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SAVVY SPENDING

Incorporating life-cycle costing into facility decisions.

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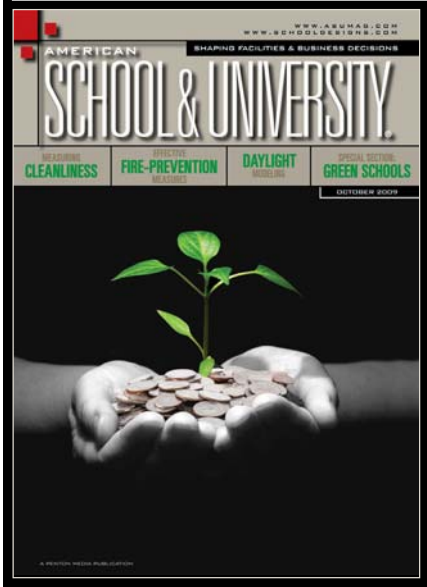

On the Cover: Life-cycle costing is explored in this month's cover story.

COVER STORY

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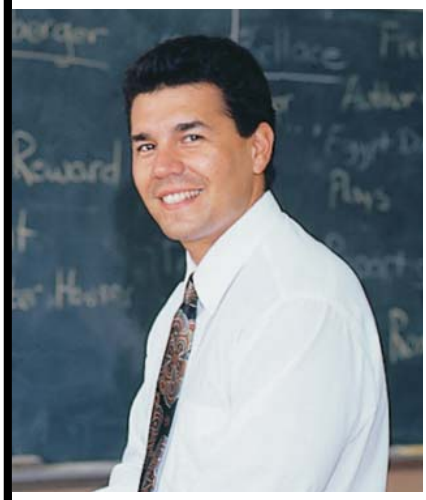
Life Choices



The concept of life-cycle costing is getting increased attention from education institutions—and rightly so.

Considering that many schools are still living with the "built fast, built cheap" facilities of the original baby-boom era—as well as the billions of dollars in deferred maintenance and poor learning environments that continue to plague these facilities today as a result of past ill-conceived choices—looking beyond the initial price tag to how much a facility will cost over its entire life is proving to be smart, responsible and financially sensible.

Life-cycle costing forces institutions to evaluate the entire cost of a facility, not just first-cost. Because costs associated with a facility do not stop when construction is complete, the costs to operate, maintain and dispose of a facility over its useful life must be considered. By making educated decisions and investing a little more at the early stages during planning, an institution can realize significant savings over the life of a building.

The concepts central to the green/sustainability movement dovetail nicely into life-cycle costing. Education institutions that strive to create and operate high-performance, environmentally friendly, energy-efficient, healthful facilities are finding that their choices are resulting not only in exceptional learning environments, but also long-lasting facilities that will use fewer resources and result in measurable long-term savings.

In this month's issue, we focus extensively on life-cycle costing and green/sustainability. The cover story (p. 18), delves into how education institutions can incorporate life-cycle costing into facilities and operations decisions; the Green Schools & Universities special section (p. 35), includes articles on crafting a campus sustainability program and creating an electronics recycling program as part of your institution's sustainability commitment.

It's true that "you get what you pay for." By incorporating life-cycle costing into your facilities decisions, you will ensure the choices made early in the process will result in the best investment for the long-term. ■

Joe Agron

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INSIDE: CONSTRUCTION/FUNDING

ZERO-INTEREST CONSTRUCTION BONDS ALLOCATED IN WASHINGTON STATE

Eighteen districts in Washington state will share in the allocation of $164 million in Qualified School Construction Bonds (QSCB).

The program, enacted as part of the economic stimulus package passed by Congress earlier this year, enables school systems to issue what in effect are no-interest bonds for construction and renovation projects. Nationwide, $11 billion in QSCB funding was available in 2009; another $11 billion will be available in 2010.

The formula for distributing the bond allocations resulted in a $17,445,000 cap on requests from individual districts. Six school systems—Bethel, Everett, Lake Washington, Seattle, Snohomish and Sumner—will receive that amount.

GRANT WILL HELP UCLA BUILD CENTER TO STUDY ORAL CANCER

The School of Dentistry at the University of California at Los Angeles has received a $5,073,075 federal grant to help pay for construction of a facility for conducting research into oral cancer.

The funding from the National Institutes of Health's National Center for Research Resource, which was part of a federal economic stimulus package enacted earlier in 2009, will enable the university to establish the UCLA Yip Center for Oral/Head & Neck Oncology Research. Outdated laboratories within UCLA's dental school building will be demolished, and the space will be converted into a 6,660-square-foot facility where students and faculty can conduct research in the biology, detection and treatment of oral cancer.

The center will include an open wet laboratory, a central core support facility and a conference room. The new lab will be designed specifically for state-of-the-art genomics and proteomics research. Officials estimate the Yip Center will be completed in 2013.

DETROIT DISTRICT SEEKS APPROVAL OF $500 MILLION BOND PROPOSAL

The Detroit school district is asking voters in November to approve a $500 million construction bond proposal that will enable the beleaguered system to upgrade aging facilities and build new schools.

The plan, dubbed Proposal S, calls for renovating 10 existing campuses and building eight new schools. About $246 million of the proposed bond issue would be no-interest Qualified School Construction Bonds, and another $254 million would be Build America Bonds, which lower interest costs through rebates. Both bond programs were authorized as part of the federal economic stimulus package.

To take advantage of the financial incentives, Detroit must use the bonds within three years.

The construction projects would help the district make the transition to pre-K to 8 campuses. Proposal S would result in five new and five renovated pre-K to 8 campuses. ■

NEW JERSEY CONSTRUCTION

$5.293 billion	Funding allocated by the New Jersey Schools Development Authority for construction projects since January 2006
144	Major construction projects completed
45	New schools completed
45,000	Student capacity added from construction projects

Source: New Jersey Schools Development Authority

CONSTRUCTION ZONE

WORK IN PROGRESS

21st-century learning

When the renovation and expansion of the Lemieux Library and McGoldrick Learning Commons at Seattle University is complete in 2011, it will be the largest capital project in the university's history.

The project creates a new 33,000-square-foot "front door" addition to the existing 92,677-square-foot facility, which will be renovated. Constructed in 1966, the original Lemieux Library serves 6,000 students and 480 faculty, as well as the surrounding community.

The project, which is slated for LEED gold certification, brings the library into the 21st century as the renewed academic heart of the campus. A multi-faceted learning commons on two floors encompasses a media center, digital commons, media production center, and mentoring and research commons. Also included are 24/7 study areas, interactive classrooms, a cafe and terrace reading room, three grand reading rooms, and a special collections archive and reading room.

Architect for the project is Pfeiffer Partners Architects (Los Angeles), in collaboration with Mithun Architects (Seattle).

Seattle University, Lemieux Library and McGoldrick Learning Commons

Santa Ana College Child Development Center, Santa Ana Calif.

A mosaic design

A parking lot that sits on the edge of a commuter college campus soon will be a place where children play and students learn. The Santa Ana College Child Development Center, Santa Ana Calif., broke ground in July and is scheduled for completion in late 2010.

The new building will serve children of college students and local residents, and will give budding child-development professionals the opportunity to observe child interaction and behavior. It will accommodate 178 infants, toddlers and preschool children, as well as up to 100 students enrolled in the college's early-child-development program.

An extension to the academic program of the college, the center features eight children's classrooms, lecture rooms and opportunities for on-site observation. The academic program will be housed in lecture rooms and offices on the second floor of a centrally located administration building.

"This new location will allow us to continue to educate and nurture our parents while they attend school, work and/or seek gainful employment as well as consolidate the location of our human development program, an influential instructional program that prepares our students for careers working with children," says Erlinda Martinez, president.

The design carefully mixes the domestic nature of neighborhood single-family suburban homes with the modern, progressive feel of the campus. The cottage concept was transformed into a cluster of nurseries for different age groups, each with self-contained kitchens and bathrooms with private patios and age-specific play yards.

Architect for the project is Harley Ellis Devereaux (Los Angeles).

Start: July 2009
Completion: Late 2010
Project area: 18,200 sq. ft.
Cost: $8.6 million

Fast track to the future

Following the destruction from one of the nation's most devastating storms, New Orleans Public Schools is looking to the completion of the new Greater Gentilly High School as a proud symbol of the community's tenacity, resilience and vision for future generations. The new 173,000-square-foot building, which will accommodate up to 800 students, was designed on a fast-track schedule and will open in early 2010.

The facility will serve as a magnet school with an academic focus on commercial arts, computer science, entertainment production and education. A flexible floor plan with retractable walls and functional classrooms and laboratories will accommodate changes in the curriculum and instructional approaches.

The three-level brick building features a wind- and water-resistant design and reflects meticulous mitigation analysis and planning to prepare for future storms and other potential disasters. Most of the academic spaces and resources are housed on the two upper levels, with the ground level partially reserved for parking. The building has moisture-resistant finishes, wind-resistant galvanized steel roofing, and hurricane impact-resistant window systems. The high school is designed to LEED silver certification standards, with a goal of reducing energy consumption by at least 30 percent.

VergesRome Architects (New Orleans, La.) and Fanning Howey teamed up for the design.

Greater Gentilly High School rendering, New Orleans, La.

Aurora Hills Middle School, Aurora, Colo., rendering

A prairie feel

The new Aurora Hills Middle School, Aurora, Colo., will be situated on a 100-acre site with a high school.

The exterior design and materials reflect a prairie concept. Primary building materials may include masonry, wood, and metal in natural colors, such as brown, beige and red. Large expanses of glass will bring nature and daylight into the building with large overhangs or shading devices to protect occupants.

The design team used LEED for Schools as a guide during the design process. The building cost will range from $18 to $23 million at about 130,000 square feet and will be designed using APS Middle School Educational Specifications.

The project is a joint venture of SLATERPAULL (Denver) and RB+B Architects (Fort Collins).

Home for social sciences

California State University San Marcos (CSUSM) is building a new Social and Behavioral Sciences Building. The 106,509-square-foot, four-story classroom/office building will house the social and behavioral sciences programs.

It will provide a 739-seat lecture area, lower and upper division labs, graduate research space, 125 faculty offices, a dean's suite, 10 department suites, support spaces and conference rooms.

Programs that will be housed in the building are psychology, sociology, communication/mass media, economics, political science, anthropology, liberal studies and human development.

Exterior finishes include extensive porcelain tile, storefront glazing and phenolic panels.

AC Martin Partners (Lost Angeles) is architect for the project. EDGE Development, Inc. (Temecula, Calif.) is general contractor. ■

California State University San Marcos, Social and Behavioral Sciences Building rendering

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Furniture

Traditional furniture pieces can encourage movement in the classroom.

To encourage physical activity throughout the day, schools should look for furniture that can be grouped and moved easily.

