



Learning From Disaster

A Vision and Plan for Sustainable Schools and Revitalized Public Education in New Orleans in the Wake of Hurricanes Katrina and Rita



U.S. Green Building Council **Sustainable Schools Charrette**

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Cover Photo: A science classroom in the Alfred Lawless Senior High School in the Lower Ninth Ward of New Orleans remains essentially untouched more than eight months after Hurricane Katrina.

Photo: Alex Wilson

Quotes are from "Rebuilding and Transforming: A Plan for World-Class Public Education in New Orleans," January 2006, a report from the Bring New Orleans Back Education Committee.



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Charrette Overview

Learning From Disaster is a vision and program plan developed by participants of a charrette on the reconstruction of New Orleans schools, which was held November 9-10, 2005, at the U.S. Green Building Council's annual Greenbuild conference in Atlanta, Georgia. This document represents findings of the approximately 30 participants of the charrette, many of whom were guests from New Orleans and other areas of the Gulf Coast. The rest were from throughout North America and represented a wide range of expertise in education, building design, policy, and sustainability, and included some of the leading voices in the sustainable design movement. The Sustainable Schools Charrette was one of four charrettes held concurrently during the Greenbuild conference. In total, more than 160 people participated in the four charrettes.

Opportunity

The destruction of houses, whole neighborhoods, and schools in New Orleans and throughout the Gulf Coast wrought by Hurricanes Katrina and Rita was devastating. Throughout the Gulf Coast region, federal disaster declarations covered an area of 90,000 square miles (about the size of Great Britain). Some 400,000 homes were damaged or destroyed, three million people were left without electricity, and more than a million people were displaced, at least temporarily, from their homes. Thousands of business were closed, and hundreds of thousands of people lost their life savings. Economic damage to the area is estimated to be in the range of \$75 to \$100 billion—the most expensive natural disaster ever in the United States. More than 1,600 people were killed and 1,300 more were still missing more than eight months after the disaster and expected to be added to the death toll.

In Louisiana, Hurricanes Katrina and Rita destroyed or extensively damaged approximately 236 public and private schools, displacing 245,000 students and more than 30,000 teachers and other employees. In Mississippi, 30 schools were destroyed and several hundred others sustained damage. Eight months after Hurricane Katrina, several hundred schools along the Gulf coast remained closed, including most of the 115 public schools in New Orleans. The New Orleans pre-Katrina public school population of 60,000 had recovered to only 12,000 by late April, 2006.

Yet while these numbers paint a picture of intense, widespread, and persistent devastation, communities are springing back and are eager to see positive outcomes emerge from Hurricane Katrina. Indeed, out of the destruction arises an historic opportunity for the schools of New Orleans: an opportunity to repair and rebuild these schools in a manner that enriches the health of students and faculty, optimizes energy and environmental performance, improves resilience to future storms, minimizes operating costs, and places schools at the forefront of efforts to foster healthy, stable neighborhoods and communities.

New Orleans has a unique position in the history and culture of America. Founded in 1718, New Orleans is the only major U.S. city to have been part of three different nations: Spain, France, and the U.S. New Orleans was the nation's fifth-largest city in 1850, just behind Philadelphia, and it remained the largest city in the South until around 1950, when it was overtaken by Houston. The Port of New Orleans is one of the largest ports in the U.S., handling 20% of all U.S. exports and 60% of U.S. grain exports. Offshore oil and gas wells supply 30% of the nation's oil and gas. The New Orleans culture is among the most diverse in the nation, and the city's festivals attract millions of visitors each year.

Yet, as we know all too well today, New Orleans' location on the Mississippi River delta and its proximity to the Gulf Coast make it vulnerable. All development in the city, including schools, should address these risks. Rehabilitation and reconstruction of the city's schools should incorporate regional and local strategies that meet the needs of New Orleans residents.

These guidelines were developed to inform school reconstruction in New Orleans with the intent of enhancing environmental, social, and economic outcomes. It is the hope of charrette participants that this report will also help to focus national attention on the considerable needs for outside support in the reconstruction of New Orleans schools. Many of the recommendations are also relevant to other Gulf Coast communities.

This report is divided into three parts: Schools in the Context of *The New Orleans Principles*; a Solutions Blueprint for Greening New Orleans Schools, which provides specific recommendations for schools in the city; and case studies of schools around the country that offer important lessons and models for greening New Orleans schools.



Schools in the Context of The New Orleans Principles

One of the outcomes of the Gulf Coast Reconstruction Charrettes held in November 2005 was *The New Orleans Principles*, a report that provides a framework for guiding the reconstruction of New Orleans within a context of sustainability. The ten principles are listed below, along with explanations of how each relates to schools in the city.

1 • Respect the rights of all citizens of New Orleans

All New Orleans residents affected by Hurricanes Katrina and Rita, including those displaced and living elsewhere, have the right to return to livable communities, and school-aged children have a right to return to schools that are safe, healthy, and productive places of learning.

2 • Restore natural protections of the greater New Orleans region

Sustain and restore the coastal and floodplain ecosystems and urban forests that support and protect the environment, economy, communities, and culture of southern Louisiana, and that contribute greatly to the economy and well-being of the nation. Ecological restoration can become a part of school curricula, and New Orleans students can become a part of efforts to rebuild coastal protections, create pocket parks and greenways throughout the city, and restore natural ecosystems to areas that are not rebuilt.

3 • Implement an inclusive planning process

Build a community-centered planning process that uses local talent and makes sure that the voices of all New Orleanians are heard. This process should be an agent of change and renewal that uses local talent to plan, rebuild, and operate New Orleans schools. Residents whose children and grandchildren will attend the schools, and even the children themselves, should have a role in determining what those schools will be.

4 • Value diversity in New Orleans

Build on the traditional strengths of diverse, mixed-use, walkable New Orleans neighborhoods in which schools serve as community centers of learning that provide access to art, music, adult education, and other services for the entire community. Redesign and repurpose schools to serve this role—helping to restore strong, diverse communities.

5 • Protect the city of New Orleans

Expand or build a flood protection infrastructure that serves multiple needs. Value, restore, and expand the urban forests, wetlands, and natural systems of the New Orleans region that protect the city from wind and storms. Locate and build schools to minimize risk of damage from future storms, flooding, or other natural or human-caused disasters. Seek natural protection afforded by site selection, elevation, and proximity to open spaces. Expand levees and other flood protection infrastructure to serve multiple uses, including school athletic programs and wildland buffers that can serve educational purposes.

