Diverse Sustainable Solutions with Concrete Masonry

PCMA
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association

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Back Cover (left to right): Art Museum and Waterworks in Philadelphia, State Capital in Harrisburg

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Getting Green Done Right with Concrete Masonry Products

By: Sara E. Sweeney, RA, LEED AP, CSI, CDT, GreenFaith Fellow

A book I read recently, *Getting Green Done*, by Auden Schendler, had the best definition of sustainability I have ever heard; "sustainability means staying in business forever." Schendler goes on to say that to stay in business forever, we have to stop climate change. Considering the vast array of impacts climate change will have on people, planet, and subsequently, business profit, it's hard to argue with him; he's absolutely right.

Design and construction is a business -a huge one, and we in this industry do indeed want to design and build forever (or frankly, we're out of a job). It is also an industry which bears the responsibility of creating an environmentally responsible, efficient, and durable built environment, one befitting of who we are as humans. Our built environment, after all, is us; it is our legacy. In effect then, we are sustaining our industry as well as the built and natural environments. At the same time, cost must be balanced with social and environmental responsibility. This makes for a delicate mix. After all, we generally want to be good stewards. We just don't want to go broke in the process.

What are the traits of an environmentally responsible building then? Generally, it is one which is functional, healthy, durable, maintainable, adaptable, energy efficient, capital efficient, non-polluting, beautiful, comfortable, and ultimately, it works -well[1]. Building material selection needs to exhibit these traits as well -particularly the exterior building envelope material, as it is directly tied to how well a building works from many standpoints. In addition, in this industry, there are a cornucopia of materials to choose from to build with, and with the increased awareness of green, each one is vying for the spot of most sustainable.

We are now at a critical juncture, wherein we can no longer afford to design and construct buildings which do not work well. In reality, we probably passed this juncture several years ago. Buildings use the majority of energy produced in the U.S. Or perhaps more aptly said, buildings require so much energy because of how they are designed and constructed. That is, they are not efficient -air infiltration, the bane of energy efficiency. They are not comfortable -they are too hot or too cold. They are not durable -they are built for 25 year life spans, if that. Ultimately then, they are not capital efficient, nor are they non-polluting.

We can do better. We must do better. Building better buildings will have a direct impact on our changing climate.

We can do better. We must do better. Building better buildings will have a direct impact on our changing climate. And building better buildings also means selecting the best material. Concrete masonry and its family of building products are by far one of the most sustainable, encompassing all the qualities of an environmentally responsible material. Now granted, there are formidable challengers to concrete masonry products, such as light wood and light gauge metal framing, ICF's, SIP's and a new compacted soil/Portland cement blend block, Integrity Block. To be fair, concrete masonry won't always be the material of choice either. But there are convincing reasons behind choosing it, and claiming it to be the best and most sustainable choice, especially when viewed through the lens of four elements: Earth, air, fire and water.

Earth – Thermal Mass

Earth, being concrete masonry's thermal mass potential. 'Thermal mass' means 'thermal storage capacity,' the ability to absorb heat, store it, and at a later time, release it. There are of course "rules" of physics to follow when locating and integrating thermal mass into an envelope or overall building design; when utilizing thermal mass, you do need to know what you're doing. It's also important to note that materials that make for

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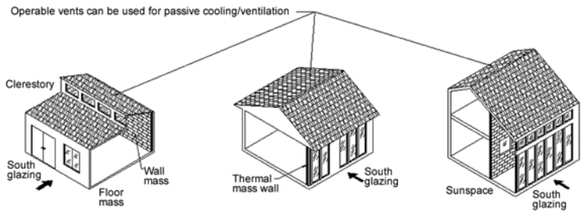

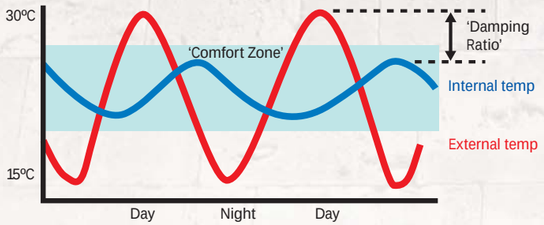

Buildings constructed with masonry can require 18% - 70% less insulation than similar frame buildings, while still providing an equivalent level of energy efficient performance.

effective thermal mass usually perform badly as insulators on their own, which is true of concrete masonry. But thermal mass plays an important role in the performance of a building by moderating fluctuations in space temperature. And the use of heavyweight construction materials with high thermal mass has been proven to reduce total heating and cooling requirements[2]. Concrete masonry has the best thermal mass potential.

