills and even floods. The closed cell vinyl cushion accelerates drying times and does not require antimicrobials to protect against mold and mildew.

INSTALLATION: Unlike some types of carpet, the low profile of the wear layer has been proven to reduce contaminant accumulations and airborne contaminants. What's more, installation of Powerbond RS is a simple peel and stick application with nearly undetectable VOC's.

WARRANTY: Powerbond RS is warranted against delamination and wear for 25 years, non-prorated.

C&A Powerbond RS® is VCTT. This floorcovering is a "product with a purpose," which means it has been specifically engineered to deliver solutions for the school environment.

POWERBOND LINK ENGINEERING



1. Super dense low-profile wear layer constructed of 100% continuous filament nylon
2. Encapsulating vinyl sealant pre-coat
3. Closed-cell vinyl cushion
4. RS tackifier pre-applied adhesive

- 25-year non-prorated warranty
- Meets the most stringent IAQ criteria
- Cushioned vinyl back for comfort that also helps reduce slip/fall injuries
- Molecularly bound seams to ensure an impervious backing
- Impervious wall-to-wall moisture barrier

The First Step

Environmentally responsible floorcoverings for school safety and comfort

Tandus and C&A create products with a purpose–floorcoverings specifically designed to support health and safety in schools, as well as foster an environment that inspires learning.

Photos courtesy of:Tandu

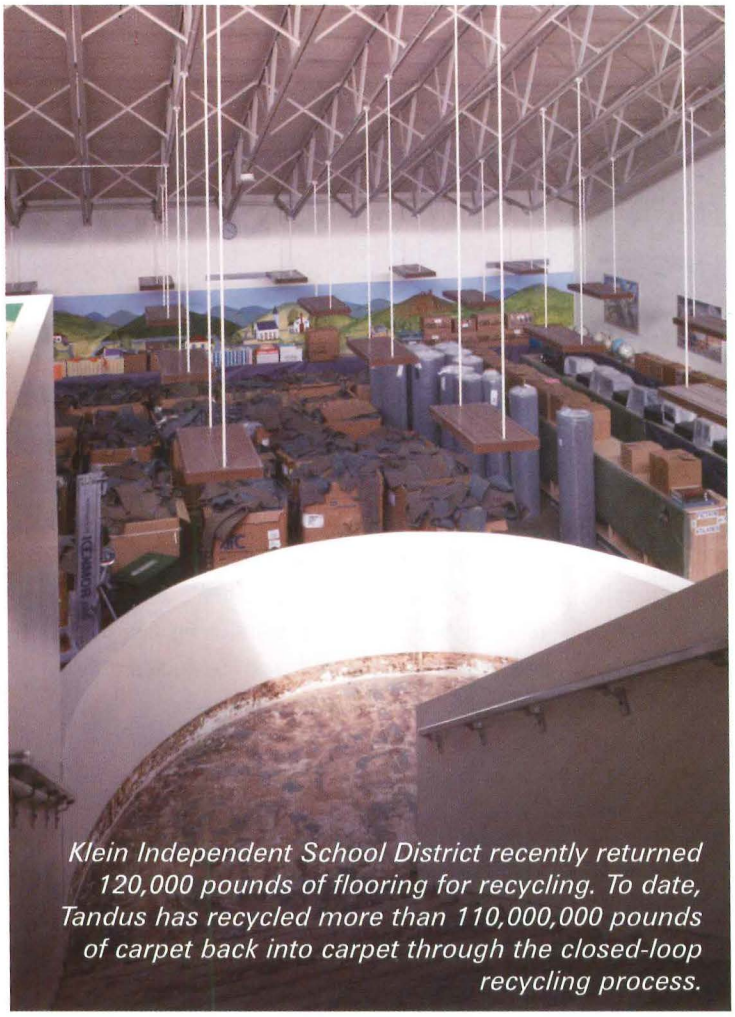
With the 21st century bringing about technological advances, globalization and an aggressive responsibility to the environment in which we live, schools need to feature more diverse learning environments with greater technology and an emphasis on the importance of sustainability.

On average, children spend close to 60% of their time away from home. If their first place of comfort is their home, shouldn't their second place of comfort be their school? At Tandus, the company works to create an environment conducive to learning that is healthy and safe for schoolchildren to laugh, learn and grow.

Tandus is a leading manufacturer of floorcoverings that unites the industry's leading specialized commercial flooring brands--Monterey, C&A and Crossley. By offering diverse product categories including Powerbond® six-foot roll goods, broadloom carpeting, woven carpets and carpet tile, their floorcovering brands offe standard product families with coordinated styles. These products enhance th appearance of any facility with proven performance, while addressing a number c budget alternatives, which is important in all school districts.

Tandus believes everyone has a part to play in the future of our education systen The role Tandus plays is to develop "products with a purpose," floorcoverinç specifically engineered to deliver solutions. Their products inspire imagination wi creative designs, are budget-friendly to meet economical restraints within scho budgets and are environmentally responsible to benefit future generations.

Tandus prides itself in appropriate applications--putting the right floorcovering the right place. Floorcovering that works well in one environment may not meet th



Klein Independent School District recently returned 120,000 pounds of flooring for recycling. To date, Tandus has recycled more than 110,000,000 pounds of carpet back into carpet through the closed-loop recycling process.

demands and needs of another environment. From using the right color in a classroom to stimulate creativity without being distracting, to providing a cushioned floor that creates a cozy atmosphere where children can be comfortable while sitting and standing, Tandus realizes the importance of a floor being more than just a floor.

Making healthy, comfortable and flexible learning spaces is key in good school design. With school facilities used daily by more than 59 million students, teachers and other adults in the U.S., adequate security, day lighting, ventilation, acoustics and other elements impact the health, and safety of our schoolchildren.

One of the most pressing issues facing our schools today is the ability to achieve good indoor air quality (IAQ). According to the Environmental Protection Agency (EPA), poor IAQ ranks as one of the top five public health hazards in the U.S. and poor IAQ plagues over half of all U.S. schools. Since flooring plays a critical role in maintaining good IAQ, it is vital to implement the right choice.

As most IAQ professionals will agree, major indoor air quality concerns, especially in schools are: mold/mildew growth, dust and air-born allergens and volatile organic compounds (VOCs). With the backing on floorcoverings as the primary defense against mold, mildew and fungal growth, it determines more than 90 percent of the flooring's overall performance. In knowing that, C&A, a Tandus brand, created the only type of floorcovering that provides a wall-to-wall barrier against contaminants and moisture flowing through the backing and seams. The vinyl cushion tufted textile (VCTT), called Powerbond®, has seams that are molecularly bound together at the time of installation and a factory-applied peel-and-stick adhesive that meets established minimums for adhesive and emission standards. Powerbond® can be cleaned with hot water extraction--eliminating harsh chemicals, allergens, fungi and bacteria up to 99 percent, and only takes a few hours to dry, eliminating the environment for mold, mildew or fugal growth. In addition, its tufted wear layer is extremely low and dense to reduce the buildup of contaminants and keep them near the surface for easy removal. With schools undergoing the continuous wear and tear that they do year after year, Powerbond® has proven to cost significantly less to maintain than conventional flow-through carpet.

With the 21st century embarking on more aggressive approaches to tackling the world's environmental issues, Tandus has made a proven commitment to stand out. Recognizing that sustainability is a journey, not a destination, Tandus is a leader in environmental innovation within its industry. It is the first floorcovering manufacturing company to create a true closed-loop recycling process. By recycling its own carpet,

> *Schools of the present and the future need to be designed utilizing natural resources and materials in order to provide the safest environment for children to learn.*

as well as its competitors' carpet, back into product, Tandus is helping to reduce landfill waste and greenhouse gases. To date, Tandus has recycled more than 110,000,000 pounds of carpet. Its environmental awareness and social responsibility does not stop there. Tandus has also invented an innovated process to recycle broken windshields into high-performance carpet backing and it uses high recycled-content products--also 100% recyclable--with virtually no VOC emissions. By collecting waste cooking oils from local restaurants, Tandus is able to use biodiesel to fuel its manufacturing processes.

The 21st century has been about growing and building in harmony with nature. Schools of the present and the future need to be designed utilizing natural resources and materials in order to provide the safest environment for children to learn. Schools shape our children's future, and in a broader sense, so do companies who are committed to children and sustainability.

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Tandus
Monterey C&A Crossley

Recent Model Code Changes Affecting the Use of Wired Glass

Does "safety" mean fire safety? Impact safety? or Both?

Glazing materials cannot be specified on the basis of intuition or rumor. In fact, all building materials must be specified on the basis of performance. For example, some glass can be used to block fire and smoke, but provides limited impact resistance. Some glass is not safe in a fire, but provides a high level of impact resistance. On the other hand, some glass can provide both fire and impact resistance. Putting the right glass in the right place starts with knowing both the capabilities and the limitations of the glass you are specifying.

FIRST, LET'S LOOK AT GLASS THAT IS SAFE IN FIRES.

Wired glass has a long history as one of the best and least expensive fire-rated glazing materials on the market. It can protect occupants trying to escape a burning building from the spread of flame and hot gasses for a full 45-minutes. In fact, as wired glass heats up in a fire, the glass softens and actually "heals" cracks that form, while the wire holds the glass firmly in its frame.

Annealed glass, on the other hand, breaks and falls out of its frame if exposed to flames or temperatures as low as 250° F. Needless to say, it shouldn't be specified in passageways constructed to keep occupants safe while exiting a burning building. Likewise, tempered and laminated glass don't perform safely in fires. Tempered glass disintegrates if it is heated or cooled unevenly and the polyvinyl butyral (PVB) interlayer used to laminate standard float glass will burn, leaving the glass to break and fall out of its frame.

NOW, LET'S LOOK AT GLASS THAT IS SAFE IN ACCIDENTAL IMPACTS.

Some building locations are prone to accidents. The building codes designate these areas as "hazardous locations." Areas susceptible to accidental human impact with glass are found mostly around doors and walkways, especially if a glass lite is put in an opening big enough that it mistakenly looks like you can walk through it.

Everybody knows that glass can break. The trick is to make sure that glass used in "hazardous locations" either won't break at all or, if it does, it will break safely if accidentally impacted.

This is where tempered and laminated glass excel. Tempered glass is extremely resilient and rarely breaks when impacted. If it does, it tends to disintegrate into harmless pieces. Although laminated glass will often break on impact, the PVB interlayer usually prevents a hand, arm or other body part from penetrating the break. Thus, tempered and laminated glass products can withstand breakage or "break safely" when impacted by as much as 150 or even 400 ft. lbs. of force.

THE RULES HAVE CHANGED REGARDING THE USE OF WIRED GLASS!

Until recently, wired glass was virtually the only fire-rated glazing material able to survive a 45-minute fire test followed by the thermal shock of a hose stream test. At the same time, however, wired glass is only able to safely pass simulated impact testing up to 100 ft. lbs. of force, less than the 150 ft. lbs. required for CPSC's Cat. I glazing or the 400 ft. lbs. required for Cat. II. Today, a number of fire-rated window makers offer fire safe products that are also able to withstand these more rigorous, 150 and 400 ft. lb. impact tests required by 16 C.F.R. § 1201. In fact, a fire safe laminated wired glass is now available that can meet the 150 ft. lb. impact test required for Cat. I products.

In response to the growing availability of newer products able to provide both fire and impact safety, the International Code Council appointed an ad hoc committee

to study the use of glass in hazardous locations. As a result of that study, the ICC made several changes to the model codes. First, they recognized that special risks of human impact naturally occur throughout athletic facilities. This led to a rule which essentially says that all areas in athletic facilities are very "hazardous locations" and, therefore, only Cat. II impact tested glass products may be used. Second, it led to a rule prohibiting the use of standard 1/4" wired glass ("standard wired glass") in hazardous locations, even if a fire-rating is also required.

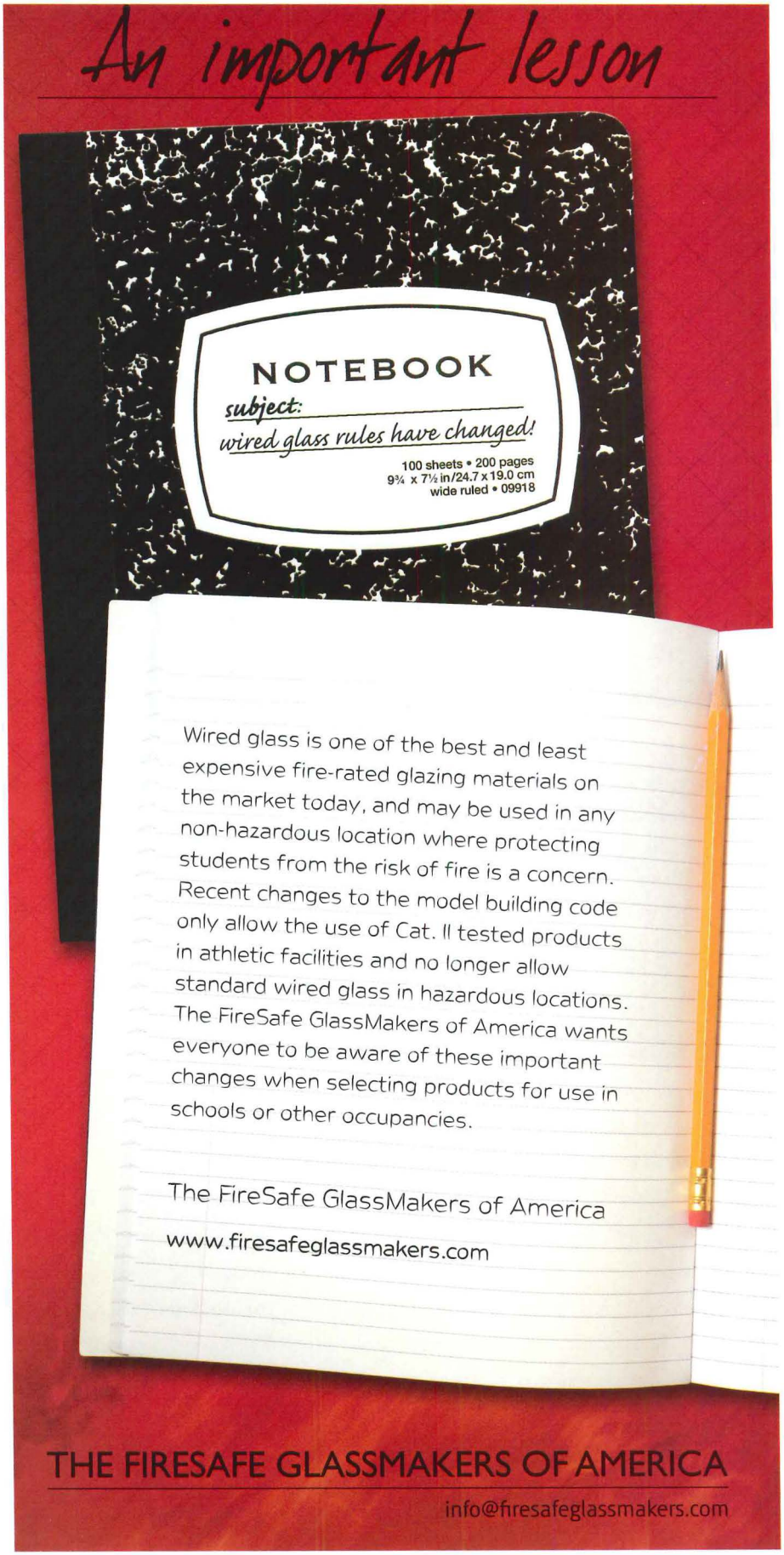
WHERE CAN WIRED GLASS BE USED AFTER THESE CHANGES?

