

Concrete creative

Technology has turned homes into top energy performers, while artistry adds unexpected twists to floors, counters, even mischievous chimps resting under a backyard hosta

BY PATRICK LANGSTON, THE OTTAWA CITIZEN APRIL 4, 2009



John Teixeira, who recently won international honours for his workmanship, builds and lives in a sunny concrete home in Westport.

Photograph by: Wayne Cuddington, The Ottawa Citizen, The Ottawa Citizen

Say the word concrete, and you probably visualize a sidewalk.

For Dr. Dov Vinograd, the word means home. Literally. Vinograd is one of a small, but growing number of custom homeowners who have opted for an ICF, or insulating concrete forms, house. He's delighted.

"It's turning out to be very much what we hoped for," says the Ottawa clinical psychologist, adding that he'd "highly, highly, highly" recommend ICF. He and his wife Patricia O'Rourke built their 2,500-square-foot concrete retirement home in Westport, in the Rideau Lakes, last year. For now, they live there part-time as they wind down their life in Ottawa.

Like most ICF enthusiasts, the couple are especially pleased with their home's superior heating and cooling attributes. Those are rooted in the air-tight construction and insulating properties of ICF buildings, along with the unique thermal mass of concrete.

Vinograd's home, like most ICF houses, is built on a concrete slab insulated from below and containing a radiant floor heating system. His builder, John Teixeira of Westport-based Teixeira Construction (www.teixeirahomes.com), used the Legalett slab system, for which Teixeira is a distributor. Unlike glycol/water-filled systems, this one moves warmed air

through PVC pipe embedded in the concrete. The floor in turn warms the rest of the house.

For the walls, Teixeira used a Logix ICF panel system (www.logixicf.com).

Two courses of interlocking polystyrene blocks are held six inches apart by plastic ties, with spaces left for doors and windows. Reinforcing rods are placed in the gap, which is then filled with concrete. Once the concrete sets, the insulating polystyrene stays in place, with imbedded strips of polypropylene strapping providing an anchor for interior and exterior finishes. Household wiring runs through channels cut into the interior polystyrene.

In the case of a two-storey home, another, slightly thinner slab with its own radiant heat system is poured for the second floor.

The roof and interior walls use conventional timber construction methods.

Because ICF walls, aside from doors and windows, are a solid mass, there is minimal heat or cold infiltration from outside. By contrast, a conventional two-by-four wood-frame house, no matter how tightly built, has studs in every wall which means breaks in insulation, as well as heat and cold, transfer through the studs. Concrete's thermal mass also means it retains heat and cold well, therefore moderating daily temperature swings.

One study by scientists at the Buildings Technology Centre, Oak Ridge National Laboratory in Oak Ridge, Tenn. found that the true R-value of batt-insulated walls in a two-by-four wood-frame house was about 10. By contrast, the walls of a concrete home, when thermal mass and airtightness are factored in, have an effective R-value of 26 to 44, depending on climate. That can all add up to big energy savings, say proponents.

"An ICF house only costs about 60 per cent as much to heat as a conventional house," says Teixeira, an R-2000 builder, who recently won an ICF Builder Award at the World of Concrete show in Las Vegas. Cooling costs about 35 per cent less than a conventional house, he adds. So owners who go with concrete should quickly recoup the extra five to ten per cent that builders say an ICF home costs (Vinograd, whose home still needs a few finishing touches, thinks it will eventually run a bit higher than 10 per cent).

A 2007 Canada Mortgage and Housing Corp. evaluation of an ICF apartment building confirms the heating and cooling advantages of concrete, but without giving specific cost savings.

Among its conclusions: An ICF building has an air infiltration rate of up to 60 per cent less than a conventional structure. That means the cold stays outside in the winter and the heat does the same in the summer. The study also predicted higher comfort for building occupants because temperatures fluctuate only marginally across the concrete mass, minimizing the hot and cold zones found in many conventional homes.

Concrete's temperature-holding power means ICF homeowners can rest easier during a power outage or other heating emergency, according to concrete builders. Gerry Donohue works with Carp's Maple Ridge Media Inc., a distributor of Legalett slabs and Arxx panels (www.arxxbuild.com), and lives in an ICF home. His boiler blew on a frosty Friday night in February and by Monday night, he says, the temperature in the kitchen had dropped from 22 C to only 20 C. "We had some heat gain from cooking and the sun, but I'd safely say to people, 'If you're in a house like mine, ice storms are no longer an issue.' "

Donohue adds that using spray insulation in the attic, rather than cellulose or fibreglass batts, has given his home the finishing touch by further reducing air infiltration.

Others recommend a backup generator to power the radiant heat system, while extras including triple-windows earn ICF homes even more eco points.

The ICF market, while still a niche occupied mostly by custom builders, is hot, with consumers increasingly aware of the technology, says Donohue. A recent study by ICF Builder confirms that: ICF residential construction grew from a 0.7-per-cent market share in the United States in 1997 to 4.5 per cent in 2007.

And don't let that term custom builder frighten you: ICF is as suitable for a 1,200-square-foot bungalow as for a McMansion.

Concrete's superior fire, insect and rot resistance further increases its appeal. So does its deadening of outside noise like neighbours' lawnmowers. Builders also claim improved air quality (no cellulose insulation means less chance of mould) and point to concrete's ability to thumb its sturdy nose at tornados and other nasty weather.

As to concrete flooring's reputation for being murder on feet and joints, David Kerbl, an Ottawa chiropodist (foot specialist), says that shouldn't be a problem. "We're all walking on concrete at work even if it's covered in carpet or tile, and it's not a big issue." A fatigue mat is a good idea if you're standing in one place, including a kitchen or workshop for a long time.

Some owners cover concrete floors with engineered wood or carpet, but it has to be thin to allow the radiant heat to work properly. And with the stunning array of floor treatments available (see sidebar), it seems almost criminal to cover concrete.

Along with providing funky design opportunities, the ICF industry vigorously promotes itself as a green choice. As proof, it cites concrete's long lifespan and its use of locally resourced natural ingredients, including water and aggregate along with recycled materials, including old concrete.

More significantly, the industry points to the lower heating and cooling requirements of an ICF home as major green pluses. A 2002 study by Construction Technologies Laboratory of Skokie, Ill., for example, found that while more energy was consumed and climate-changing carbon dioxide produced in manufacturing cement than in processing wood, an ICF house uses so much less energy over its life cycle that it easily outstrips wood as a green building material.

However, a recent review of multiple studies on ICF, wood and steel-frame construction by Minneapolis, Minn.-based environmental consulting firm Dovetail Partners Inc. questions that conclusion.

It notes that in studies like the one by Construction Technologies Laboratory, the R-value of walls in the wood-frame house used as an example is less than that of walls in the ICF house. That renders almost meaningless the conclusions of Construction Technologies Laboratory about comparative energy use over the wood and ICF homes' life cycles.

The answer seems to lie somewhere in between. If wood-frame walls could achieve the high R-values of concrete, especially in regard to airtightness, they would be greener. For the moment, most can't, so concrete comes out as the environmental good guy over a home's life cycle.

If all this has you thinking about ICF for your next home, one final note: You can do some of it yourself. Both Teixeira and Donohue, who offer ICF workshops, say that building ICF walls for a one-storey home is possible for a competent do-it-yourselfer. Both are willing to help homeowners get started and offer advice along the way.

"It's not very complicated," says Donohue. "You could save \$5,000 or \$6,000 on a bungalow by doing it yourself."