Air – Wind + Infiltration

Air next, with respect to damage caused by winds, and envelope efficiency lost due to air infiltration. It is a fact that wood and metal frame buildings don't hold up as well in tornados and hurricane force winds, resulting in tremendous damage to and loss of property. Properly reinforced, concrete masonry is incredibly durable and can withstand these forces. Imagine Greensburg, Kansas, the town essentially wiped out by a tornado in May 2007. What if more buildings had been built of concrete masonry? Would the devastation have been as pronounced? How about air infiltration, the bane of energy efficiency. You need a tight envelope with very, very low air changes per hour. Buildings built with wood or metal frame construction have a higher potential for air infiltration from gaps and cracks in the building envelope. A tight envelope means sealing it very well, and also involved construction techniques which are not common practice -yet. Concrete masonry results in a tight envelope, especially when sealed with a liquid air barrier. Combine this with thermal mass and think about the effects this kind of construction will have on reducing our need for heating and cooling, directly related to our use of fossil fuels and CO2 emissions.

Fire – Non-Combustible Materials

Fire next, another destructive force resulting in tremendous loss of property and in many cases life, whether a building fire[3] or a large wild or forest fire[4]. Often we construct buildings out of wood or metal framing because it is perceived to be faster and cheaper. But should fire strike, what are the consequences of using materials like this, which are not as durable and fire-resistant? Several: the fire being contained in smaller areas, less water needed to fight a fire, less money towards fuel and energy costs -and the resulting carbon footprint, of fighting the fire in equipment, news media coverage and the like, less risk

Compartmentation with concrete masonry for multi-residential structures provides protection by preventing the spread of fire from one unit to the next. This conserves life, property and valuable natural resources.

to the fire fighters, less burned debris to landfills (since little to none of it can be recycled), residents not losing their homes and possessions, less time and money tied up in litigation (fire can often result in lawsuits, some times taking years to resolve), less costs towards material replacement and labor for rebuilding, and finally -and most important, the probability that the fire would not have started. Concrete doesn't burn.[5]

Water – Avoid Runoff

Finally, water, our most precious resource.[6] We cannot live without it, whereas believe it or not, we can live without coal, oil and natural gas. How can the use of concrete masonry products contribute to more responsible use and management of water and help us replenish our resources? The use of permeable concrete pavers in parking lots, driveways, patios and sidewalks is one way to lessen the impact of storm water runoff, as well as increasing on-site infiltration, which replenishes our groundwater sources, such as aquifers, where a large amount of our daily water comes from.[7] Using SRW's can also stabilize streams and riverbanks in urban or suburban areas, resulting in less pollutants and erosion. In addition, concrete masonry products have an incredible hygric buffer capacity, which is a measure of a materials water storage capacity. The more water a material can hold, the less likely the chance of damage over time. Concrete masonry can hold 500 gallons per 2000 sf compared to 50 gallons per 2000 sf for wood studs and 3 gallons per 2000 sf for GWB and metal stud construction. In the face of the potential for increased precipitation with climate change, this capacity will increase the durability of any building.

The book *Getting Green Done* also had a Redneck Ten Commandments, the Eighth Commandment being: "Don't fall in love with... funky ecoproducts... For today, just get 'er done right," paraphrased a bit. Masonry is a tried and true product -the craft of laying stone upon stone or unit upon unit has not changed; it is not a new or funky ecoproduct. Concrete masonry is a simple and elegant product, adaptable to many uses, and made from widely available products. The industry has also always recycled, and will continue to do so, further reducing the demand for raw materials. Finally, concrete masonry products have tried and true boots on the ground experience, a 120 year history. You cannot mess

Continued on page 4

Permeable Pavers contribute to responsible water management by lessening the impact of storm water run off as well as increasing on site filtration.