Physical activity throughout the day helps keep students focused and enables them to expend extra energy. Whether using exercise balls as seats, stand-up desks or more traditional furniture options, items that facilitate movement are critical to help students succeed.

Traditional furniture pieces can meet the physical needs of students, keep them engaged and make them more successful. Here are a few things to keep in mind when investing in traditional classroom furniture for a moving classroom environment:

•**Seating**. No longer does sitting in chairs mean sitting still. To encourage student movement while seated, look for chairs that are ergonomically designed and that have foot rests.

-*Ergonomics*: In order for students to succeed, they need to be comfortable and supported physically while sitting. Chairs must provide a natural posture for students, while also being flexible and enabling a broader range of movement.

-*Foot rests*: Children typically have a high amount of pent-up energy and have a natural tendency to fidget. A great way to help students expend extra energy and relieve restlessness is with a sturdy foot rest or book rack beneath the chair on which they can tap or bounce their feet.

•**Tables.** Tables and desks may not be the first thing that comes to mind when thinking of a moving classroom, but these pieces are important. To encourage more physical activity throughout the day, look for workspaces that can be grouped and easily moved.

-*Groupability*: When selecting workspaces, choose tables that can be grouped together or stand alone, such as furniture designed for collaborative learning. Periodic desk groupings not only get students out of their seats and moving around, but also facilitate group learning, which encourages more physical movement from students (e.g., talking with hands and exaggerated facial expressions.)

-*Portability*: Not all learning activities take place at seated workspaces, so be sure to select tables and desks that can be moved easily and enable open areas to be created when full-body activities are introduced. Look for workspaces that are lightweight and set on casters.

Space planners should keep many things in mind when creating a classroom that encourages movement. Whether you choose to purchase trend items for now, or invest in more traditional furniture pieces for the future, give careful consideration to all aspects of the decision. Remember that any effort to encourage movement in the classroom will benefit students. ■

—By Amee Meghani, product engineer, Smith System, Arlington, Texas.

Harvard University, Hamilton Hall
Cambridge, Mass.

Architect: Finegold Alexander + Associates. Photo courtesy of HBS

SAVVY SPENDING

Incorporating life-cycle costing into facility decisions enables schools and universities to have buildings that operate efficiently for the long term.

BY MIKE KENNEDY

To keep up with a growing suburban community east of Indianapolis, Mt. Vernon High School in Fortville, Ind., is in the midst of a $44 million overhaul. Renovations to the 210,000-square-foot campus and construction of about 180,000 square feet of new space are expected to meet the school's space needs for years to come.

And to meet the school's energy needs well into the future, workers have drilled several hundred holes 200 to 300 feet into the ground to install a geothermal heat-pump system.

If administrators in the Mt. Vernon district were concerned only with the costs of installing a system to heat and cool the campus, it's unlikely that they would have chosen a geothermal system. "The upfront costs are more than for a traditional system," says assistant superintendent Mike Horton.

But by looking beyond initial construction and analyzing how much the school district would have to pay to operate and maintain the system in the years ahead—and how much the system would reduce the facility's carbon footprint—Mt. Vernon leaders concluded that a geothermal system was the most cost-effective.

"The ongoing cost to run the system is going to be less," says Horton. "With our general funds shrinking, it's important to find ways to save money."

Mt. Vernon is one of many school districts and higher-education institutions that have embraced life-cycle costing strategies as they make their facility plans.

"The understanding of the process is growing," says Richard Thomas, a vice president at SHP Leading Design, an architecture firm based in Cincinnati. "Because of rising energy costs and a greater awareness of the environmental movement, more people are willing to look at the long term."

Continued...

The long view

The concept underpinning life-cycle costing strategies should be familiar to every consumer that makes a spending decision. Two products may promise similar benefits, but the price of one is noticeably less. Can you choose wisely? If the price at the cash register were the only factor, buyers would opt for the lower price every time. But many people consider other characteristics: which product performs better, which one lasts longer, which one has more appealing aesthetics. Consumers don't always have access to that data, so they may have to make decisions based on other factors—marketing, word of mouth, and trial and error.

In education, life-cycle costing is a method of gathering reliable information to provide administrators with a basis for choosing the most cost-effective option in designing, building and outfitting a facility. Rather than rely on hunches, vague estimates or promises, life-cycle costing can help schools and universities arrive at objective answers to questions about the total cost of owning a facility over its entire life. That includes how long a building will last and how much it will cost to operate and maintain it to make sure it does last. It also may include the costs of disposing of the facility and the materials and equipment within it once they have worn out.

Old idea

The concept of life-cycle costing is not new. The expression "penny wise, pound foolish" has been around for centuries to admonish those who opt for short-term solutions that don't provide savings in the long run. Yet, much of modern society, especially in the post-World War II United States, has adopted a throw-away culture that emphasizes discarding and replacing items.

"Americans have tended to focus on more short-term investments," says Thomas.

That short-term thinking is reflected in many of the school facilities built in the baby-boom era. Thousands of hurriedly planned, built-on-the-cheap schools provided badly needed classroom space for the post-war generation. Those buildings served their purpose of accommodating the baby-boom population bubble, but by the 1990s, facilities were deteriorating more quickly than those built decades earlier.

As more educators, administrators and political leaders came to the realization in the 1990s that they had to do something about the hundreds of billions of dollars in deferred-maintenance needs in U.S. school facilities, a new wave of school construction and renovation began with a different perspective. Instead of short-term providers of space that taxpayers reluctantly paid for out of an obligation, schools were seen as integral components of a community and worthy of significant long-term investment.

Schools and universities that look at their facilities as assets that will be valuable and vital for years to come

Pay now, save later

Hundreds of colleges and universities in the United States have committed to reduce their carbon footprint and operate in a more environmentally friendly way. Life-cycle costing is one way higher-education institutions can determine which facility decisions will lead to the most efficient use of resources.

Harvard University's Office of Sustainability makes the case for life-cycle costing on its Web page:

"Were Harvard simply a developer whose interest in the buildings it constructs ended with the ribbon cutting, it might be understandable for the university to ignore ongoing operating costs," the office says. "However, Harvard owns and occupies a large majority of the buildings it constructs .... Decisions made to cut costs in the capital budget up-front can easily lead to greatly increased maintenance and utility costs, burdening the university for years and years to come. This would not be an intelligent way for America's most-long lived institution of higher education to operate."

Harvard University's Hamilton Hall is certified LEED gold. Architect: Finegold Alexander + Associates

Harvard has created a Green Campus Loan Fund that provides up-front capital for projects that reduce the university's environmental impact in the long term and have a payback period of five to 10 years. The fund has made $11.5 million in loans for 153 projects; so far, the projects have generated $4 million in savings.

The first project to use the fund, the university says, was a renovation of Hamilton Hall, a student residence. Occupancy sensors were installed in 72 student rooms, as well as conference rooms and lounges, to reduce the heating and cooling demand when spaces are unoccupied. Engineers estimate the sensors will save $8,485 a year in utility costs, which would enable Harvard to recover its costs within seven years.

River Springs Middle School, Orange City, Fla., takes advantage of the district's geothermal system, which uses water from the Floridan Aquifer. (Architect: Hawkins, Hall and Ogle Architects Inc.) Photo courtesy of Smith Aerial Photos

are more likely to see the worth of life-cycle costing strategies.

Green considerations

In the last several years, the growing demand that education institutions incorporate sustainable design and construction concepts in school facility plans has created a greater emphasis on using life-cycle costing. The use of long-lasting materials and equipment enables schools and universities to avoid the unnecessary consumption of energy and resources to replace those items.

Systems designed that generate sufficient heating and cooling but use less energy and emit fewer pollutants can provide schools with operational savings and environmental benefits. Buildings that use less water save schools money and conserve limited resources.

Life-cycle costing can be applied to countless items in a school facility. As the process evolves, designers and administrators are gathering more data about how various elements in a project can affect costs over the life of the project. Sifting through all that information and determining how all the factors interrelate to affect building performance can be overwhelming, so many planners have turned to building information management (BIM) technology to create models and test how decisions influence how building systems operate, says Aaron Phillips, director of technology and BIM services at SHP Leading Design. (see sidebar, p. 22.)

The data collection won't enable planners to translate all the potential features of a school facility design to a simple price tag. Still, school and university officials may decide they want them included.

"It's not all dollars and cents with (life-cycle costing)," says a guide published by the state of Hawaii's Department of Business, Economic De-

River Springs DDD High School, Orange City, Fla., which will open in 2010, also will be cooled by the district's geothermal system. (Architect: SchenkelShultz Architecture)

velopment and Tourism. "Qualitative factors should also be considered."

Among those factors cited in the Hawaii publication: Occupants' access to views; illumination provided by daylight; occupant thermal comfort; access to operable openings; compatibility with maintenance staff capabilities; and use of standardized parts and materials.

Institutions that use life-cycle costing in their facility decisions may have to change how they handle operations and maintenance. A facility designed to maximize efficiency and reduce operational costs over the long term may require different maintenance methods and equipment.

"We try to provide a clear picture of how they should maintain the facilities," says Thomas. "Sometimes a school system will have to bump up against the culture of its own maintenance staff. They may feel threatened by outsiders or fear their jobs will be outsourced."

Too much information?

One of the keys to calculating the life-cycle costs of an education facility is gathering accurate data. The more data, the more confident planners are that their projections of long-term costs are reliable.

But assessing the effects of all the elements involved in a school project can be a headache as planners try to account for the consequences of each design choice. For instance, choosing a certain type of window glazing or altering the amount of glazing will affect how large a facility's heating and cooling system should be. A roof that includes solar panels will carry an additional cost, but it also will ease the energy an HVAC system will have to produce.

A planner trying to account for the effects of all the building characteristics soon can become entangled in a web of confusion as each slight change can alter countless other calculations. To provide education institutions with precise and accurate projections, design firms have turned to technology.

Building information modeling (BIM) technology enables designers to use computer programs to create a three-dimensional model of a planned facility. With a BIM program, a designer can ask "What if?" and see almost immediately how a design change—moving a wall, or re-orienting the building footprint—will affect the performance and costs of other aspects of the facility.

"We're trying to find the proper balance," says Aaron Phillips, director of technology and BIM services at SHP Leading Design. "The analogy I use is setting up a stereo system in a room to get the proper and perfect balance of sound so you get the highest quality of music."

From the ground up

One of the best examples of adopting a long-term approach in facility planning is the use of a geothermal system that uses the energy found in the earth's surface to provide heating and cooling.

Installing such systems generally cost more than a more conventional system, but geothermal systems typically provide energy savings that enable schools and universities to recover the upfront costs. The Collaborative for High Performance Schools *Best Practices Manual* states that geothermal heat-pump systems provide energy cost savings ranging from 20 percent to 50 percent; maintenance costs are reduced by 30 percent. The payback period for recovering initial costs is five to 10 years, the CHPS says.

