

BRICK HOME BUILDING

From the Brick Industry Association

THE BOTTOM LINE ON BRICK'S ROLE IN SUSTAINABILITY AND GREEN BUILDING DESIGN

WHAT IS SUSTAINABLE DESIGN?

To some, sustainable design is simply the number of points attained through one of the various “green” rating systems. To others, it’s a comprehensive view of building that focuses on solutions and approaches that follow along a continuum from orientation on the site to materials selection to construction to reuse. ASTM International describes sustainability as “the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs.” While all prevailing wall cladding materials can contribute to points on any given green rating system, there are many other factors to consider. Therefore, adopting a broader view is more advantageous because sustainable design is a holistic, all-encompassing approach—not just an arbitrary score.

HOW IMPORTANT IS GREEN BUILDING DESIGN AND SUSTAINABILITY?

With environmental and economic concerns hitting the headlines on a regular basis, it is clear that architects, builders, and designers in every facet of the construction industry will increasingly deal with the issue of green building design and sustainability. The October 2008 McGraw Hill *Builder SmartMarket*® report entitled “The Green Home Builder: Navigating for Success in a Down Economy” states that 40% of builders find that building green makes it easier to market in a down economy.

In addition, more than 100 cities across the country have already instituted various policies that require new buildings be certified as sustainable. For instance, more than 30 cities—located in every major region of the United States—have voluntary green building programs affiliated with the National Association of Home Builders (NAHB). Many of these programs have adopted the Model Green Home Building Guidelines published by the NAHB in 2004 as a building standard. Local programs, such as the Austin Energy Green Building Program in Texas and Earth Craft Homes throughout the southeastern U.S., have also taken hold. Not surprisingly, NAHB reports that the number of homes that have been certified by green building programs has increased by 50% from 2004 to 2007.

More changes are on the way. In January 2008, the U.S. Green Building Council published a LEED for Homes standard. In January, 2009, NAHB and the International Code Council released the National Green Building Standard that is available for local jurisdictions to adopt and enforce. In both cases, the standards will cover both single-family and multi-family homes.



HOW WILL BRICK'S SUSTAINABLE DESIGN ATTRIBUTES BENEFIT ME?

For **custom builders**, brick offers the best cladding alternative for quality, maintenance, and longevity—as well as its numerous green attributes described here. By using brick, builders provide superior protection and shelter for their customers. Brick is made from natural materials free of volatile organic compounds, which results in better occupant health, comfort, and well-being. Brick also provides acoustic comfort by shielding occupants from distracting noise outside the house. Brick's properties can also play a key role in passive solar design, which is a building method that takes advantage of the sun's energy for heating, cooling, and illuminating spaces. This design uses a structure's windows, walls, and floors to collect, store, and distribute the sun's heat in the winter and reject solar heat in the summer without the use of mechanical or electrical devices. Unlike other readily available residential materials, brick from demolished buildings can be reused in a variety of applications—including rebuilding. Put together, brick's properties and natural aesthetic beauty help create homes that exude quality, thereby solidifying your reputation as a first-rate builder.

For **production builders**, brick's long-term maintenance, renowned safety, and protective properties, as well as its energy efficiency, justify its initial costs. Because brick never needs painting, never rots, will never be eaten by termites, and will never dent or tear, homeowners will not have to pay the recurring maintenance and/or replacement costs that are required with other wall cladding materials. Brick also has exceptional thermal mass properties, which is the ability of a heavy, dense material to store heat and then slowly release it. This ability allows brick homes to save energy by staying cooler in the hottest part of the day during the summer and warmer during the coldest part of the night during the winter. Lightweight

building materials, such as vinyl, aluminum, wood, and EIFS (artificial stucco), neither possess good thermal mass properties, nor play, by themselves, a significant role in passive solar design.

WHY INCORPORATE BRICK IN SUSTAINABLE DESIGN?