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with odds like this. With concrete masonry, you will indeed build an environmentally and socially responsible built environment -and get 'er done right.

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Sara Sweeney *is a registered architect, LEED AP, and a GreenFaith Fellow in religious environmental leadership. Her 19-year architectural career reflects her passion and commitment to sustainable building design and stewardship of our natural environment. She is the founder of EcoVision LLC, a solutions-based research and consulting firm, grounded in sustainable design practices, environmental stewardship, and building science.*

[1] From presentation given by John Straube at NESEA's Build 2006 Conference, Boston, MA.

[2] See "Critical Mass" in the January/February 2009 issue of Eco-Structure as one example. This is an article specifically on thermal mass, with studies and modeling showing that heavy mass wall construction contributes to better energy efficiency, when properly integrated into the overall building.

[3] See "Ensuring Sustainable Fire-Safe Construction with Durable Concrete Masonry" in the October 2008 issue of CM News.

[4] Large fires are becoming much more common as our climate heats up. See this December 2007 60 Minutes link for an in-depth report on mega-fires:*www.cbsnews.com/stories/2007/10/18/60minutes/main3380176.shtml*

[5] See "Don't Get Burned - National Cost Comparison Study" *www.pafscac.org/pdf/DontGetBurned_brochure.pdf*

[6] Each day, we in the United States use an estimated 340 billion gallons of water to support our daily lives, from sewage conveyance, to water for drinking and cooking and washing, to irrigation, to manufacturing and more. We are currently using more water per day, per person, than is being returned by the natural water cycle. Current population in the U.S. is 304,000,000; predictions for 2050 hover around 402 million, with some predictions of US population topping 1 billion by 2100. It doesn't take a rocket scientist to understand that the water deficit will continue to rise.

[7] For an excellent discussion about interlocking concrete pavers, see "Permeable Interlocking Concrete Pavements: Selection, Design, Construction, Maintenance," Third Edition, by David Smith ◆

Paradise Elementary School
Paradise, PA
PCMA Producer - York Building Products
The first school in Lancaster County to reach LEED Gold Certification - LEED NC 2.2

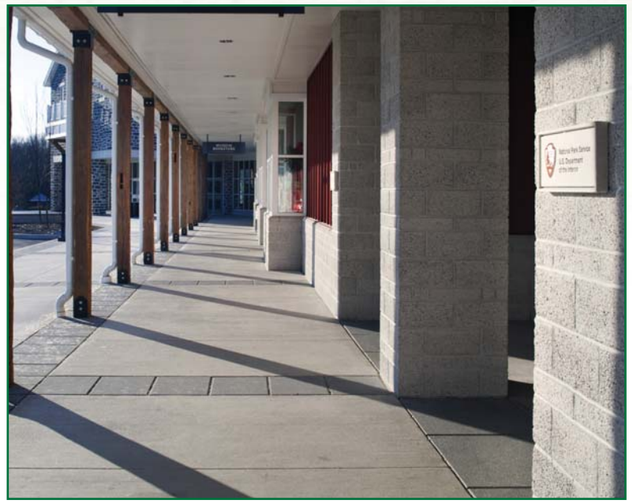
FYI

Did you know? A series of five recorded webcasts and Q&A sessions hosted by various USGBC and GBCI experts covering various LEED v3 topics can be viewed by anyone interested in hearing more about the newest version of LEED. Topics are: LEED 2009 rating systems, the project certification process, the LEED AP and LEED GA professional credentials, LEED Online, and USGBC's LEED and green building education.