In the Mt. Vernon district, administrators were confident that a geothermal system would be beneficial at the district's high school because Mt. Vernon Middle School has had a similar system since 2001. That gen-

Hebrew Union College, Cincinnati, uses a geothermal heat-pump system on campus. Photo courtesy of SHP Leading Design

erated sufficient savings to recover the initial cost in eight years, Horton says. In addition to the geothermal system being installed at the high school, the district also has installed one in a new elementary school.

"The geothermal system provides a lot more consistent heat," says Horton. "It also has a very limited maintenance cost."

The Mt. Vernon systems work by transferring heat back and forth from the ground. Other systems tap energy from water flowing underground.

In Orange City, Fla., the Volusia County district has a geothermal system that uses water from the Floridan Aquifer hundreds of feet below to provide cooling for River Springs Middle School, says Larry Hood, senior construction project manager for the district. The system has been built so that it also will provide cooling to a 3,000-student high school set to open in 2010; long-range plans call for the system to connect to a nearby elementary school in another 10 years or so, Hood says.

Having three campuses within a mile of each other provides enough economy of scale to justify the initial costs—including $100,000 for each 750-foot-deep well that is dug.

But the operational savings that the district anticipates are significant. The engineering firm working on the project estimates that the system will save the district $3.6 million over 20 years, and school leaders gave the go-ahead for the geothermal system.

"The numbers convinced them real fast," says Hood.

The life-cycle cost analysis covered a 20-year timeframe, but Hood says the geothermal system is expected to last 50 years or longer. In addition, because the system doesn't require cooling towers, the schools will use significantly less water. ■

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WEB 101

Also read: "Good Performers" from the green article archives at ASUmag.com.

Administrators should take a fresh look at their fire-prevention efforts.

Fire Power

With the assistance of risk-control experts, administrators can put effective fire-prevention measures into place.

By Deb Denker and Lee West

For education administrators, campus fires are not only a distressing loss, but also a stark reminder that a campus faces risks that require special vigilance.

In many ways, campuses resemble small communities, with areas for living, working and relaxing. A residence hall fire may raise the specter of careless youth, often with the complication of alcohol thrown in. But fire-safety concerns also center on classrooms and faculty offices, where tinder-dry books and papers are abundant. Throw in irreplaceable special collections in university libraries, valuable fine-arts exhibits and historic buildings, and it becomes clear that fire prevention requires comprehensive planning beyond

rules about residence hall living.

Now, with new efforts at the federal level to track campus fires, administrators should take a fresh look at their fire-prevention efforts. Although many fire-safety steps fall under the category of common sense, others require specialized knowledge. An insurer that provides comprehensive coverage and a suite of services may provide education administrators a resource of risk-control experience.

The scope of a threat

Understanding any risk typically begins by knowing how likely a problem is to occur. There is no study specific to college and university fires, but statistics from various studies performed by the National Fire Protection Association (NFPA) that apply to education institutions indicate opportunities for improved fire safety.

In its report on structural fires on education property for the years 2002 through 2005, the NFPA includes elementary and secondary schools. The closest accounting for college and university fires is a mixed category labeled "adult education centers and college classrooms." For that category, the report identifies an average of 730 fires per year, which accounted for an annual average of 14 injuries and $25 million in property damage.

In a separate report for the same timeframe, NFPA found an average of 3,300 fires occurred each year in residence halls (including K-12 schools with boarding facilities), fraternities, sororities and barracks. These caused an average of seven deaths and 46 injuries each year, as well as $25 million in property damage.

An NFPA researcher notes that fires that may occur on college and university campuses in structures that are neither classrooms nor residence halls are not captured by the reports. In addition, fires not reported to municipal fire departments

K-12: Playing with fire

Although a college campus can be a fire-hazardous environment of youthful carelessness exacerbated by alcohol impairment, K-12 schools have proven to be more likely settings for arson. The National Fire Protection Association has reported that almost a quarter of all fires in education properties are set intentionally, compared with a much lower 4 percent incidence of arson in college residence halls.

Elementary and secondary school administrators need to plan their prevention measures around the contributing factors that make their facilities so vulnerable.

Some factors can only be understood but not prevented. For example, the U.S. Fire Administration notes that half of all arson arrests involve juveniles—the population served by K-12 schools. The reasons are many: Young people are prone to experimenting with lighters, firecrackers and other incendiary material. They often have poor impulse control, especially when gathered with a group of like-minded friends. They also may lack the maturity to think through the consequences of their actions.

Other factors at K-12 schools, however, can be addressed by security measures. Many schools feature open designs on large lots, providing multiple points of entry. They may have low roofs that are easy to climb on to. They often are deserted for large parts of the day and night. Among the measures that can be taken are to counteract these vulnerabilities:

- Ample exterior lighting, with timers, motion-sensing controls or daylight-detection sensors. Bulletproof coverings may be needed to protect bulbs, frequent targets of BB guns.
- Trimmed shrubbery and trees that keep all parts of the facility visible.
- Intrusion alarms for doors, windows, ventilator openings and roof hatches.
- Placement of trash containers, where fires often are set, away from buildings. Locked metal lids also provide effective prevention.
- Good communications with nearby homeowners, who should be provided with key contact information and encouraged to call when they see signs of vandalism or trouble.

are not included.

In both reports, the leading cause of fires was cooking equipment (accounting for 72 percent of the fires in the residence hall report and 25 percent in the all-schools report), followed by contained trash fires (7 percent and 25 percent, respectively) and arson (4 percent and 22 percent, respectively). In the residence hall report, lighted tobacco products and candles each caused only 2 percent of fires, but together accounted for almost two-thirds of the deaths. For all education property, intentionally set fires caused the most injuries and the most property damage.

One aspect of data collection is expected to improve because of a late-night fire in January 2000. Two young men finished a night of drinking by setting fire to a "Welcome Back" banner in a residence hall lounge at Seton Hall University in New Jersey. The fire spread to a couch and from there became an inferno that killed three students and injured more than 50 others.

In the outcry that followed, the U.S. Congress made fire-incident reporting for student residence halls a new requirement for colleges and universities when it reauthorized the Higher Education Act in 2008. In addition to reporting fires, campuses will be required to describe the presence of fire-protection equipment; fire-safety training programs; and the number of regular mandatory fire drills. Final regulations to complete this and other portions of the act are expected to be published in November 2009.

A sound plan

With the onset of federal tracking of fire-safety provisions at campuses, now is an excellent time for administrators to review the plans they have in place, assess any shortcomings and work with risk-control specialists to improve fire-prevention efforts. There are three areas on which to focus:

•**Prevention.** An effective fire-prevention program should be tailored to an institution's specific conditions, but in general should have four key elements: rules that limit the potential for fire; education and training that alerts everyone about the rules; regular inspections to ensure the rules are being followed; and enforcement of consequences to encourage compliance.

Because studies indicate cooking is a leading cause of fires, administrators need to encourage vigilance about residence hall rules concerning hot plates, popcorn poppers and other heat sources that students may use to prepare food. Similarly, halogen lights, frayed extension cords, flammable decorations, tobacco products and candles can be dangerous in any setting, but particularly in residence hall rooms. With arson fires causing the most injuries and property damage, good campus security will be key to preventing fires, including good lighting and supervision outside and effective access control to interiors.

Administrators also should educate staff about the role that alcohol plays in many fires. Students who drink to excess can become careless with flammable materials, be unable or hesitant to properly alert authorities when a fire breaks out, and have difficulty following directions if an evacuation of a burning building is required. In addition, student apathy

Precautions in residence halls

Recommendations for dealing with fire prevention and suppression in residence halls:

Equipment

•Install an automatic sprinkler system, especially in high-rise housing.

•Install hard-wired (not battery-operated) smoke alarms in every room and every level of the housing facility.

•Maintain and test smoke alarms, fire-alarm systems and sprinklers.

•Provide covered, metal waste receptacles.

Student education

•Show students how to notify the fire department properly using 911.

•Conduct fire drills and practice escape routes.

•Teach students about the dangers of overloaded electrical outlets, and make sure extension cords are used properly.

•Educate students about using and maintaining heating and cooking appliances, if they are allowed in residence hall rooms.

Enforcement

•Forbid smoking in rooms, as well as the use of open flames.

•Require adequate ventilation for computers, televisions and radios.

•Ban halogen lamps or restrict to low wattage and have them shielded by a bulb guard.

•Restrict cooking to approved areas with fire-protection features.

•Carry out a strong discipline response to any incident involving arson.

•Regularly inspect rooms and buildings for fire hazards.

Preparation

•Create and update detailed floor plans of buildings and make them available to emergency personnel, staff and students.

•Train and drill residential assistants on emergency procedures.

•Inspect exit doors and windows to make sure they work properly.

NOTABLE

3,300 Average number of fires per year in residence halls (including K-12 schools with boarding facilities), fraternities, sororities and barracks.

Source: NFPA

in the face of what they may consider to be a drill or a prank can be a problem when a real fire alarm is set off.

•**Protection**. Along with many fire-protection features and equipment, campuses should include smoke-detection devices wired into the electrical system, a centralized monitoring system and automatic sprinklers.

Central monitoring already has been adopted widely. The National Association of College and University Business Officers reported that in September 2008 a large majority of its members have all or most of their campus facilities centrally monitored for fire alarms, and more than three-quarters of residence halls are monitored centrally.

Automatic sprinklers, which can be expensive, are less prevalent. They can make a substantial difference. The NFPA noted in its residence hall report that in the 36 percent of fires in buildings with automatic-suppression systems, deaths and property damage were far less than in buildings without the equipment (zero vs. 13.9 deaths per 1,000 fires and $3,800 vs. $35,000 in average losses). For academic buildings that are unattended at night, burglar-alarm systems and closed-circuit TV monitoring are important deterrents to vandalism and arson.

Campuses also should ensure the equipment is functioning. Maintenance and testing should be carried out regularly.

•**Insurance services**. Education administrators can benefit from an insurer that provides services in fire prevention and readiness. For example, a risk-control department should be available to conduct site surveys, provide guidance and plan reviews for new projects, and offer on-campus training, webinars and other prevention resources.

In addition to standard business policies, administrators may want to consider extended coverage, such as a business-continuity policy to cover the costs of using alternative sites in the event of fire damage. Policies should cover special collections, such as library resources, artwork and other university assets.

The threat of fire can be devastating for an education institution. By working closely with experts, administrators can create an effective prevention plan and improve the odds against a destructive fire. ■

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WEB 101

Also read "Major Losses" from the security archives at ASUmag.com.

Measured Success

Measuring cleanliness can foster feelings of respect among students and the staff responsible for keeping schools clean and healthful.

By Tom Keating

Many students think custodians are hired to pick up after them. And sometimes adult workers voice similarly negative impressions: "These kids act like animals."

What can education institutions do about this negative and improper thinking?