These new rules only apply to athletic facilities and other hazardous locations. Standard wired glass can still be used in any window or other opening (such as a transom) that is not a hazardous location.

MY JURISDICTION HASN'T ADOPTED THE NEW IBC: WHAT SHOULD I DO?

The central issues surrounding the use of standard wired glass are fire and impact safety. Whether or not the building code in your jurisdiction has been updated to include new model building code rules, only Cat. II tested products should be used in athletic facilities. Likewise, only Cat. I or Cat. II tested products should be considered in any other hazardous location. While standard wired glass should be considered whenever fire safety is an issue, it should not be used in any hazardous location, even if fire-rated glazing is also required.

For more information about wired glass, e-mail info@firesafeglassmakers.com or visit firesafeglassmakers.com.



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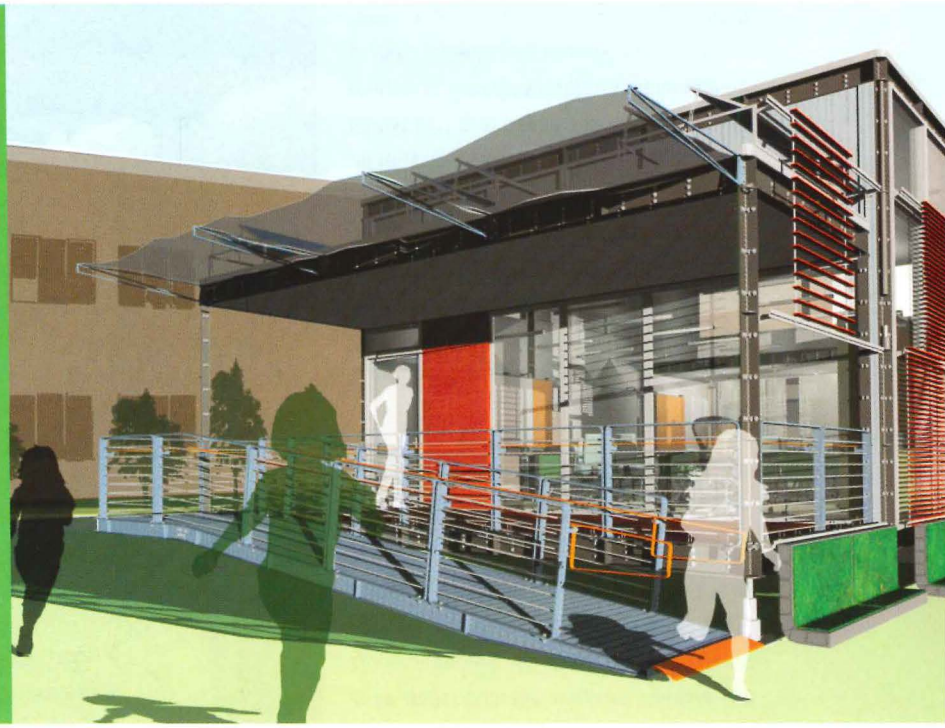
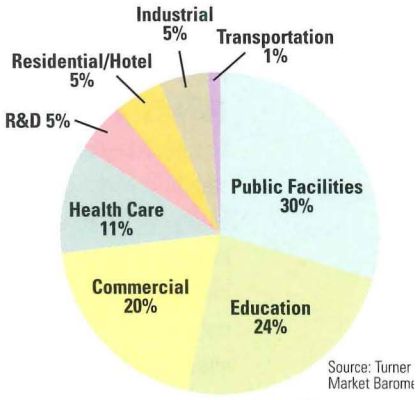
Williams Scotsman... Looking towards the future of modular classrooms today.

"Educators are looking for classrooms where learning is not only enabled but actually inspired. By creating a modular product with space that is voluminous, naturally day lit, adaptable, and environmentally friendly and have it accomplished with intuitive and understandable technologies we believe we can create true learning environments for the 21st Century"

– 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 | Coplan | 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 100 offices, Williams Scotsman provides premier quality and service.



Sectors Expected to Have the Most Green Building Activity

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Photo courtesy of: Williams Scotsman

Modular Buildings Mean Optimal Learning

According 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.

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.

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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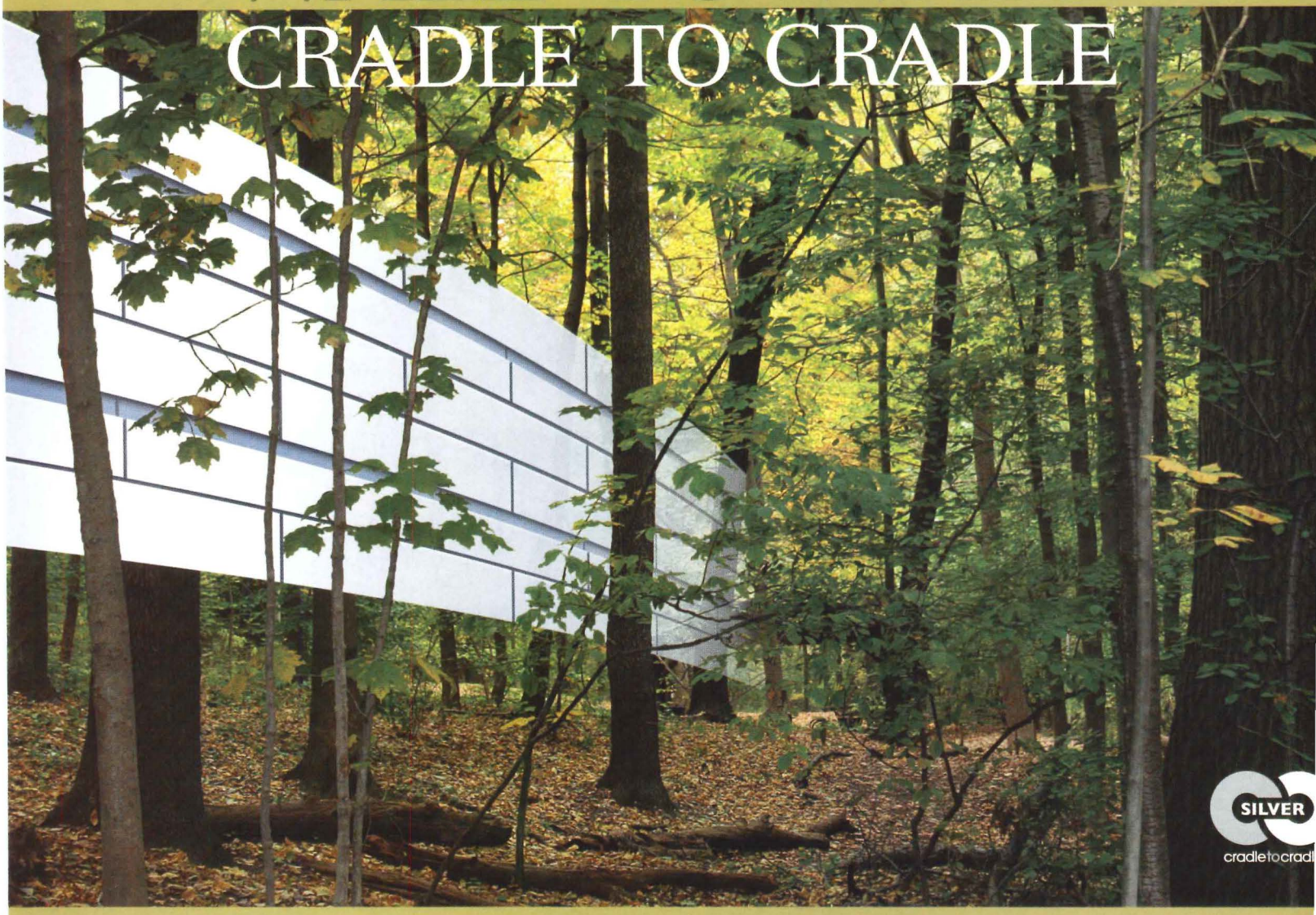

Cradle to Cradle certification means more than Green. It means Ecologically Intelligent Design.

CENTRIA Formawall® and Versawall® insulated metal composite wall systems are the first-ever exterior building products to receive the coveted Cradle to Cradle™ certification. This means both wall systems have been evaluated and approved by McDonough Braungart Design Chemistry as the best choice for the environment. From foam insulation to metal face and liners, from package design to the use of water and other natural resources at CENTRIA manufacturing sites.

Learn more today at CENTRIA.com/C8/GreenData or call 888.216.9600

100 YEARS
CENTRIA

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New 3 R's for New School Solutions

Wall and roof systems for the green educational building

Today's complex educational building market highlights the importance of meeting a wide variety of aesthetic and functional challenges for school construction. This is at the foundation of CENTRIA's leadership position in custom-engineered architectural metal wall and roof systems, as they create solutions for this all-important segment of the construction industry.

As a result of ongoing research and studies in advanced thermal and moisture protection, CENTRIA continues to refine new solutions for the Green Educational Building, which includes:

- Resistance to mold
- Recyclable
- Reliability

Resistance to Mold

CENTRIA has responded to the need for better thermal and moisture control with their Advanced Thermal Moisture Protection solutions. ATMP® focuses on the use of single component wall systems or an Insulated Composite Back-up Panel (ICBP) solution that reduces the number of materials used and trades involved in wall installation, resulting in higher thermal efficiency and a lower potential for mold. The Formawall® Dimension Series® insulated metal composite panel system is one solution that offers a complete, thermally efficient, high-performance exterior wall that can be installed quickly and economically. The panel's horizontal joint is pressure-equalized and provides uninterrupted air, water and vapor barriers.

The future requires advancements in wall and roof system design and technology to meet the increasing demands for better materials, value, performance and longer life cycles.

Recyclable

Recognizing the importance of environmentally responsible building, CENTRIA product design focuses on energy efficiency, sustainable design, and utilizing recyclable materials. Two CENTRIA products, Formawall Dimension Series and Versawall® exterior metal panels, are Cradle-to-Cradle Silver certified and our EcoScreen™ perforated screenwall product was recently certified Cradle-to-Cradle Gold. The certification process is currently underway for the new Formawall® Graphix Series™, an insulated metal composite panel with segmented joints that creates the appearance of a multi-panel design with a single panel.

Furthering the company's commitment to sustainable design, CENTRIA is a member of the U.S. Green Building Council, the Cool Roof Rating Council and an Energy Star Partner.

Photo courtesy of: CENTRIA

Reliability

The future requires advancements in wall and roof system design and technology to meet the increasing demands for better materials, value, performance and longer life cycles. CENTRIA stands ready to provide solutions. Utilizing the entire CENTRIA organization, their 100-year experience, in-house testing facilities and relationships with national consultants and universities, the company's goal is to provide superior long lasting product solutions to the construction industry.

Based in Moon Township, near Pittsburgh, CENTRIA is an international company and the nation's premier supplier of architectural metal wall and roof systems used in industrial and commercial projects. Since 1906, CENTRIA professionals have provided quality products and service for architectural and construction firms worldwide.

