Photo: Giattina Fisher Aycock Architects, Inc.

Homewood Middle School
Homewood, Alabama

A First in Sustainability for Alabama

When it came time to plan the new middle school in Homewood, Alabama, the Homewood City Schools Board of Education and staff envisioned a model of sustainability and a teaching instrument to promote the environmental awareness of students. This vision became a reality in January 2005 when Homewood Middle School opened its doors as the first Leadership in Energy and Environmental Design (LEED®) Silver-certified middle school in the nation and the first LEED-certified building in Alabama. The school incorporates numerous environmental and engineering best practices that warrant an optimized whole-building performance.

Design Goals

The Homewood City Schools Board of Education faced a modest budget; recognized a need for multiple-use spaces, security, and maintainability; and wanted to reinforce the community's participation with the school. The superintendent wanted to divide the student body into manageable subgroups, creating home bases for each in the context of the entire school. With help from the project architect, GA Studio, the board's objectives were distilled to the following:

- To create an environment that encourages and fosters learning at multiple levels and to extend this environment into the adjacent community in such a way that the community becomes a participant in the school
- To create an environment that specifically responds to and reinforces the school's current teaching strategies while providing a flexible facility that will accommodate changes over the next 50 years

> "We are very proud that Homewood is the nation's first LEED-certified middle school. Our students are learning the benefits of sustainable design through our digital learning wall and by seeing how these design principles work every day. We have been able to show our community and the nation what we were able to accomplish on a modest budget."
>
> —Martin Nalls, Principal, Homewood Middle School

Media center

Gym entrance

Typical classroom

Photos: Giattina Fisher Aycock Architects, Inc.

Homewood Middle School—EnergySmart Choices

Feature	Benefit
Site	Reclaimed a previously developed site within walking distance of the community's core. Restored 77% of site to open space. Reduced development footprint by 66%. Provided shading and light-colored pavements to reduce heat island effect.
Electricity	Lighting power density reduced by 25%. Daylighting, occupancy sensors, and high-efficiency HVAC system with direct digital control used.
Materials	28% recycled content and 29% regional materials. Forest Stewardship Council (FSC) certified wood produced with no added urea-formaldehyde. Low/no volatile organic compound adhesives, paints, sealants, and coatings.
Building envelope	R-18.5 continuous insulation on roof and R-10 continuous insulation on concrete masonry walls.
Daylighting	Natural daylighting of 82% and views of 92% of regularly occupied spaces, light shelves. Overhangs.
Windows	High-performance windows. Window-to-wall ratio of 38%, U-0.27, solar heat gain factor range from 0.37 to 0.16 with visible transmittance (VT) range from 0.7 to 0.2, depending on orientation.
Air conditioning	Variable air volume system selected to maximize energy efficiency and individual control to each zone; central plant with air-cooled chiller.
Heating	Electric boilers provide hot water for preheat. Variable air volume terminal reheat allows switching to alternative heating sources when advantageous. Hot water terminal reheat with electric boilers allows flexibility to transition to natural gas in the event that natural gas or electrical rates justify a change.
Water	School uses less potable water (40% projected) than a typical code-compliant new school, thanks to a rain sensor, drip irrigation, drought-tolerant plants, and water-efficient low-flow and waterless plumbing fixtures.
Indoor air quality	Air distribution system designed in accordance with *ASHRAE 2001 Fundamentals Handbook* Chapter 32 to attain ventilation effectiveness by meeting air diffusion performance index guide that helps ensure effective delivery of air. Carbon dioxide-controlled ventilation in gyms.

- To integrate substantive sustainable building concepts into the building in a way that makes them part of the school's core principles for administration, faculty, students, and community.

A clear communication of benefits for the community, school, and society was required to lead the board of education in selecting sustainable solutions for the Homewood Middle School project. The communication of these possibilities fundamentally affected the client's expectations and the school's design. For example, the project began at site selection. The board faced political pressure to move the site to a greenfield outside the community. Instead, the school board, with the help of the architect, worked with the city to reclaim a previously developed property within walking distance from the original school. The site was located adjacent to the community but was separated on one side by a busy highway and the other by a steep ravine. The design solution created two main entrances: one via automobile and another via a pedestrian bridge spanning the ravine that directly connects to the neighborhood's historic core. The challenge was to balance the needs of drivers, access, and parking requirements, while encouraging a more sustainable approach of walking, biking, and carpooling.

> **"I am very pleased that we were able to take a well-located ... site and [build] a LEED-certified school. The community supported us in this effort, and the design and building team worked together to create this worthwhile project."**
>
> —Gary Grogan, Director of Operations and Facilities, Homewood City Schools

Opportunities to reduce Homewood Middle School's environmental impact were identified and implemented into the project by capitalizing on an integrated approach by the design team and owner. The team got a better understanding of the possibilities, goals, and elements required for success, with help from the U.S. Green Building Council LEED rating system and guidance from Commissioning and Green Building Solutions, Inc. When sustainability was initially discussed, it was essential that not only the school board, but also the community buy into the concept for it to have long-term success.

Results

Homewood City Schools was behind the success of a high-performance, energy-efficient green building, which came in $500,000 under budget and six months ahead of schedule and was projected to use 36 percent less energy than a typical code-compliant new school building. Currently, GA Studio is conducting a post-occupancy energy performance analysis to see if the building is meeting the energy-efficiency and performance projections. The post-occupancy evaluation is necessary now that the school is five years old and facility management is operating and maintaining the building.