Microbe measurement

Because of heightened concerns

about invisible pathogens such as MRSA and swine flu, improved technologies are available to measure bacteria or organic matter that feeds bacteria. Progressive custodial departments are using these devices—known as ATP meters (used to measure levels of adenosine triphosphate—the energy molecule present in all living cells)—in their day-to-day cleaning rounds. Custodians in many schools have professionalized their approaches, training and equipment, and integrated the use of measured cleaning methods to foster enhanced respect for their roles.

In addition to integrating ATP devices, another possible approach to help close the attitudinal gap would be to adopt more widespread use of fluorescent "revealing" devices. For example, a "black light" used with a fluorescing hand-or-surface treatment will show abundant germ-promoting soil left behind after improper washing. This can be an important educational tool for students as well.

Surveys and wellness teams

Student attitudes about custodians rarely are surveyed in middle and high schools, but it is a good idea. Included in the curriculum of a health class, a survey may prompt great discussion and some change. A survey easily could include questions about custodians and their role in ensuring healthful schools.

A five-to-seven-person school-hygiene and wellness team or committee could be set up with custodians, students, a teacher, an administrator, and even a parent or two. Every school district in the nation has a wellness policy, so such teams or committees easily would fall within the purview of the "other school-based activity" requirement of this policy.

Benchmarking benefits

Selected restroom surfaces such as sinks, mirrors and stall doors could be identified in restrooms throughout the building, including the locker rooms. A portable device such as an ATP meter would record the hygienic condition of these surfaces initially for the new wellness teams. Then through an integrated cleaning and measurement (ICM) approach using high-productivity equipment such as spray-and-vac machines, the surfaces would be cleaned thoroughly.

Students, staff and custodians would re-measure the "cleaned" surfaces, and present the comparison between pre-cleaning and post-cleaning scores. As important as the reduction of infectious organisms and biocontaminants is, these measurements are likely to not only take place, but also to occur often.

Students would then see that custodians with professional training and equipment are not just "people who pick up trash," but respected professionals helping to make restrooms and schools hygienic. This would help alter the perception of cleaning, enhance respect for the facility and service staff, and by extension, assist in changing the attitude of students who think they can do what they want: throw trash on the floor, urinate on stall doors and dump trash in the commodes.

Students on such wellness teams would begin to feel that custodians are their allies in getting and keeping restrooms more healthful; integrated, measured results can speak volumes. Custodians increasingly would see students as partners in a team effort to have a healthful building. Teachers could use the results in health, biology and science classes to convey valuable lessons and reinforce good behaviors.

For many, seeing is believing, so clean restrooms also would provide a model and prompt a cleanliness trend that would reduce restroom abuse. ■

Student attitudes about custodians rarely are surveyed in middle and high schools, but it is a good idea.

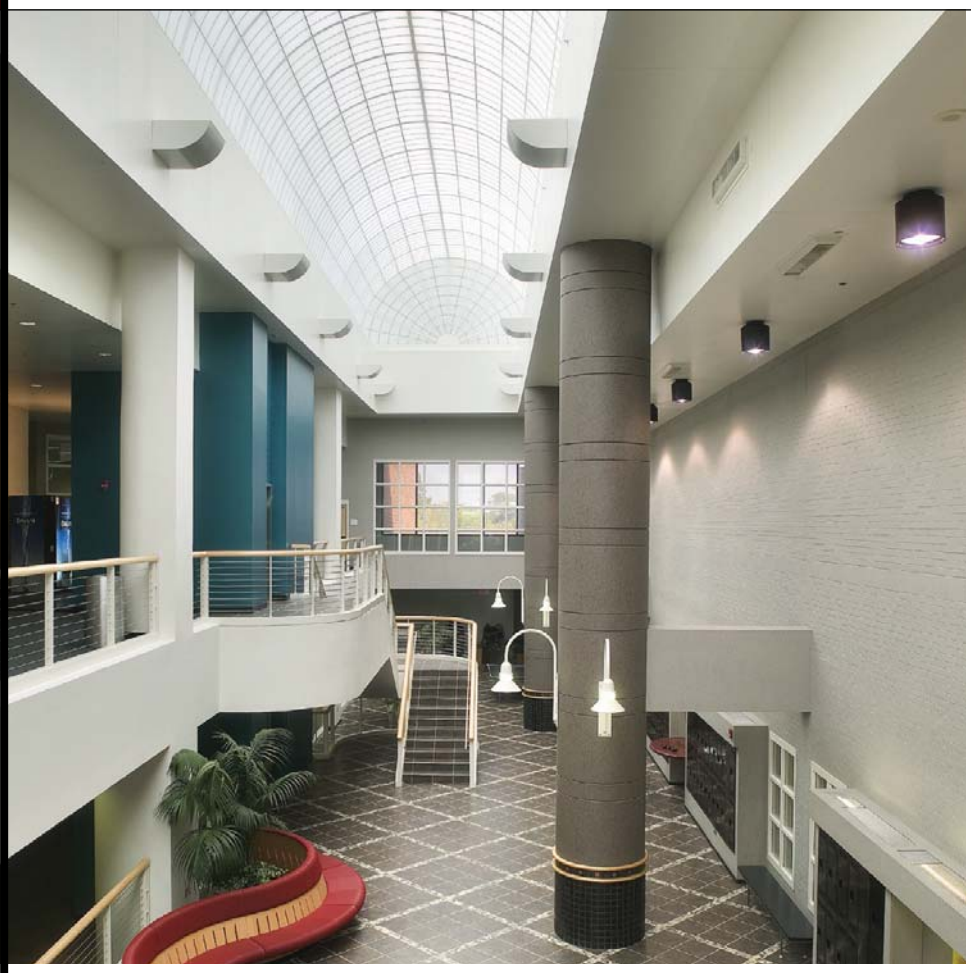
Keating has served as a teacher, governmental liaison, school board member and self-employed educator during his 40-year education career. He founded Project CLEAN (Citizens, Learners, and Educators Against Neglect), a multi-year effort to improve school restrooms worldwide. For more information, visit http://project-clean.com.

Hand-washing habits

Parents optimistically believe their children wash their hands with soap and water 68 percent of the time after using the school restroom, according to a national survey conducted by Bradley Corporation.

Bradley's first Healthy Hand Washing Survey also determined that the spread of the H1N1 virus hasn't changed the majority of American adults' hand-washing habits, as 54 percent of the 1,020 respondents said they "wash their hands no more or less frequently" in public restrooms as a result of the virus. Overall, 87 percent of respondents said they did wash their hands after using public lavatories, but other responses indicated that some may have exaggerated how often they actually did the job correctly. When asked if they had also used soap, the numbers declined only slightly, to 86 percent; yet 55 percent of the group admitted on occasion they've simply rinsed, without using soap.

For more information, visit www.bradleycorp.com.



The amount of daylighting in a space can affect occupant comfort, productivity, performance and health. Photo courtesy of Curtis Photographics

The Science of Light

The benefits of daylight modeling: a site-specific simulation that aids the process of intelligent daylighting design.

By Amy Keller Gleed

Daylighting a space is both an art and a science. The impact of daylight can make a building's design come to life. Daylighting can be carried out skillfully, or it can be too casually considered or totally misunderstood. Bad daylighting is devastating to a space and costly to fix. Today, in this era of sustainable design, daylighting is given more consideration than ever.

One of the desirable attributes of daylighting is its significant role

in creating the mood or atmosphere of a space. It affects the comfort, productivity, performance, health and well-being of occupants. Daylighting has a significant influence on energy efficiency, electrical lighting costs and HVAC climate control. And of course, the green movement and desirability of earning LEED points increasingly inform the daylighting plans for buildings.

Too often, designers don't comprehend the result of a daylight scheme until construction is completed, the space occupied, and all the money spent. This is the wrong time to discover glare, over-bright areas, shadows, dark spaces or poorly balanced light levels. Effective daylighting, one of the most powerful tools available to architects, should be planned in the design phase.

Well-planned daylighting considers significant circumstances beyond the confines of a building.

Simulated results

Just as traditional miniature, scale-model building and 3-D computer modeling help represent what a finished design will look like, climate-based daylight simulation demonstrates clearly the impact of the size, type and placement of skylights, windows or translucent wall systems. Results can be compared and changes made in the early design stages before final recommendations are made. Using computer-generated charts and light-level schematics, daylight modeling simulates the effects of daylighting and enables designers to analyze the behavior of light within the space.

Well-planned daylighting considers significant circumstances beyond the confines of a building. How is the structure to be positioned on a site relative to the lay of the land or the points of the compass? Local climate and seasonality of the sun's path should be simulated, along with the surrounding topography. Are there

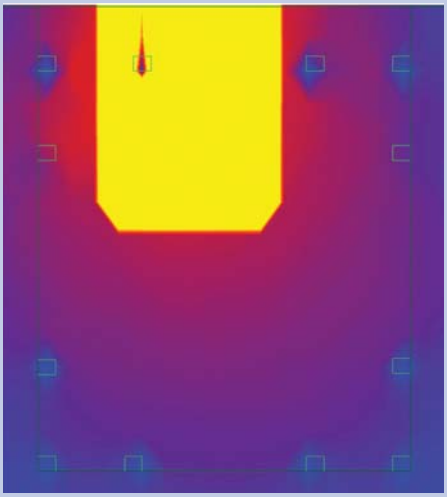


Figure 1

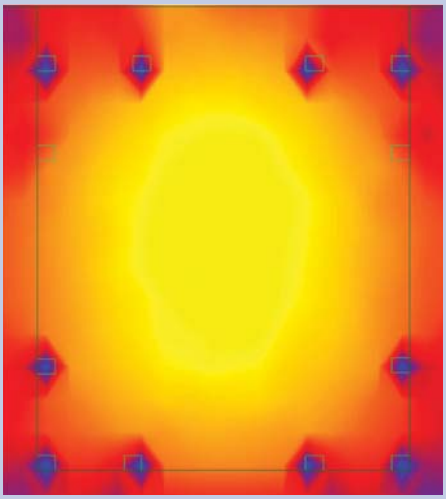


Figure 2

Light evaluation

One of the first steps in designing a space is to evaluate the effect of direct beams of sunlight. In educational settings, such as classrooms or libraries, balanced daylighting is essential for ambient light levels.

Figure 1 shows an example of a design submitted for daylight simulation. The architect asked for help in selecting light transmittance for the skylights. The model was run with different glazing options, and it provided the designer with information to help meet the target luminance for the space below.

First to be assessed was the skylight at noon on the equinox (Sept 21st); the sun is overhead where it is strongest and gives a good indication of typical light levels midday in the space for most of the year (noon in summer months is higher as the solar angle is more direct; winter months have a lower sun angle at noon). Using 30 percent glass for the skylight results in uneven light levels, as direct sunlight is not controlled. Shown here is a false-color plan view, which reveals excessive areas of direct sun (shown in bright yellow); light levels are not balanced within the space. This highlights the glare problem caused by sunlight coming through the glass.

