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Portland Cement Association
5420 Old Orchard Rd.
Skokie, IL 60077
847.966.6200 PH
847.966.8389 FX
info@cement.org

Technology Brief 1

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Concrete Homes Save Energy

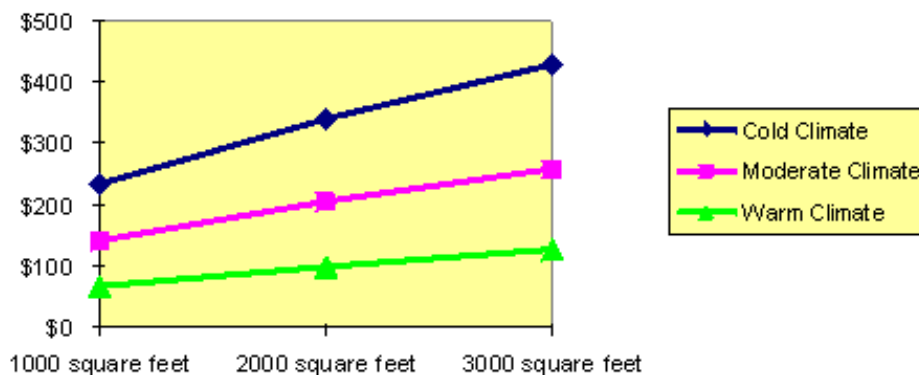
Building a concrete home with insulating concrete forms (ICFs) saves energy and money. The greater insulation, tighter construction, and temperature-smoothing mass of the walls conserve heating and cooling energy much better than conventional wood-frame walls. This reduces monthly fuel bills. It also allows use of smaller heating and cooling equipment, saving money in construction.

How much will I save?

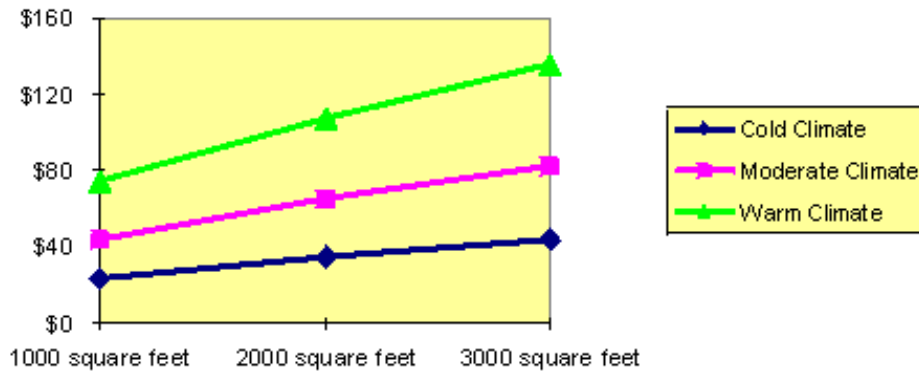
Houses built with ICF exterior walls require an estimated 44% less energy to heat and 32% less energy to cool than comparable frame houses. A typical 2000 square foot home in the center of the U.S. will save approximately \$200 in heating costs each year and \$65 in air conditioning each year.

The bigger the house the bigger the savings. In colder areas of the U.S. and Canada, heating savings will be more and cooling savings less. In hotter areas, heating savings will be less and cooling savings more.

Estimated Annual Heating Savings



Estimated Annual Cooling Savings



The smaller heating and cooling equipment needed for such an energy-efficient house can cut construction costs by an estimated \$500 to \$2000. The biggest equipment savings come with the houses that have the most energy savings.

How do we know all this?

The energy savings estimates are from a study of 58 single-family houses across the US and Canada. Half had exterior walls constructed with concrete using ICFs made of expanded polystyrene (EPS) or extruded polystyrene (XPS) foam.

The other half were neighboring houses with wood-frame walls. All houses were less than 6 years old.

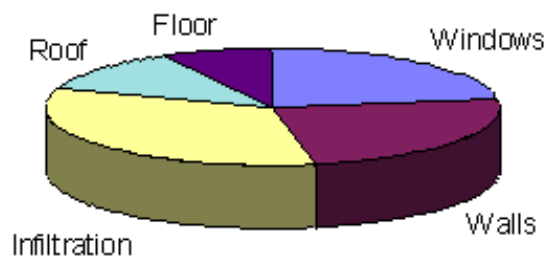
The researchers compared the energy bill of each concrete house to its frame counterpart, carefully correcting for important differences to get an "apples-to-apples" comparison.

Estimates of equipment savings are actual numbers reported by contractors who build ICF houses.

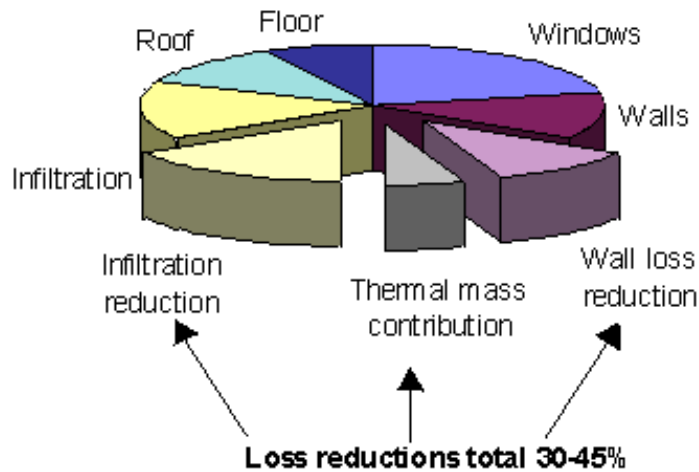
Where do the savings come from?

Insulating values for ICF walls using polystyrene foam are R-17 to R-26, compared to wood frame's R-9 to R-15. So ICF walls are expected to cut conduction losses through foundation and above-grade walls in half. And ICF walls are tighter. In tests, they averaged about half as much infiltration (air leakage) as wood-frame homes.

Sources of Energy Loss



Energy Loss Reduction



The energy efficiency of ICF houses has been independently verified by other agencies. They compared the energy use of single family houses with various exterior walls including ICF, concrete masonry and wood framing. The results show that in almost all climates across the US and Canada, concrete homes use less energy for heating and cooling.

But ICF walls do more than cut down on energy loss. Concrete gives them the heat-absorbing property, "thermal mass," the ability to smooth out large temperature swings. It keeps the walls warmer when the outdoor temperature hits its coldest extreme and cooler when the outdoor temperature is hottest. The walls "add back" heat or cooling, which contributes about 6% of the needed energy to the house for free.

Since the energy needed is less, furnaces and compressors that heat and cool can be smaller. And the more the energy savings, the greater the possible reduction in equipment size—and cost.

Estimating the size of heating and cooling equipment for concrete homes is complicated because the effect of thermal mass must be simulated in a computer program. But the software tool "HVAC Sizing for Concrete Homes" takes care of the difficult calculations. All you have to do is enter information about the house, like location, house size, and wall construction.

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What's the bottom line?

In planning a new house, you can estimate that building with ICFs will save hundreds of dollars per year in energy costs. You may also save hundreds or thousands of dollars in construction costs for heating and cooling equipment. Talk with an ICF homebuilder for estimates.

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More Information?

[Energy Comparisons of Concrete Homes vs. Wood Frame Homes](#)

RP119 - \$10

Thermal Mass Comparison of Wall Systems

CD026 - \$20

HVAC Sizing Software for Concrete Homes

CD044 - \$59.95

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