Concrete Homes

Count on Concrete

Technology Brief 3

Fire Resistance of Concrete Homes

Of all construction materials, concrete is one of the most resistant to heat and fire. That fire resistance gives houses built with insulating concrete forms (ICFs) certain safety advantages. And those advantages give builders and buyers yet another reason to consider using ICFs for their next project.

How well do ICF walls hold up in a fire?
Experience shows that concrete structures are more likely to remain standing through fire than are structures of other materials. Unlike wood, concrete does not burn. Unlike steel, it does not soften and bend. Concrete does not break down until it is exposed to thousands of degrees Fahrenheit—far more than is present in the typical house fire.

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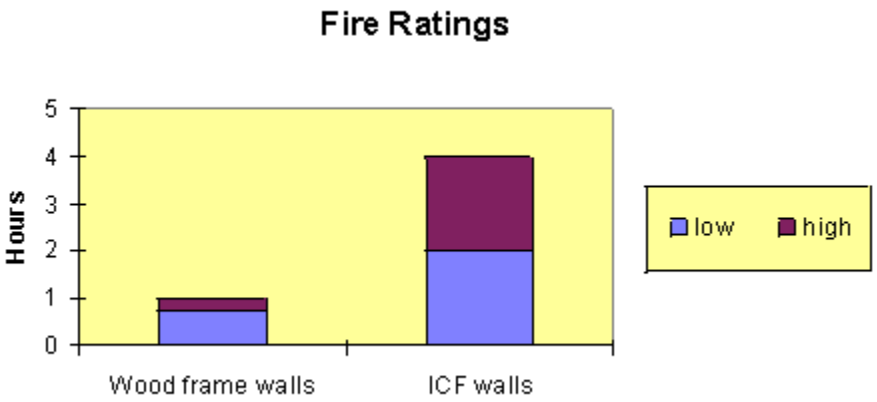


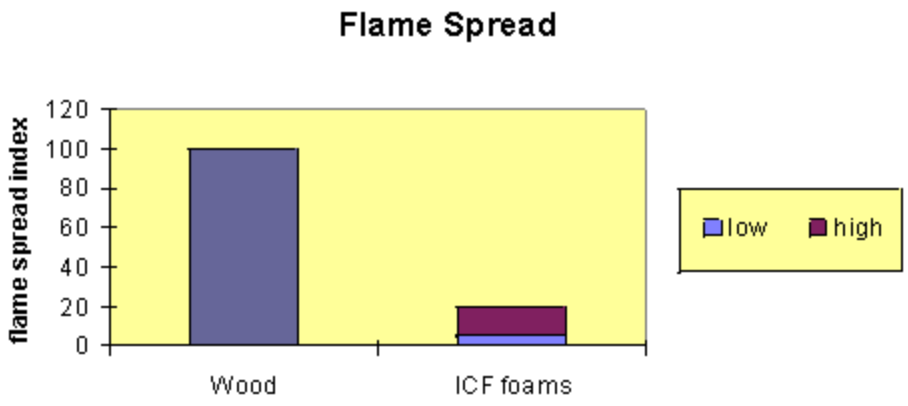
This has been confirmed in so-called “fire-wall” tests. In these tests ICF walls were subjected to continuous gas flames and temperatures of up to 2000°F for as long as 4 hours. None of the ICF walls ever failed structurally. All of the ICFs tested were of the “flat” or “uninterrupted grid” type, having no significant breaks in the concrete layer . In contrast, wood frame walls typically collapse in an hour or less.

Do they stop fire from spreading?
Concrete walls have also proven more resistant to allowing fire to pass from one side of the wall to the other. This is especially of interest in areas with brush fires that could spread indoors.

The fire wall test confirms this rule for ICFs once again. Part of the test measured how well the wall slows the passage of heat and fire from the side with the flame to the other side. The ICF walls tested did not allow flames to pass directly through. They also did not allow enough heat through to start a fire on the cool side for 2-4 hours. In contrast, wood frame walls typically allow both flame and fire-starting heat through in an hour or less.

Will the foam add fuel to the fire?
The foams in ICFs are manufactured with flame-retardant additives. These prevent the foams from burning by themselves. If you hold a match to the material, it will melt away.

Of course, in a house fire the foam may be subjected to constant flame from other materials burning nearby (wooden floors, fabrics, etc.). The “Steiner Tunnel Test” measures how much a material carries fire from an outside source. In the test, technicians line a tunnel with the material, run a fire at one end, then measure how far the flame spreads. The flames travel about one-fifth as far down a tunnel lined with ICF foams as they spread down a tunnel lined with wood.



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Can the foam give off harmful emissions?
Practically any organic material, be it wood or plastic, gives off emissions when it is subjected to intense heat or flame. The Southwest Research Institute reviewed the numerous existing studies of fire emissions and concluded that the emissions from polystyrene foams are “no more toxic” than those of wood.

What precautions should I take to make my house fire resistant?
No matter what your walls are made of, there is no sense playing with fire. Building codes require covering the inside face of exterior walls with a fire-resistant material, such as gypsum wallboard or a stout plaster.

In areas prone to outdoor fires, it is wise to finish the exterior with a fire-resistant material, too. Favorites are Portland cement stucco and masonry.

And of course the more you can design your home to limit the exposure of flammable materials like wood and fabrics, the better.

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What's the bottom line?

Evidence suggests that ICF walls may be safer in many ways than wood frame in a fire. Including ICF walls in your next home would provide an important and effective measure of fire safety.

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More Information?

Insulating Concrete Forms for Residential Design and Construction
VanderWerf, Feige, Chammas, and Lemay
New York: McGraw-Hill Inc., 1997 - $75

Insulating Concrete Forms Construction Manual
VanderWerf and Munsell
New York: McGraw-Hill Inc., 1996 - $34.95

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