Clay brick can play a critical role in your green building strategy within any rating system used today. Learn more about how the use of brick can help attain ratings points by going to www.gobrick.com/BuilderNotes and clicking on Builder Note 5 entitled, "Brick: Green Building Design and Sustainability." More importantly, brick has several advantages over other building materials, including:



With the use of locally sourced and produced brick, the National Homebuilder Mainstream Green Home was the first LEED Platinum home in the southeast. © Chris Beck

Durability, Superior Longevity, and Life Cycle Assessment

Brick's renowned strength, long life, and low maintenance requirements are some of the reasons why the International Building Code allows brick to be reused as a building material. In fact, these qualities are at the crux of any comprehensive and true sustainable and green building design strategy.

Brick. According to the National Institute for Standards and Technology (NIST), brick masonry has a 100-year life. This longevity is also supported by a Life Cycle Assessment conducted via the Building for Environmental and Economic Sustainability (BEES) software. However, there are numerous instances where brick structures have *surpassed* this benchmark as evidenced by the large number of historic monumental buildings constructed of brick. Finally, with very little need for maintenance, the ongoing costs of upkeep and repair are significantly reduced over brick's lifetime compared to other materials.

Other materials. According to life cycle assessments conducted by the ATHENA Institute and BEES, few materials can match brick's service life. Depending on the rating system used, vinyl siding is typically rated between 25-50 years. Fiber cement is a material too new to rate over a long period. In addition, it



These homeowners will enjoy the natural beauty of brick, with little or no maintenance, for decades.

must be painted every 5-7 years, contributing to ongoing costs and to potential emissions of volatile organic compounds. Some ratings systems give stucco a 50-year life span, but to receive this rating, it must be well maintained—including regular joint maintenance and painting. Similar to fiber cement, manufactured stone is too new as a building material to rate long term.

Built-In Safety and Security

If a primary purpose of a house is protection from the elements, it should be able to withstand a wide variety of conditions and circumstances in order to protect building occupants and their personal property.

Brick. Brick is a sound material of choice in areas that are moving toward higher-density construction or are near locales that are frequently exposed to high winds. A minimum 1-hour fire resistance rating is offered by brick veneer backed by typical wood frame construction, as tested in accordance with ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials. Brickwork is resistant to fire and noncombustible according to the International Building Code, which is why fireplaces, which are exposed to fire on a regular basis, are built from brick. In addition, brick offers superior resistance to wind-blown debris. A study conducted at the Wind Science and Engineering Research Center at Texas Tech University demonstrated that a medium-sized wind-blown object, such as a 7½-foot-long 2x4, would penetrate homes built with vinyl or fiber-cement siding at a speed of 25 miles per hour (mph). By comparison, the same object would need to travel at a speed exceeding 80 mph in order to penetrate the wall of a brick home. This test was representative of weather events like hurricanes and tornadoes that would generate wind speeds between 100 and 140 mph.



This test, conducted at Texas Tech, shows what happens during a 100-mph wind storm. The 2x4 impales the fiber cement while it merely bounces off of the brick wall.

Other materials. In accordance with the International Building Code, stucco, manufactured stone, vinyl, EIFS, and fiber cement siding do not achieve a one-hour fire resistance rating by themselves. To receive a one-hour rating, these materials have to incorporate other fire-resistant materials in the wall system, which increase the wall costs. In addition, as demonstrated in the test noted above, vinyl and fiber cement siding do not possess the ability to withstand wind-borne debris, which frequently occurs in high-wind situations. With these results, it is clear that not all walls are built the same, nor do they perform the same. By achieving the results mentioned above, brick provides safety for building occupants and security for property while other materials can pose a threat to the safety and welfare of your customers.