An alternate toplighting strategy then was considered, changing to translucent sandwich panels to manage the direct beam penetration. This analysis is based on 8 percent light transmittance. **Figure 2** shows the new plan view for the same space. Given the same sky condition, the translucent sandwich panels diffuse direct sunlight to fill the entire space evenly with controlled, balanced daylight.

Had the original plans been executed, the results would have been disappointing. Students and staff would have had difficulty dealing with imbalanced light levels and glare. Thanks to daylight simulation, alternatives were considered and decisions made that resulted in a more effective design and a more comfortable space. Balanced daylighting also will generate operational savings through reduced HVAC loads and electric consumption.

mountains or trees nearby, or reflections off the surfaces of buildings or bodies of water? Nearby structures might create an urban canyon on the site during certain hours of the day or times of the year.

Effective daylighting cannot be rubber-stamped from one building to the next. A daylighting design that is effective in one location simply may not be in another. How much daylight does it take to provide the desired results? What about harsh glare and shadows?

Who has not observed a space, such as a restaurant, waiting room, manufacturing area, retail space or classroom, where bright sunlight from time to time blinds occupants, overheats the space or overworks the HVAC system? Unmitigated sunlight often ruins a daylighting design. Controlling quality and quantity of daylight is imperative to managing related heat loss/gain and overall comfort.

Using daylight modeling, "what if" scenarios can be considered and demonstrated; pre-planning can manage and eliminate all of the negatives. Alternative design solutions can be studied and planned. Spaces can be analyzed for a certain time of day or season, as solar angles change, or evaluated for overall annual performance using local climate conditions. Daylight modeling shows the way to better illuminate any space and eliminates costly design mistakes. ■

Gleed is a principal of Kalwall Corp., Manchester, N.H., and serves on several technical committees of the Illuminating Engineering Society of North America (IESNA). She can be reached at info@kalwall.com.

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Also read: "Lighten the Load" from the Windows/Daylighting article archives at ASUmag.com.

GREEN schools & universities

strategies to create sustainable, high-performance facilities

INSIDE THIS SPECIAL SECTION:

Veterans Tribute Career & Technical Academy
Las Vegas, Nev.

Architect: Pugsley Simpson Coulter Architects
CM-at-Risk: McCarthy Building Companies, Inc.
Photographer: McCarthy Building Companies, Inc.

The 130,700-square-foot academy is designed around LEED standards, including solar-panel outdoor lighting, insulated concrete walls, a daylight dimming system, sun-tracking solar lighting systems and a geothermal well system.

Green Planning

Crafting a campus sustainability program for your institution.

By Michael Crowley

Education institutions are developing sustainability programs to address the effects that their operations have on climate change and other environmental issues. This effort can be attributed to pressures from unpredictable energy markets; sustainability ratings from groups such as the Princeton Review and the Sustainable Endowments Institute; new and impending greenhouse-gas emissions regulations; and pressures to join organized advocacy groups such as the American College and University Presidents Climate Commitment (ACUPCC).

Many successful sustainability programs are in place; although all of these programs share some fundamental characteristics, specific issues such as campus culture, values and monetary constraints have led some schools down unique paths toward sustainability.

Sustainability team

The best sustainability programs develop synergies from existing campus resources. For instance, waste vegetable oil from dining halls can be used as fuel for the campus transportation fleet; storm water can be captured and reused to irrigate lawns, and "energy hog" buildings can be tuned properly to generate savings that in turn can be reinvested into on-campus renewable energy projects. For programs to be successful, campus administrators need to foster new types of collaborations across departments.

Many schools are developing interdepartmental campus sustainability teams. With student, faculty and staff representatives from groups such as operations, finance and academics, these teams often are cut from a real cross section of the campus.

Some campuses have leveraged existing interdepartmental teams that have experience working together. Others increasingly are turning to a new breed of administrators called campus sustainability professionals. These professionals are skilled at facilitating interdisciplinary approaches to sustainability, and can help build consensus for the program's goals and priorities. In addition, support from

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the top combined with project success and confidence from management is required for sustainability to thrive.

A key first task of a sustainability team is to conduct a campus sustainability assessment. These assessments combine metrics such as recycling rates, energy usage (by building if possible), and greenhouse-gas emissions with additional qualitative evaluations of program opportunities. This creates the basis for establishing definable goals that are supported by appropriate programmatic strategies and metrics. Sustainability assessments enable schools to define what sustainability means to them, chart a path to meet their goals, and create a baseline to gauge their efforts.

A recent focus has been on defining similar methodologies for the more focused, calculable metrics. Methods such as the World Resources Institute and the Climate Registry's Greenhouse Gas Protocols, or the National Recycling Coalition's "RecycleMania" competition are good examples of these efforts.

Surveys and lessons learned

•National Wildlife Federation's 2008 Campus Sustainability Survey
National Wildlife Federation (NWF) reported that more than 50 percent of colleges and universities surveyed for its "Campus Environment 2008" report having a staff person dedicated to sustainability on campus; 76 percent of those surveyed reported that they developed their sustainability programs primarily because they "think environmental sustainability programs fit the culture and values of the campus." This marks a significant milestone in the ecological identity of campus communities.

•Harvard University Green Campus Revolving Loan Fund
Harvard University has been funding on-campus energy and resource conservation projects through a revolving loan fund since 2002. The fund's operation is simple and direct: capital is provided to fund sustainability projects, and the savings generated from those projects are reinvested into the fund. Harvard has invested more than $12 million in projects since the loan fund's inception, and has maintained an estimated return on investment of 25 to 30 percent.

•Duke University: "Charting a Path to Greenhouse Gas Reductions"
Duke was one of the first universities to apply the metric of "Net Present Value per Metric Tons of Carbon Dioxide Equivalent avoided" to climate action planning. In a paper presented at Ball State University's Greening of the Campus VI in 2005, Duke University's Environmental Sustainability Coordinator Sam Hummel showed that this metric can address the "question of how to compare the relative benefit of strategies as diverse as increasing carpool incentives and burning more natural gas in the steam plant."

Strategic planning

Since its inception two years ago, the ACUPCC has become the impetus behind a series of strategic plans that use greenhouse-gas inventories as their baseline metric. This has spurred a new set of sustainability metrics used to prioritize projects, such as accounting standards that evaluate "cost and returns per metric ton of carbon" from energy-efficiency projects.

Harvard University, for example, has demonstrated a consistent return on investment from its energy and resource conservation projects of more than 30 percent. Projects such as commissioning (or retro-commissioning) buildings, replacing lighting and upgrading heating, ventilating and air conditioning (HVAC) systems are profitable, and have a significant effect on greenhouse-gas emissions.

The ACUPCC's goal of "carbon neutrality" also has opened new, harder questions about sustainability planning for campuses, and colleges and universities have embraced the challenge. It provides an opportunity to engage all resources, academic and administrative, to use the campus as a kind of sustainability laboratory to develop solutions that can be shared beyond the campus gates.

As campuses take this planning challenge head on, they are beginning to consider the relationship between the "hard" metrics of energy use and greenhouse-gas emissions, and the "soft" goals of culture and identity. For instance, a new construction project that effectively integrates green aspects into its design can be considered to have value far beyond its LEED rating or energy score. For instance, if students witness stormwater capture through green roofs, the use of daylight instead of artificial light, or the production of electricity through photovoltaic panels or wind turbines, they may gain a greater sense of possibility and ownership for their schools.

Observe and report

Sustainability assessments enable campuses to define, measure and prioritize their efforts, and they provide a means to track progress over time. Those hard metrics such as net present value per metric ton of carbon equivalent, thousands of British thermal units (kbtu) per square

feet of building space, or numbers of students that sign on to sustainability pledges provide yardsticks of progress that help sustainability teams stay on track. Successful programs provide the sustainability team with a measurable picture of their efforts in each area and enable the team to make informed decisions on all sustainability initiatives.

Good tracking and reporting systems add an appropriate weighting and balance to sustainability metrics and prevent any one activity from taking center stage. "Triple-bottom-line" accounting, which is used nicely in the University of British Columbia's annual report, provides equal weight to social, environmental and economic aspects of sustainability. This approach can help balance reporting and ensure that all stakeholders have an equal seat at the table.

Campus sustainability no longer is considered a fringe movement championed only by student environmental activists. Administrators are beginning to understand that sustainability can generate economic value and improve campus morale and reputation. It also may help retain committed employees, recruit passionate students and make a positive impact on society. ■

Crowley, MS, LEED AP, is program manager, Pathways to Campus Sustainability, for Environmental Health & Engineering, Inc., a Needham, Mass.-based environmental and engineering consulting firm specializing in the development of campus sustainability programs. He can be reached at mcrowley@eheinc.com or (800)825-5343.

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Additional resources:

- National Wildlife Federation's 2008 Campus Sustainability Survey:
http://www.nwf.org/campusEcology/campusreportcard.cfm
- Harvard University Green Campus Revolving Loan Fund:
http://www.greencampus.harvard.edu/loan-fund
- Duke University: "Charting a Path to Greenhouse Gas Reductions":
http://www.duke.edu/sustainability/documents/Greening Campus VI - GHG Paper.pdf

Free Resources

Unplugged Funds

Using recycling to raise school funds enables administrators to help their budgets while providing a valuable service to the community.

By Bill Rockett

In the last two decades, the growing use of electronics has improved productivity in business and education. This technology market shift also has introduced a waste-management problem: ensuring the proper disposal and sustainable treatment of outdated electronics. The U.S. Environmental Protection Agency (EPA) says that as of 2007, about 235 million obsolete units had been shifted to storage; that includes more than 65 million desktop computers and 42 million monitors. The recycling rate for outdated electronics was only 15 percent.

The need for electronics recycling, also known as e-cycling, is apparent; many states are working on mandatory, regulated initiatives. But academic institutions can take the initiative to organize an electronics recycling collection day. Such an event can help reduce the amount of hazardous electronics in the waste stream, boost community support and raise funds for the school.

Given the significant quantity of obsolete electronics in an academic setting, a school or university easily can be seen as the ideal site to host a collection event.

Why and what?

The broad scope of electronics that can be recycled safely may be surprising; In addition to computers and monitors, items such as televisions, entertainment components, kitchen appliances and cell phones can be recycled safely. For a school or university, recyclable e-waste includes everything from telephones, data servers and peripherals to security components, kitchen and cafeteria equipment. Research facilities and universities also may choose to include defunct laboratory and engineering equipment.

Clearing out and recycling outdated electronics, collected from individual consumers as well as those pulled from school grounds, provides an institution with several benefits.

E-cycling can prevent hazardous components found in some monitors and televisions—lead, mercury, cadmium and beryllium—from leaching into landfill sites. This will help schools and universities avoid possible state and federal fines for inappropriate disposal. Also, valuable resource components (from precious metals to engineered plastics) require substantial energy to manufacture and process. Recycling these materials uses fewer resources and results in fewer environmental emissions. Recycling old electronics also frees up storage space and allows for the total destruction of secure data, preventing sensitive or confidential information from leaving the custody chain.