CENTRIA
For more information,
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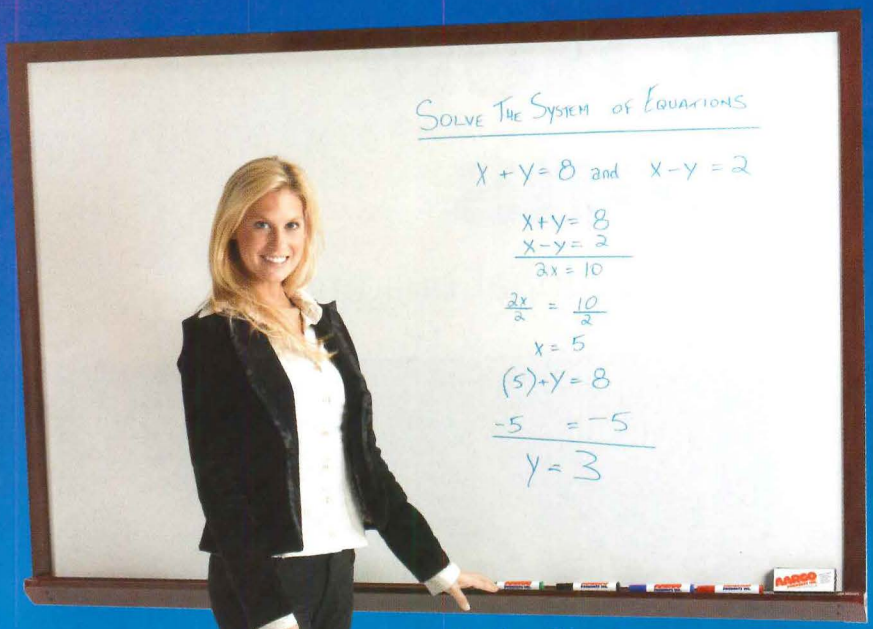
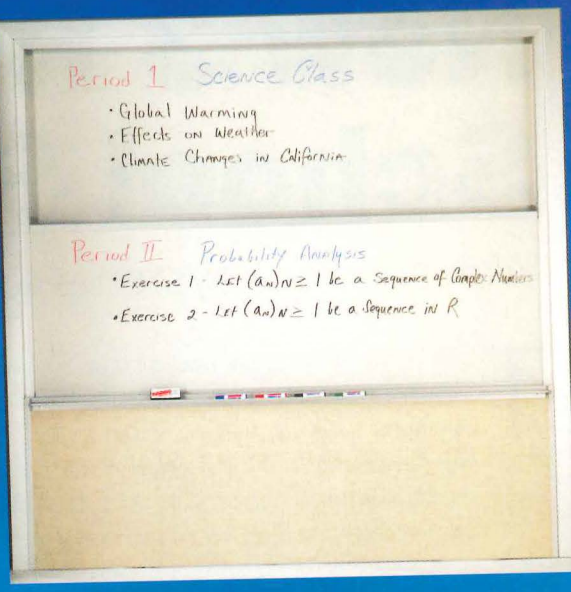
For All Your Visual Communication Needs





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- Chalkboards
- Bulletin Boards
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- Projection Screens
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- Bulletin Board Cases
- Trophy Cases
- Crowd Control Products
- Menu Boards and Signs
- Literature Racks
- Markers and Accessories
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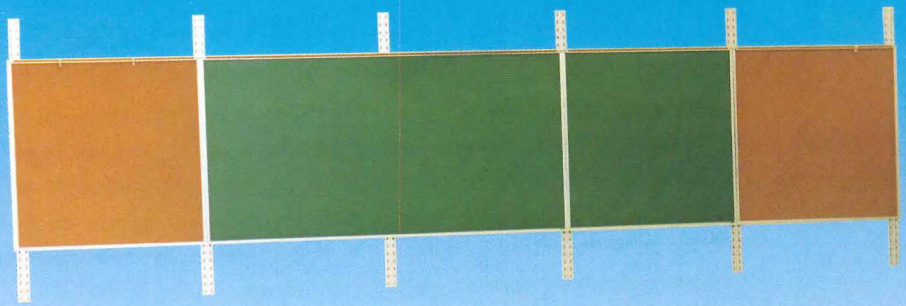
- Outdoor Changeable Signs



AARCO PRODUCTS INC.

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www.aarco.com

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How traditional products meet today's needs

In today's classroom environment the demand is for dust free, durable products that are cost effective. They must also take into account changes such as new building codes and the use of technology. Rising costs related to installations and product failure have prompted school boards to purchase quality products with long life expectancies.

For over 30 years, Aarco Products has been manufacturing visual communication and display products that often out perform those considered to be the industry standard. Innovative design and engineering allow their products to meet the demands of today's classrooms.

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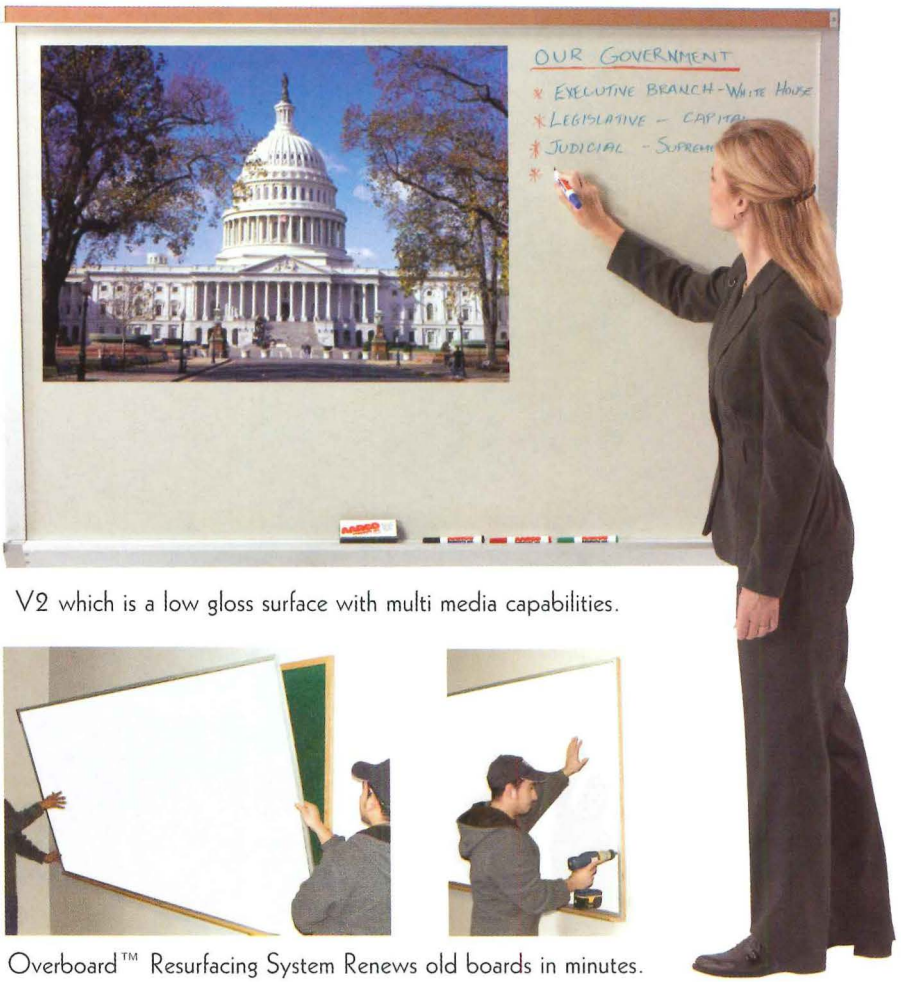

V2 which is a low gloss surface with multi media capabilities.

Overboard™ Resurfacing System Renews old boards in minutes.

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Meeting the demands of modern building codes is another challenge. Some cities and towns have implemented more stringent fire codes. To satisfy these requirements, Aarco Products has developed their Metal-Fab™ built in lighted display case. This unique product gives architects an option to provide a built in display case that is class A fire rated.

As school designs become more creative, there is a growing need for products that are customizable. Aarco offers a full line of traditional products that can be specified to meet the requirements of todays modern school design. They also offer an extensive variety of finishes that are available on both standard and specified products. An example of which is the new WOOD LOOK FINISH. This new finish offers the warm traditional look of wood but with durable powder coating over extruded aluminum shapes. They also offer a wide selection of colors, many of which are available at no addition cost.

In a time when many companies are selling products that are imported from far away places, Aarco has increased its all domestic manufacturing facilities. This protects the quality of their product and maintains fast lead times that are often faster than other manufacturers.

In all, Aarco Products is a leader at innovating and manufacturing traditional products for modern day schools that are always to spec and always a value.

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A Shared Vision

Architects and their clients strive to nurture collaboration and community with learning environments that are adaptable and sustainable

BY JOANN GONCHAR, AIA

When selecting the schools for the case studies that follow, the editors of SCHOOLS OF THE 21ST CENTURY aimed to assemble a group of buildings that were thoughtfully designed, conducive to learning, and responsive to the needs of their many constituents. In addition to these qualities, we hoped the collection would be diverse. We worked hard to find schools large and small, in different parts of the country, and representative of distinct educational philosophies and design sensibilities.

And at first blush, these schools couldn't seem more different. A two-classroom private preschool in San Francisco, with a curriculum that focuses on sensory learning, would seem to have little in common with a 1,700-student high school in Columbia, South Carolina, where educators are working to prepare students for work and college. Nor could a low-rise elementary school surrounded by woods in a suburb of Seattle be more different than a sleek six-story arts high school on a constrained site in gritty Detroit.

However, when we scratched beneath the surface, commonality emerged. Flexible, adaptable, and sustainable were the adjectives that educators and architects used to describe their schools again and again. They said the buildings provided intimate learning environments and fostered a sense of community and collaboration among students and faculty members alike.

Not only did they speak of their buildings in similar terms, but the architects employed some of the same design strategies. For example, the Denver School of Science & Technology, the Alpine prototype schools, and Blythewood High School use a clustered-classroom model despite their differences in both size and educational mission.

Designers and school officials also described the process used to create the schools in remarkably similar ways. Design and programming almost always began with a series of collaborative meetings that included parents, educators, administrators, community members, and students.

Although the shared qualities that surfaced during the course of our investigation were somewhat of a surprise, they were also reassuring. The commonalities are a sign that most districts, regardless of individual circumstances, have similar aspirations for their students and the buildings they will occupy. We feel confident you will find inspiration for any K-12 project on the following pages. ■

www.schoolsofthe21stcentury.com

CREDITS

OWNER: **Olympic View Realty, LLC**

ARCHITECT:
Mark Horton/Architecture—Mark Horton, *AIA, principal-in-charge;* **Chris Roach,** *project architect;* **Paul Haydu,** *project designer*

CONSULTANTS: **Endres Ware Engineers** *(structural);* **MHC Engineers** *(mep);* **Brian Kangas Foulk Engineers** *(civil);* **Treadwell & Rollo** *(geotechnical);* **Charles M. Salter Associates** *(acoustical);* **Conger Moss Guillard** *(landscape);* **Northern Sun Associates** *(general contractor)*

SOURCES

PREMANUFACTURED BUILDING SYSTEM: **VP Buildings**

CEILING SYSTEMS: **USG**

CARPET: **Milliken**

PAINTS AND STAINS: **Benjamin Moore**

KITCHEN APPLIANCES: **General Electric**

INTERIOR AMBIENT LIGHTING: **Prudential, SPI, and Zumtobel**

PLUMBING FIXTURES: **Kohler and Elkay**

A New Slant on Preschool

Using a prefabricated structure and varied building materials, a building promotes learning through all five senses

BY C.C. SULLIVAN

The Montessori Children's Center in San Francisco had an opportunity for blank-slate planning when it was compelled to move from its home in an adapted locker room of an university athletic facility. To make way for new occupants, the landlord of the planned-unit development offered to relocate the pre-school a half-mile away. The project's planners saw the new structure and its playground as a chance to create a facility that embodied the school's unique philosophy and curriculum.

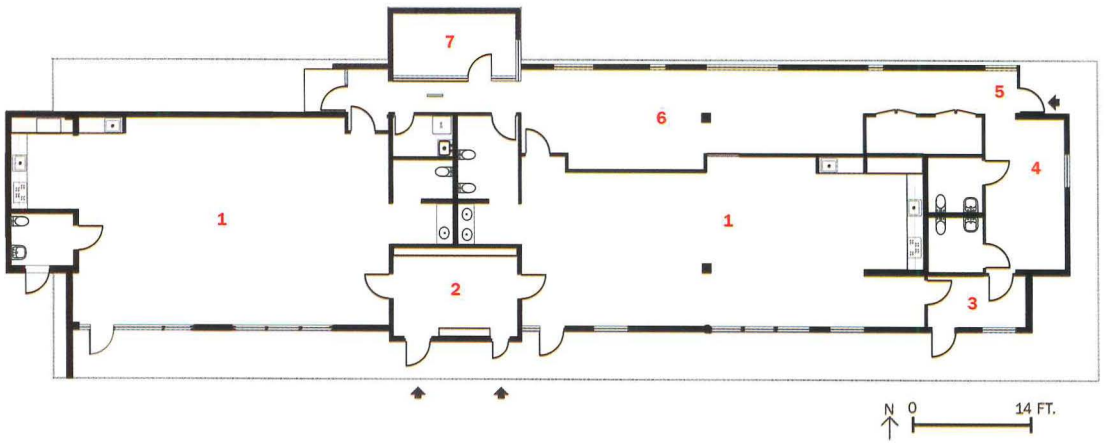
So the two-classroom, 4,400-square-foot building had to reflect the Montessori method, which generally focuses on natural discovery and self-motivated learning through all five senses, structured and paced according to each child's needs and choices. "We provide a foundation for the excitement of learning," Judith Flynn, the school's founder and director has explained. "And we create a harmonious atmosphere so children can develop all aspects of their personalities—physical, social, intellectual, and emotional." Typically classes span a three-year age range to encourage the passing of knowledge between older and younger children. Learning areas are designed to house various stations for activities, many employing patterns and colors to stimulate the mind.

The spatial programming and design ideas respond to the curriculum by emphasizing the connection to nature and the distinction between indoors and outdoors, says Mark Horton, AIA, the architect. Horton gathered information through firsthand observation of early-age classrooms.

To express a connection to the environment "the building faces south and [the roof] was sloped to allow the school to collect rainwater in a cistern for their garden," says Horton. The standing-seam metal roof's three supporting steel trusses were assembled off-site and are oriented along the building's long east-west axis. The approach decreased the number of field connections required and helped ease construction, according

Floor Plan

1 Classroom
2 Student entry
3 Break/conference room
4 Administration
5 Visitor entry
6 Nap room
7 Director's office



Sliding glass doors in the south facade (above and right) open to a landscaped play area, where aromatic plants and varying surfaces encourage sensory exploration. Window headers echo the slope of the roof. Corrugated metal panels and large glazed openings contrast with stucco surfaces and punched openings.

to the architect. Ample windows on the south facade have angled headers that echo the slope of the roof. The eastern wall lists dramatically in an opposing direction.

Classrooms open to a landscaped play area through sliding glass doors. Vinyl floors transition to a stained concrete terrace emphasizing the indoor-outdoor threshold. Other finishes add pattern and texture: corrugated metal panels and large areas of glazing contrast with stucco surfaces and punched openings. Different colors accentuate the various materials. The theme extends to the playground, where aromatic plants and special surfaces support sensory exploration.

With vanilla tones, the interiors are subdued. Contrasting flooring colors reflect a ceiling soffit line demarcating classroom space and circulation area.

NOT JUST A BOX

From the exterior, the pre-school's unusual shape and demeanor announce immediately that the academic approach contained within is not run-of-the-mill. The link between the classrooms and the outdoors informs much of the student experience, and the expressive patterning and coloring reinforce experiential Montessori learning. This modest, $1.5 million facility fuels discovery and discussion.