6 • Embrace smart redevelopment

Maintain and strengthen the New Orleans tradition of compact, connected, mixed-use communities. With the city population smaller in the aftermath of the 2005 storm damage, the challenge of maintaining adequate density to support walkable communities and public transit is particularly challenging. Look to schools for jumpstarting neighborhood redevelopment and rebuilding strong communities in the city.

7 • Honor the past; build for the future

In the rebuilding of damaged schools and the construction of new schools, honor the traditions and vernacular of the region, while creating 21st century facilities that are durable, affordable to operate, and healthy to occupy. Schools should embody the best available practices in achieving high standards of energy, structural, environmental, and human health performance.

8 • Provide for passive survivability

School campuses and buildings should be designed and built or rebuilt to maintain living conditions in the event of extended interruptions of power, fuel, water, or sewage disposal. Schools, which often serve as emergency shelters, should provide livable refuge and improve communities' disaster resilience and passive survivability.

9 • Foster locally owned, sustainable businesses

Support existing and new local businesses built on a platform of sustainability that will contribute to a stronger and more diverse local economy. Integrate sustainable business teaching into school curricula. Foster partnerships that bring the business sector into schools, both to teach about opportunities in a 21st century economy of sustainable business and to strengthen linkages between the business community and schools.

10 • Focus on the long term

Undertake all measures related to rebuilding and ecological restoration, even short-term efforts, with explicit attention to long-term solutions.

“The schools don’t belong to the board or the principals or the teachers, they belong to the students and their families.” – School principal in the Bring New Orleans Back Education Committee Report

The New Orleans Principles, published in December 2005, can be downloaded in its entirety at the following website:

http://green_reconstruction.buildinggreen.com/documents.

A Solutions Blueprint for Greening New Orleans Schools

Inventory and Assess Schools

Background and Context

Every child in New Orleans has the right to a quality education in a safe, healthy school that is conducive to learning. Hurricanes Katrina and Rita ravaged schools throughout the city. Damage in some parts of the city was catastrophic, with the storm surge or flooding entirely destroying buildings. In other situations, extended exposure to floodwaters caused insidious mold and decay that may force the razing of these buildings.

According to many residents, this destruction only highlighted what they had observed for a period of years: that many public schools in New Orleans had deteriorated to the point that their effectiveness as learning environments had been seriously compromised.

“My vision for New Orleans Public Schools starts with equality for all students. [Pre-Katrina] there was a great disparity between schools in the city. In some areas, it was criminal.” – Teacher in the Bring New Orleans Back Education Committee Report

There is an immediate need to thoroughly inventory all schools in New Orleans to assess their condition and safety and to determine what must be done to bring these facilities into compliance with generally accepted standards for school buildings. Costs of repairs should be estimated, funding sources identified, and priorities established for the needed work. Opportunities for making these schools models of sustainability should be investigated. Schools should also be examined from a broader context, evaluating not only their effectiveness as learning institutions, but also their role as focal points of community learning and activity.



Photo: Alex Wilson

Corridor in the Alfred Lawless School in the Lower Ninth Ward, May 2006.

Benefits

It is clear that New Orleans communities will need new and creative strategies to fund and support the immense needs of schools as they strive to rebuild to meet student needs. Only by thoroughly assessing the state of existing schools and evaluating the needs for repairs and reconstruction can a logical and documented case can be made for that funding. The impact of these efforts can be doubled by also assessing how schools can help restore strong and cohesive communities to the region. Such coordinated efforts can address some of the underlying problems of drug use, violence, and underemployment that plague parts of New Orleans. Schools ultimately serve not only students but also their communities; by assessing schools within this broader context, both schools and communities have the opportunity to emerge as more livable and effective than they were prior to Hurricane Katrina.

“The most important thing to me is that ALL children, regardless of race, economic background, religion, etc., receive the same education and access to resources.” – Teacher in the Bring New Orleans Back Education Committee Report



Photo: Alex Wilson

Debris outside the Alfred Lawless School, May 2006.

Strategies

- **Federal** – Distribute money and technical assistance to affected states to carry out post-Katrina assessments of damage and develop plans for repairs and improvements.
- **State** – Secure funding to assist New Orleans schools in assessing damage and developing remediation plans. Seek from the state products and services that can serve this effort, such as kits to test for mold and other contaminants in schools.
- **New Orleans Public Schools** – Develop detailed plans for assessing school damage and developing remediation plans. Seek local or regional companies, where possible, to carry out assessments.
- **Community** – Form local committees or task forces to assist school boards in addressing community needs relative to education. Brainstorm with community members new ways in which schools can serve local communities. Advocate for using the post-Katrina repairs and reconstruction to address other problems with local schools and communities.
- **Building Assessments** – Comprehensively assess schools for structural and mold damage caused by wind or flooding from Hurricanes Katrina and Rita. In addition to testing within the buildings themselves, test for toxic chemicals and contaminants on playgrounds and school campuses.

- **Community Assessments** – Assess how effectively schools serve community needs. In heavily damaged parts of the city, create local committees or task forces to assist the New Orleans Public School Board and school administrators in carrying out these assessments and identifying opportunities for more effectively using schools as the focal points for rebuilding efforts.
- **Site Assessments** – Where heavily damaged schools have to be rebuilt from the ground up, assess potential building sites from the standpoint of creating strong communities, making communities more walkable, increasing density where that density can be supported and where flooding risks are minimal, safeguarding children from toxins and contaminants, and minimizing the environmental impacts of building.

Timeframe

Much of this work should be well underway. With ongoing initiatives, modify plans to address considerations raised here.



Photo: Alex Wilson

Heavily damaged science classroom at the Alfred Lawless School, May 2006.

Set High Goals for School Reconstruction

Background and Context

Schools are huge investments for the taxpayers in New Orleans; they are also critically important in ensuring future prosperity for children growing up in this area. Everyone agrees that achieving excellence in our schools is an important goal. Various federal and state agencies establish metrics of student performance and specific targets for achievement, based on those metrics. But these metrics typically only look at one area of performance: grades on standardized academic tests. There are other important ways to gauge the performance of schools.

Environmental and energy performance of a school building can be evaluated through various third-party assessments and rating systems. The healthfulness of a school building can be measured by tracking absenteeism. More challenging is assessing the effectiveness of a school in promoting a strong community—another critical role of schools.