Fund-raising possibilities

Planning an electronics recycling event is an excellent opportunity to coordinate a fund-raiser for your school. Many parents welcome the opportunity to participate in a fund-raising event, and many university students are happy to participate in green activities. Hosting a collection fund-raiser enables students and parents to clear their homes of outdated e-waste.

Part of the electronics recycling process is the stripping of valuable materials such as gold, silver, copper and platinum from de-manufactured components. Recyclers are able to sell these metals in order to recover a portion of the cost of processing, keeping the fees imposed on those dropping off electronics fairly low. However, the fluctuating market price for metals greatly affects the amount of money that is recovered from each piece of equipment, and in turn dictates the fees that will be charged in order to conduct a collection event. When working with an e-cycler to plan a recycling day, be sure to discuss the fees that will be charged for each electronic component (from $5 to about $25, depending on the item). This fee can be adjusted to incorporate an amount to be returned to the school: for example, a participant may pay $10 to recycle an old laptop computer—$5 for the recycler to cover costs, and $5 for the school.

Each collection event may incorporate different pricing strategies, depending on the market requirements and the needs of the e-cycler; any school wishing to plan a collection day should be able to work out a mutually beneficial relationship with a local

e-cycler to ensure a successful event.

Planning the event

Assign a project coordinator to organize, promote and provide a principal contact for the collection day event. This person will identify and work with a recycling business to plan the event and manage any volunteers. Several key elements need to be discussed and agreed upon:

•**Date and time.** Consider holding the event in conjunction with a local special event or promotion (Earth Day, community drives, parent appreciation days); provide a tent or rain date in the event of inclement weather.

•**Location on school grounds.** Schools are ideal settings because of large parking lots with established traffic patterns. Be sure to plan a circular traffic flow to accommodate easy dropoff of items and to encourage quick transactions.

•**Transportation of collected waste.** Most e-cyclers provide a truck or trailer to collect and haul waste.

•**Accepted items.** Many e-cyclers are not able to handle refrigerators and certain hazardous materials. Reduce confusion by agreeing upon the types of electronics that will be accepted at the event, and be sure to publicize these guidelines when promoting the collection day.

•**Destruction certificates.** Most e-cyclers will be able to provide confirmation certificates for the destruction of important items, if asked. This may be an attractive option for participants with unique items or computers containing sensitive data.

•**Financial arrangement.** This is key to any successful fund-raiser. Be sure to clearly establish the fees to be charged to collection-day participants and the amount returned to the school, as well as any applicable fees for any e-waste that may be contributed by the school.

After these details are confirmed with the e-cycler, the project coordinator then can promote the event to students, parents and the surrounding community. Remember to specify the types of items that will be collected, and what fees and form of payment will be required. On the day of the event, ensure smooth collection by posting traffic signs on campus to direct participants and avoid confusion. Consider offering a "school ID" discount to students and their parents, if pricing allows.

Contact a local or state environmental or solid-waste agency for assistance on issues that cannot be addressed by the e-cycler. ■

Rockett is vice president of M&K Recovery Group, an electronics recycler with locations in North Andover, Mass., and Austin, Texas. He can be reached at bill@mkrecoverygroup.com.

Choosing the right e-cycler

In the e-cycling arena, some companies have betrayed their customers' trust by disposing of items improperly. The improprieties range from inappropriate dumping of toxic components to the exporting of e-waste overseas where it is dismantled unsafely by at-risk, unprotected workers. When choosing an e-cycler, administrators must ask:

•Is the recycler licensed to handle hazardous waste? What procedural and environmental certifications do they possess?

•What is the final disposition of those materials and how is it tracked? How and where are assets recycled, and is that process auditable?

A growing number of e-cyclers are committed to proper, transparent management of e-waste; asking these questions can help administrators ensure they are choosing the right partner to carry out their recycling event.

For more information on e-cycling, local regulations and state recycling programs, visit the EPA e-cycling Web page at www.epa.gov/waste/conserve/materials/ecycling/index.htm.

Part of the electronics recycling process is the stripping of valuable materials such as gold, silver, copper and platinum from de-manufactured components.

WEB 101

■**From ASUmag.com:**
Michigan State University in East Lansing is celebrating the opening of its new Surplus Store and Recycling Center. The $13 million facility will accommodate three times the amount of materials as the previous MSU recycling facility. A comprehensive recycling program will enable the university to expand recycling collection in 553 buildings on campus. The five target materials are white paper, mixed office paper, newspaper, cardboard and plastics. The 74,000-square-foot center will house the MSU Surplus Store; recycling operations, offices and education center; storage areas for compost and metal scrap; a truck scale and space for roll-off and semi-trailer storage containers. The university is seeking LEED silver certification for the building. The architect is Fishbeck, Thompson, Carr and Huber.

Tools to Fight H1N1

Selecting green disinfectants for this flu season.

STEPHEN ASHKIN

Ashkin is executive director of the Green Cleaning Network, a 501(c)3 not-for-profit educational organization.
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Because of concerns about the H1N1 virus, this year's flu season is likely to affect schools and universities significantly. It is important to be familiar with state and local health recommendations, as well as information from the Centers for Disease Control and Prevention (CDC).

The CDC's recommendations include frequent hand washing with soap and water; establishing regular schedules for frequent cleaning of high-touch surfaces; providing disposable wipes so that commonly used surfaces can be wiped down before each use; and encouraging students to clean their living quarters frequently. However, the CDC does not call for any additional disinfection beyond the recommended routine cleaning.

But how does a school or university select and use a disinfectant as part of a green-cleaning program?

Selecting green disinfectants poses a challenge because disinfectants are regulated by the U.S. Environmental Protection Agency (EPA), which prohibits manufacturers from making green or health claims and forbids the use of third-party certifications. Keep in mind that disinfectants are chemical compounds specifically formulated to kill living organisms. These products can pose risks to users and the environment during use and after disposal.

Nonetheless, this does not mean that a disinfectant cannot be part of a comprehensive green-cleaning program. As a matter of fact, a disinfectant can help create a healthful, high-performing indoor environment.

Presidential Executive Order 13423 defines green (or "environmentally preferable") products as those that "reduce the health and environmental impacts compared (with) similar products and services used for the same purpose."

Apply the definition of green from Executive Order 13423 when comparing products. For example, it is preferable to select a disinfectant that has a neutral pH (closer to 7) instead of a product with a pH at the extreme ends of the scale (0 or 14). It also is preferable to use a more concentrated product compared with a ready-to-use or less-concentrated alternative. This reduces environmental impacts from packaging and transportation.

Cleaning staffs trying to meet the requirements of green-cleaning programs found in the U.S. Green Building Council's LEED rating system or the Healthy Schools Campaign's *Quick & Easy Guide to Green Cleaning in Schools* should make sure the product manufacturer can document that the disinfectant meets or exceeds the requirements from the state of California for volatile organic compounds (VOCs). Another way to "green" a program is to use disinfectants only where and when needed.

In all cases it is important to make sure the disinfectant is appropriate for the organisms being targeted. Don't forget the importance of training on proper procedures, application, dwell times and other techniques. ■


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Eco-friendly restrooms

Nature sanctuary is green from all angles

California Academy of Sciences, San Francisco.

Mitsubishi Electric HVAC. The California Academy of Sciences is nestled in San Francisco's Golden Gate Park—and is a sanctuary for all objects related to nature.

The headquarters—a multi-level, single structure filled with hundreds of exhibits and thousands of plants and animals—contains an aquarium, a planetarium, a natural history museum and a four-story rainforest. In addition, there is a 3-D theater, a lecture hall, a Naturalist Center, two restaurants, a garden and aviary, a roof terrace and a store. The building also houses the Academy's science labs and administrative offices, including an extensive library and archive with more than 20 million specimens.

The academy's headquarters building is now the largest public LEED platinum-rated building in the world and also the world's greenest museum. How did the museum and scientific center design its public restrooms to be eco-friendly?

"It was our internal green team that came up with the idea of installing an automated hand dryer in the public restrooms," says Erin Riley, project manager for the academy. "We had made the decision to compost paper towels used in the staff facilities, but wanted something with a sleek design for guests of the academy. It was an add-on that wasn't suggested by architects, but by our own people."

The team tested **Mitsubishi Electric HVAC**'s Jet Towel and one other brand.

"We found that the Jet Towel was quieter, sleeker in its design and its drying time was quicker than its competitor, not to mention the fact that the Jet Towel offers users a heated stream of air rather than a cold blast like they are used to," says Riley.

Two months after opening, the academy added Jet Towels to one of the hands-on attractions. The staff had noticed that a large amount of paper towels were being used per day at the Touch Tidepool, a pool where visitors can interact and touch live sea creatures such as starfish and sea anemones.

"We noticed how many paper towels we were going through and then we realized that by putting Jet Towel next to the exhibit, we would not only save money on the continual purchasing of paper towels, but also reduce the waste produced by the Academy each day," says Riley.

Circle 156 for more information ■ freeproductinfo.net/asu

Launderable dust mops

Nexstep Commercial Products. New MaxiPlus Microfiber Launderable Dust Mops are 100 percent microfiber and feature a double-sewn "lock-stitch" edge. A slip-on slot pocket secures the dust mop to the frame. Quick-dry synthetic backing ensures the mop dries fast. The mop fits standard dust mop frames, eliminating the need to buy special frames.

Circle 150 for more information ■ freeproductinfo.net/asu

Vacancy/Occupancy sensors

Orbit Industries/UMI. A new series of vacancy/occupancy sensors helps save energy in public buildings. The sensors automatically optimize the Auto-Off Time Delay to a minimum for safety. The devices use passive infrared sensor technology and have an LED indicator. They are 800W-rated for incandescent at 120VAC and 800VA-rated for fluorescent at 120VAC. Adjustable time delays can be set from 15 seconds to 30 minutes. Both models are offered in white, ivory or almond, and cover plates are included.

Circle 151 for more information freeproductinfo.net/asu

Recycling station

Rubbermaid Commercial Products (RCP). The new Two Stream Glutton Recycling Station combines strength and durability into a fully integrated station that provides sortation and containment for up to two waste streams—making it easier to build a recycling program and encourage compliance. It includes two removable 23-gallon Slim Jim containers in one Glutton for a total capacity of 46 gallons. With three possible sortation openings to choose from (slot, square, circle) and optional color-coded symbols and word labels for visual cues, separating and recycling waste is easy, manageable and efficient.

Circle 152 for more information freeproductinfo.net/asu

Sustainable Design for Inspiring Minds

ECOsurfaces Commercial Flooring. Created with designers in mind, ECOshapes offer myriad choices and out-of-the-box options for floor creations that are anything but ordinary. They are available in three versatile shapes that work well together or alone: a diamond (45-degree angles); a 24-inch hollow frame; and a 12-inch square that can be used with the frame or the diamond.