Yet, while its custom premanufactured structural system saved construction time, it wasn't especially economical. And not all of the building's features are used by the Montessori teachers. For example, the school has yet to collect rainwater from the roof. Horton attributes this under-utilization to the project's unusual circumstances and to a lack of educator input in the design process. "There were two clients, the paying party and the Montessori school, and it became awkward," he says. In spite of the less-than-ideal situation, the resulting school seems remarkably in sync with the Montessori mission. ■

C.C. Sullivan is an author and communications consultant specializing in architecture and construction.

A stained concrete playground patio (above) transitions to vinyl classroom floors inside the building (left). Differing colors of the vinyl flooring material and a ceiling soffit distinguish classroom space from a circulation zone.

CREDITS

OWNER: **Richland School District Two**

ARCHITECTS: **Perkins+Will** *(design architect)*—**Steven Turckes,** *AIA, managing principal;* **Jerry Johnson,** *AIA, design principal;* **Hans Thummel,** *AIA, senior project architect;* **The Boudreaux Group** *(architect of record)*—**John A. Boudreaux,** *AIA, principal-in-charge;* **Heather A. Mitchell,** *AIA, principal;* **R. Randall Huth,** *AIA, principal*

CONSULTANTS: **Swygert & Associates** *(mechanical);* **Belka Engineering Associates** *(electrical);* **RB Todd & Associates** *(civil);* **Southern Management Group** *(construction manager)*

SOURCES

STRUCTURAL SYSTEM: **Dixiana Steel**

EXTERIOR MASONRY: **Allied Concrete Products and Exum Company**

CURTAIN WALL: **Conmat Inc.**

ENTRANCE DOORS: **Palmetto Metal Products**

WOOD DOORS: **Weyerhaeuser**

HARDWARE: **Corbin Russwin**

AUDITORIUM SEATING: **Architect Equipment Systems/Hussey**

LOCKERS: **Tri-State Installations/Lyon**

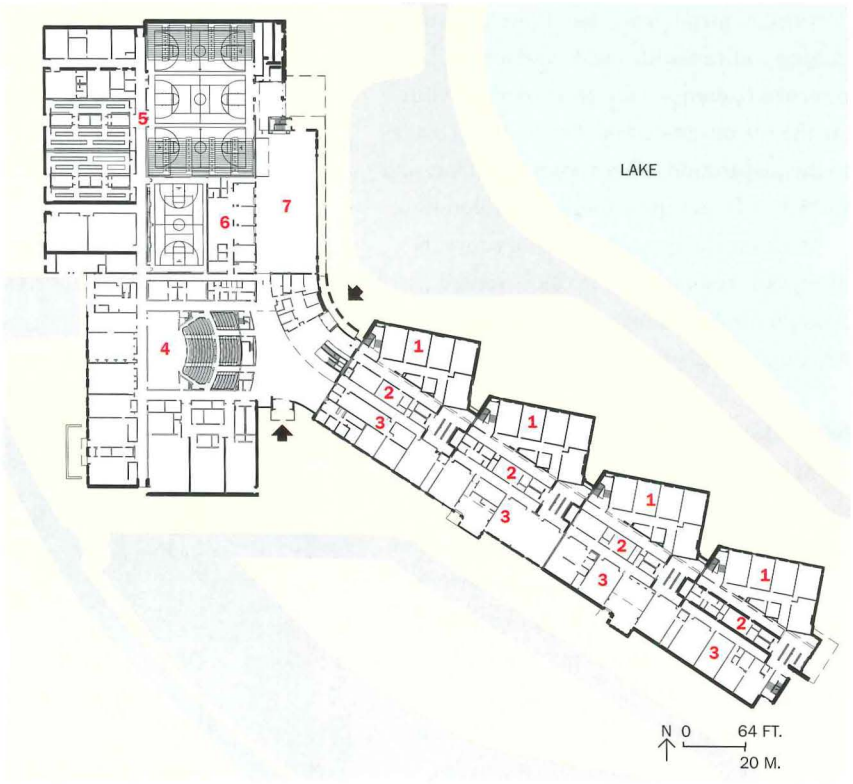
The Sum of Smaller Parts

On a geographically rich site, a quickly growing South Carolina district builds a large high school with intimate and flexible learning environments

BY C.C. SULLIVAN

When a fast-growing, progressive school district in suburban Columbia, South Carolina, started planning Blythewood High School in 2001, administrators wanted to create an intimate learning environment despite the need for a building that would accommodate 1,700 students. "Our philosophy is like an elementary school," says Sharon Buddin, the school's principal. "We want to know everybody and have students know each other well, too," she says. The district is a participant in Breaking Ranks II, a national reform movement that advocates development of small learning communities, or SLCs, within large high schools.

On a 140-acre wooded site, notable for wetlands and a 10-acre pond—as well as for a major highway running along its western flank—the Richland School District Two envisaged Blythewood as a high school with four themed zones geared toward business, health, engineering, and the humanities, supporting a dozen "career clusters." Each of these



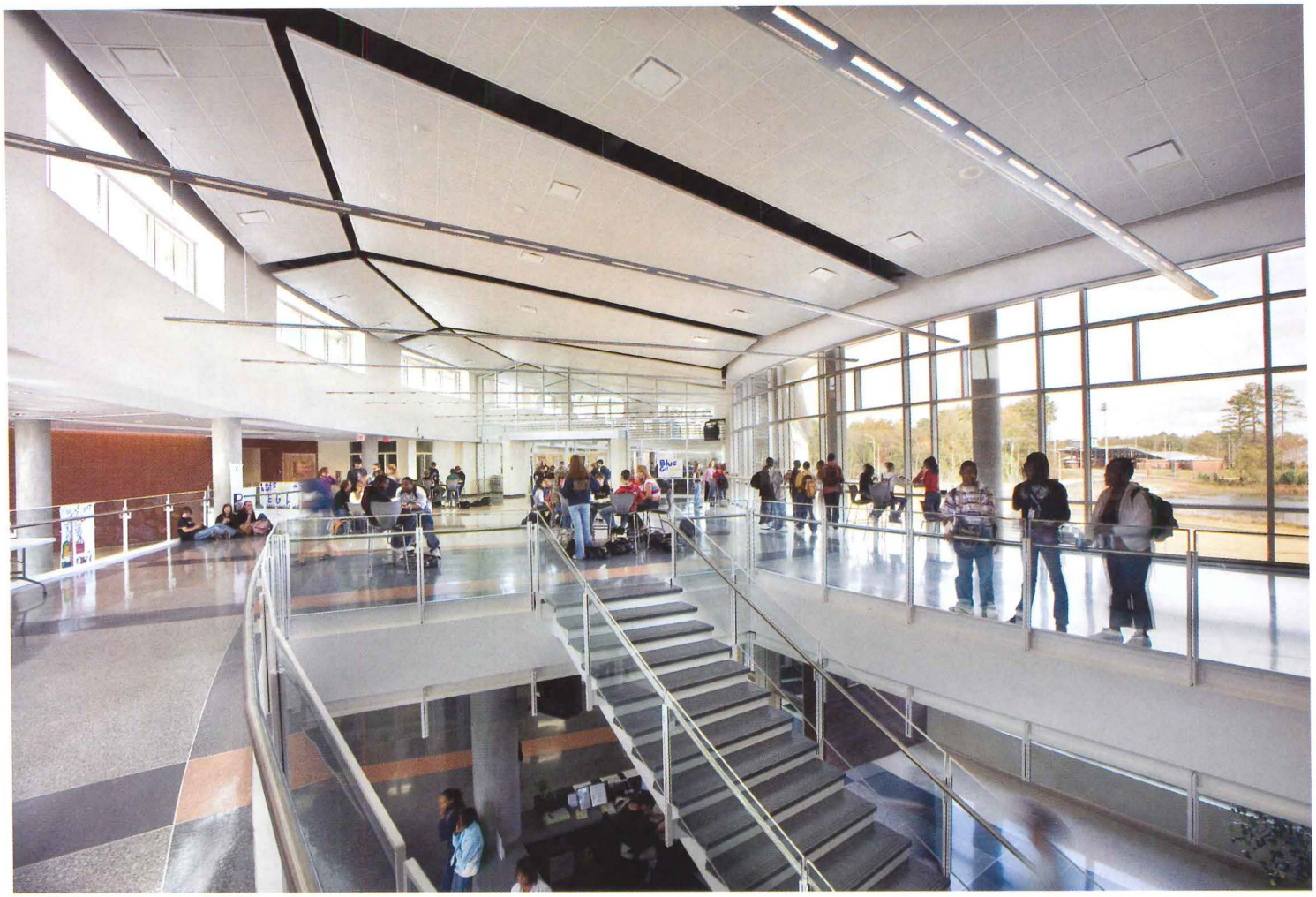
First Floor

1 Classrooms
2 Administration
3 Science labs/ technology studios
4 Arts
5 Wellness center
6 Kitchen
7 Commons/cafeteria

A small tower marks the curved entrance to the school, where a dramatically sloped roof covers an ample, largely glass-enclosed lobby.

The building is configured to take advantage of the site's natural assets, including a 10-acre pond and surrounding woods.

The design and construction team also preserved the site's ecologically sensitive wetlands through careful planning.



Although wireless connectivity is available throughout the school, the second-floor "cyber cafe" is intended as a place for informal student interaction. It is located directly above, and is open to, the lobby below.

zones would have a dedicated locker common and a faculty planning area. Shared by the SLCs—informally known as "houses"—would be laboratories, a media center, a wellness center, a 500-seat theater, and other common facilities. The site also would have to accommodate a 6,000-seat, district-wide stadium with separate vehicular access.

FLEXIBLE AND FOCUSED

Planning workshops involving designers, educators, community members, and students produced a profile of "a learner-centered, teacher-focused facility with flexible spaces to accommodate groups as small as six kids at a time," says the project's lead design architect, Steven Turckes, AIA, a principal at Chicago-based Perkins+Will. Rather than the departmental model more typical of a traditional high school, Blythewood's program and spatial organization reflects its interdisciplinary and collaborative curriculum, he says.

Capitalizing on the site's rich natural features, the 294,000-square-foot, two-story building hugs the pond. Linked along the north side of a circulation and administrative spine, four projecting volumes contain the houses and provide views over the water. Science labs linked to double-story technology studios—large multifunction rooms for undertaking school projects—line the south side of this spine.

A small tower draws the eye toward the curved entry, where a dramatically sloped roof covers an ample, largely glass-enclosed lobby. This area connects to administrative offices, the cafeteria and student commons, a media center and "cyber cafe," as well as a culinary arts lab. Beyond these central facilities are the theater, arts and music classrooms, two gymnasiums, and locker rooms.

Through its orientation and organization,

PHOTOGRAPHY: © JAMES STEINKAMP, EXCEPT AS NOTED;

the facility richly exploits sunlight and views of nature. Clerestories and south-facing windows admit daylight deep into the building. The classrooms enjoy a visual connection to

Planning workshops produced a profile of a learner-centered, teacher-focused facility with flexible spaces.

the pond and woods, which also support outdoor education through a state university-funded biology initiative.

Although the building is surrounded by ecologically sensitive wetlands, the architect was able to leave them largely untouched through careful planning. The design and construction team also worked to minimize the number of trees felled, maintaining a wooded buffer between the high school grounds and the noise and pollution produced by the neighboring interstate.

FRINGE BENEFITS

As for the SLC-driven layout, Buddin points to unexpected functional advantages beyond the school's anticipated improved student achievement. "For example, none of us realized how quiet it would be," she explains. "Once the students get in their houses, their pattern of movement is not so large." Yet the feeling indoors remains lively, with spaces of different sizes and character.

In spite of varied building forms and extensive glazing, the $37.3 million cost was lower than the district anticipated, allowing the architect to specify upgraded finishes such as terrazzo and brick.

Feedback on the facility, which was completed in August 2005, has been positive. "Students say the building makes them feel smart," Buddin reports. "It does work." ■

Blythewood's double-story, multi-purpose technology studios (top) are directly connected to clusters of science labs. The school has several career-oriented facilities to support its atypical curriculum, such as the culinary arts lab (bottom).

CASE STUDY *Detroit School of Arts*

Culture Club

Two distinct curricula are skillfully choreographed to foster a beehive of professional-level arts activity

BY DAVID SOKOL

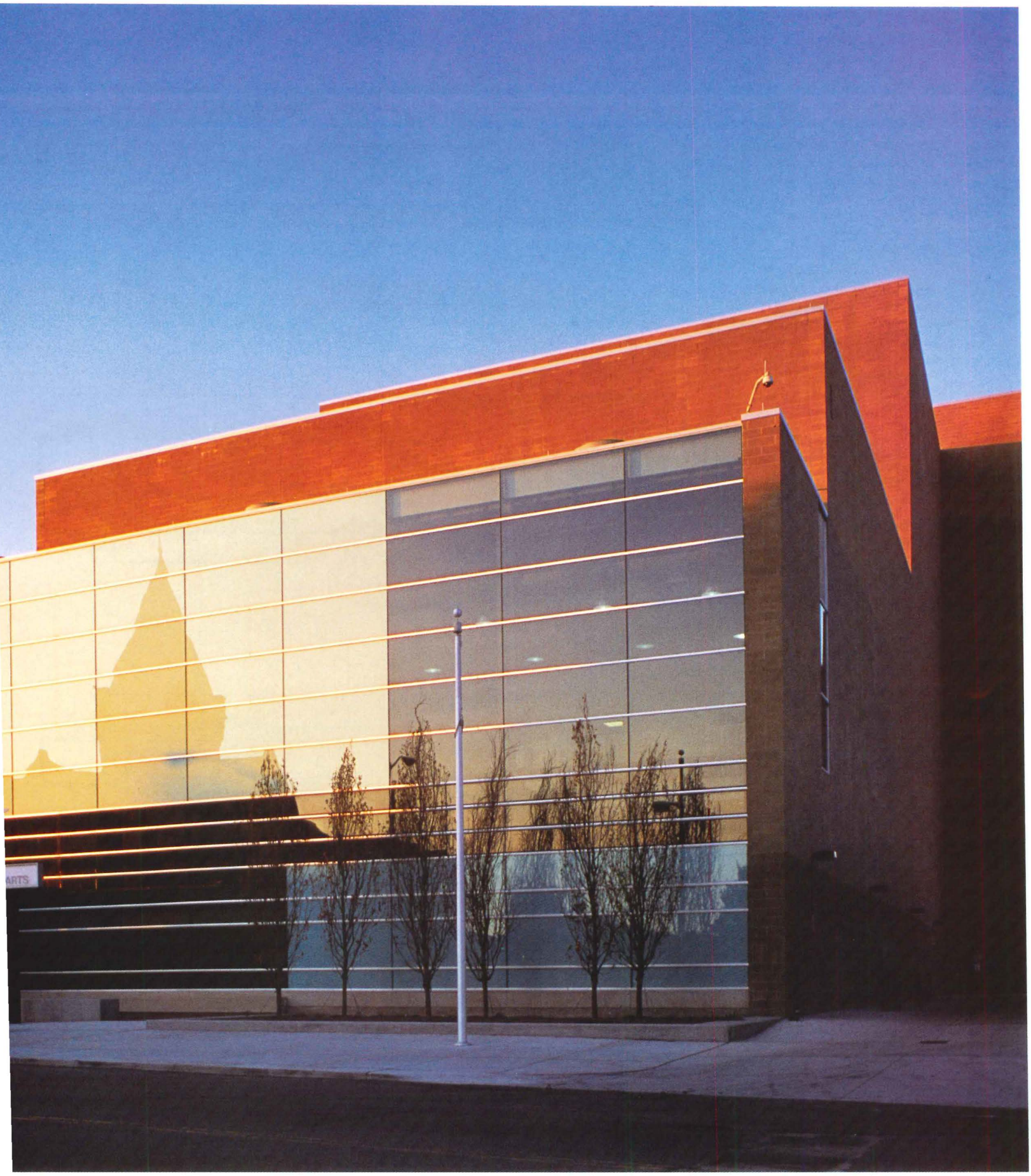
The story of the Detroit School of Arts' gestation could be the subject of its own melodrama. The city school district had hired a joint-venture team that included architecture firm Hamilton Anderson Associates to design a replacement performing arts high school after passing a $1.5 billion bond measure in the 1994. Then, the state took over the school board, restructuring the governing body and repackaging the high school project. A happier chapter opened in 2000, when the new board asked Hamilton Anderson to bid once again. This time, the firm got the job on its own.