Benefits

Strong, healthy schools that serve as pillars of their communities are critical to the future of New Orleans, the Gulf Coast region, and the nation. Quality learning environments may improve students' chances of success in life. To be most effective places of learning, schools should be comfortable, healthy, and productive. Natural lighting and views to the outdoors have been shown to increase rates of learning. Healthy indoor environments decrease absenteeism, further improving student performance. Low energy consumption, more efficient cleaning, and minimal maintenance requirements serve to reduce school operating costs—leaving a school district more money to spend on textbooks, field trips, and programs like art, music, and physical education that build healthy, well-rounded students but frequently become victims of budget cuts. As centers and focal points for communities, schools play a critical—yet underappreciated—role in fostering strong, cohesive communities.

“We have got to bring the arts and music back into the schools; nowhere else is this more important than in a cultural city like New Orleans.”

– Committee member in the Bring New Orleans Back Education Committee Report

Strategies

- **Adopt a Green Rating System for Schools** – Adopt a rating system for green school design and construction for New Orleans or the Gulf Coast region. This could be a hybrid system, adapting components from both the LEED® Rating System (including the LEED for Schools Application Guide, under development) and the Collaborative for High Performance Schools (CHPS). The U.S. Environmental Protection Agency's Target Finder should also be used as a metric of performance. Tailor the selected rating system to New Orleans climatic conditions and specific circumstances, such as flood resilience and passive survivability.
- **Establish Performance Metrics** – Set specific targets with whatever building rating system is employed. For energy consumption, establish a target well below the ASHRAE accepted standard for schools, such as 40% savings. With the EPA Target Finder, adopt a target, such as a rating of 80. Consider a specific target for renewable energy use, such as 7.5% of electricity consumption from renewable sources. Look into specific metrics and targets relating to student performance.
- **Address Importance of Community Linkages** – Identify mechanisms to address the role of schools in fostering strong, cohesive communities. Address these as components of school rating systems or design parameters for school design, construction, and renovation. Such measures will extend beyond school buildings to curricular, extra-curricular, and community uses of schools.
- **Set Timelines** – Develop phased plans to address the long-term improvements needed in schools through the mechanisms addressed above, while getting schools functioning on a short-term basis.

“I want to be able to send my kids to a good school in my own neighborhood.” – Parent in the Bring New Orleans Back Education Committee Report

Timeframe

Adopting a green building rating system for use in setting goals and planning new, repaired, or renovated schools should be a top priority.

Reestablish Schools as “Community Centers of Learning”

Background and Context

Schools have the potential to serve as far more than educational facilities for school-age children. In many areas, the best, most vibrant and most successful schools serve the entire community—offering adult education programs, housing community resource centers, providing public meeting spaces, and serving recreational needs for all residents. As budgets have become increasingly tight in New Orleans, these multifunction roles of schools make a great deal of sense.

“Schools should be a focal point for the neighborhood. [A school can serve] as a local library or as a gathering place for adult education, community groups, and city health and human services. Working together can be much more effective than working in separate silos.” – Community leader in the Bring New Orleans Back Education Committee Report

Benefits

Reestablishing a whole-community role for schools can do a great deal to rebuild strong communities. Schools can again provide the focal point for community-building. A school that operates from dawn through late evening with a range of programs serving the entire community can help to foster community cohesiveness and cooperation. By helping public schools to serve the entire cross-section of a community, the economics of these facilities become more positive, and even taxpayers without children will be more willing to pay for their maintenance, upkeep, and growth. Such a role for schools is particularly important in regions that are prone to natural disasters; schools commonly serve as emergency shelters, and these are places where all community members should feel comfortable.

“We’ve got to stop waiting for parents to show up. We have got to get out there and bring the school to the parents.” – Teacher in the Bring New Orleans Back Education Committee Report



Photo: Alex Wilson

Four Gulf Coast Reconstruction Charrettes in November, 2005 brought together more than 160 people from the New Orleans region and throughout North America to address rebuilding in the wake of Hurricane Katrina.

Strategies

- **Envision the Potential** – Encourage community participation in focus groups, coffee meetings, and other gatherings throughout New Orleans to envision the roles their public schools can serve.
- **Establish Committees and Workgroups** – Set up committees and task forces within New Orleans communities to develop concrete plans for broadening the role of school facilities. Specific committees could address such issues as recreational amenities, self-funded adult-education programs, school-based computer centers with Internet access, and management of community meeting spaces in a way that doesn’t interfere with classroom use.
- **Seek Partnerships** – Seek public-private partnerships to provide after-school, evening, and weekend activities at schools. These could include commercial partnerships for specialized vocational training, business centers, and job training for culinary arts, construction, agriculture, technology, and trades.
- **Expand Library Services to Community** – Keep library/resource centers open into the evening to provide a safe space for students to study after school and to serve as a community resources.

- **Expand School Offerings** – Offer community programs in schools, including English as a Second Language (ESL), adult-literacy programs, computer-skills workshops, and gardening classes.
- **Provide Daycare** – Provide daycare centers in schools to serve the needs of students and staff who have young children.
- **Establish Senior Centers** – Consider co-locating with schools senior centers and “adult daycare” facilities.
- **Establish Health Clinics** – Consider co-locating with schools health centers and clinics that serve the larger community.
- **Involve Schools with Entertainment** – Integrate entertainment venues into school facilities—for example, community movie and documentary discussion series, community theater, and Visual Performing Arts Institute (VPAI) programs.
- **Seek Agricultural Partnerships** – Investigate the potential for agricultural partnerships on or adjacent to school land. Such initiatives could serve agricultural-trade education needs while providing sustainable economic development and providing local produce for student meal programs.
- **Expand Meal Offerings** – Investigate providing within schools more complete meal programs, including breakfasts and dinners, for low-income students.
- **Serve Emergency Needs** – Design school facilities to make them more usable during emergencies, including extended power outages. This may necessitate designing dry storage areas for cots, blankets, and other emergency provisions. See section on Passive Survivability, page 00.

- **Provide Emergency Communication** – Locate emergency communication centers in or near schools.
- **Use Schools as Transportation Hubs** – Identify strategies for using schools as community transportation hubs, including the possibility of using school busses to serve broader community needs. The latter may require thinking about student transportation and school schedules more broadly and considering strategies for making buses more suitable for older riders.