Circle 153 for more information
freeproductinfo.net/asu

Atlas Combines Respect for the Environment With Added Value

Atlas Paper Mills. Green Heritage brand of recycled tissue and towel products feature a value line of Green Seal-certified items. Green Heritage combines respect for the environment with exceptional value and quality without the premium price. The products are made from 100 percent recycled paper, are 100 percent chlorine-free, made in the United States and biodegradable.

Circle 154 for more information
freeproductinfo.net/asu

Microfiber cloth

Kimberly-Clark Professional. WypAll Microfiber Cloths feature Microban Antimicrobial Product Protection. The cloths are an environmentally friendly, green cleaning option that can be used without chemicals. When dampened, the cloths remove up to 99 percent of bacteria from non-porous surfaces, helping to prevent cross-contamination between surfaces. The cloths are thick, heavy, durable and absorbent—lifting and trapping dirt, and holding up to eight times their weight in liquid. ■

Circle 155 for more information
freeproductinfo.net/asu

Making Room

Laying a strong technology foundation for a building's future.

As common sense as this may sound, remember to allow for technology moves, adds and changes in a building infrastructure. Make sure this is included in the planning process.

For example, a school district in a southern state installed a cable tray more than 25 feet in the air above the finished floor in the hallways. When the contractor was asked how anyone was going to reach the cable tray once the building was completed, he replied: "They won't be able to." Asked "How will the school do technology additions in the future?" he said: "Why would anyone need to do that?"

It is amazing to find architects, engineers and designers that do not understand the concept of a building whose functions evolve after it is constructed. There always seems to be a debate for oversized conduits and cable trays. These two items are among the first things on the list to be eliminated from a building project when construction budgets need to be reduced. When one sees cables pulled across ceiling grids, often exposed in hallways and down walls in exposed raceways, you can bet it was an attempt to save money.

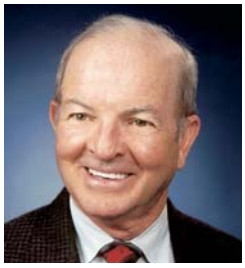
Think back to any facility in your district or on your campus: are all the spaces being used in the same manner as they were on the day it opened? Somewhere in those ceilings are wires that have been moved or added. Lifting up a ceiling tile in an existing building usually reveals whether a building has the right infrastructure that allows for moves, adds and changes. Contractors often take the easiest path permitted, so technology designers should make that path to the data closet the one that will best serve the institution. In any building there will be changes that are all proper functions of an evolving education facility. But installing the right infrastructure when the building is constructed will bring about this growth in a structured manner.

Many retrofit projects become very expensive when a wire-management system and conduits need to be added. It is far cheaper to build the proper foundation in the beginning of a building project than to add it later.

Schools always should require additional rack space in the data closets for growth—about 20 percent of what originally is being installed, as well as additional sleeves between firewalls and oversized conduits (usually 1 inch) to each data outlet—all with the thought of adding additional technology cabling in the future. These relativity inexpensive steps will ensure a building's technology growth will be less costly.

Some education institutions don't give much thought to the future of their technology infrastructure. However, as software and hardware change, the infrastructure also must change. Finding the dollars associated with these changes later on can be hard. ■

C. WILLIAM DAY



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Digital-Age Design

Change is a constant, and so is the learning environment.

Ten years ago, the approach of the new millennium created much excitement and concern. Educators, planners and architects were focused on designing learning environments for new technologies, delivery methodology and educational philosophies. Designing schools for the 21st century was the focus, and the Information Age was maturing into the Digital Age.

But the classroom learning environment has been evolving since the early 1800s, when one teacher taught all grades in a one-room schoolhouse and worked with small groups of the same age and learning ability.

As a result of urbanization, the Lancastrian School system developed and lasted until about 1840; large-group instruction is one of its legacies. The Transitional School (1840-50) unified separate reading and writing schools, and contained classrooms with small rooms for individual recitation. During the Industrial Revolution (1850-1950), large multi-storied schools in urban centers were built with self-contained classrooms.

The Crow Island School (1941) in Winnetka, Ill., was the birthplace for classrooms designed to address differing learning styles. Crow Island rejected the rigid conventional classroom associated with the Industrial Age and demonstrated how learning environments could enhance new educational philosophies.

In 1968, the Educational Facilities Laboratories published *Educational Change and Architectural Consequences*. It stated that flexibility was an abstract concept that needed to be defined in four specific terms: expansible space, convertible space, versatile space and malleable space. One of EFL's innovations was the development of the "open plan."

In the 1960s, schools were designed for new technologies, including information-retrieval systems, overhead projectors and television. Individualized education focused on the uniqueness of each student. Many schools were designed with semi-open classrooms surrounding a resource center.

In the 1980s, the Information Age was developing as video, voice and data systems were incorporated. The 1960s open-plan classroom design was adapted and enhanced with breakout spaces in houses that contained flexible team learning areas (FTLA).

Today, the Digital Age has become the new descriptive for the Information Age. Technology has created a global learning environment—virtual, online and remote. Digital Age learning environments need to respond to varying class sizes, changing curriculum and educational philosophies, and technologies—using movable walls, partitions, portable furniture and sometimes open-classroom concepts.

Unaware of changes that would occur during the next 40 to 50 years, the architects of the 1960s "open-plan schools" created learning environments that even today accommodate the needs of the Digital Age. ■

JAMES E. RYDEEN

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Bond solutions

District addresses needs with performance contract

Houghton-Portage Elementary School, Houghton, Mich.

Johnson Controls. Houghton-Portage (Mich.) Township Schools wished to address the need for new technologies, facility improvements, and larger physical education and music facilities.

"Our goal with the upgrades and new construction is to do everything we can to provide the academic environment for students and teachers that the community expects," says Bill Polkinghorne, superintendent.

The district teamed with **Johnson Controls** to leverage community support through a bond referendum, coupled with a performance contract, resulting in facility and technology upgrades, building expansion and operational cost savings. This approach resulted in more than $12 million of improvements to the district's schools, while delivering 100 percent of the $3 million in energy savings guaranteed under the performance contract back to the district's general fund.

Energy-efficiency upgrades are expected to bring a savings of nearly $110,000 annually over the 20-year contract. Improvements include window and roof replacement, lighting retrofits, water-conservation measures and a building-management system.

The bond included upgrades to classroom and lab computers, monitors, printers and projectors. A wireless network and VoIP system will save $10,000 annually in communications costs. The project also included installation of a security-management system.

Circle 181 for more information ■ freeproductinfo.net/asu

Waterfree urinal

Falcon Waterfree Technologies. The new F7000 waterfree urinal has a splash-free bowl design that ensures a dry experience. It also includes a special area for messaging, which can be used to describe water savings and other environmental accomplishments of the facility, or it can be employed as revenue-generating advertising space. The hyper-hygienic urinal helps protect and preserve the environment by conserving up to 40,000 gallons of fresh water per urinal, per year.

Circle 160 for more information
freeproductinfo.net/asu

Cleaning systems training

ProTeam. Cleaning Systems Training Group helps organizations improve the quality and productivity of their on-site cleaning and maintenance practices. The program gives leaders a systematic approach for improving cleaning quality, establishing control of supply costs and maximizing labor while minimizing overall costs. The program provides concrete tools for leaders to address opposition from a resistant workforce in positive, constructive ways. All training is done on-site and customized to each institution.

Circle 161 for more information
freeproductinfo.net/asu

Paper-towel dispenser

Bobrick Washroom Equipment, Inc. New dispensers feature non-proprietary, automatic, universal roll towel dispensing, saving as much as 30 percent or more compared with proprietary roll towel purchasing agreements. Available in five models, units dispense universal, 1½-inch to 2-inch diameter core, up to 8-inch diameter, 8-inch wide, non-perforated, nonproprietary rolls, eliminating proprietary purchase agreements. Additional features: automatic, touch-free dispensing; extended 300,000 cycle, one-year battery life; available AC adapter; and 50 to 70 percent recycled stainless-steel fabrication.

Circle 162 for more information freeproductinfo.net/asu

Energy savings tool

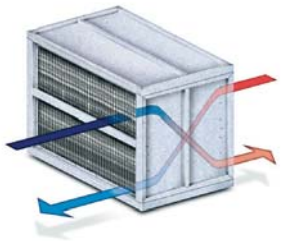
WattStopper. The Energy Calculator Web-based energy savings tool enables users to calculate the potential energy savings available with occupancy sensors. The calculator is designed to help users identify lighting-control strategies that best match energy-savings goals for retrofit or new construction projects. It provides a list of pre-defined lighting control measures (LCMs) that help users compare different control methods to identify how best to achieve additional maximum energy lighting savings. Energy-savings percentages are based on third-party published documents and research, and other industry case studies. The Energy Calculator offers two assessment levels: quick assessment and full assessment.

Circle 163 for more information freeproductinfo.net/asu

Fire-rated glass floor

Technical Glass Products (TGP). The Fireframes ClearFloor advanced glass floor system is impact-resistant and fire-rated for two hours. It can be used as a durable, non-slip walking surface, and is approved for loads up to 150 psf. The floor enables glazing in spaces that previously would have required alternative opaque fire-stopping materials like concrete and corrugated steel, which enables more design options.

Circle 164 for more information freeproductinfo.net/asu



Ventilation pool

Munters. The Ventilation Pool unit is an enhanced energy-recovery system for natatorium dehumidification. By using outdoor air, the pool's heat exchanger provides effective natatorium dehumidification up to about 60°F dew point. This enables the system to maintain and control the desired space humidity under most conditions with no need for mechanical dehumidification. .

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Continued...

Daylighting solution

Education Center is now glare-free

Novato Unified Education Center, Novato, Calif.

Nanogel. The main boardroom of the Novato Unified Education Center, Novato, Calif., is a vital part of the city's community. The room is crowned by a grid of 16 skylights that make up a large portion of the ceiling. When the education center was built, the skylights were tinted dark bronze to help eliminate glare. However, this not only made the room too dark, but also did nothing to reduce the thermal discomfort that was making it unbearably hot.

The solution was to install Acralight International Skylight's NanoStar skylighting, a system that incorporates **Nanogel** aerogel. This translucent granular form of silica aerogel comprises 95 percent air and is a light, insulating solid material. Thirty-nine times more effective than the highest-grade fiberglass insulation, this ingredient increased the skylights' insulating properties from an R value of 1.5 to R-6.5. In addition to providing the vital insulation and solar control, its translucent nature means that the daylight is diffused and distributed evenly as soft museum-quality light, without shadows or glare.

"I knew that the inclusion of Nanogel in the new skylights would make the room brighter, but I was pleasantly surprised by how much additional light was transmitted," says John Silvestrini, executive director of facilities. "The room is now at least twice as bright as before and we never have to turn on the lights during the day. Also, the new skylighting helps keep the room really cool during the summer, and will prevent heat loss during the cooler months."

