SUSTAINABLE

A sustainable school design integrates energy conservation and renewable energy strategies; high performance mechanical and lighting systems; environmentally responsive site planning; environmentally preferable materials and products; and water-efficient design.

USGBC LEED for Schools

A widely accepted benchmark of sustainable construction is the LEED certification, developed by the US Green Building Council (USGBC). The LEED for Schools rating system recognizes the unique nature of the design and construction of K-12 schools. The Energy Optimization credit is the most heavily weighted, with up to 10 points out of a possible 69 total. This reflects the importance of energy savings in the environmental footprint over the lifetime of a building. LEED for Schools also addresses issues such as classroom acoustics, mold prevention, and environmental site assessment.

The high performance thermal envelope of ICF construction can offer a significant contribution to the energy optimization points, as well as exceed the LEED for Schools requirements of a Sound Transmission Class (STC) minimum of 38. ICF construction is typically rated at a 50 STC or higher, eliminating many noise disturbances.

The Clearview Elementary School in Pennsylvania found ICFs to be a solid contributor towards a LEED Gold rating. According to architect John Boecker, AIA, “Robert Kimball & Associates: “The insulating concrete form wall provided us with a high-performance thermal envelope that contributed significantly to down sizing our HVAC system and reducing energy consumption.”

Schools for High Performance

A quick review of the schools built with ICFs would indicate that a 40% energy savings over code is a reasonable goal for schools. If all of the new school buildings were to realize this amount of energy savings, the impact on available funding for student education would be tremendous. School districts could afford additional books and supplies, and perhaps even hire more staff.

High Performance Schools are also reporting better student performance. Studies have noted a correlation between daylighting and improved student test scores. Cleaner indoor air quality results in fewer sick days and higher classroom attendance. Thermal comfort improves the learning environment and increases teacher satisfaction.

There are many reasons to build High Performance Schools with Insulating Concrete Forms, but none so compelling as the future of our children.

McGraw Hill Education Green Building SmartMarket Report
http://dodge.construction.com
ENERGY STAR Schools, www.energystar.gov
REV. 05/08/08 © Insulating Concrete Form Association

At no other time in history of the USA has there been such a surge in school construction. An estimated 8,000 new buildings will be needed to serve the growing K-12 student population. Of the existing schools, at least a third is in need of repair or replacement. Communities have a once-in-a-lifetime opportunity to make a lasting impact on the environment of education.

Energy efficiency is a top criteria. The potential energy savings of new schools can have a direct impact on the quality of education. Each year, taxpayers spend over $6 billion on energy costs for aging school buildings, about 25 percent more than necessary. That $1.5 billion could be redirected to hire 30,000 new teachers or purchase 40 million new textbooks annually.

The concern for improved health and well-being has prompted an even more integrated design approach, sometimes referred to as high performance, or “green.” In fact, according to McGraw Hill reports, the education sector is the leading market in green building today.

A High Performance School is:
- healthy and productive school environment,
- cost effective to build and operate and
- a model of sustainable construction.

High Performance School Building Resource Guide
The Sustainable Building Industry Council

Healthy and Productive

A healthy and productive environment is one that provides high levels of acoustic, thermal and visual comfort; large amounts of natural daylight; superior indoor air quality; and a safe and secure environment.

Quiet

Anyone who has spent time in a classroom knows the importance of noise management to the learning environment. Solid mass, such as the concrete in insulating concrete forms provides an effective barrier to exterior noises. The ICF wall assembly also consists of a layer of EPS foam and gypsum board finish on the interior, which provides noise absorption. The result is a quiet space, where a teacher’s voice can be heard.

Thermal Comfort

The unique ICF combination of concrete sandwiched between insulation provides an airtight, highly efficient insulated wall. With neither drafts nor hot/cold spots, a steady and even temperature can easily be maintained within the classrooms. Not only does this resolve common HVAC problems, it also results in more usable floor space, as student desks can be placed right up against the exterior wall.

Indoor Air Quality

As with any public gathering place, clean indoor air is a high priority. Eliminating source pollutants starts with the building materials. ICFs are an excellent choice, as EPS is a closed-cell foam, made using pentane, a non-ozone depleting blowing agent. Upon manufacture, it is rapidly replaced by air resulting in a product that is in a stable state. The resulting EPS foam is an inert material which tests favorably for mold resistance. The upstream manufacturing process is equally benign, as EPS foam generates no CFCs or HCFCs.