Timeframe

Measures to turn schools into more complete community resources should be considered immediately in communities throughout New Orleans, especially in the more heavily damaged communities as residents return to the city. There are opportunities both with new schools that will be built from the ground up and existing schools that will be repaired and renovated.



Photo: Tulane Community Service

Clean-up, repairs and painting of New Orleans schools are being done through volunteer efforts.

Site Schools for Maximum Protection from Storms and Flooding

Background and Context

As anchors of communities and neighborhoods, schools must be safe from storms and all reasonably expected flooding. The siting of schools is the obvious place to start. When the damage to a school from storms and flooding is so extensive as to require rebuilding from the ground up, careful consideration should be put into where to rebuild.

Benefits

Avoidance of flooding and other storm damage has significant—and obvious—benefits. Even limited flood damage is often expensive to repair as well as disruptive to schooling. Building in locations that are less susceptible to flooding not only protects against catastrophic flood damage but also reduces the risk of less severe damage that can result in mold and long-term decay.

Strategies

- **Site Schools Above Flood Level** – Wherever feasible, site new schools above the most stringent flood elevation lines; if levees are redesigned into wide, elevated berms, consider building new schools on the elevated ground.



Damaged wall and furnishings in the library of the Alfred Lawless School, May 2006.

Photo: Alex Wilson



Photo: Alex Wilson

St. David School in the Lower Ninth Ward, May 2006.

- **Learn from Elsewhere** – Pay attention to lessons from other areas that have been affected by disasters, such as Dade County in Florida, in siting new schools.
- **Evaluate Risk** – When evaluating whether to repair and reopen a flood-damaged school, weigh the risk of future flooding; high risk of flooding could tip the scale toward rebuilding from the ground up.

Timeframe

Decisions about where to rebuild schools should be made on an as-needed basis, but consideration of potential sites should begin even before a decision has been made to condemn an existing storm-damaged school.

Incorporate Storm Resilience into Schools

Background and Context

Much of the Katrina-related damage in New Orleans schools resulted from the breaching of levees. Designing for resistance to that level of flooding may not be feasible. However, some of the hurricane and flood damage to schools in the city could have been prevented through storm- and flood-resistant design features and water-resistant construction practices. There are huge opportunities to significantly enhance safety and resilience in *new* schools, but many opportunities also exist for improving existing school facilities.

Benefits

Hurricanes Katrina and Rita certainly won't be the last hurricanes to damage New Orleans and the Gulf Coast. In fact, experts predict global climate change to contribute to increasingly severe storms. Designing and building or renovating schools in a way that increases storm and flood resilience can dramatically reduce costs of repairs down the road, while reducing risk to students and faculty from mold and other problems associated with water damage.

Strategies

- **Value Redundancy** – Provide redundancy in infrastructure and support services to avoid failure.
- **Build to the Highest Safety Codes** – Follow highest-level hurricane resistance codes to protect against wind-blown debris, rain penetration, uplift, and flooding.
- **Protect Against Moisture** – Use inherently moisture-resistant and mold-resistant construction systems, such as tilt-up concrete, autoclaved aerated concrete (AAC), and masonry block. With concrete and masonry systems, do not sacrifice energy performance; rigid insulation may be required to ensure low energy use.
- **Build Taller Schools** – Provide protection from flooding by building multi-floor schools that keep upper floors well above flood elevation.



Rendering: Ethan Gibney, National Oceanic and Atmospheric Administration

There was a dramatic increase in the frequency and severity of tropical storms in the decade 1995-2004, compared with the previous ten-year period. Ocean surface temperatures in the most recent period were 1-2° F warmer, driving this increase in storm activity.

- **Designate Lower-Elevation Spaces in Schools as Floodable** – Consider designing first floor spaces as “sacrificial” to reduce damage and clean-up costs following flooding.
- **Specify Moisture-Resistant Materials** – Avoid conventional drywall, carpeting, and other water-absorptive materials in New Orleans schools. For example, finish first-floor walls with non-paper-faced drywall or other surfacing that is resistant to moisture and mold. Avoid carpeting on first floors in favor of flooring options like polished concrete.



Photo: Alex Wilson

St. David School in the Lower Ninth Ward, May 2006.

- **Specify Moisture- and Termite-Resistant Wood** – Where wood is used, specify moisture- and termite-resistant species or wood that has been treated with nontoxic chemicals for moisture and termite resistance. A highly durable and nontoxic sodium silicate treatment for wood is available (TimberSIL™), though until it is listed by code bodies, special approval by local building officials may be required. Avoiding termite-prone building materials will reduce the need for pesticide treatments, which pose health risks to building occupants, especially children.
- **Protect Against Moisture Penetration** – Use proper flashing details at exterior wall penetrations, and provide deep roof overhangs to keep rain away from school walls.
- **Provide Proper Drainage** – Provide proper drainage for foundations, slab floors, and wall systems (including brick facings). Provide passive drainage and, where needed, sumps.
- **Provide Storm Shielding** – Provide removable storm shields or shutters for windows and doors with integral attachment on walls and storage space for storm shields when not in use, or install permanent storm shutters that can be manually closed and secured when storms threaten.

- **Protect Mechanical Systems** – Install mechanical equipment and electrical panels on upper floors to reduce the risk of moisture damage in the event of flooding.
- **Use Removable Components** – For certain applications, consider the use of materials that can be removed prior to a storm—for example, awnings that can be taken down to prevent damage.
- **Consider On-Site Renewable Electricity** – Investigate and seek funding for renewable energy equipment that can supply electricity when the power grid is down.
- **Provide Protective Landscaping** – Landscape with trees that will help to deflect wind up and over schools. Select tree species that are resistant to strong winds to minimize tree loss and damage from falling trees during storms.

Timeframe

Incorporating storm resistance into schools should be a key design criterion for all schools in New Orleans whenever new schools are being planned or existing schools are being renovated or modified.



Photo: Alex Wilson

Louis Armstrong Elementary School in the Lower Ninth Ward, May 2006. Upper floors were largely spared of damage.

Provide for Passive Survivability

Background and Context

Hurricanes Katrina and Rita left 4 million people without electricity throughout the Gulf Coast region. Loss of power leaves residents not only without electricity, but also often without heating, air conditioning, water, and sewage treatment.