The architect couldn't just dust off old plans, however. As the cast of characters shifted, so did the school's program. The new $72.4 million Detroit School of Arts would also have to contain a communication and media arts curriculum. The change also meant a population jump

To accommodate 1,200 students and varied curricula, the school needed an unusually tall building for not-so-dense Detroit.

Although the six-story school is taller than many of its neighbors, its height is reduced at the building's west end to relate to a nearby church.

PHOTOGRAPHY: © BALTHAZAR KORAB LTD., EXCEPT AS NOTED; © JEFF KOSRO (BOTTOM LEFT)


ARTS

CASE STUDY *Detroit School of Arts*

CREDITS

OWNER: Detroit Public Schools

ARCHITECT: Hamilton Anderson Associates—Rainy Hamilton Jr., *AIA, principal in charge;* Kent Anderson, *vice president;* David Esparza, *AIA, project manager;* Tom Sherry, *AIA, design lead;* Paul Locher, *AIA, project architect;* Paul Weidl, *AIA, design architect*

CONSULTANTS: L&A Structural Engineers *(structural);* Albert Kahn Associates *(mep);* Kirkegaard Associates *(acoustical);* Schuler & Shook *(theatrical);* Archteck *(broadcast telecommunication design);* L.S. Brinker/Skanska Building USA *(construction manager)*

SOURCES

EXTERIOR STEEL PANELS: Centria

EXTERIOR CURTAIN WALL SYSTEM: Kawneer

GLAZING: Viracon and Advanced Glazing Limited

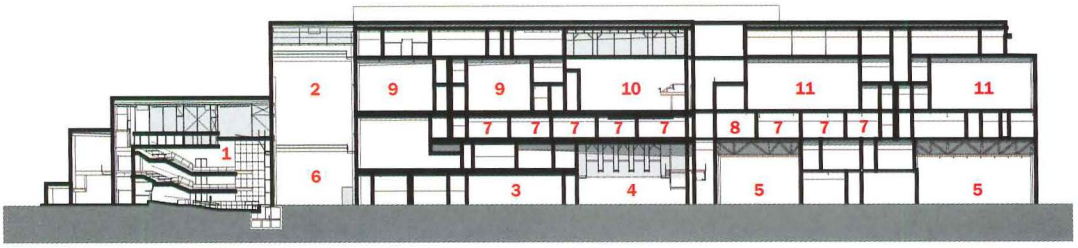
GREEN ROOF SYSTEM: Hydrotech

HOLLOW METAL DOORS: Ceco

EXIT DEVICES: Von Duprin

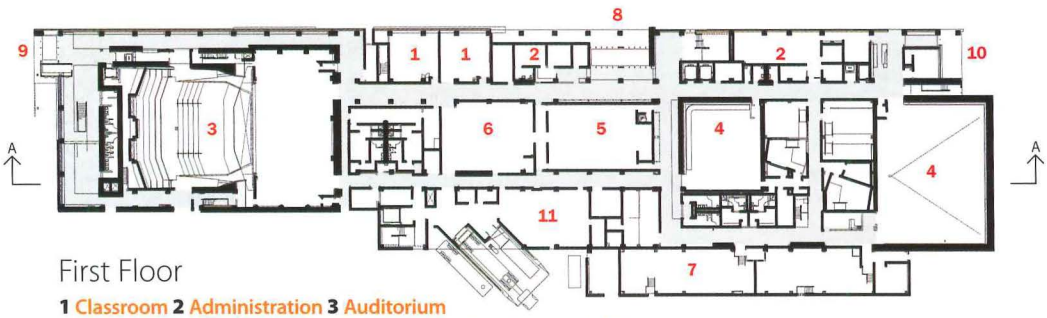
ANTI-GRAFFITI COATING: Dumond Chemicals

WOOD FLOOR FINISHES: Dura Shield



Section A-A

1 Auditorium **2** Fly loft **3** Scenery workshop **4** Black box theater **5** TV production studios **6** Multipurpose **7** Media labs **8** Gallery **9** Vocal rehearsal room **10** Recital hall **11** Band/orchestra rehearsal

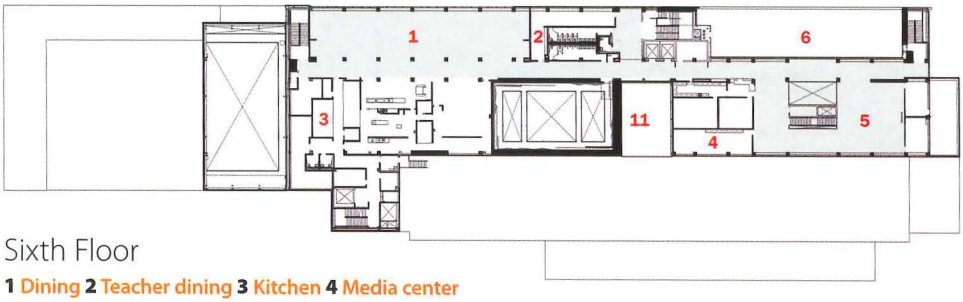


First Floor

1 Classroom **2** Administration **3** Auditorium **4** TV production studios **5** Black box theater **6** Scenery workshop **7** Mechanical **8** Main entrance **9** Student entrance **10** TV production entrance **11** Loading

Fourth Floor

1 Classroom **2** Teacher planning **3** Language lab **4** Vocal rehearsal room **5** Recital hall **6** Band/orchestra rehearsal room **7** Mechanical **8** Music library



Sixth Floor

1 Dining **2** Teacher dining **3** Kitchen **4** Media center support **5** Media center **6** Green roof

The architect used dynamically arranged fenestration and a variety of materials for the building skin, including brick, glass, and metal panels.

from 500 to 1,200 students, and necessitated an approximate trebling of area to 300,000 square feet. The site—2.5 downtown acres donated by the Detroit Symphony Orchestra—did not grow with the scope of the program.

UP RATHER THAN OUT

Hamilton Anderson had no other choice but to build upward. Vice President of Design Tom Sherry, AIA, admits that the firm's six-story product "is very unique in Detroit, which is low-rise and spread out."

Complicating the design assignment was a plan to combine two predecessor schools that couldn't have been more different. A *Fame* type of atmosphere characterized one, while a hushed, collegial environment prevailed at the other. "There were positive layers of culture coming from each," Sherry says. "We elected to organize the program to create dynamic interfaces between the two. It was a conscious effort to blend and elevate experience."

Although the two schools were not ultimately combined, Hamilton Anderson deployed this approach for layering radio and television production into the performing arts program. Due to the facilities' size and accessibility needs, the architect used the 800-seat auditorium and two large television studios to anchor the building, placing them at opposite ends of the ground floor.

Remaining large-scale spaces, like performance and rehearsal rooms, were located in the center of the building's three "cores" and wrapped with sun-filled circulation and gallery space. Besides using this circulation as

The building is a hub of activity even during non-school hours. At night, Detroit Public Television and a radio station use its production facilities.

PHOTOGRAPHY: © LARA SWIMMER (BOTTOM)

From the Detroit School of Arts' upper levels, in spaces like the top-floor dining area (below), offering students views of the predominantly low-rise surrounding cityscape.

a daylight and acoustical buffer for the more controlled environments contained within, the design strategy moves students toward the center of the building for rehearsals, recitals, or exhibitions, instead of relegating the various curricula to separate pockets. Multi-tasking rooms also contribute to the mix. The black box theater, for example, is outfitted to perform as a third television studio.

BIG BUT NOT OVERPOWERING

Of the school's anomalous bigness, Sherry says, "We were very conscious to scale it down wherever appropriate." Switching from masonry on the southern elevation to a dynamically fenestrated steel-panel-clad north face demonstrates such care. So do the placement of the anchors. The building steps down at its west end to terminate in the auditorium. Not only does the smaller volume

Sun-filled circulation spaces (above and left) serve as daylight and acoustical buffers to the building's more controlled environments.

acknowledge the scale of a neighboring church, but it also situates an optimistic public use on a street whose reputation for poverty and crime is perhaps overstated.

There's nothing childlike about the school. Detroit Symphony Orchestra members give lessons to students, and at night, production

PHOTOGRAPHY: © CLAYTON STUDIOS (TOP RIGHT AND BOTTOM)

facilities become the very grown-up workplaces for Detroit Public Television and the radio station WDTR FM. The old performing arts high school lacked even an auditorium.

While the architecture is similarly sophisticated, it, too, is defined by optimism. Sherry remembers that, back in the 1990s, Hamilton Anderson considered designing a marquee for the school. Far subtler is the glazed stairwell that marks the entrance to today's iteration and quite literally highlights the young talents within. Inside, students congregate on the sixth-floor, in the dining area and media center, where they can soak up the city skyline and overlook the green roof—one of many sustainable features that helped the project win LEED Silver certification from the U.S. Green Building Council. Hamilton Anderson's design is both a palace of learning and a place to dream. ■

David Sokol is a New York–based design writer and the acting news editor of ARCHITECTURAL RECORD. He has written for *Interior Design*, *Azure*, *Metropolis*, and *The Wall Street Journal*.

An 800-seat theater (above) with a fly loft and a 200-seat recital hall (right) are just two of the many professional-level facilities contained within the Detroit School of Arts. The old arts high school lacked even an auditorium.

CREDITS

OWNER: Denver Public Schools

ARCHITECT: klipp—Brian Klipp, *FAIA, design principal;* Greg Cromer, *AIA, managing principal;* Sam Miller, *AIA, project architect;* Keat Tan, *AIA, design architect;* Jason Finnegan, *Job Captain;* Dionne Koehler, *Interior Designer*

CONULTANTS: Swanson Rink *(mep);* JVA Consulting Engineers *(structural);* Olsson Associates *(civil);* Nuszer Kopatz Urban Design Associates *(landscape);* D.L. Adams Associates *(acoustical);* M.A. Mortenson Company *(design-build contractor)*

SOURCES

MASONRY: Endicott Brick

GLAZING: Viracon

PLASTIC LAMINATE: Wilsonart

A Learning Community

Dynamic and adaptable spaces serve hands-on education at a charter school with a science, math, and technology focus

BY JOANN GONCHAR, AIA

On a 10-acre parcel at the southern edge of the master-planned community that is emerging on the site of Denver's former Stapleton International Airport, educators at an unusual high school are working to provide its diverse student body with a rigorous science, math, and technology focused liberal arts education.

The Denver School of Science & Technology (DSST) is not a neighborhood school, however. Few of its 400 students are Stapleton residents. DSST is a public charter school that admits students from the entire metropolitan area by lottery only. Low-income students make up at least 40 percent of each class, and at least 45 percent are girls. All are expected to attend four-year colleges, despite varying degrees of academic preparation before high school.

To house the ambitious program, officials imagined a building "where kids could feel good about coming to school and about being involved in the

First Floor

1 Galleria **2** General classroom **3** Studio
4 Project room **5** Science lab **6** Faculty office
7 Administration **8** Cafeteria **9** Gymnasium

sciences," says David Ethan Greenberg, DSST founder and member of its board of directors. The school's architect, klipp, responded with a colorful building made up of a pleasing collection of different sized volumes clad in brick, stucco, and metal. The facility opened in January 2005, after DSST spent is first semester of operation in temporary quarters at a parochial school.

The $9.9 million project was funded through several sources, including the Bill and Melinda Gates Foundation and the Colorado Small Schools Initiative. Denver Public Schools contributed $5 million in bond funds, and Stapleton's developer donated the site.

The 65,883-square-foot, two-story building is organized along a double-height east-west circulation spine and gathering space called the "galleria." The cafeteria and gymnasium are at the eastern terminus of this spine with a dedicated entrance, allowing use of these facilities during non-school hours.

Along the galleria, on the first floor, are administrative offices, science labs, project rooms, and three classroom clusters. Each cluster contains a faculty office and a "studio" for individual or group study. The proximity and a visual connection between the classrooms and the studio allow teachers to supervise both spaces simultaneously, points out Sam Miller, AIA, Klipp associate principal.

South-facing courtyards between each classroom cluster extend the instructional space to the exterior.

