



Understand the True Cost of Building with Insulated Concrete Forms

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As building codes demand homes with tighter building envelopes and continuous insulation, home builders and consumers are looking for building strategies that deliver that performance without paying a premium.

That's why homes built with insulated concrete forms (ICFs) are becoming a popular choice in many climates.

Insulated concrete forms (ICFs) are cast-in-place concrete walls that are sandwiched between two layers of insulation material, usually expanded polystyrene (EPS) foam insulation forms. The foam blocks are stacked as interlocking blocks, connected with steel reinforcing rods. They offer well-insulated, airtight, energy-efficient building enclosures. Also, ICFs are a great fit for regions prone to severe weather because of their strong impact resistance.

In ICF construction, two insulating faces of a foam block are separated by a connector or web and concrete is poured into the cavity. The foam blocks are left in place to provide insulation throughout the life of the home. Any traditional finish from wood to brick to siding can be applied to interior and exterior faces. From the outside, an ICF home can display any architectural style.

Building codes in the United States are beginning to incorporate continuous insulation, an uninterrupted layer across all structural members of a wall to eliminate thermal bridging. Continuous insulation is part of a strategy to deliver higher R-values for wall insulation performance. Many U.S. codes are based on ASHRAE Energy Standard 90.1, which has called for continuous insulation since 2007.

The goal is to combat heat loss through thermal bridging, or heat loss. Thermal bridging through framing components can envelope insulation performance by 15 to 20 percent in wood frame construction and by 40 to 60 percent in metal frame construction.

The fear in the marketplace is that higher performance comes with a higher price tag. This white paper sponsored by Fox Blocks, a maker of insulated concrete forms (ICFs), explores some of the advantages of ICFs that show this construction method delivers value over the life of the home.

In addition to energy efficiency, ICFs also offer resilient buildings that withstand severe weather events like hurricanes and floods better than stick-built construction.

Comparable Construction Costs

The short answer to the question, "How much does it cost to build an ICF home?" is, it depends. It depends on the local market in terms of costs of material and labor, and experience of the contractors involved. But that's also the case with a wood-framed home as well.

The U.S. Department of Housing and Urban Development studied ICF construction in its report "Costs and Benefits of Insulating Concrete Forms for Residential Construction." After several studies of ICF construction costs, HUD determined that using ICF wall construction generally adds about 3 to 5 percent to the total purchase price of a typical wood-frame home and land (about 5 to 10 percent of the house construction cost).

"In other words, the added cost is about \$2 to \$4 per square foot of the floor area of a typical home. For a typical 2,500 square-foot, two-story home and lot (sale price of

\$180,000), the additional cost amounts to about \$7,000. The additional first cost of ICF construction should be weighed against longer-term benefits," the report said.

Basically, the report indicates that construction costs are only part of the big picture.

Because ICF houses are more energy-efficient, the heating and cooling equipment can be smaller than in a frame house. This can cut the cost of the final house by an estimated \$.75 per square foot. So the net extra cost is about \$.25-\$3.25, according to the EPS Industry Alliance, a concrete forms trade organization. Additional costs may come from wall thickness adding costs to window and door installation, as well as indirect cost impacts to plumbing, HVAC and electrical installations.

The EPS-IA says that it's safe to assume that a home will cost about \$2.00 more per square foot to build with ICFs on average, and particular architectural features or site issues could have an impact as well.

Reduced Energy Costs

One of the biggest benefits of using ICF is the continuous insulation on both sides of the wall that virtually eliminates thermal bridging and energy loss. An ICF home can cut energy bills in half and can achieve a HERS index in the 40-50 range, which means they are outperforming existing building codes by 50 to 60 percent.

According to the HUD report, field comparisons of similar ICF and wood-frame house constructions found that ICF wall construction can provide a 20 to 25 percent savings in annual heating and cooling costs.

To achieve a similar level of energy performance, a typical wood-frame home would require an “energy upgrade” that adds about \$2,640 to an average home cost of \$200,000 (or about \$1.32 per square foot of living area). This amount is equivalent to about one-third of the cost difference between ICF and typical wood- frame house construction.

According to the HUD report, many ICF homeowners who are willing to pay a little extra on the front end for downstream energy cost savings, not to mention the benefits of added safety and comfort.

One caveat: a tight building envelope means that contractors must size the heating and cooling equipment correctly. Most heating and cooling contractors not experienced with homes as energy-efficient as ICF houses, so they tend to install equipment sized for a conventional house. Often that equipment is larger than necessary so the homeowner pays more for large system that's not necessary and often does not perform properly because it is oversized. When building with ICFs, using the right size of HVAC unit is an additional upfront costs savings compared to building a less energy-efficient home.

According to the Department of Energy's Office of Energy Efficiency and Renewable Energy, the combined advantages of structural integrity, low air leakage, and high insulation value make ICF construction an attractive option in many building applications.

About the Sponsor: Fox Blocks is a leader in developing and manufacturing Industrial Strength Insulated Concrete Forms (ICF).