

FIRE RESISTANCE OF CONCRETE HOMES



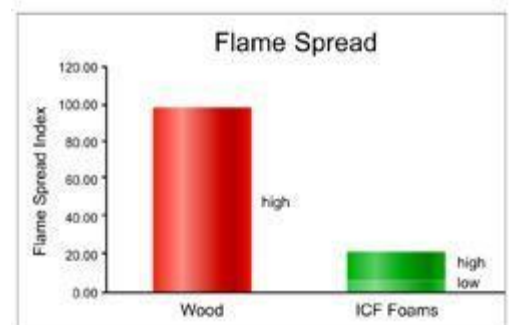
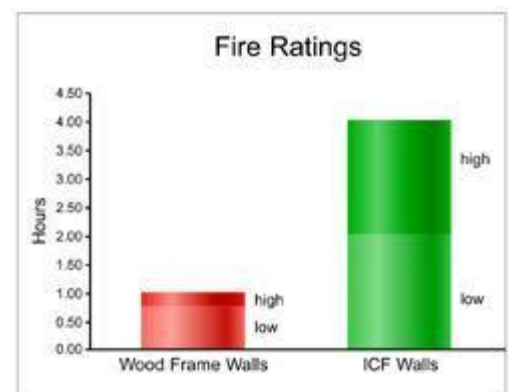
Portland Cement Association Residential Technology Brief

By Residential Concrete Staff

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

HOW WELL DO CONCRETE WALLS PERFORM 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 hotter than in the typical house fire.



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

Concrete walls have proven more resistant to fire passing from one side of the wall to the other. This is especially of interest in areas where brush fires could spread into homes, or fires from adjacent structures could jump to the next house.

The fire-wall tests confirmed this rule for concrete once again. Part of the tests measured how well a wall slows the passage of heat and fire from the side with the flame to the other side. The concrete 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 to 4 hours (for concrete 5 inches or thicker). In contrast, wood frame walls typically allow both flame and fire-starting heat through the walls in an hour or less.

WILL THE FOAM ADD FUEL TO THE FIRE?

Foams used in ICFs and other concrete walls are manufactured with flame-retardant additives. These prevent the foams from burning by themselves. In a fire, the material will melt away.

Of course, in a house fire the foam may be subjected to constant flame from other materials burning nearby (such as wooden floors or fabrics). 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. In this test, the flame spread for ICF foam is about one-fifth that of wood.

Wood frame (top) and concrete masonry walls (bottom) after fire test. Then the question becomes, can the foam give off harmful



emissions? Practically any organic material, like wood or plastic, gives off emissions when subjected to intense heat or flame. The Southwest Research Institute reviewed numerous existing studies of fire emissions and concluded that 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 foam insulation on the inside face of exterior

walls with a fire-resistant material, such as gypsum wallboard or a stout plaster.

In areas prone to forest or brush fires, it is wise to finish the foam on the exterior side with a fire-resistant material. The most commonly used materials are Portland Cement stucco, fiber-cement siding, and concrete masonry.

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

WHAT'S THE BOTTOM LINE?

Concrete walls are safer in many ways than wood frame in a fire. Designing your next home with concrete walls would provide an important and effective measure against fire.