



Precast Provides Options For Single-Family Housing

— Craig A. Shutt



Designers find that various precast concrete components can aid the flexibility and marketability of single-family homes

With the housing boom slowing down, developers and builders are looking for ways to differentiate themselves in a tighter market. A number are finding that precast concrete components can provide benefits to both them and the homeowners that other materials can't match.

An example can be seen in the housing units constructed in Yonkers, N.Y., by Habitat For Humanity of Westchester County. The four duplexes' design follows a plan used earlier by the group in another neighborhood, in which a total-precast concrete system created the homes' shell. The components consisted of precast concrete waffle foundation panels, stem and roof

decks, demising wall panels and insulated wall panels.

"As we saw with our recently completed homes on Willow Street, this construction method will allow us to more quickly place families into homes that will last much longer than a wood-frame structure," says Jim Killoran, director of the group. "This could revolutionize the way we build homes for Habitat for Humanity locally and nationwide." The 1,800-square-foot, two-story homes will have an appearance consistent with other residences in the neighborhood, including numerous architectural features. With the shells in place by the fall, the homes are planned for occupancy in 2007.



A variety of home styles, from ranch styles to large, two-story models with soaring ceilings, can be created using precast concrete components, as seen in these examples from Dukane Precast.

multifamily housing. We can use a similar approach to them all, creating a precast concrete shell that goes up fast and then attaching metal studs to create the finished interior."

A number of components can be used in this construction, either together or individually. The key types are:

Solid wall panels. These panels can have insulation attached to the interior side to aid energy efficiency and can be used as foundation walls or as façade panels. Solid concrete slabs also are used to span long distances as flooring units, and this type of component can be used as the foundation wall as well.

Insulated sandwich wall panels. This configuration of panel features a layer of insulation, typically 2 inches of material, "sandwiched" between

two layers of precast concrete. The wythes of concrete are secured with connections that can be designed to ensure no thermal breaks occur that conduct heat. The panels can be loadbearing, with an interior wythe that supports flooring units above, eliminating the need for any other structural framework.

Double-wall panels. These panels are similar in their final design to sandwich wall panels but are cast differently, with the two panels cast and then the interior filled with foam insulation afterward. The panels are form-finished on both sides, eliminating the need for drywall on the interior. These panels also can be used as flooring units, with the top surface not requiring a leveling course and the bottom surface offering a drywall-smooth finish.

Hollow-core panels. These panels, typically used as flooring panels, feature voids through their lengths to lessen their weight while maintaining their structural integrity. They can span long distances, while the internal voids provide conduits for running mechanical services.

A Multitude of Benefits

Owners, designers, contractors and homeowners are realizing the benefits that using precast concrete components can offer to a home. Some of these result from the inherent attributes of concrete, while others are derived from the value

The components were produced by Oldcastle Precast in South Bethlehem, N.Y., and were delivered to the jobsite as needed for immediate erection. The panels, called CarbonCast panels, feature carbon-fiber grid reinforcement, which replaces the typical secondary steel reinforcement in the components for more durability and lighter weight.

More designers are seeing the benefits that can be provided, which go beyond speed and aesthetic appeal. "We've done quite a few single-family homes using precast concrete components," says Thad Gleason, principal in Gleason Architects PC in Sugar Grove, Ill. "They work well for single-family projects as well as townhomes and



Habitat for Humanity of Westchester County, N.Y., is using CarbonCast precast concrete panels and components from Oldcastle Precast to create housing quickly and economically.



Finrock Industries' president designed and built his own dramatic home using precast concrete components that keep it highly energy efficient.



Building on a Grand Scale

The potential for building dramatic homes that can hold their own with other showpieces can be seen in the residence built for Robert Finrock, owner of Finrock Industries Inc., a precast concrete manufacturer in Florida. Working with architectural firm Burke, Hogue & Mills & Associates Architects in Lake Mary, Fla., Finrock designed a 6,644-square-foot home featuring a total-precast concrete shell.

"I built it because of my abilities and desire to have a home made with precast concrete," Finrock says. The home features architectural and structural pigmented precast concrete exterior walls and structural interior walls with hollow-core and solid-slab concrete floor and roof components.

Some 426 precast components were used to build the home, which includes four bedrooms, 4.5 baths, family room, living room, billiard room, dining room, kitchen, laundry, closets, a large garage with a workshop, a lap pool and sun deck.

The home features a Prairie-style design and follows the shape of the site. The residence was sited to take full advantage of views without overpowering the delicate nature of the location. The structure is nestled among trees, which remained in place thanks to the use of precast concrete components that were cast offsite and delivered as needed each day.

"I love the house," Finrock says. "It's very low maintenance and highly energy efficient. Because of the mass of the walls, it doesn't change temperature—when the weather changes, it takes three days for the building to know it. It's definitely a one-of-a-kind home, but the principles can be applied to other single-family housing styles."

added by precasting the products under factory-controlled conditions. The advantages include:

Speed of design and construction. Precast concrete components can be fabricated while other work progresses, such as foundation work. Once the site is ready, the panels can be erected quickly. "I can set a house in two days with precast concrete and get them weathertight," says Clifton Crawford, president of Crawford Development Partners in Evanston, Ill. He uses double-wall insulated panels produced by Dukane Precast in Naperville, Ill.

"It takes a lot longer with traditional framing and siding material, and with money the way it is today, that creates a major difference." He estimates that using precast panels reduces the home's overall timetable by 25% to 30%. His process consists of putting in footings, setting the precast concrete double wall on the footings, and laying deck panels across the tops of the panels for flooring and roofing supports. Gable roofs framed in wood complete the shell.