The classrooms are designed for adaptability, with moveable furniture and operable walls. The instructional space even extends to the exterior of the building: each classroom has direct access to south-facing courtyards

DSST's two-story school building is a pleasing and colorful collection of brick, stucco, and metal-clad volumes.

PHOTOGRAPHY: © JAMES H. BERCHERT

Officials envisioned the building as one "where kids feel good about coming to school and about being involved in the sciences," says David Ethan Greenberg, DSST founder.

During school hours, little lighting is needed to supplement daylight in spaces like the galleria (left and top, facing).

where the building's wireless network can also be used. The school can accommodate "project-based learning with a variety of flexible environments," says Miller.

On the second floor, overlooking the galleria, are seminar rooms, additional faculty offices, and project rooms. Throughout the school, bright colors and materials that deviate from the district's standard specifications, such as carpeting and drywall, contribute to the warm, almost domestic feel.

The school uses about 50 percent of the energy of a similar code-compliant building, according to Kris Leaf, senior project manager for the Weidt Group. Weidt performed energy modeling for the project as part of a utility-sponsored design assistance program.

A number of strategies helped the building achieve these savings. The building's east-west orientation minimizes solar gain. Because use of daylight is maximized, little lighting is needed during regular school hours in spaces such as the galleria. Features like a high-performance building envelope and a carbon dioxide monitoring system reduce the need for heating and cooling, explains Leaf.

The building itself serves as a learning tool. Dropped ceilings are eliminated wherever possible to reveal structure and ducts. Polycarbonate is substituted for drywall in some places to reveal normally hidden components. "The studs, the steel deck, the bracing—everything is exposed," says Miller.

The cafeteria (below) and the gymnasium have a dedicated entrance, allowing use of the facilities after hours and on weekends.

The school's designers and planners were a little ahead of their time in some respects. For example, the school first opened without lockers because they had envisioned that all textbooks would be digital, making storage space unnecessary. However, all the required educational material is still not available online, and lockers have since been installed.

On the whole, however, the building seems perfectly suited to its purpose. It provides a safe, comfortable, and even inspiring environment where kids of all backgrounds can focus on academics. The Head of School, Bill Kurtz, points to to DSST's very rare incidence of vandalism as one measure of students' appreciation for their building. "Great school cultures take care of buildings, and great buildings take care of school cultures," he says. ■

CASE STUDY *Timberline and Willowcreek Middle Schools*

CREDITS

OWNER: Alpine School District

ARCHITECT: VCBO Architecture—**Steve H. Crane,** *FAIA, principal-in-charge;* **Vern Latham,** *AIA, project manager;* **Boyd McAllister,** *AIA, project designer;* **Jeanne Jackson,** *AIA, project designer*

CONSULTANTANTS: Bsumek Mu & Associates P.C. *(structural);* Van Beorum & Frank *(mechanical);* BNA Consulting Engineers II *(electrical);* Ensign Engineering *(lanscape);* Spectrum Engineers *(acoustical);* Hogan and Associates *(general contractor)*

SOURCES

MASONRY: Buehner Block Company

METAL/GLASS CURTAINWALL: United States Aluminum

SKYLIGHTS: Kalwall

CERMIC TILE: Dal-Tile

PLASTIC LAMINATE: Wilsonart International

LOCKERS: Republic Storage Systems

BLEACHERS: Hussey Seating Company

Seeing Double

Fast-growing district saves millions by building two nearly identical schools tailored to its needs

BY JOANN GONCHAR, AIA

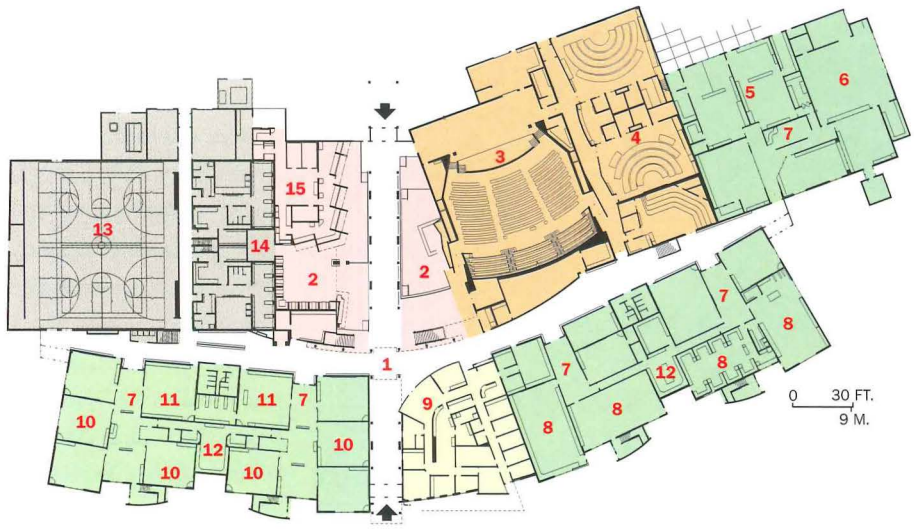
To satisfy its need for two new middle schools on a very tight budget, a quickly growing Utah district, located between Provo and Salt Lake City, decided to build two, almost identical schools for different sites. The approach saved almost $2 million, say the architect and district and officials.

The buildings, Timberline and Willowcreek Middle Schools, were bid simultaneously and won by Centerville, Utah-based contractor, Hogan Associates. Construction was slightly staggered, however, with completion of the first school, Timberline, in the fall of 2003, and the opening of the second building a year later.

Both schools were built for roughly $35 million total, saving Alpine School District about $1.8 million, according to Steve Crane, FAIA, principal of VCBO Architecture, Salt Lake City, the project's designer. These savings were achieved primarily through bulk purchasing of materials and the ability of the contractor to send subcontractors from one site to the other. "Once subs move on its hard to get them back," Crane says.

Although the buildings are prototype schools, they are far from cookie cutter. "They are not like anything we've built before," says John Childs, district administrator. The schools are in part the product of a series of collaborative planning meetings that included the architect, educators, maintenance staff, community members, and at the insistence of Crane, students. One of the tasks he assigned to students was photographing elements of their current schools that they liked and disliked.

These meetings, and the subsequent design process, produced a two-story prototype with exterior bearing walls made of split-faced block, alternating



First Floor

1 Commons
2 Dining
3 Auditorium
4 Music
5 Art
6 Technology center
7 Collaboration area
8 Applied technology
9 Administration
10 Classroom
11 Science lab
12 Faculty office
13 Gymnasium
14 Locker rooms
15 Kitchen

with walls clad in deep-colored ribbed metal. The variety of textures helps define separate masses in the large building. The materials were also chosen for their durability and resistance to vandalism. "The block is not inviting to graffiti," notes Crane.

Inside, the 180,000-square-foot school is organized around a cross-shaped circulation zone that divides the plan into quadrants. Because of its openness, the area is easily supervised by just two teachers.

On the first floor, at the center of the circulation zone, is the commons and a double-height cafeteria area. Also on this level are the gymnasium, an 800-seat auditorium, and facilities for music and visual art instruction. The media center, located on the second floor, offers views of the surrounding landscape.

COLLABORATION AND COMMUNITY

But the most notable feature of the design is its grade-level specific academic learning centers or "houses." The prototype has four of these centers total—two per floor. They divide each school's 1,500-students into smaller, more intimate learning communities.

A house is composed of classrooms, a teacher preparation area, lockers, and a collaboration space, intended to accommodate team teaching, group learning, or individual study. The shared spaces are sometimes used by students who finish tests before the others, according to Crane. They can leave the classroom and start another project while still being supervised by the teacher, he says.

The classrooms are connected to these shared collaboration areas with glass garage doors (for photo, see page 16). When closed, the doors prevent noise from traveling between the spaces, while still maintaining the visual connection.

The flexibility of the school's facilities extends beyond its classrooms and houses. The auditorium, for example, can be split with a curtain and projection screen to create two smaller spaces. And if a school play draws only a small audience, the divider can help the event seem better attended, Crane points out.

The school has other multi-use spaces. The cafeteria doubles as an Internet cafe. It also has a stage and large TV screen for movies, announcements, and other programs. "We can use it throughout the day," says Childs.

This flexibility and functionality have so satisfied the district that it plans to build two more middle schools, using the same prototype, as part of a $230 million bond passed by voters in November. Changes to the design will be very minor, according to

Before building the almost identical Timberline and Willowcreek Middle Schools (top and bottom, respectively) Alpine School District held several collaborative planning meetings involving a diverse set of stakeholders. The approach saved $1.8 million and produced buildings well suited to the district's needs.

The double-story cafeteria is more than just a space for dining. It has Internet access, a small stage, and equipment for showing movies.

PHOTOGRAPHY: © DANA SOHM

CREDITS

OWNER: **Lake Washington School District**

ARCHITECT: **Mahlum Architects—Gerald Reifert,** *AIA, principal-in-charge;* **Anne Schopf,** *AIA, design principal;* **Mitchell Kent,** *AIA, project manager;* **David Mount,** *AIA, project architect*

CONSULTANTS: **Coughlin Porter Lundeen** *(civil/structural);* **Stantec** *(mechanical);* **Coffman Engineers** *(electrical);* **The Greenbusch Group** *(acoustical);* **Integrated Design Lab** *(lighting);* **Cascade Design Collaborative** *(landscape);* **SpeeWest Construction** *(general contractor)*

SOURCES

STOREFRONT & CURTAINWALL: **Kawneer**

ACOUSTICAL CEILINGS: **Armstrong**

RESILIENT FLOORING: **Johnsonite**

CARPET TILE: **Interface**

LIGHTING CONTROLS: **Leviton**

WATER-FREE URINALS: **Falcon**

CLASSROOM FURNITURE: **Virco**

MILLWORK: **Westmark Products**

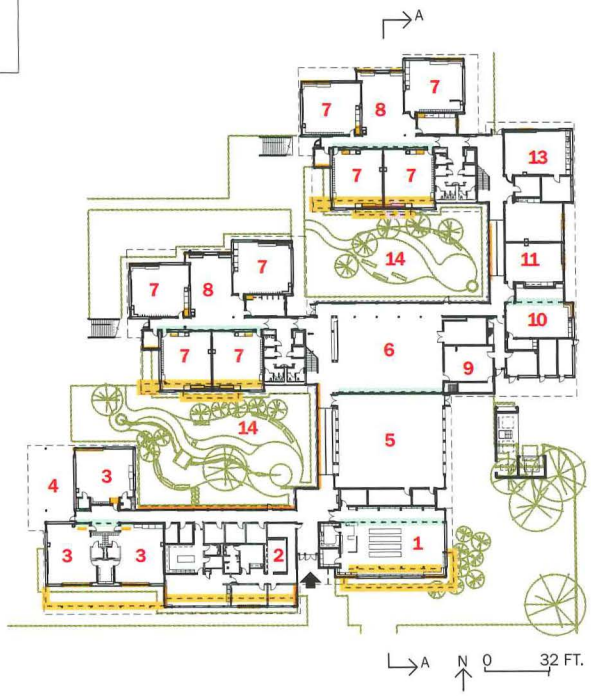
Field of Vision

Sustainability, pedagogy, and a stand of Douglas firs combine in an elementary school tied to nature

BY DAVID SOKOL

Benjamin Franklin Elementary School was located in an almost idyllic setting. The 38-year-old building occupied a 10-acre site in a low-density neighborhood of Kirkland, Washington, that featured riding trails, horse paddocks, and abundant greenery. So when it came time to construct a replacement facility on top of the older school's playing fields, Mahlum Architects sought to capitalize on the surroundings and create a building that would support the district's updated teaching philosophy: Lake Washington School District's "teachers are more like facilitators in the learning process," explains Forrest Miller, support services director. "We believe that both teachers as well as students do better in a collaborative setting."

Mahlum was handed the district's standard program mandating that the two-story, 450-student school be arranged in series of four, two-story classrooms clustering around shared learning areas—a direct manifestation of Lake Washington's pedagogical approach. In addition to satisfying these programmatic requirements, the architect also wanted the $10 million facility to provide stake-

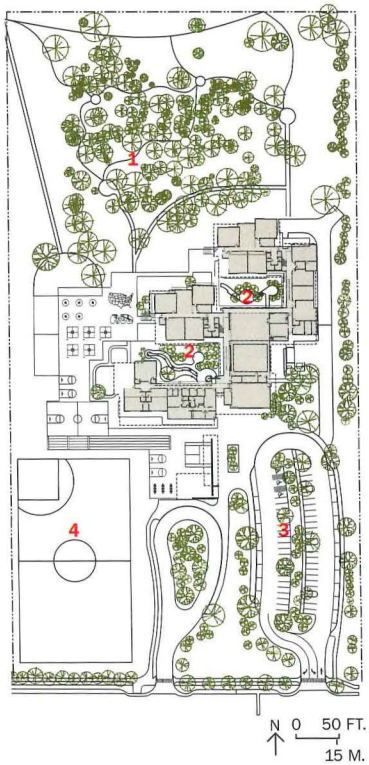


First Floor

1 Library
2 Administration
3 Kindergarten
4 Covered play
5 Gymnasium
6 Commons
7 Classroom
8 Activity area
9 Food service
10 Music
11 Resource
12 Technology
13 Science/art
14 Outdoor classroom

Site Plan

1 Wooded area
2 Outdoor classroom
3 Parking
4 Community/ school playing fields



The architect limited glazing on the east and west facades where direct sunlight is difficult to control.

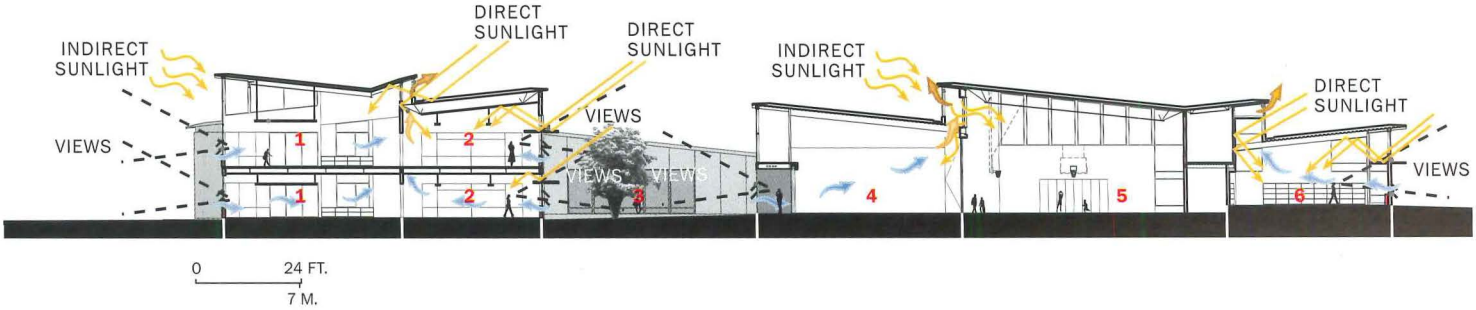
holders with something they may not have known they wanted—a forward-thinking, green building with abundant daylight and no mechanical ventilation. Marrying the program with the architect's daylighting aspirations helped the form come into focus.