These hurricanes will not be the last to hit the Gulf Coast; there will be others. Terrorism and resource shortages could also cause power outages and fuel supply interruptions. In the weeks following Katrina, many newer buildings with little damage, could not be occupied because they depended on electricity for basic habitability. A lot of older, traditional buildings, meanwhile, functioned without power as they had for many years before electricity. These older buildings were designed to minimize solar gain through the use of deep porches and overhangs, to allow natural ventilation and relative comfort, and to function adequately during the daytime with daylight as the primary source of illumination. *Passive survivability* is a newly articulated design criterion for buildings that refers to the ability to maintain livable conditions in the event of extended power outages or interruptions in fuel or water supplies.

Benefits

Providing for passive survivability in the design and construction of buildings offers an important level of security that could prove vital if power outages and fuel supply interruptions become more common. A school designed for passive survivability can be occupied even during extended power outages or with heating fuel supply interruptions. This is particularly important since schools are often relied upon as shelters during emergencies. Such buildings are also significantly less expensive to operate, due to their high levels of energy efficiency and natural heating and cooling features, and they offer commensurate environmental advantages over conventional buildings.



Photo: Cody Anderson, Arup

Classrooms at the Kirsch Center for Environmental Studies in Cupertino, California, feature ceiling fans and operable windows to maximize daylighting and natural ventilation.

Strategies

- **Make Passive Survivability a Priority** – Make it the policy of New Orleans and other municipalities throughout the Gulf Coast region that all new schools be designed and built to provide passive survivability. Upgrade existing school buildings, over time, to incorporate passive survivability features.
- **Maintain Livable Thermal Conditions** – Design school buildings to maintain survivable thermal conditions without air-conditioning or supplemental heat through the use of cooling-load-avoidance strategies, natural ventilation, highly efficient building envelopes, and passive solar design.
- **Provide Daylighting** – Design and build schools with natural daylighting so that they can be used without power during the daytime.
- **Back-Up Water Systems** – Provide all schools with emergency water systems. At a minimum, provide cisterns that can be kept full for use during power outages or interruptions in the municipal water system. Cisterns fed by rooftop rainwater catchment systems provide a greater level of protection from supply interruptions.



Photo: Mark Littrell, Wilcox Group Architects

This 700-gallon cistern stores rainwater for the Camp Aldersgate Commons Building in Little Rock, Arkansas.

- **Install Waterless Urinals and Toilets** – Provide waterless urinals as standard practice in school boys’ and men’s rooms; these can function without water (though they do require functioning sewer systems). Also consider providing in each school several large-capacity composting toilets that can be used when water is unavailable or in limited supply.



Photo: Kohler Company

Waterless urinals function without water, so they can be used in the event of a water shortage.

- **Convince City Officials to Provide Backup Power for Sewage Treatment Plants** – City officials and school leaders should work together to ensure that backup power is available for a minimum level of city sewage treatment plant and pumping station operation in the event of an extended power outage.

- **Solar Electric Power Systems** – To the extent that funding can be secured, include solar-electric power systems to provide critical functions in schools during extended power outages. Configure these photovoltaic (PV) systems to be grid-connected during normal operation, but with storage capacity and safety controls to allow use of power within the school when the power grid is down. In normal (non-emergency) times, these PV systems will reduce a school’s need to purchase electrical power, reduce peak demand, and lower regional pollution levels.

- **Provide Solar Water Heating** – Incorporate solar water heating systems on school rooftops. While reducing electrical or fossil-fuel energy use during normal operation, these systems will provide important water-heating capability during power outages or fuel-supply interruptions. These systems should operate passively (using thermosiphon or integral-collector-storage designs), or they should use PV-powered pumps.

- **Provide Areas of Refuge** – Design schools to serve their communities as shelters or refuges during emergencies. Provide storage areas for cots, blankets, food rations, and other emergency needs. Work with the community on plans to educate residents about this role of schools.

- **Provide Emergency Access** – Designate spaces at schools for helicopter landing, resupply, and distribution of food and other supplies. If rooftops are used for this, structural measures and access will be needed.

- **Plan for the Use of School Busses for Evacuation** – Establish plans to use school busses to evacuate community residents during emergencies.

Timeframe

Passive survivability features should be considered whenever new schools are being planned or existing schools are being renovated or modified to a significant extent. Passive survivability should be a key design criteria for all schools in New Orleans and throughout the Gulf Coast.

Create High-Performance Schools

Background and Context

High-performance schools are designed with state-of-the-art features to minimize energy and water consumption. Along with saving energy and water, such features provide a wide range of ancillary benefits ranging from durability and low maintenance cost to healthy indoor spaces. “High-performance” also covers strategies addressing the efficient use of water on a site and the efficient use of materials. Recognizing the benefits of high-performance schools, many areas have adopted high-performance school guidelines—providing standards that school boards, building committees, and design teams can follow in achieving the school buildings they want.

Benefits

High-performance schools operate with low energy inputs, thus saving taxpayers money over time. While there is considerable variation, typically they are comfortable and productive to work in with natural light. They use water efficiently, both indoors and outdoors. They provide healthy spaces for students and staff. They are durable. From an economic standpoint, high-performance schools are inexpensive to operate and maintain, and their durability ensures a long life. A well-designed high-performance school can use less than a third as much energy as a conventional school, while keeping students and staff healthier. Along with the direct economic and health benefits of high-performance schools, such facilities help to protect the environment—both locally by using less energy to operate and globally by emitting less carbon dioxide, which is the leading cause of global climate change. Because climate change is believed to be resulting in more intense tropical storms, creating high-performance schools is one way to help protect us from these direct effects of global warming. With so many schools in need of reconstruction or major repairs in New Orleans, there is tremendous opportunity create buildings that will benefit students and taxpayers for decades to come.

“We spend at least 25% of our time managing the facilities—that’s time taken away from instruction and teaching.” – School Principal in the Bring New Orleans Back Education Committee Report



Photo: Duane Lempke, Sisson Studios

The LEED® Rating System from the U.S. Green Building Council provides an objective, third-party way to assess energy and environmental performance of schools.

Strategies

The strategies below will be easiest to apply with new school construction, though some can also be implemented during renovation of existing buildings.