Featured Sustainable Projects

From the early days of concrete masonry, right up to the present, those who understood the energy efficiency, durability, and natural aesthetics of concrete masonry have realized that it doesn't take special efforts to make concrete masonry environmentally friendly... it is a natural building material with unparalleled environmental qualities. And concrete masonry has the flexibility to be adapted to specific needs. Concrete masonry producers are eager to demonstrate how these qualities can contribute to practical designs, enduring structures and environmental responsibility. Sustainability is about building the quality of life for now and future generations. This concept includes improving occupant well-being, mitigating environmental impacts, and providing reasonable economic returns on investment. Using green building practices can result in energy and cost savings over the life of the structure. Occupants of green buildings enjoy improved indoor air quality and day-lit spaces, improved health, comfort and productivity.

Note featured sustainable projects for which concrete masonry has contributed throughout this publication.



Gettysburg National Battlefield Museum & Visitor Center
Gettysburg, PA
PCMA Producer - Trenwyth Industries
LEED NC 2.1 - Silver

FYI

The ASHRAE Standard 189.1 Standard for the Design of High-Performance, Green Buildings, Except Low-Rise Residential has been published. It is the green building standard co-developed by ASHRAE and USGBC.

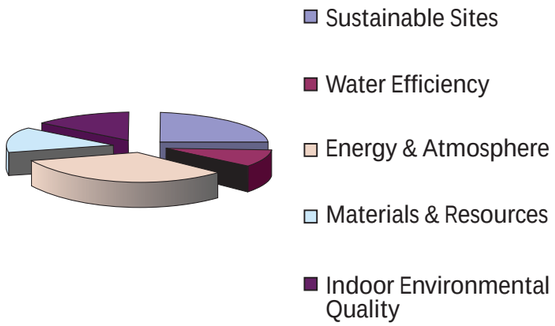
Concrete Masonry and LEED® - NC

By: Christine Subasic, P.E., LEED A.P.

As green building becomes more common, so do LEED-certified buildings. LEED® stands for Leadership in Energy and Environmental Design. The LEED®-NC rating system evaluates the energy and environmental aspects of new building design and construction in five environmental categories: Sustainable Sites (SS), Water Efficiency (WE), Energy and Atmosphere (EA), Materials and Resources (MR), and Indoor Environmental Quality (EQ). *(See Figure 1)* Each category is divided into mandatory prerequisites and optional credits typically worth 1 to 2 points that cover everything from building energy use to how much construction waste is diverted from landfill. The more points a building earns, the "greener" it is. The U.S. Green Building Council recognizes four levels of certification: Certified, Silver, Gold and Platinum.

Building product choices can play a role in achieving many of the credits in the LEED®-NC rating system. However it is important to remember that in the LEED® rating system, the entire building is examined and all building products are included in the calculations necessary for certification. Loadbearing concrete masonry walls and concrete masonry hardscapes offer strength, durability and performance. They can also contribute to several LEED®-NC credits.

Figure 1: LEED®-NC 2009 Categories



Energy Efficiency

In the LEED® 2009 Energy and Atmosphere category, **EA Credit 1** awards up to 19 points for increased building energy efficiency as compared with a building designed to ASHRAE Standard 90.1-2007[1] Concrete masonry walls provide thermal mass that can improve the building energy performance significantly. This performance is best modeled with energy simulation software such as EnergyPlus.[2] The advantages of thermal mass are even more pronounced when loadbearing concrete masonry walls are used on the interior of the building as well. In addition to providing the necessary structural strength and durability, masonry walls also help shift peak cooling loads and mitigate indoor temperature swings.

Recycled Materials

One of the more common credits achieved in the LEED® rating system is the credit for use of building products with recycled content. Concrete masonry walls can utilize several recycled materials. Materials and Resources **MR Credit 4** offers up to 2 points if the total value of recycled content products used on the project is at least 20% of the total cost of products used. If the recycled content products constitute at least 10% of the total value of products used, 1 point is earned. When determining the recycled value of building products, all products must be included. For reinforced, grouted concrete masonry walls, this includes the concrete masonry units, the grout, the mortar, the reinforcement and any accessories that are used. Concrete pavers and segmental retaining wall (SRW) units incorporating recycled materials can also contribute to this credit.