Nanogel can be used in a wide range of daylighting applications, from skylights to glass walls. When used within translucent cladding systems, it can increase the insulation value up to an R value of 20, equivalent to that of a solid wall, while still diffusing daylight into the building.

Circle 182 for more information ■ freeproductinfo.net/asu

Software-as-a-Service winner

SchoolDude.com. The company has been named the latest winner of the Best of SaaS Showplace (BoSS) Awards program, which promotes the measurable business benefits delivered by Software-as-a-Service (SaaS) solutions. It is being recognized for its suite of on-demand operations-management tools that helps institutions save money and time. The suite includes solutions for preventive maintenance, facility work-order management, inventory management, IT incident and asset management, community use, field-trip scheduling, capital planning, and utility use tracking and analysis.

Circle 166 for more information
freeproductinfo.net/asu

GREENGUARD certification

Wenger Corporation. The company has achieved GREENGUARD Children & Schools Certification for its musical instrument and equipment storage solutions. The certification is among the most stringent in the world and takes into account the special sensitivities of children. It requires all products be tested annually for more than 10,000 different chemicals and meet rigorous health-based criteria for volatile organic compounds (VOCs) including phthalates and formaldehyde.

Circle 167 for more information
freeproductinfo.net/asu

Compact unit

MicroFridge. The new unit combines a spacious refrigerator, freezer and microwave in a single unit and is ideal for residence hall rooms where space is limited. The stylish, space-saving, and ENERGY STAR-rated unit features patent-pending Safe Plug Technology, which automatically shuts off the refrigerator and charging station when the microwave is on, limiting the maximum electrical draw of the unit to just 11 amps. A Dual-Outlet Charge Station enables students to charge their electronic devices such as laptop computers, MP3 players, cell phones and digital cameras.

Circle 168 for more information
freeproductinfo.net/asu

Portable conditioners

Atlas Sales & Rentals, Inc. An upgraded line of portable air conditioners that use environmentally friendly refrigerant R-410A is available for rental or purchase. Manufactured by MovinCool/DENSO Sales California, Inc., all models of Office Pro, Classic and Classic Plus portable coolers are available with the green R-410A refrigerant. The air conditioners can be used for primary, supplemental or emergency cooling. Applications include data centers, server rooms and telecom closets, offices, warehouses and special-event locations.

Circle 169 for more information
freeproductinfo.net/asu

Electronic faucet

Chicago Faucets. The E-Tronic 40 faucet features hermetically sealed, above-deck electronics for easy maintenance and long-term reliability, with a choice of a CRP2 battery or an AC adaptor. An efficient, dual-beam infrared sensor has multiple modes and ranges that can be adjusted by manual teach-in, or remotely from a palm-enabled device. This remote technology also makes monitoring battery levels and troubleshooting accurate and convenient. Other features include a water-saving, vandal-resistant 0.5 GPM outlet, a polished chrome-plated finish and solid, metal spout construction.

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CONTINUED...

Evaluating expenditures

Waste reduction in restrooms helps district save time and money

Niles Township School District 219, Ill.

Excel Dryer. Situated north of Chicago, Niles Township School District 219 serves more than 4,800 students. The sprawling district, similar to others across the country, is facing cutbacks that force it to examine the use of every dollar.

Administrators recently took advantage of the schools' renovations to re-evaluate expenditures in a number of facility-related areas.

"Restrooms had always been an area where we faced a lot of extra work," says Joe Tomaselli, Aramark director of operations for the district. "Our student restrooms had both paper towels and traditional hand dryers, but we were constantly dealing with vandalism, blocked toilets and more, which translated into an extra four hours of clean-up every night. This was costing us an extra $16,500 per year in restroom maintenance."

Furthermore, the schools were spending about $38,700 per year on paper towels, not including the costs associated with running hand dryers for 30 seconds per use.

After researching alternatives, Tomaselli decided to install high-velocity hand dryers from **Excel Dryer** in the restrooms. "In terms of energy savings, the hand dryers we installed draw an average of 1,500 watts per use, compared with the traditional 2,300 watts. Annually, this translates into an electrical consumption savings of $52 per unit, or for 80 units, $4,160 per year in savings."

Additionally, the installation of the dryers addressed the schools' desire to incorporate more green products.

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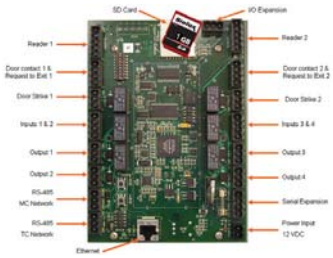

Access controller

Sielox Access Control. The AC-1700 access controller can be deployed as a main or terminal controller. Used as a main controller, the AC-1700 can control up to 16 terminal controllers, including one on-board, providing regional anti pass-back functionality and regional input/output linking. Featuring a removable secure digital card (SD), the AC-1700 has storage capacity ranging from 128 MBytes to 8 GBytes for controller database and events storage. Equipped with a Web-based maintenance port, technicians can perform infield diagnostics and updates on the AC-1700 using a Web browser.

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Table technology

PS Furniture. The new Revolution Table uses a new patented ultra-lightweight composite core technology that produces an incredibly strong top at a fraction of the weight of conventional table top materials like particleboard or plywood.

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Precast wall panels

Fabcon. The VersaCore Emerald panel consists of up to 68 percent post-consumer/post-industrial recycled material, improving the green attributes of wall panels while maintaining their structural integrity and cost-effectiveness. The panels contains 10 percent more recycled material and are more energy-efficient than the company's previous line, providing increased R-Values across all temperature zones and product configurations, up to a maximum of R-24. The wall panels help reduce heating and cooling costs, fossil-fuel emissions and manufacturing waste.

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Architectural lever

Sargent Manufacturing Company. The Studio Collection line has been expanded with the introduction of seven architectural levers. The new additions provide a solution for areas requiring return-to-door levers, as well as offer architects and designers more style options. Return-to-door levers are required in some jurisdictions to prevent clothing from being caught on the door while exiting the building during an emergency. They also help meet accessibility guidelines by stopping the hand from slipping off the end of the lever.

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Piping project

High school science labs convert to CPVC

San Dimas High School, San Dimas, Calif.

ChemDrain. The installation of acid waste piping presents a number of challenges above and beyond a typical piping project. Zeen Plumbing, based in La Habra, Calif., knows that better than most contractors because of its plumbing experience with area schools. Science labs need to safely and cost-effectively dispose of highly corrosive and sometimes toxic chemicals.

As part of the science lab updates at San Dimas High School in Los Angeles County, a new chemical-waste system was required. The challenge was to transition the ChemDrain CPVC piping to the lab's existing glass piping. The advantages of the CPVC product were considerable, starting with a lower materials cost compared with the cost of glass piping.

The team also benefited from a faster, easier installation that required no electrofusion. The solvent cement joints were faster and also proved more reliable because it was easy for the installers to visually inspect the joints as they progressed.

CPVC has been used successfully in a variety of elevated-temperature, high-pressure chemical-processing piping system applications for nearly 50 years. It has proven to be well-suited for chemical-waste drainage applications as a result of its resistance to a broad range of chemicals, including strong and dilute acids, bases, caustics, salts, aliphatic solutions and other common laboratory reagents. In addition, the CPVC can convey liquids in gravity drainage applications safely at temperatures up to 210°F.

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Fan-coil unit

Greenheck. The new Model VSH vertical stack high-rise fan-coil unit provides space heating and cooling for residence halls and other multi-story buildings where a small footprint and quiet operation are required. The units are available with concealed or exposed housings and can be configured with 2- or 4-pipe water coils and electric heaters with optional silent contactors.

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Raised-access flooring

Tate. New engineered hardwood tiles are a 3mm natural wood laminate bonded to an 11mm Versacore wood veneer backer. Available in four patterns, the laminate can be made from a variety of species of hardwoods in optional strip sizes. The surface of the tile is sanded smooth and finished with a UV-cured ecological oil that penetrates into the wood, providing a long-lasting, durable finish. The hardwood tiles also contribute to good indoor air quality. The VOC-free tiles do not require harsh chemicals. Routine maintenance is a simple process of sweeping and damp mopping with oil soap.

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Pre-taped EPDM

Mule-Hide Products Co. Inc. New Mule-Hide Pre-Taped EPDM makes achieving wrinkle-free seams faster and easier. Application of the tape to the membrane in a factory-controlled environment ensures uniform width and thickness of the adhesive, resulting in more reliable seams with 30 percent greater peel and sheer strength and no entrapped air bubbles. It is available in 14 combinations of sheet size, tape width, membrane thickness, membrane type and color.

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Cloth color coding

ERC Wiping Products, Inc. Colordentify is a proactive color-coding program to help identify different colored wiping cloths for different departments and wiping applications. The main goal is to prevent cross contamination between departments and wiping applications, resulting in safer, cleaner and more healthful environments. Other benefits of color coding include infection control, keeping track of inventory, simplifying employee training and helping to bridge the language barrier.

Circle 178 for more information freeproductinfo.net/asu

Door coating

Besam Entrance Solutions. MicroShield Antimicrobial Coating for manual sliding ICU/CCU latches and door packages is available. The imperceptible coating uses silver-based technology from Agion to stem the spread of bacteria and other microbes. It is effective against a broad range of germs, including bacteria, mold, mildew, algae and fungi. Bacteria and other microbes can live on hardware surfaces for hours, transferring from one person to another, so the coating helps prevent the spread of bacteria. The door finish destroys organisms continuously in three ways: by attacking the cell wall, interrupting metabolism and preventing reproduction. It is effective, natural, safe (EPA-approved) and long-lasting.

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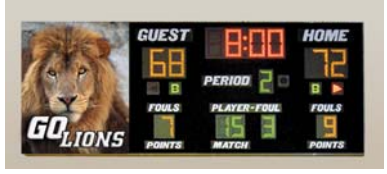

Wall-mounted scoreboards

Bison. New wall-mounted scoreboards with unlimited graphic options now are available. A sturdy aluminum extrusion frame with a black finish encases 100 percent solid-state electronics on both the 13-foot by 5-foot and 12-foot by 3-foot scoreboards. Packages include a tabletop control console and control cable. A remote-control console and receiver are optional. Both scoreboards have 12-inch red clock and yellow score digits, green period digit and bonus possessions. ■

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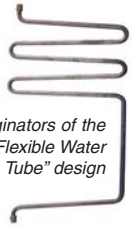

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F ❑ 2,500-4,999
E ❑ 1,000-2,499
M ❑ Under 1,000

6. Total number of buildings:

1 ❑ 100+
2 ❑ 76-100
3 ❑ 51-75
4 ❑ 21-50
5 ❑ 11-20
6 ❑ 6-10
7 ❑ 5 or less

7. Total square feet of buildings directly involved with:

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2 ❑ 7-9 million
3 ❑ 4-6 million
4 ❑ 1-3 million
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