Insulating Concrete Form (ICF) construction is ideally suited to this market. Builders appreciate the speed of construction and extended building season to reduce first-time costs, while school districts look forward to a lifetime of energy savings. ICF construction can also provide a community storm shelter. It has been such a success that some school districts have identified ICF construction as a preferred building material.
Airtight Construction

The design strategy to “build tight, ventilate right!” allows for better control of the quality of indoor air. A poured-in-place concrete ICF wall, combined with continuous air sealing at the openings and the roof assembly, can reduce almost all unwanted air infiltration. To maintain a healthy quantity of “fresh” air, replacement air can be introduced through a controlled opening, where it can be filtered and humidity controlled. Active circulation and further filtration of this air within the building can help eliminate many of the airborne contaminants which can affect student’s health.

Safety

For the protection of our students, schools should be designed to provide protection from natural and man-made disasters. This includes protection from fire, floods, storms, blasts (or gunfire). In many communities, schools are the officially designated safety shelters from natural disasters. While there are many materials which provide some of these benefits, few can compete with concrete and ICF’s in providing a safe, durable building shell.

COST EFFECTIVE

A high performance school should be cost effective to operate and maintain.

While construction has historically focused on first costs, schools designs are increasingly based on the merits of a life cycle cost. A school building that is effective to operate and maintain allows for more funding to be available for students services.

The integration of energy modeling in the early stages of design can help optimize the use of daylighting and solar tempering, as well as provide a tool to evaluate the cost effectiveness of proposed energy saving strategies. A team approach to the building design which includes the mechanical and lighting professionals can identify potential synergies for further cost and energy savings, as well as occupant comfort. These strategies have been shown to be effective in keeping first costs for high performance schools in range of the first costs of an average school.

First Cost

A perfect example of a well integrated, cost-effective high performance strategy is the Los Paseos Multi-purpose Center, the first USGBC LEED school in of ICF walls and a “Cool Roof” resulted in a significant reduction in the air conditioning unit - an immediate savings. As an added bonus, a smaller AC unit also meant less weight, which allowed for a decrease in the structural components of the roof - another immediate savings. The total first cost was $4 million, which is less than the average cost of similar facilities in California. Yet this school is designed to be 27% more energy efficient than the minimum requirements of the governing Title 24 Energy Code. “This energy savings is for the life of the building,” says Lesley L. Miles, AIA, of Weston Miles Architects, “money which can be redirected to benefit the students.”

Speed of Construction

First costs are influenced by speed of construction and the time of year. Many schools are built through the winter months, to be completed in time for a September opening. The Bishop Hamilton Montessori School in Ottawa, Canada specifically chose ICF’s for the fast, accurate installation which would meet the contractor’s winter construction schedule. The ICF foam panels assured properly cured concrete, despite cold temperatures. And, the school was able to save crucial dollars normally spent on winter heating associated with conventional construction.

Elaine Hopkins, the school principal, is pleased with the results: “Our new school is quiet, energy efficient, functional, bright and cheerful. Our maintenance costs are very low compared to our other school. ICF’s are simply common sense construction.”

Durability

Taking a life cycle cost approach supports the decision to choose durable building materials. School building can actually be designed for a service life of hundreds of years, with very low maintenance, and low utility costs. The two materials used in ICF’s, concrete and expanded polystyrene (EPS) foam plastic, have a proven track record of durability with no compromise to performance.

Designing the structural loads to bear on the outer walls, leaving the interior walls as non-bearing partition walls allows for the school to adapt to new needs, as populations shift and space expectations change. The concrete ICF walls can easily be designed to handle the loads of long bearing beams, or full width concrete floors systems.

Energy Savings

The Energy Star program has been a powerful advocate of high performance schools, with over 700 certified schools. “You can build Energy Star certified schools without spending extra money, but you need to make good decisions when you design the building” says Doug Hurdley, CMT Engineering. “Creating an energy efficient school requires a three-part responsibility among the building owner for its operation, the architect for the building envelope and the engineer for the building system.”

A recent project, the Alvaton Elementary School, raised the bar for energy efficiency in Kentucky schools, and triggered a state-wide boom in ICF construction for schools.

Energy Savings from the “ICF Effect”

- continuous insulation,
- reduced air infiltration,
- thermal mass moderation.

Approaching Net-Zero Energy

The San Luis Headstart School in Southern Colorado took sustainability one step further. The building is oriented and designed for passive solar design and maximum daylighting. The solar heat gain is controlled by integrated shading in the windows, Solatubes and deep porch overhangs. The building envelope consists of ICF walls coupled with an R-40 roof. The reduced cooling load reduces the air conditioner size, and the electricity consumption is significantly offset by the photovoltaic metal roof laminate shingles.

Air quality was protected by eliminating VOC emitting and/or toxic building materials. The facility was designed to serve as an educational model of sustainable building and has instilled pride in the children and the surrounding community as to their rich cultural heritage.