In order to determine the value of recycled content products, the percent of recycled content by weight must be known as well as the cost of the product. This is illustrated by the following equation.

$$\text{Product Recycled Value} = \frac{\text{weight of recycled content}}{\text{total weight of product}} \times (\text{product cost \$})$$

Design options are unlimited with concrete masonry units, which vary in size and shape while providing thermal mass and durability to the structure.

The calculation for recycled content is further refined by distinguishing the source of the recycled material. Recycled materials that come from a post-consumer source are more highly valued in the LEED® point calculations than materials that come from a pre-consumer, or industrial, waste source. To further complicate matters, LEED® allows recycled content of cementitious products to be based only on the recycled content and value of the cementitious portion, rather than on the total weight and cost of the product. This is an acknowledgement that though cement replacement is small on a weight basis, it has large positive environmental effects. For concrete masonry products that incorporate both cement replacements and aggregate replacements, or cement replacements only, both calculations should be done and the better results used.

To determine the recycled content value for LEED® MR Credit 4, the designer takes the information on a given building product, factors in the total dollar cost of the product, and combines it with recycled content information for all building products used on the project. Building product manufacturers must therefore provide information on the recycled content of their products:

- percentage of post-consumer recycled content by weight
- percentage of pre-consumer recycled content by weight

Concrete masonry units can incorporate recycled materials as part of the cementitious portion of the mix and/or as part of the aggregates used. Materials such as recycled concrete, bottom ash, and ground glass can be used as aggregate replacements. Fly ash and slag cement can be used as cement replacements. Availability of recycled materials varies by region and manufacturer. Units made with recycled materials must still meet the requirements of the ASTM standard for that unit and provide the necessary performance. See NCMA TEK 6-6B for a detailed discussion of recycled content and concrete masonry units.[3]

In addition to the concrete masonry units themselves, in the case of reinforced concrete masonry walls, each product used in the wall may contain some type of recycled content. Grout can make up to one-half the volume of the wall in a fully-grouted wall. As such, use of recycled materials in the grout mix can make a substantial contribution toward recycled content of a wall system. Fly ash can be used as a cement replacement in grout and recycled aggregates can be used. Mortar can also incorporate fly ash. Deformed steel bars used for reinforcement have at least 95% recycled content according to the Concrete Reinforcing Steel Institute.[4] The recycled content of any accessories used can also be included.

Loadbearing concrete masonry walls and concrete masonry hardscapes offer strength, durability and performance.

Regional Materials

LEED®-NC **MR Credit 5** in the Material and Resources category awards up to 2 points for using building products that are extracted and manufactured within 500 miles of the project site. Concrete masonry units, grout and mortar are all regionally available materials. Only the percentage by weight of a building product that is both extracted and manufactured within 500 miles is counted in the calculation. For many concrete masonry products, this is nearly 100%. When calculating the distance from the point of extraction or manufacture to the project site, be sure to measure the distance "as the crow flies."

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Construction Waste Management

Within the LEED® rating system, up to 2 points can be earned in **MR Credit 2** for diverting construction waste from landfill. Because concrete masonry materials are inert, they can be safely recovered and recycled. Concrete masonry units and demolished grouted concrete masonry walls can be crushed, recycled and used as aggregate for concrete or concrete products or as structural fill. Unused concrete masonry units can also be recovered for use on another project, and most manufacturers take back pallets for reuse. In this way concrete masonry can contribute toward construction waste management. Similarly steel reinforcement can also be recycled into new steel products.

Sustainable Sites

In the Sustainable Sites category (SS), hardscape concrete masonry products can be used as strategies to reduce stormwater runoff and the heat island effect. Sustainable Sites **SS Credit 6** awards up to 2 points for pervious paving systems that reduce and treat stormwater runoff according to the specified criteria. Concrete masonry pavers can be used as part of such as design. In addition, hardscape designs can earn 1 point in **SS Credit 7.1** if at least 50% of the hardscape uses open grid pavers or pavers with a Solar Reflectance Index (SRI) of at least 29. Most concrete pavers made with gray cement will have an SRI of at least 35 based on information in the LEED®-NC Reference Guide.[5] Pavers made with white cement will typically have an SRI of 86 or more. Thus many concrete pavers can meet the criteria for this credit.

