

Concrete factory innovates on construction of homes

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Dick Wehrli, owner of Dukane Precast Inc. in Aurora and Naperville, had the idea to create and build a concrete home for more than 15 years. But it wasn't until a visit to Europe seven years ago that Wehrli decided the project was feasible in this country.

The last three years, Wehrli returned repeatedly to Europe, touring some of the 250 plants there that produce concrete homes.

"Finally, I put the cost figures together and it came out real attractive," he said.

In October, Wehrli opened an 80,000-square-foot plant in Naperville designed to build single- and multifamily homes, townhouses, condominiums, apartments, hotels and motels, plus dormitories and schools. It employs 15 people.

The highly automated plant produces a double-sided concrete panel with insulation in the middle, the first such panel in North America, according to industry sources.

There are other types of concrete homes, such as concrete masonry or concrete blocks and insulation concrete forms, in which a layer of concrete is sandwiched between layers of foam insulation.

"But this particular variation is the first of its kind in the nation," said Jim Niehoff, residential program manager for the Portland Cement Association.

Wehrli said he can build a concrete house at a cost 5 percent to 10 percent more than that for a "bricks and sticks" home. But Niehoff, noted that the extra cost can be quickly recouped.

"We have conducted studies that the homeowner of a concrete home will save 30 to 50 percent on heating and cooling costs," Niehoff said.

Meeting village codes

The Dukane plant's first project is a home in the Heritage Knolls subdivision off Royce Road in Bolingbrook. Mustang Construction, partly owned by Wehrli, is putting the finishing touches on the \$320,000, white stucco-look, 3-bedroom ranch made with the factory's double-wall, precast concrete panels. Only the roof is wood.

Bolingbrook went to great lengths to ensure that the home meets village codes, said Dennis Kowalczyk, community development director.

"That wasn't a hurdle," he said.

He and the building commissioner frequently visited the building site to what was going on, he added.

"We worked very, very closely with the builder and saw it being built. It looks like any normal house," he said.

Plainfield recently approved two concrete homes. Village Trustee Ron Swalwell said he is in the construction business and had been skeptical until he visited the Naperville plant.

"I was amazed. There just wasn't any downside at all," Swalwell said. "The plant is about as high tech as you ever wanted to see."

Dukane is trying to educate builders, architects, and building and code inspectors throughout the area. In April, it held a seminar for suburban building officials, and 150 people toured the plant.

An average size home consists of 60 panels. From the outside, the home looks like any other, but all the perimeter walls and floors are concrete. The plant uses computer-aided design and robots to construct each panel, which can be as long as 12 feet and as wide as 33 feet, officials said.

Each panel consists of two sides, or wythes, of concrete connected by steel truss girders. The first side is laid out by a robotic marker. Any door or window openings and electrical, cable, computer and phone conduits are marked and laid out on a casting table. Then reinforcing steel is placed throughout. If the panel is for a floor, radiant floor tubing is affixed to the trusses.

The table, with everything in place, is moved to a placement station where a special mixture of concrete is poured. It is then moved to a shaking table where it is oscillated to ensure an even placement and smooth surface.

After being placed in a curing room for a minimum of eight hours, it is placed on its recently poured mate. The panel is then cured again. The two are joined by the steel trusses and are one unit. A foam insulation is then sprayed between the panels.

"There is constant quality control through each step," said Brian Bock, Dukane's director of marketing.

The panels are taken to the site and grouted together to create a monolithic structure. The entire house can be constructed in two to three days, said Joe Gallione, research and development engineer.

Energy Star status

The Bolingbrook home was awarded recently an Energy Star distinction from the U.S. Environmental Protection Agency. To achieve that status a home has to have a rating of 86, calculated from criteria established by the EPA. The house in Bolingbrook has a rating of 91.6.

"I have never tested a home that tight before, and it is a healthy house with a heat-recovery ventilator to bring in outdoor air," said James Cavallo, a certified home energy rater for the state and associate editor of Home Energy magazine.

As for safety and durability, the panels can resist a 15-pound, 2 foot by 4 foot missile traveling at 100 m.p.h., according to tests done by the Texas Tech

University Wind Science and Engineering Research Center in Lubbock. The center's tests simulated the force of a missile propelled by a 250-m.p.h. ground speed tornado.

The panels, according to the center, are suitable for construction of above-ground tornado shelters and fall within the guidelines established by the Federal Emergency Management Agency.