Energy Efficiency

In 2007, 21% of U.S. energy production was consumed by the residential sector. Therefore, to help produce homes that have reduced peak heating and cooling loads, moderated indoor temperature swings, and reduced use of fossil fuels during



The exterior walls of this Ohio house would have endured this hail storm a lot better if they all had been clad with brick.

operation, passive solar design and thermal mass are important components in the green building ratings systems. When compared with lightweight building materials, with all other building conditions kept constant, homes with thermal mass can save energy as well as play a central role in passive solar design—important considerations for builders who want to differentiate themselves in today's challenging economy.

Brick. Brick masonry possesses thermal mass, which is the inherent ability to absorb and retain heat to release at a later time, resulting in less energy used to heat and cool homes. In fact, a recent study by the CTL Group compared different claddings on a standard house located in ten different cities across the U.S. The study concluded that houses with brick veneer use 2% to 7% less energy than those with fiber cement siding and 1% to 2% less energy than houses with insulated vinyl siding in cities in southwestern climates. Additionally, the study reported that houses with brick veneer use less energy than insulated vinyl siding with respect to cooling. Moreover, these benefits are even more pronounced when brick masonry is exposed on the interior of the building.

Other materials. While other materials can make claims about energy efficiency, many do not possess the inherent attributes of brick. Lightweight building materials, such as vinyl, aluminum, wood, and EIFS (artificial stucco), do not possess good thermal mass properties to retain heat and cooling. Further, these lightweight materials do not possess the intrinsic properties necessary to be an integral part of passive solar design. For those builders who want to publicize the fact that they incorporate passive solar design into their houses as well as provide comfortable interior conditions naturally, brick can play an important role.

Regional Sourcing and Availability

The distance travelled during the manufacturing and distribution of building materials can play a central role in green building strategies, with both having a potential impact on the environment. Additionally, wildly swinging fuel costs can also result in financial concerns about distances required for transporting materials.

Brick. Most brick are manufactured from raw materials obtained from an average of 15 miles away from the plant site. Additionally, brick manufacturing facilities are located in 38 states, and there are at least two brick plants located within 500 miles of 49 of the country's top 50 metropolitan statistical areas.

Other materials. Depending on which region of the country a project is located in, a large portion of other wall cladding

materials use sources that are much farther than 500 miles away from the building site. While vinyl siding is manufactured throughout the U.S., one of its primary ingredients—polyvinyl chloride—is primarily made at facilities near coastal oil refineries. The wood pulp from some fiber cement manufacturers is frequently sourced from Australia and New Zealand. The manufacturing plants for stucco are located primarily in the west and south—a long way from northern and northeastern markets. Similarly, manufactured stone also must travel a long distance between manufacturing sites and distribution channels.

Besides potentially long distances, fiber cement, stucco, and manufactured stone can have a negative impact on the environment because of cement's resource-heavy excavation and manufacturing processes that actually remove water from the water cycle.

Use of Recycled Content

Using recycled material in a manufactured product can play an important role in sustainability because it reduces the need to extract virgin materials and diverts materials from landfills. With nearly 8,000 pounds of waste typically thrown in a landfill during the construction of a 2,000-square-foot home, using products that incorporate recycled content and minimize waste is crucial.

Brick. Fired brick are inert after being fired to more than 1,800° F, which enables a large variety of materials to be included in the manufacturing process. Pre-consumer recycled content can be used as colorants for brick, and recycled materials from other industries may be incorporated as well. Brick can also be made by using clay or soil that would have otherwise been considered waste, such as, but certainly not limited to, excavated soil from swimming pool and road construction. Mortar and grout, which comprise about 18% of a brick wall's surface in a typical application, may also include recycled materials.



The packaging on this brick is 100% recyclable.

Other materials. While most competing wall cladding producers claim their product incorporates recycled content, none have such a longstanding or proven track record as clay brick. For example, many fiber cement manufacturers do not use recycled content. Vinyl siding manufacturers use recycled content, but the amount varies greatly by the type of product and the quality of polyvinyl chloride used. The amount of recycled content in stucco is typically limited to replacing a portion of the cement content. Public substantiation that supports claims of recycled content for manufactured stone manufacturers is not readily available.