This article is edited from a longer article written by Christine Subasic that originally appeared in Concrete Masonry Association of California and Nevada's *Masonry Chronicles.*

Christine A. Subasic, P.E., LEED A.P. *is a self-employed consulting architectural engineer in Raleigh NC, specializing in masonry and structural engineering and sustainable design. Ms. Subasic provided technical support services, including standards development, educational seminars, masonry detailing, inspection services, and expertise on the role of masonry in sustainable design for clients throughout the U.S. She can be reached at CSubasicPE@aol.com*

[1] ASHRAE/IESNA Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (with errata but without addenda). American Society of Heating, Refrigeration and Air-conditioning Engineers, 2007.

[2] "EnergyPlus Energy Simulation Software." U.S. Department of Energy, Energy Efficiency and Renewable Energy, Building Technologies Program, www.apps1.eere.energy.gov/buildings /energyplus/, accessed on November 6, 2008.

[3] "Determining the Recycled Content of Concrete Masonry Products, TEK 6-6B." National Concrete Masonry Association, 2009.

[4] "Steel Reinforcing Bars: Recycled and Recyclable." Concrete and Reinforcing Steel Institute,www.crsi.org/pdf/recycling_report.pdf, accessed on November 6, 2008.

[5] LEED®-NC for New Construction Reference Guide, version 2.2. U.S. Green Building Council, 2005. ◆

FYI

Did you know? Concrete Masonry related sustainability information is available through Sustainability E-news. You can be placed on an email list to receive this through PCMA. Contact jboyer@pacma.com for more information.

Featured Sustainable Projects

Gettysburg College - The Center for Athletics, Recreation and Fitness
Gettysburg, PA
PCMA Producer - Trenwyth Industries
LEED NC 2.2 - Silver

Wrightsville Elementary School
Wrightsville, PA
PCMA Producer - York Building Products
LEED Silver

FYI

While the LEED rating systems address sustainable sites, the American Society of Landscape Architects published a new rating system, The Sustainable Sites Initiative, specifically for landscapes. It addresses permeable pavements, but also includes credits for "firewise structures" such as those clad in non-combustible masonry. For a copy of the new rating system log onto *www.sustainablesites.org*

Concrete Masonry Permeable Paving Units

By: Randall Bragdon, PE

As the concept of sustainability and green projects grows in acceptance, site designers, engineers, land developers and architects are increasingly pressured to limit storm water runoff, increase infiltration rates and, similarly, improve the quality of the runoff that does make it off the site. Gaining widening acceptance in limiting site runoff, permeable paver system usage is increasing in the United States. Permeable concrete pavers, combined with best engineering design practices in managing storm water, provide a cost effective solution in controlling storm water pollution.

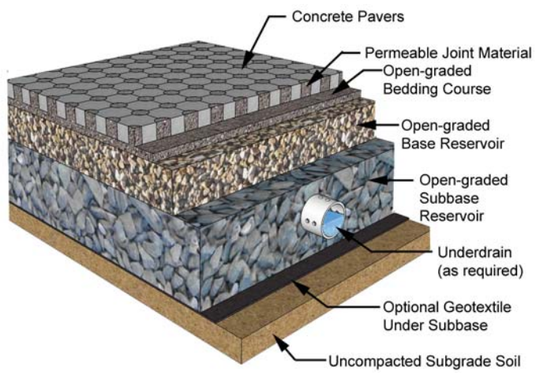
A permeable paver is a solid concrete masonry paving unit that through its special design, can let water pass through the void space between adjacent paving units. Typically, permeable pavers are designed with "lugs" around the edges that provide a "spacing guide" to aid in the installation of the pavers. The lugs create a void between the pavers in a unified manner that allows a drainage space between each paver. This space allows the storm water to drain through the pavers slowly releasing the runoff back into the ground. Other types of permeable paver systems include Turfstone which have hollow spaces within the design of the unit that allows water to pass through.