- **Adopt Green Building Rating Systems** – Require the use of the LEED® or CHPS rating system to achieve high-performance school buildings. Consider modifying the chosen program to apply more directly to New Orleans conditions.
- **Set High Performance Goals** – Aim for a high rating with the chosen high-performance school rating system, and obtain points from all categories.
- **Incorporate Daylighting** – Provide daylighting as a top priority in school design. Controls on electric lighting should provide for switching off or dimming electric lights when daylight is adequate. (Motion or occupancy sensor controls for lighting can also save energy in certain applications.) High levels of daylighting will not only reduce energy use if properly implemented, but can also improve student performance, according to a number of respected scientific studies.

- **Use Displacement Ventilation** – Incorporate displacement ventilation, in which fresh air is introduced at or near floor level and exhausted near the ceiling, to ensure fresh air delivery throughout occupied spaces while allowing the ventilation air to be delivered at a higher temperature (reducing chilling requirements). Provide carbon dioxide monitoring to control the ventilation system.
- **Use Computer Modeling** – Use computer modeling during design to optimize energy performance.
- **Provide a Thermally Efficient Envelope** – Ensure that adequate insulation and high-performance glazings are specified. Provide airtight construction with natural and mechanical ventilation to provide adequate fresh air. Do not limit performance to that required by code. Avoid thermal breaks in the wall and roof systems.
- **Install a Reflective Roof** – To reduce cooling loads, and the school’s contribution to the urban heat-island effect, provide a roof that meets ENERGY STAR® guidelines for roof performance.
- **Provide Exterior Shading** – Plant appropriate, wind-resistant trees and incorporate building forms (overhangs, awnings, exterior window blinds, etc.) that provide shade, reducing heat gain. Consider removable shading systems, such as awnings, that can be taken down and stored when storms threaten.



Photo: Duane Lempke, Sisson Studios

Shades on the southwestern windows of Langston High School in Arlington, Virginia, help maintain livable thermal conditions in the building, even when the power goes out.

- **Provide Off-Peak Cooling** – Provide off-peak thermal energy storage systems relying on ice or chilled water for cooling. These systems can dramatically reduce peak electricity usage and electricity demand charges by shifting cooling loads to nighttime hours.
- **Use Combined Heat and Power** – Consider utilizing a combined heat and power (CHP) system, in which power is generated and the waste heat is also used. This is probably only feasible in the largest New Orleans schools.
- **Commission School Buildings** – Provide full building commissioning to ensure that energy-saving equipment and systems operate properly.
- **Conserve Water** – Incorporate such water-conserving products as high-efficiency toilets (using 1.28 gallons of water per flush or less), dual-flush toilets, low-flow and sensor-activated restroom faucets, waterless urinals, and water-efficient outdoor irrigation systems.
- **Manage Stormwater** – Provide porous pavement surfaces and landscape elements to allow rainwater to infiltrate into the ground rather than contributing to the runoff volume. Despite the high water table in New Orleans, porous pavement and other stormwater infiltration strategies can reduce flooding from small and moderate storms. Rainwater harvesting systems, covered under “Passive Survivability,” also help to reduce stormwater runoff.
- **Use Green Building Materials** – Use building materials that were salvaged from storm-damaged buildings or sustainably produced. Use recycled-content building materials.

Timeframe

Strategies for creating high-performance schools should be addressed whenever new schools are being planned or existing schools are being renovated or modified in any way.

Provide Healthy, Productive Learning Environments

Background and Context

First and foremost, schools are places of learning. To be able to achieve their full potential as learning environments, schools must be safe and healthy for the students and faculty occupying them. Healthy indoor spaces are particularly important for young children, who are more susceptible to toxins than adults. Poorly maintained, uncomfortable schools have high absenteeism rates, which negatively affects learning. Beyond simply keeping occupants safe and healthy, certain characteristics of classroom spaces may increase the rate of learning by students, according to recent studies. Paying attention to school design from the standpoint of student performance should be a high priority.

Benefits

A detailed 1999 study at the Capistrano School District in California found that students in classrooms with natural daylight outperformed students in classrooms with only fluorescent lighting. The differences were dramatic: 20% faster learning in mathematics and 26% faster learning in reading (based on measured

improvement in standardized tests taken at the beginning and end of the year). Other studies have shown that views to the outdoors improve student performance. Daylighting is also an important component of design for “passive survivability” (see earlier discussion), and, if properly implemented with automated controls to reduce electrical lighting use when daylight is adequate, it also saves energy. Beyond daylighting and outdoor views, displacement ventilation reduces the risk of spreading contagious respiratory illness, and minimizing volatile organic compounds (VOCs) and use of pesticides and unhealthy cleaning compounds reduces health problems for students and faculty, especially those with chemical sensitivities or respiratory problems.

Strategies

- **Use Green Building Rating Systems for IEQ Guidelines** – Follow guidelines, such as those presented in the LEED Rating System, for ensuring healthy indoor environmental quality (IEQ). Even if a school building is not going to be certified through LEED, follow the IEQ guidelines laid out in the rating system to keep it healthy.

Improvement During School Year	Difference in Average Test Improvement (Normalized RIT points)		Difference as a Percentage Of District Average Improvement	
	Reading	Math	Reading	Math
Model 1: Individual performance				
Improvement of students in classrooms with maximum daylight over those in classrooms with minimum daylight	2.8	2.3	26%	20%
Improvement of students in classrooms with operable windows over those without	0.8	-	7%	-
Model 2: Performance by classroom group				
Improvement of students in classrooms with large numbers of windows over those with few windows	2.4	1.7	23%	15%
Improvement of students in classrooms with a skylight that diffuses light (Skylight A) over those in classrooms with no skylights	2.0	2.3	19%	20%
Improvement of students with a skylight allowing patches of light (Skylight B) over those in classrooms with few windows	-2.2	-	-21%	-
Improvement of students with access to operable windows over those in classrooms with few windows	0.9	0.8	8%	7%

A Heschong Mahone Group study shows that increased daylighting in schools has a statistically significant effect on student performance on standardized tests.

Source: "Daylighting in Schools: An Investigation into the Relationship between Daylighting and Human Performance." Heschong Mahone Group, 1999. www.h-m-g.com/projects/daylighting/projects-PIER.htm



Photo: RetroPlate

Polished, densified concrete, such as this installation at the Benjamin Franklin Elementary School in Kirkland, Washington, offers a highly durable, low-maintenance flooring option for schools.