Effective Waste Management

Effective waste management helps divert construction and demolition debris from landfills. It also redirects recyclable resources

back into the manufacturing process and reusable materials to appropriate sites.

Brick. Brick masonry results in little waste at the job site. The packaging on a cube of brick is minimal, including only banding and possible wood or cardboard strips. These are 100% recyclable. Brick itself can be reused and recycled into new projects and applications. As a further waste reduction measure, brick units that cannot be used in the wall can be used as site infill or infill for the walls. Brick's modular dimensions also reduce waste when wall and opening dimensions are designed to match a multiple of the units' dimensions, therefore eliminating the need to cut partial units. Finally, brick does not need any paints or coatings to enhance its durability or exterior appearance, which eliminates the need to use additional materials that are potentially harmful to the environment.

Other materials. Many other products pale in comparison to brick when it comes to waste management. With no known available recycled uses, construction waste from fiber cement, manufactured stone, and stucco construction must all be taken to a landfill. While some vinyl siding construction waste is recycled, the Association of Post Consumer Plastic Recyclers labeled the vinyl siding recycling program as a failure in 2000.

Recyclability and Reusability

Recyclability is a critical element of green building design and sustainability, and it is accomplished in several different ways. Buildings can be refurbished to preserve existing building stock and conserve resources, or materials can be salvaged and reused in new construction.



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Brick. There are numerous examples of brick buildings that were once warehouses, retail stores, or offices that have been converted to lofts, condominiums, and other building types. Unfired or fired brick can be recycled back into the production stream during the manufacturing process. Additionally scrap, scrap brick, and brick from demolition can be crushed for use as brick chips for landscaping, baseball diamonds, and tennis courts or even for aggregate for concrete. The demand

for salvaged and reclaimed brick is high; in fact, a growing infrastructure exists to support this market. The fact that brick, which in many cases was made well over a century ago, can be reused and put back in service again is a testimony to its durability.

Other materials. Most other materials do not have brick's ability to be recycled in so many different ways. Vinyl siding, for example, is difficult to recycle because it contains high levels of contaminant at the end of its service life and is not cited as a material frequently retained during building refurbishment. At this point, neither fiber cement nor manufactured stone are recycled at all, and both products make no claim about their respective recyclability. Additionally, these products do not have a long enough track record to determine their viability in building refurbishment and/or reuse. Finally, stucco cannot be recycled and must be taken to the landfill at the end of its life.

Residential Materials Green Comparison

Materials	Attains Green Rating Points	Superior Longevity	Built-In Safety	Energy Efficiency	Regional Sourcing	Recycled Content	Waste Management	Recyclability/ Reusability
Brick Masonry	✓	✓	✓	✓	✓	✓	✓	✓
Vinyl	✓	✗	✗	✓-	✓-	✗	N/A	✗
Fiber Cement	✓	✓-	✗	N/A	✓-	✓-	✗	✗
Stucco	✓	✓-	✗	✓	✓-	✗	✗	✗
Manufactured Stone	✓	N/A	N/A	✓	✓-	N/A	N/A	✗

- ✓ = valid claim
 - ✓- = valid claim for some manufacturers or in some cases
 - ✗ = invalid claim for the category
 - N/A = no information available
- Source: Ducker Worldwide

SUMMARY

Unlike many of the other wall cladding materials in use today, brick's excellent performance attributes have been proven time and again for centuries. With its combination of qualities, brick masonry can play an important role in building sustainably designed homes as no other building material can. Whether you are trying to maximize credits in a green building rating system or follow a more strategic view of building sustainable homes that exude quality, stability, and demonstrated value in a challenging economic environment, clay brick can help you achieve your goals. Consider clay brick—the most sustainable, green building material made—on your next project. For more information, visit the Brick Industry Association at www.gobrick.com.



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