Typical permeable paver applications may include:

- residential driveways
- parking lots
- light residential or commercial traffic applications
- office plazas
- pedestrian sidewalks and crosswalks.

Several municipalities are beginning to adopt the National Pollutant Discharge Elimination System (NPDES) limitations on storm water runoff and recommend permeable pavers be used in specific applications. Benefits to municipalities and homeowners alike are numerous. In the past, you might capture and control the roof runoff, runoff from the driveway, parking areas and around a house be directed to the nearest street gutter or to a nearby swale.

Permeable concrete pavers, combined with best engineering design practices in managing storm water, provide a cost effective solution in controlling storm water pollution.



Permeable pavers are now being used to allow the surface runoff to be captured in place, stored on-site and slowly returned to the groundwater table by as much as 80% to 100% thus reducing puddling and local flooding. There are several additional and measurable benefits including the reduction in rainwater pollutants, meets the U.S. EPA stormwater performance criteria, compliant with ADA requirements, reduces localized erosion and is compliant with the NPDES regulations.

The design requirements for the site engineer or architect are relatively straightforward. You will need to know the percolation rate of the base soil upon which you will be building the paved surface and you need to obtain the local rainfall data to determine the local storm event required for design. This may be a 10, 25 or 50 year design storm, which is storm level for which you need to provide runoff control. Next, you determine the amount of storage you will need to control the storm event so that you can calculate the amount of base aggregate for the base and subbase reservoir beneath the pavers. This base depth will be proportional to the porosity of the soil being used as a base. Other design factors include the use geotextile fabrics which prevents the mitigation of the bed material into the base stone.

Depending upon the site elevations and the restrictions to for off-site flow, rainfall captured by the permeable surface will be stored beneath the surface and eventually percolate into the groundwater table, or it can get directed to underground piping for controlled flow to an off-site waterway or retention basin. In either case, the surface runoff is reduced, soil erosion is reduced, pollutants are captured and treated, and most importantly, stormwater flow off the site is controlled. Therefore, permeable pavers are friendly to the environment, eco-systems and the public at large both in ground water quality and groundwater control.

Additional information may be attained by your local paving stone manufacturers, concrete block producers and suppliers.

Randall Bragdon, PE *is a Professional Engineer registered in the six New England states, New York, and in Pennsylvania and has been providing site design services since 1985.* ◆

Roosevelt Elementary School
Allentown, PA
PCMA Producer - New Holland Concrete & Trenwyth Industries
LEED NC 2.2 - Silver

Jaindl Elementary School
Breinigsville, PA
PCMA Producer - New Holland Concrete
LEED for Schools 2.0

FYI

Did you know? Technical information is available *FREE* through National Concrete Masonry Association (NCMA) *Concrete Masonry & Hardscape Products in LEED® 2009,* TEK 6-9C. This information can be accessed on the NCMA website *www.ncma.org.*