Habitat's Killoran agrees that precast's speed creates a definite benefit. "Precast breaks the traditional mold," he says. "I can do 25 shells collectively, knowing I am getting a great product that will get families in homes quicker."

Energy efficiency. Concrete's inherent thermal mass helps insulate homes and keep interior temperatures more consistent, absorbing heat and releasing it when temperatures cool at night. Insulated panels such as Dukane's double-wall design add R-21 insulating value to a 8-inch panel and up to R-35 for a 10-inch panel. Oldcastle's panels typically are created with an R-15 insulation value, but they can go as high as R-25, according to Harold Messenger, vice president.

Moisture control. Completing the shell quickly prevents other construction materials from becoming wet, creating moisture problems that could encourage mold and mildew. The precast panels, when used for either foundations or façades, create a large, solid expanse with very few joints compared to concrete masonry units or brick. The solidity minimizes the potential for moisture



Precast concrete panels can replicate the look of brick by using thin brick embedded in the panels or by creating a pattern on the face with formliners, as in this example from Prestress Engineering Corp.



'I can set a house every two days with precast concrete and get them weathertight.'

penetration, helping to keep the interior watertight throughout its lifetime.

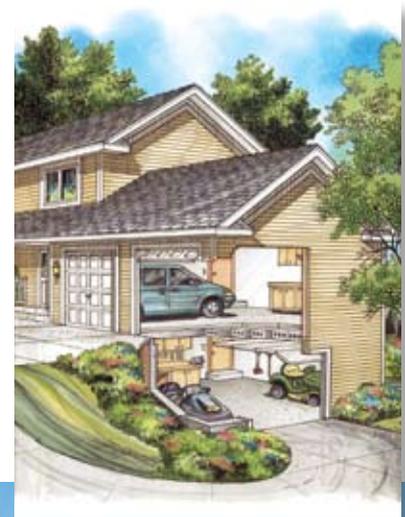
Long-term durability. Concrete's durability ensures the home will maintain its appearance for generations. If a brick look is achieved, with thin brick embedded into the panels or with formliners to cast a brick appearance into the panels, it won't require tuckpointing, creating a low-maintenance design that saves cost over the home's life. CarbonCast panels, created by members of AltusGroup including Oldcastle, feature C-Grid carbon fiber that can't corrode as other reinforcement might. The concrete also is impervious to termites and rodent infestation.

Wind resistance. Precast concrete homes provide significantly more protection from wind-borne debris than other building materials. Tests sponsored and conducted by the Portland Cement Association (PCA), PCI and Dukane Precast have helped to create examples of fortified homes in Bolingbrook, Ill., where insurance companies offered premium discounts to homes built to the standard. (For more on this program, see "Designing For Hurricane Zones" in the Summer 2006 issue of *ASCENT*.)

Design flexibility. Precast flooring units, such as hollow-core

slabs, provide the ability to span long distances without interior support columns. This opens up interiors for more flexible layouts. Ben Miller of Streeter Associates in Minnetonka, Minn., has had great success using hollow-core planks to create new space on lower levels, particularly beneath garages, he says.

The components, produced by Molin Concrete Products Co. in Lino Lakes, Minn., are set on the foundation walls to open space below while providing structural



Hollow-core planks can create added column-free space beneath a home, particularly in the garage where loads are heaviest, as seen in these homes that used components from Molin Concrete Products.





Piekarz Associates Architects in Chicago has been designing single- and multifamily housing for many years using precast concrete panels. The latest designs feature two finishes: embedded thin brick on top with a rusticated-stone appearance below.

'The long, clear spans offer a key marketing advantage for builders, and the speed of installation is a big plus.'

stability that will support cars. "We've been using this approach for eight years now," Miller says. "Prior to that, we didn't offer this option on homes, because we didn't have a way to achieve it."

Adds Erik Molin, "The long, clear spans offer a key marketing advantage for builders, and the speed of installation is a big plus. You can quickly have a completed deck for a home." Typically, 8-inch panels are used for spans up to 28 feet long, after which the company uses 12-inch-thick panels. Recently, 6-inch hollow-core slabs were used for a project where a garden was being placed overhead.

Fire safety. Precast concrete's inherent noncombustible composition ensures it won't encourage flame, either inside or outside the home. This creates a safer environment that can also help reduce insurance rates.

Acoustical control. Precast's dense composition, coupled with high levels of interior insulation, helps keep noise out and create a quieter home. The precast concrete flooring units can help ensure noise doesn't travel from one floor to another.

Aesthetic versatility. Precast concrete panels can replicate the look of a variety of more expensive and labor-intensive materials. This includes brick and many types of stone. Using precast panels inset with thin brick reduces scheduling conflicts, creates a less congested site and provides an economical way to fit in with the neighborhood.

The market for precast concrete panels will continue to grow as more developers, designers, homebuilders and homebuyers become aware of the possibilities. "Most homeowners have never seen this technology," says Brian Bock of Dukane. "The greatest challenge is just getting people comfortable with the idea of

doing something different, while also having the experts in architecture, concrete and insulation explain to their own peers why it makes sense."

Gleason agrees. "We've been doing these projects for four years, and they work well. They can be constructed any time, they're durable and well insulated. As the initial costs become more cost-competitive as volume rises, I expect we'll see more built." ■

For more information on this or other projects visit www.pci.org/ascent.

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