"Generally, educational buildings should face north and south to control sunlight," explains Mahlum principal Anne Schopf. To avoid direct east-west sunlight, the architect devised a 57,000-square-foot building that resembles an inverted "E" in plan. Three flanges run east and west, permitting glazed facades with optimum north-south exposures in the classroom clusters, shared learning areas, the school commons, and gymnasium. Roof overhangs and sunshades minimize solar heat gain and glare.

The orientation focuses the shared learning areas northward toward a stand of Douglas fir trees "so that it becomes the spiritual center for the building and a reinforcement of the importance of nature," Schopf says. The flanges also create two courtyard areas, both of which are conceived as outdoor classrooms. The courtyards are planted with drought-tolerant native species. One of these

Section A-A

1 Activity area
2 Classroom
3 Outdoor classroom
4 Commons
5 Gymnasium
6 Library

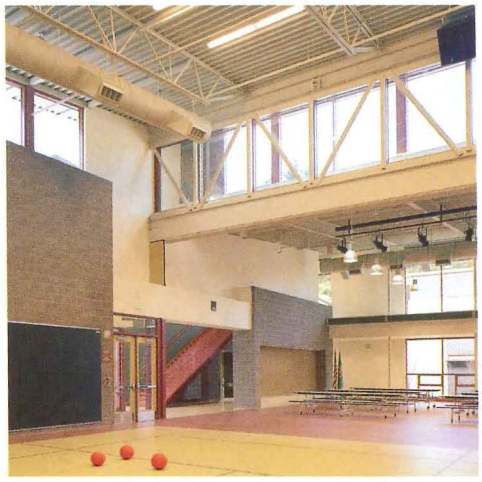


spaces includes a basalt water sculpture and an intermittent stream supplied by rainwater collected from the school's butterfly roofs.

AHEAD OF THE CURVE

The building was the district's first project to embrace sustainability and was designed long before Washington Governor Christine Gregoire signed ESSB 5009 in April 2005, requiring that schools and other state-funded buildings go green. Franklin Elementary opened that August, and the law has not yet been fully implemented. Even though the district was not compelled to build green, selling administrators on a day-lit school was not a struggle, Schopf says. "The statistics exist [showing] that daylighting improves academic performance."

The relationship between natural ventilation and performance is less well documented. However, forgoing air handling equipment was not a "difficult stretch, because the district is not cooling right now," she adds.



The configuration creates outdoor classrooms (below) and allows daylighting for instructional and common spaces, such as the gymnasium (right).

At Franklin Elementary, air flows via natural convection into rooms through louvers and is exhausted through operable windows and chimneys.

The approach provides both upfront savings on equipment and operating costs. And

The school has ample daylight and no mechanical ventilation even though it was designed before a state green mandate.

the absence of a traditional air handling system means that students are free from the distraction associated with mechanical noise.

SCIENCE PROJECT

Miller is collecting data for student test results, faculty retention, and absenteeism. He plans to compare it with data from the old Franklin Elementary and conventionally built schools to better understand the relationship between sustainable design and occupant performance.

Already on the energy front, after only one full year of occupancy, the district has documented significant savings. For the 2005-2006 academic year, total energy costs were about $1 per square foot, compared with $1.20 in the old school, despite a rise in rates, according to Miller. Lake Washington officials expect even greater savings this academic year after commissioning the building in May, and have already committed to deploying many of the strategies used at Franklin in the district's next 11-school program, funded by a $463 million bond passed in early 2006. ■

he shared learning areas (top) have a strong visual onnection to the outdoors and the adjacent class- ooms. Facilities like the library (right), and the gym- asium are used after school hours, on weekends, nd during the summer by the community.

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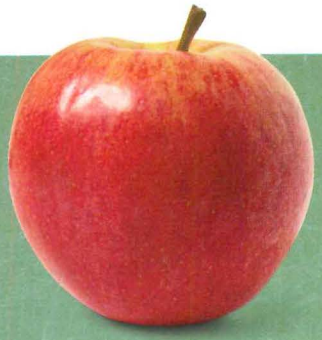

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The goal is to provide plumbing and locker solutions that take up less space so there's more space for learning. With corridor-concept washrooms in mind, the linear Express® lavatory system does the work of multiple individual lavs. Express lavs are available with ndite technology™, a proprietary energy management system that collects and stores restroom lighting, eliminating the need for electricity, as well as costly and time-consuming battery changes. These units require only one set of connections, reducing installation cost and time.

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The goal is to provide plumbing and locker solutions that take up less space so there's more space for learning.

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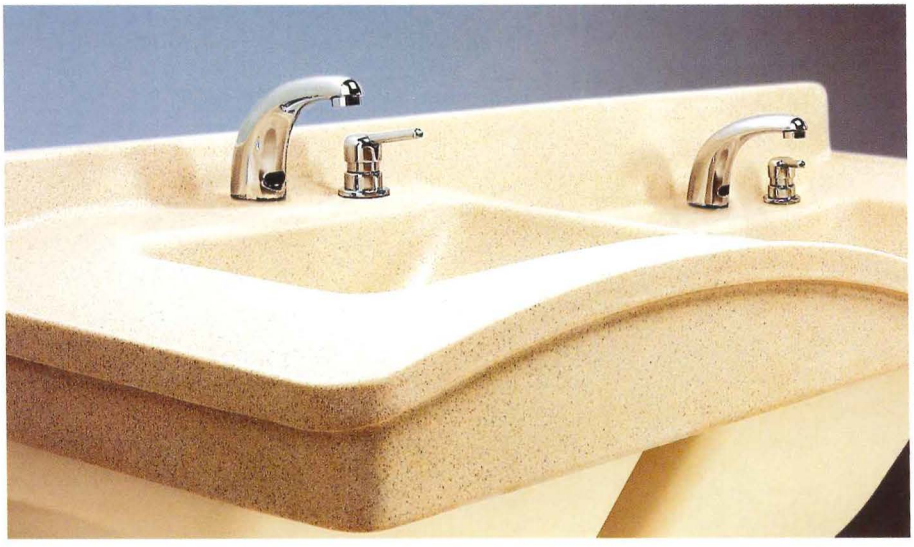


Photos courtesy of: Bradley Corp.

Wood takes on concrete

Innovative design choices for 21st Century schools

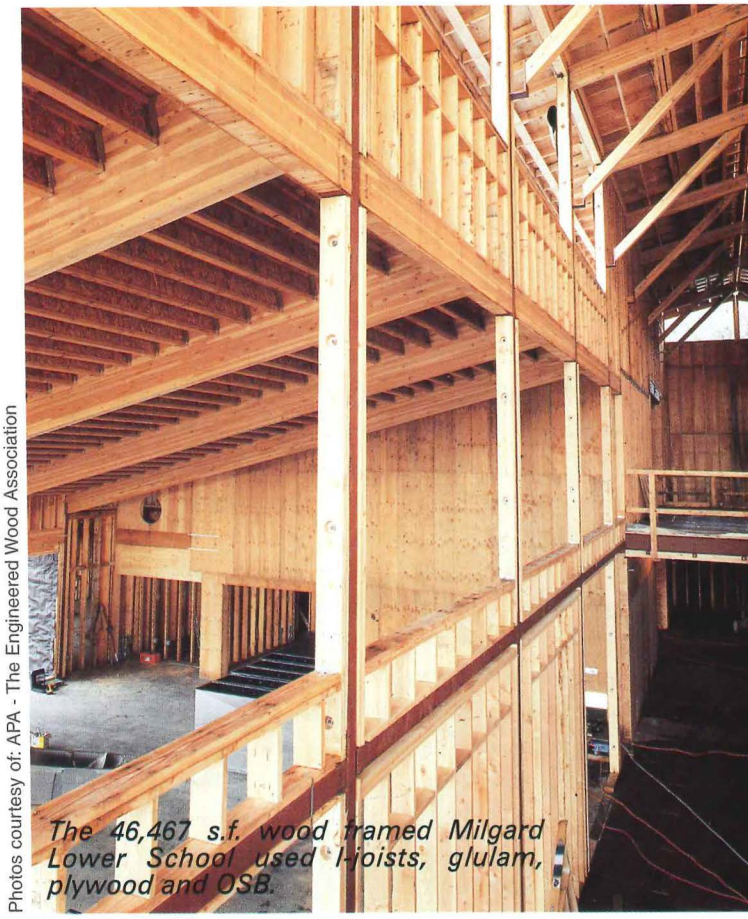
School design has come a long way since the "quick and cold" concrete structures of the 1950s. Today, architects work to create large, open spaces that meet project-oriented teaching styles instead of traditional, classroom-centered "chalk and talk" presentations.

Wood is increasingly used in place of steel and concrete to design these warm, friendly and inspiring learning environments for children. Exposed wood construction provides structural integrity as well as eye-catching design.

Structural engineered wood products--exposed glulam beams, I-joists and panelized wood roof systems--enable architects to design not only high quality and durable schools, but also schools that save taxpayer dollars.

Schools built with engineered wood products can be built considerably faster. APA commissioned an independent cost analysis, prepared by a veteran Certified Professional Estimator, where the superstructure of a typical steel-framed elementary school was compared to one built with engineered wood. Each of the wood options using progressively more wood in the superstructure came in well under the cost of the steel superstructure.

The other significant advantage is the shortened construction schedule. The wood option in the cost study projected to finish 12 weeks ahead of the steel option because wood requires much less fabrication and erection time and does not require specialized trades to install.



Photos courtesy of: APA - The Engineered Wood Association

The 46,467 s.f. wood framed Milgard Lower School used I-joists, glulam, plywood and OSB.

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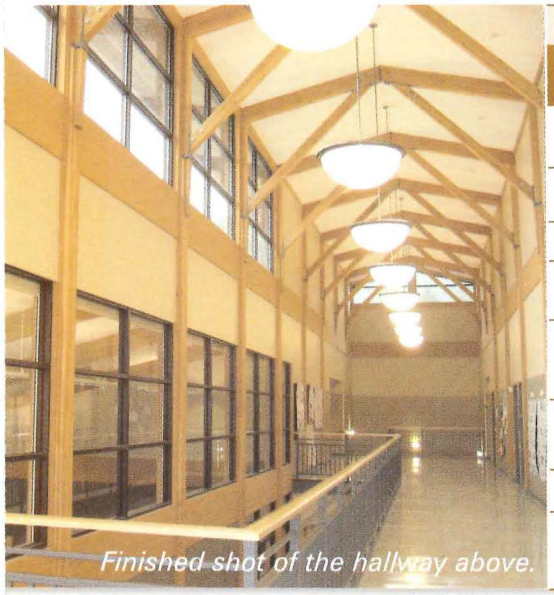

Finished shot of the hallway above.

Practical and Aesthetic Considerations

Criteria	Benefits
Sight	Wood creates a feeling of warmth, softness and brightness. It makes students feel like they are surrounded by nature and are studying in a natural environment.
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Speed of Construction	Wood products enjoy one of the widest distribution networks of any building product. They require less fabrication lead time and can be installed using basic carpentry skills and tools.
Fire Safety	Typical building codes require sprinkler systems and a host of fire control measures in school construction, whether it's steel, concrete or wood. Should structural elements come under fire, wood beams have outlasted comparable steel beams in controlled fire tests.
Moisture Control	Compared to concrete and steel structures, wood structures have less humidity in the classrooms and les internal condensation and related problems within the structure.
Psychological	Wood helps create feelings of ease and well-being, and reduces stress.
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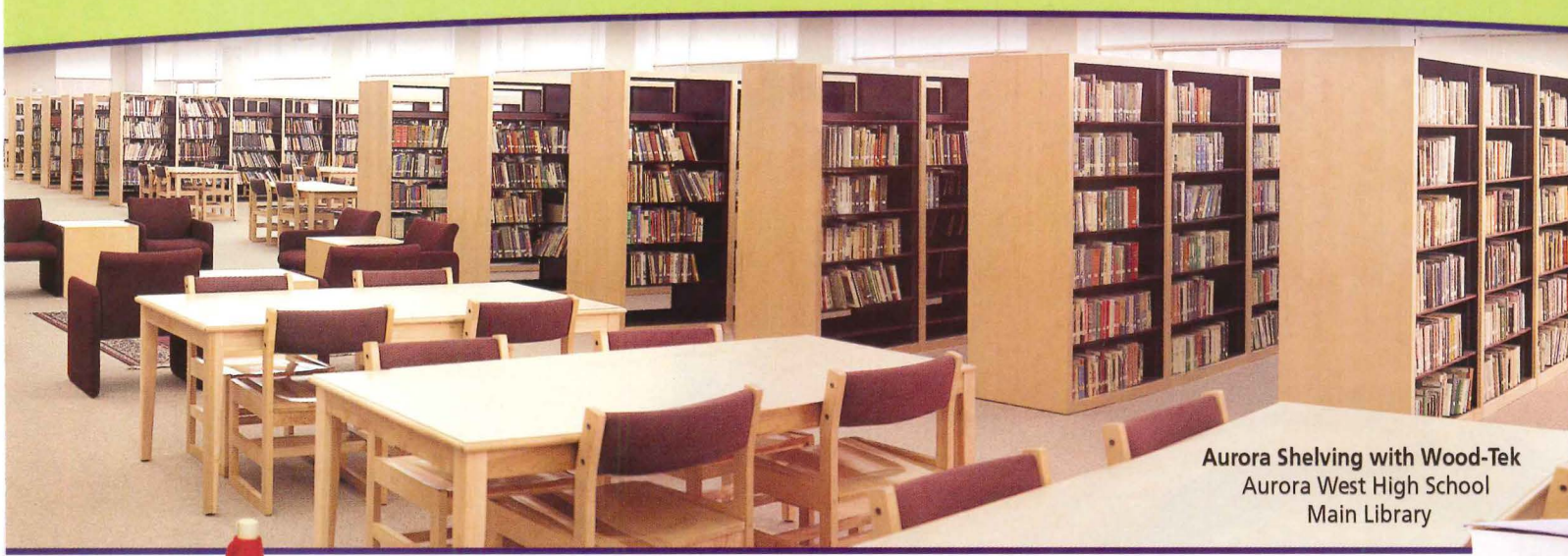
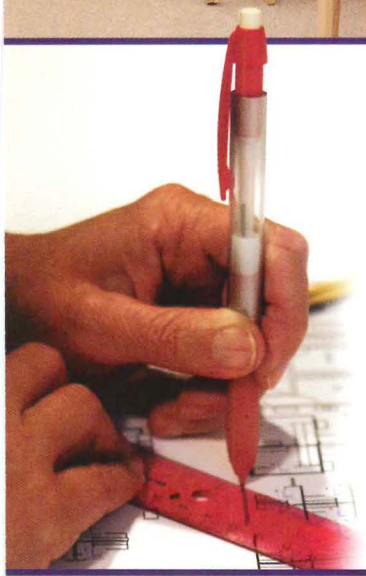