Project Name	Location	PCMA Producer	Registered
Bakery Square - Nabisco Building & Retail Complex	Pittsburgh, PA	RI Lampus Company	LEED CS 2.0
Bancroft Elementary School	Kennett Square, PA	Fizzano Bros. Concrete Products	
Bryn Athyn College - Doering Center	Huntington Valley, PA	New Holland Concrete	LEED NC 2.2
Bucher Elementary School	Lancaster, PA	Beavertown Block Company	LEED for Schools 2.0
Craig Academy - Watson Institute	Sewickley, PA	Beavertown Block Company	
Cranberry Woods	Pittsburgh, PA	Rennekamp Supply Company now owned by RI Lampus Company	LEED EB O&M
Curtis Institute of Music	Philadelphia, PA	Fizzano Bros. Concrete Products	LEED NC 2.2
David L. Lawrence Convention Center	Pittsburgh, PA	Rennekamp Supply Company now owned by RI Lampus Company	LEED NC 2.0
Ferguson Elementary School	York, PA	Trenwyth Industries	LEED for Schools 2.0
Harriton High School	Lower Merion, PA	Fizzano Bros. Concrete Products	LEED NC 2.1
Haverford College	Haverford, PA	Fizzano Bros. Concrete Products	LEED NC 2.0
Haverford School	Haverford, PA	Fizzano Bros. Concrete Products	LEED NC 2.2
Kimpton Hotel Palomar	Philadelphia, PA	Fizzano Bros. Concrete Products	LEED CI 2.0
Market Square Place	Pittsburgh, PA	RI Lampus Company	LEED CS 2.0
Millennium Science Center	University Park, PA	Beavertown Block Company	
Parkland Elementary School	Emmaus, PA	Eastern Industries	
Peco West Chester Service Facility	West Chester, PA	Trenwyth Industries	LEED NC 2.2
Penn Charter School	Philadelphia, PA	Fizzano Bros. Concrete Products	LEED for Schools 2.0
Penn Music School	Philadelphia, PA	Fizzano Bros. Concrete Products	
Phipps Conservatory and Botanical Garden	Pittsburgh, PA	Rennekamp Supply Company now owned by RI Lampus Company	LEED NC 2.0
Radnor Middle School	Radnor, PA	Fizzano Bros. Concrete Products	LEED NC 2.1
Science Building - Susquehanna University	Selinsgrove, PA	Beavertown Block Company	LEED NC 2.2
Selinsgrove High School	Selinsgrove, PA	Beavertown Block Company	LEED for Schools 2.0
Southside Works Hotel and Condominiums	Pittsburgh, PA	RI Lampus Company	LEED NC 2.2
Stereo Barn	Reading, PA	Trenwyth Industries	
Systems Biology	Princeton, NJ	Fizzano Bros. Concrete Products	
WCU School of Music	West Chester, PA	Fizzano Bros. Concrete Products	
Widener University Crossing	Chester, PA	Fizzano Bros. Concrete Products	
William Allen High School	Allentown PA	Trenwyth Industries	LEED NC 2.2
Willow Grove Stryker Brigade	Willow Grove, PA	New Holland Concrete	LEED NC 2.2

FYI

According to an Industry survey commissioned by PPG Industries, U.S. Architects say durability is the most important attribute for a “green” building product. Durability is also ranked the most important attribute among building products in general, ranking slightly ahead of price.

Sustainability

The ordinance for High Performance Building Codes addresses many sustainability related aspects of building design and construction covering those generally within the purview of building code administration and enforcement. Indoor comfort controls, indoor air quality and ventilation, and noise control are among the many mandatory requirements. Items that may not be within the purview of the authority having jurisdiction are included in appendices which address parking areas, material resource requirements, and land use. The requirements are consistent with most generally accepted criteria for sustainable or green buildings, but like the main body of the ordinance the enhanced with additional criteria. Examples are the inclusion of first flush criteria for impervious paving surfaces in the appendix on parking areas and drives and reduction of materials in the appendix on material resources.

Jackson Elementary School
Allentown, PA
PCMA Producer - New Holland Concrete
& Trenwyth Industries
LEED NC 2.2 - Silver

Clearview Elementary School
Hanover, PA
PCMA Producer - York Building Products
LEED

Green Construction with Concrete Masonry Units

- CMU’s are typically produced locally, thus reducing the carbon footprint associated with large shipping distances.
- CMU’s can be used without the need of additional architectural treatments (i.e. paint, etc.) particularly in the interior of a structure, thus improving indoor environmental (air) quality.
- Because of CMU’s non-combustibility and excellent fire resistance, a lower cost of insuring a Green Building may be possible.
- When utilizing the “high thermal mass” inherent in CMU’s, maintaining a 40 degree F temperature to prevent the freezing of fire sprinkler systems is achievable utilizing a non-combustible product.
- There is no reduction in the structural load capacities of CMU's manufactured with recycled content.

PCMA
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concrete masonry
association

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To contact a local concrete masonry, segmental retaining wall and paver producer, visit the Pennsylvania Concrete Masonry Association website www.pacma.com for complete contact information.