- **Minimize VOCs** – Avoid building materials, finishes, and furnishings that emit high levels of VOCs. Avoid flooring materials, such as vinyl composition tile (VCT), that require regular stripping and waxing—operations that release large quantities of VOCs. Polished concrete flooring is an excellent alternative, reducing emissions and offering dramatic cost savings over time.
- **Ventilate Properly** – Provide continuous ventilation using outdoor air, with demand-controls or CO₂-based controls. Displacement ventilation, in which fresh air enters occupied spaces low in the room and rises to the ceiling where it is removed, can be easily incorporated into classroom spaces and offers significant health and energy-savings benefits.
- **Eliminate Moisture Sources** – Water is directly or indirectly related to the most significant IEQ problems in buildings. Control moisture entry into buildings through use of plumbing inspections to find leaks, proper exterior detailing and roof overhangs to prevent rainwater entry, regular roof maintenance, high-performance glazings and skylights that prevent condensation, and track-off grates and mats to remove moisture from occupants' shoes. Provide roof overhangs and grade the ground away from the school building to help keep moisture away from the building.
- **Dehumidify** – Provide dehumidification as needed to keep moisture levels low—preventing mold growth and maintaining comfortable conditions.
- **Ensure Proper Cleaning and Maintenance** – Develop cleaning and maintenance procedures that minimize the use of harmful chemicals and the release of VOCs. Lay out such procedures in an operations and maintenance manual for the custodial staff; school administrators should oversee adherence to those procedures. Use only the safest pest control practices.
- **Incorporate Daylighting** – Design schools with extensive use of daylighting in classrooms. Employ diffusing skylights, windows with lightshelves that carry daylight deep into a room, light-colored ceilings, and other strategies to achieve high daylighting fractions in schools. Daylighting designs should avoid glare, which negatively affects students. Ensure that controls for electric lights turn lights off or dim them when daylight is adequate.
- **Provide Views to the Outdoors** – Provide views to the outdoors. While some argue that windows provide a distraction, studies show that views to the outdoors benefit students and improve academic performance.
- **Consider Acoustics** – Controlling both indoor and outdoor sources of noise can improve learning environments by reducing distraction.
- **Provide Thermal Comfort** – Maintain classrooms at reasonable comfort levels, but pay attention to studies showing that some temperature fluctuation throughout the day may benefit attention and learning.
- **Track Illness** – Develop with state health officials a database for tracking incidents of chronic illness. This may be helpful in identifying correlations between cleaning activities, maintenance, humidity levels, seasons, and other factors.
- **Address Outdoor Health and Safety Hazards** – Identify potential health and safety hazards outdoors as well as indoors. For example, examine playground equipment and ground surfaces relative to impact from falls, toxins in the ground, toxic fumes from nearby chemical facilities, and toxins in drinking water. Cleaning up potentially harmful deposits left from flooding is a high priority.

Timeframe

Strategies for ensuring that schools provide healthy indoor environments should be addressed whenever new schools are being planned or existing schools are being renovated or modified in any way. Those IEQ strategies relating to operation and maintenance should be addressed as soon as possible with existing schools.

Use School Buildings as Teaching Tools

Background and Context

While schools house our children and provide a place for academic instruction to occur, the school facilities themselves have tremendous potential for teaching. A priority of greening schools in New Orleans should be to incorporate teaching about sustainable buildings into the curriculum and to identify opportunities for using school facilities as learning laboratories.

Benefits

By instilling knowledge about energy-efficient, environmentally responsible buildings into students, there is opportunity not only to influence those students throughout their lives but also to reach parents and extended families through those students and to bring about broader change in living behavior.

Strategies

- **Incorporate Interpretive Features** – Provide signage on energy-saving and green features in schools to provide learning opportunities. Encourage classes or student groups to create and post that signage.
- **Hold Educational Programs on Sustainability** – Hold educational assemblies in the school or in specific classes to teach principles of sustainable design.
- **Integrate Green Building into the Curriculum** – Incorporate building technology and green building information into career-focused vocational-technical curriculum.
- **Organize Class Projects to Monitor School Performance** – Work with physics and environmental science classes to monitor the energy and environmental performance of school buildings. Create and post graphical *report cards* showing school-building performance. Software programs are available to facilitate this sort of monitoring, including systems that provide real-time display of energy consumption.



A sampling of interpretive signs used by Ashley McGraw Architects to educate building occupants about green features. The arrows point to the features.

Source: Ashley McGraw Architects

- **Design Class Projects to Inventory Ecological Health** – Work with biology and environmental science classes to carry out ecological inventories on school grounds and to study changes in those ecosystems over time.
- **Plan Ecological Restoration Activities** – Work with classes to participate in ecological restoration activities in and around New Orleans that are needed to protect the city from future hurricanes and storm surges.
- **Generate Student Participation** – Inspire the establishment of student clubs to take a lead role in addressing sustainability in schools and to support all of these strategies. For example, encourage student-led recycling efforts in schools and student monitoring of energy and environmental performance.

Timeframe

Existing schools can integrate sustainability and green building principles into curricula and encourage student involvement in school sustainability initiatives at any time.

Benefiting from the Experience of Others

Case Studies of Three Schools

In envisioning appropriate school characteristics and features for New Orleans, it helps to look at what has been created elsewhere around the country. In the following pages, three schools are profiled: the J. J. Pickle Elementary School in Austin, Texas; the Cesar Chavez Elementary School in Long Beach, California; and the Langston High School in Arlington, Virginia.

All three of these schools are in low-income or mixed-income areas, all integrate community functions into the schools, and all are stand-out examples of green, high-performance buildings. Collectively, these leading-edge schools demonstrate the potential of thoughtful planning, community involvement, and good design in creating schools that effectively serve their communities and the people learning and working in them. New Orleans can learn much from these projects.

A classroom in Langston High School integrates indirect lighting and clerestory windows.

Photo: Duane Lempke, Sisson Studios



A replacement for the 1920s era first African-American elementary school in Arlington, Langston High School includes the Langston-Brown Community Center to provide a multiuse, multigenerational facility for residents of the community.

Photo: Duane Lempke, Sisson Studios



The J.J. Pickle Elementary School and connected St. John Community Center provided not only a new school for the community, but also a neighborhood center, health clinic, public library, and police office, all in a pragmatically sustainable building.

Photo: TeamHaas



The Cesar Chavez Elementary School is the first school in the Long Beach Unified School District to be built using California's CHiPS sustainable design principles. The school includes a community health clinic.