Aurora Shelving with Wood-Tek
Aurora West High School
Main Library



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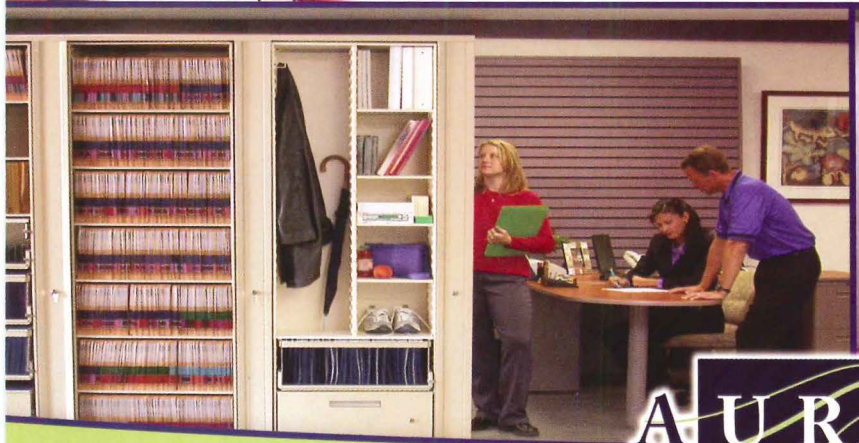

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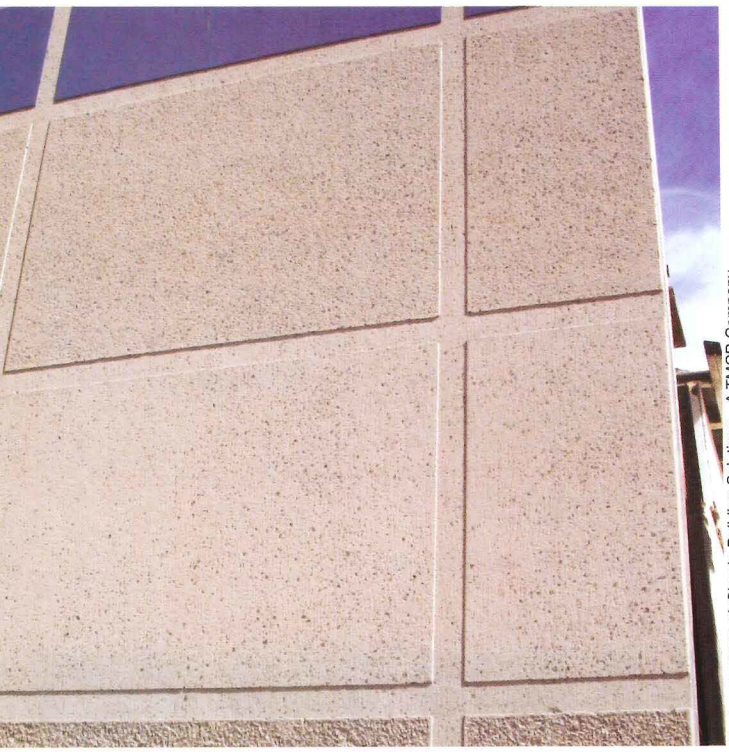
The company's SteelCrete method is the combination of thin, conventional concrete and conventional light gauge metal framing with an embedment in thin concrete. This industry was founded by Tony Ruiz using a continuous embedment he replaced with a "temporary" MetalStudCrete "strip" that depends on friction and fasteners that SteelCrete I, II and III render obsolete. In this new and improved strip method, slots are punched out of standard stud and track flanges. Concrete is then placed around and between the studs and track, exceeding all the latest building codes. In addition, patent-pending CIPS will enable Cast-In-Place SteelCrete to form a new, better 'solid wall' with numerous advantages over poured-in-place concrete walls, wood or metal framing, concrete block, ICF, SIPS or any other foam core.

The evolution of the SBS SteelCrete technology has brought about vast improvements in its strength. The SCIII strip doesn't require fasteners, and is formed with hole-punched "peaks" that pass through the studs and track from the back side, snapping into place, and additional reinforcing can be passed through them. Simple Building Solutions combines Light Gauge Metal Framing and Standard Concrete for composite Thinshell panels that optimize the best structural properties of each where the whole exceeds the sum of its parts. This is the strongest method of



Photos courtesy of: Simple Building Solutions - A TMCP Company

any of these "Thinshell" systems and comes with the numerous advantages of using the "strip," including:

- Control over the amount used
- Can use conventional, standard studs and track
- Slots punched by the manufacturer or on the jobsite using an inexpensive punch press
- CIPS–Cast-In-Place SteelCrete with no mesh, cranes, casting tables, trucking or joints

Here are just some of the benefits of using SteelCrete over traditional building techniques for your K-12 building project:

- Patented New Cast-In-Place Systems with Less Concrete
- Exceeds Seismic Zone IV Requirements
- Engineered for Hurricane Force Winds
- Fire and Termite Resistant
- Water and Corrosion Resistant
- Low Maintenance
- Energy Efficient
- Fire Rated
- Easy to Learn
- Can Eliminate Slab Forming
- Smaller Footings
- Reduced Construction Steps
- Fewer Inspections
- No Dry Rot or Mildew
- Reduce or Eliminate Sprinklers

With their SteelCrete III and CIPS–Cast-In-Place Thinshell systems, as well as the company's many other ground-breaking products and services, Simple Building Solutions (SBS) is dedicated to improving the methods by which today's school buildings are constructed by advancing innovative building systems, methods, materials and equipment. Their goal is to provide durable, cost-effective, quality, simple building solutions to the industry.

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Redefining School Window Performance

A look at real-world benefits for 21st Century educational institutions

Graham school windows help control the sun with low-e glazing, internal blinds, and multiple operating systems for good ventilation. (Shown: Lincoln High School, Denver.)

Graham replaced all the windows in East Boston High School, in the shadow of Logan Field, with special acoustical windows that shut out air traffic noise from classrooms overlooking the busy airport.

Nobody understands better than Graham Architectural Products, the important role quality windows and proper daylighting and noise control play in the daily lives of students, teachers, and administrators in schools across America. Graham makes custom and custom-look windows for many of America's public and private educational institutions. From K-12 classrooms to university dorms, Graham makes quality structural aluminum windows with top comfort, performance, and operating features.

While Graham builds the best windows for your facility's needs, the company can also build all of these real-world benefits into any or every window it makes:

- Outstanding thermal performance with low-e IG systems, and thermal strut construction, for significant energy savings year round.
- Fenestration products for LEED certified projects.
- Ventilation at will and solar control with multiple operating systems, and solar shading devices, including internal blinds.
- Maintenance-free dependability, thanks to heavy extruded aluminum construction, internal blinds that never need dusting, and smooth-operating balances.
- Disaster protection with special frame and glazing systems designed to prevent loss of life during hurricanes, seismic events and even bomb blasts.
- Generous daylighting to promote learning, including from multiple lites of glass in geometrical and circular shapes.
- Outstanding security with polycarbonate panels, combined with proprietary integral perforated steel security screens that are factory-attached to the windows, providing complete protection during shipping and at the job site--as well as for the life of the windows.
- Enhanced safety for students, thanks to excellent egress and ease of operation.
- Protection from disruptive street noise, an added benefit of Graham acoustical windows that boast some of the highest STC ratings in the fenestration industry.
- Sensitivity to historic window aesthetics, a benefit that allows Graham to replicate the sightlines, muntins, etc. of the original windows through the use of special design tools and panning systems for modern thermal windows.
- Prefect complements to Graham windows: a wide selection of sliding glass doors and terrace doors--all with the same special benefits of the company's windows.

Nobody understands better than Graham Architectural Products, the important role quality windows and proper daylighting and noise control play in the daily lives of students, teachers, and administrators in schools across America.

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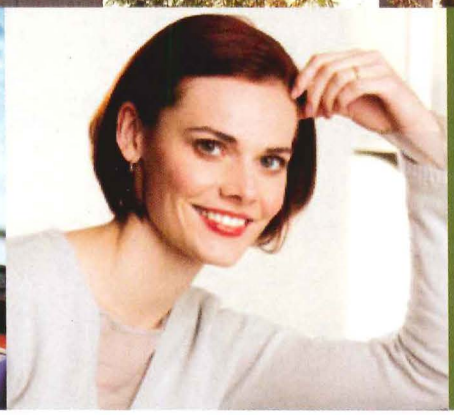

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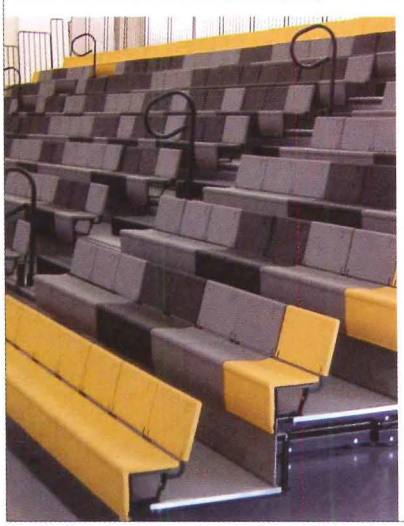
Seating Solutions

Irwin Telescopic Seating Company



Irwin Telescopic Seating manufactures a complete line of quality constructed seating solutions, from innovative seating accessories such as the Irwin Folding Back Support (featured photograph) for use on their gym seating product, to the most complex chair platform designs found in major university and NBA/NHL arenas. In addition to their standard telescopic systems, they offer complete custom designs. Call or visit their web site for complete product information.

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www.irwintelescopicseating.com

Circle Reader Service #165

Glass Block for Diffused Daylight

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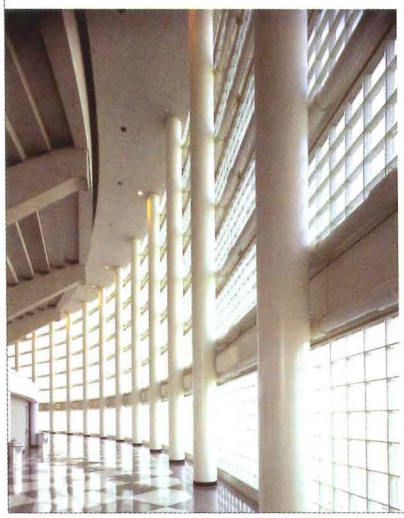

Studies have shown that learning productivity increases in the presence of natural daylight. WECK Glass Block is a natural for providing students with diffused glare-free daylight, plus the variety of shapes and colors, and the strength and fire resistance of today's finest building blocks of light. See the full line of WECK Glass Blocks at www.weck.com.

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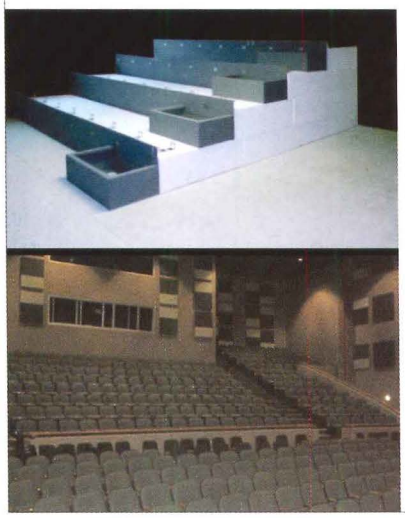
Circle Reader Service #163

Riser System for Stadium Seating

Stadium Savers

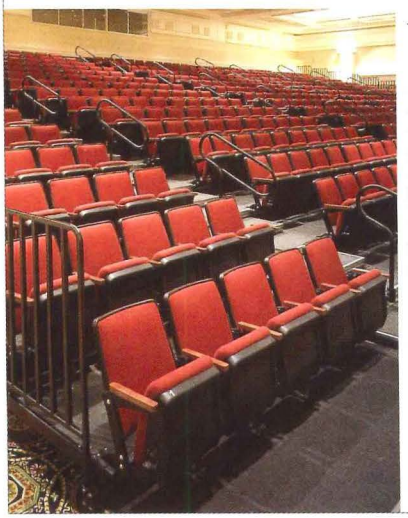


Stadium Savers provides an economical and proven alternative for achieving stadium seating tiers in an existing or new building. Stacked Geofoam blocks and Stadium Savers metal risers provide stable formwork for concrete seating platforms. The system is lightweight, easy to install, and is custom cut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

Circle Reader Service #166

Retractable Chair Seating

Irwin Telescopic Seating Company



As the use of retractable chair seating continues to grow, Irwin Telescopic Seating Company continues to expand their seating and design options. This type of seating is being used in sporting venues, education facilities, theaters, churches and corporate training facilities. They offer blow molded plastic seating, with or without upholstery, or the very comfortable and attractive auditorium style chair (featured photograph). In addition, a large variety of fabrics, finishes and powder coat options are available. Call or visit their web site for complete product information.

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