Homewood Middle School Sustainable and Energy-Related Goals

Goals	Project Outcomes
Minimize environmental impact during site development and construction.	Restored 77% site area that does not fall within building; exceeded local zoning open space requirement by 60%.
Reduce potable water use.	• The school uses less potable water than a typical code-compliant new school. • A rain sensor automatically measures daily rainfall amounts and prevents the irrigation system from turning on when rain has fallen. • The school incorporated drip irrigation, selected drought-tolerant plants, and chose water-efficient low-flow and waterless plumbing fixtures.
Use recycled and environmentally friendly construction materials.	• New materials contain recycled contents and account for 29% of the total material costs. • Construction materials, including those with high recycled content, were manufactured locally or regionally. Approximately 90% of the wood products used in the project were certified by the Forest Stewardship Council (FSC).
Create a healthy and safe indoor environment.	• All adhesives, sealants, paints, coatings, and carpets emit low or no volatile organic compounds. • All composite wood products contain no added urea-formaldehyde. • Air distribution is designed in accordance with *ASHRAE 2001 Fundamentals Handbook* Chapter 32 to attain ventilation effectiveness that helps ensure effective delivery of air.
Promote "green school" education.	• The building was designed so sustainable features such as daylighting, water-efficient fixtures, and recycled materials are evident to students and teachers. • The digital learning wall is strategically stationed at the entrance linking the academic wing to the activities building. It highlights the environmental benefits and green strategies of the school through pictures, video, and text, and showcases sustainable development principles to the students and visitors. • Classrooms have a daylighting system that modulates the level of artificial light provided by the electrical lighting system in proportion to the amount of natural light available. • Motion detectors control lighting, turning off lights when the classroom is unoccupied. The system is designed to minimize energy consumed for lighting.

In a collaborative effort that included general contractor Brasfield & Gorrie, the team developed the first construction-waste recycling program in Alabama and helped to extend the program community-wide.

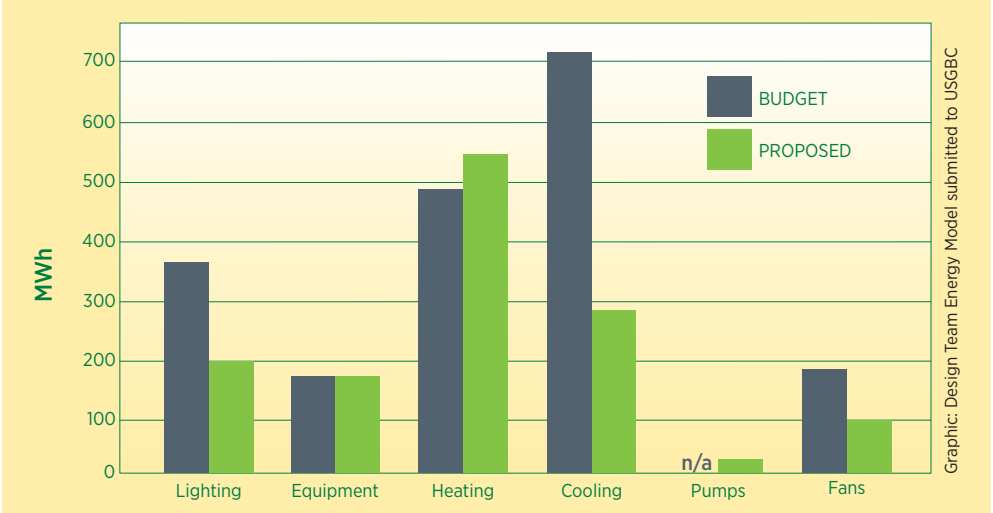
The Homewood Middle School project proved that green buildings cost no more to build than typical buildings because their resource-efficient construction allows downsizing of costly mechanical, electrical, and structural systems. High-efficiency, air-cooled chillers were selected to lower maintenance costs, conserve potable water, and reduce energy consumption. The form and orientation of the academic wing on an east-west axis provide for maximum energy efficiency. This helps to utilize prevailing winds and natural daylight. Horizontal concrete fins acting as shading devices span the south perimeter, not only contributing to the cool daylight environment of the classroom, but also reducing cooling load demands, particularly in hot summer months. A high-performance glazing system, in conjunction with sophisticated building automation technology, helped to achieve natural daylight in 82 percent of the building, which contributed to the 36 percent reduction in energy use compared to a similar-sized code-compliant school. The school consumes about 64.4 kBtu per square foot annually. Homewood Middle School projected, on average, $46,653 in energy cost savings annually—about $1.24 per square foot.

The learning wall helps promote green building and sustainability to students, faculty, and the outlying community. To create the learning wall, the architect spent time with faculty, students, and other interested parties to formulate ways information would be presented. The result was a translucent structure between faculty offices and the library that integrates math, science, language, and the arts. The screens on the learning wall pose questions to students and then display their answers in a student-created digital video. Three new questions and three new solutions are posted every nine-week term as part of a continuous loop that challenges the students to learn. The first question on the wall was: "What is sustainability and why does it matter?"

Lessons Learned

- A green building can be built ahead of schedule and under budget.
- Indoor environmental quality enhances the learning experience.
- Operable windows provide outside air.
- Get buy-in from the community early in the planning process to help ensure success. Make sure everyone understands how important sustainability is to their lives.

Homewood Middle School Annual Electric Energy Use



Project Details

Building: Three stories, 180,000 square feet

Completed: January 2005

Grades served: 6–8

Financing: Financed through bonds paid for through local money

Cost: $23 million; $121 per square foot; $23,000 per student

Capacity: 1,000 students

Energy performance and savings:
- 36% energy cost savings over ASHRAE 90.1-1999
- $46,653 annual reduction in energy costs

Energy costs:
- $1.24 per square foot per year
- School consumes about 64.4 kBtu per square foot per year

Homewood City Schools:
- 5 schools; 3,300 students

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