Photo: Cris Costea Photography



J.J. Pickle Elementary School

Much more than a school, the J. J. Pickle Elementary School is a true community center, serving the St. John neighborhood of Austin, Texas. The 116,000 square-foot assembly of buildings, connected by an arcing corridor, includes an elementary school serving 600 students, a community center with a health clinic, recreation spaces, public meeting rooms, a police office, and a branch of the Austin Public Library. A gymnasium and cafeteria are shared by both the school and the community center. Two “valves” in the building control access into the school and community center.

The vision for the building originated with community leaders who, in 1998, carried out an assessment of the existing services and needs in the neighborhood. Their innovative proposal to build a multipurpose facility prompted the City of Austin to partner with the Austin Independent School District (AISD). In an integrated design process with extensive community involvement, the architects crafted the plan for this artfully arranged building. Their life-cycle cost models projected dramatic savings through the application of sustainable

design features such as extensive daylighting, dimming-controlled lighting, right-sized mechanical equipment, stormwater infiltration, rainwater harvesting, and tilt-wall construction. The School District representatives were so persuaded by these projections that they allocated an additional \$1.8 million to incorporate green features into the building.

Through Austin’s “Art in Public Places” program, the school and community center incorporate and celebrate 35 marble “thresholds” marking the locations of the 35 homes that were relocated, deconstructed, or (in only four cases) demolished to make room for the Pickle School. Because the project contributed to a demographic shift from a majority African-American population to a majority Hispanic and recent-immigrant population, these public art initiatives were designed to acknowledge the impact of the school in a positive and productive manner.

The J. J. Pickle Elementary School/St. John Community Center was completed in January, 2002, and has been a success on many levels. The building is a point of pride in the community. The \$13.6 million construction cost included approximately \$1.8 million for sustainability features, but those features have reduced overall energy consumption by 25% and peak loads by 40%; overall, the measures are expected to save \$4.5 million over a 25-year period. In addition, student test scores have increased up to 30% from previous years, and over 50% of students were awarded perfect-attendance citations in the building’s first year. The neighborhood has also experienced significant growth since the school/community center opened.



At the J. J. Pickle School, a long curving corridor connects the school and community spaces. Two doors along this corridor serve as “valves” to control access to these areas.

Photos: TeamHaas

Cesar Chavez Elementary School

Built in 2004 to accommodate students who were being bussed to schools outside of their neighborhoods, **Cesar Chavez Elementary School (grades K-5) is the first Long Beach, California, school built using California's Collaborative for High Performance Schools (CHPS) sustainable design principles.** The school, a major project in the city's downtown redevelopment zone, shares resources with the Long Beach Aquarium and includes joint-use spaces for the Parks and Recreation Department and a Long Beach Memorial Hospital children's clinic that offers community and student wellness programs.

The Chavez school bridges the gap between an older residential neighborhood with overcrowded schools to the north and the affluent downtown area with high-rise buildings and ocean views to the south. This bridging was accomplished by redeveloping a small urban site cluttered with dense industrial buildings and several dilapidated apartment buildings. The development met the goals of the City's master plan by eliminating small and irregular lots, obsolete and

aged buildings, and inadequate public infrastructure, including water, sewer, and storm-drainage systems.

The Long Beach Unified School District saw the potential to use the school as a sustainable showcase that would change the way the community conceived of schools in the district, and, by working with Southern California Edison's Savings by Design program, it was convinced to carry the sustainable strategies even further than first imagined. A central mechanical plant provides heating and cooling, a vegetated "green screen" shades the gymnasium, a "cool roof" and sun-blocking overhangs decrease solar heat gain, daylight permeates the halls and all classrooms, and advanced lighting controls dim electric lighting when daylight is adequate. Natural ventilation and daylighting contribute to the building's passive survivability. In all, energy savings of \$29,000 per year are expected, derived in part by a 60% reduction in peak demand. Since the school is located near the students' homes, most of them walk to school.

As the focal point of the community, the Cesar Chavez School has strengthened the neighborhood's identity and generated a newfound sense of optimism throughout the community. Joint use of the school facilities and the adjoining park provides a sense of neighborhood to an area that was previously fragmented. The integrated community health clinic provides a valuable service, and the building provides ongoing lessons to the community about sustainability and a respect for the environment. The school is also a seed: it is one of the first amenities in a community that is expected to have over 700 new housing units built in the upcoming years.



A wide range of green design features, including significant use of daylighting, advanced controls on electric lighting, and vegetative shading, were used to boost the performance of the Cesar Chavez Elementary School and its associated community health clinic.

Photos: Cris Costea Photography

Langston High School

Located in Arlington, Virginia, the Langston High School replaced a dysfunctional building slated for demolition. **This multi-use, multi-generational facility sets a new standard for Arlington's schools.** Completed in 2003, the building uses include an alternative high school, a community recreation department incorporating both senior-citizen and teen programs, a community historical archive room, and the Arlington Community Action Program's Head Start program. These layered uses make the building a center of community from its opening at 7:45 a.m. until its close at 10:00 p.m.

The County had the vision to imagine that the school could increase energy and resource efficiency, so the architects developed a preplanning brainstorming process to explore, evaluate, and document their environmental commitment. The County set a goal of LEED Silver, and, with sustainable stormwater management, construction and demolition recycling, and a focus on indoor air quality, it achieved the

rating, making the school the first LEED-certified building in Virginia.

The three-story building, with community uses and a Head Start facility on the first floor, was designed to use 17% less energy than a conventional school. It was designed with natural ventilation and daylighting in case of extended power outages or mechanical system failures.

In design charrettes, the architects, engineers, County and school representatives, and community members developed site and land-use concepts and investigated many options and schemes to optimize the building's design. They considered how the project could strengthen the community while ensuring its appropriateness in the community and its respect for the region's rich African-American heritage. With the group's feedback, designs were evaluated against the defined mission statement and established sustainability guidelines.

Bordered on the north and west by commercial establishments and a fire station and on the south and east by an older, established single-family community and a townhouse community, the school has become a gateway within the community. The sustainable design and joint-use program combine to make the building a point of pride for residents, and the building brings a new, exciting image to the area, while respecting the history of the community.



Langston High School includes a community recreation department serving teens through senior citizens, and a Head Start program. Community uses occupy the first floor, with the high school occupying the 2nd and 3rd floors.

Photos: Duane Lempke, Sisson Studios

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Those individuals in boldface joined the charrette at the invitation of—and support from—the U.S. Green Building Council.

