The Personalized Countertop

Inspired by precast concrete, designers cast personal effects into permanent kitchen fixtures.

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Brian Bock is a hard man to talk with. Not that he's unfriendly – quite the contrary, he's very gracious, but so very busy fielding calls from prospective clients, it's impossible to interview him without interruptions. While getting questions lobbed at him on line one about how a staid precast producer came into nationwide media attention, lines two and three kept ringing. Bock, vice president of marketing with Dukane Precast in Naperville, Ill., conducted the interview on speakerphone, creating an eavesdropping situation, simultaneously exposing the inquiries from other callers. Every call started with something like, "Hello, I just read about your ..." Or, "Last night I saw something on the evening news and ..."
Soon the interview seemed more like a chat with the publicist for a Grammy-winning rock band, not the point man for a precast concrete producer specializing in mid-rise buildings, hospitals and hotels.

Like a juggler, Bock worked the phones without cutting the interview short, and in bits and pieces, between answering customer calls and fielding other reporters, he explained how he had turned an innovative but arcane precast concrete production process into a media frenzy. What also surfaced: the reason why Dukane's new production plant may indeed revolutionize the construction industry.

A 21st century precast product

Weather-wise, Illinois is a cool northern state with brutal winters and a short building season. Construction labor costs have remained high because of the sporadic nature of the work and strong unions demanding higher wages. In this environment, a factory-built construction product that cuts labor in the field and shortens construction schedules makes a lot of sense. Precast concrete certainly affords the benefits of off-site construction. But after walking the floor on dozens of precast plants in Europe, the owners of Dukane Precast, realized that American manufacturers had a long way to go before achieving the full potential of the precast process.

Until that moment, Dukane's business had thrived by offering a traditional line of precast concrete building
Media-savvy manufacturer introduces innovative precast technology by forging into residential construction.

components, including panels, columns, spandrels and beams. Nevertheless, it was hard to ignore the glaring difference in technological advancement between European and American production methods. "They're decades ahead of us," Bock said. According to Bock, the Europeans have embraced factory production methods pioneered by Henry Ford and perfected them; their precast plants resemble a modern automated manufacturing line.

Not satisfied with second place, Dukane management decided to take a leap into the future, setting up what they say is the first double-wall, trilly automated, European-style plant in the United States. This did not just mean building a new plant, a big step by itself, but also delivering a radically different product. Beyond improving European production, Dukane has also enhanced precast concrete to include insulated panels with electrical chases, high-velocity air conditioning ducts, radiant floor heat and plumbing precisely laid into walls and floors. Shipping, erection and utility hook-up is all that's left for the job site. It's as close to complete factory fabrication as a 500,000-square-foot mid rise or hospital building can come.

Even more important than speed, savings and convenience for the contractor, the European process delivers a wall or floor section with continuous R-21 to R-49 insulation. Structural thermal bridges, which can compromise the building envelope, are absent in the panel design. Thermal bridges are places where the insulation is compromised by low R-value components, usually structural members such as beams or columns. Typical American-designed insulated concrete construction come with thermal bridges, especially around the wall perimeter and around openings, where the R-value of the wall drops to single digits.

The European method adopted by Dukane provides an uninterrupted
insulation sandwich. No thermal bridges anywhere. To achieve this level of precise engineering and energy detailing, the Europeans have developed a robotic precasting process that brings the precast industry on a level with Detroit auto manufacturers.

**Marketing the advantage**

Having worked in the industry more than 20 years, Bock knew how difficult it would be to sell this new system on a promise. Builders and developers usually don’t like new methods of construction, because the learning curve can be costly and it’s a hassle to persuade subcontractors, suppliers and employees to change their standard practices.

“IT’s hard to sell a job on just an idea.” Bock said. “We needed something to show.” Even if Dukane landed a few good jobs, changing industry attitudes would take a long time. From a public relations perspective, it’s hard to get the press excited about a cool new method for building hotels or apartment buildings.

Bock scratched his head vigorously until he had a brilliant idea: Build a technologically advanced precast concrete single-family home showing all the advantages of this new method of concrete production, including energy efficiency, fire safety and, perhaps most appropriately on the heels of Hurricane Katrina, a truly storm-proof structure.

The idea resonated with Chuck Vance, who manages the Fortified program at the Institute for Business and Home Safety (IBHS) in Tampa, a nonprofit group funded by the insurance industry to research and promote disaster-resistant building technologies. He loved the idea of building with precast concrete. “Although we work with a lot of types of buildings, the precast concrete house is inherently more storm resistant,” Vance said.

One of the major hazards to wood frame and even concrete block construction comes with windblown...
debris. A tree trunk flying on a 130-mph gust can blow right through a conventional wall, perhaps landing in a living room — but not through a precast concrete wall. Wood studs shot from a cannon at Texas Tech University in Lubbock to simulate debris hurtling at peak hurricane gusts sheltered an impact without even chipping the precast concrete wall.

Of course, there's more to a fortified, storm-resistant house than concrete walls. Windows, doors and the wood roof assembly represent weak links that can cause devastation no matter how solid the perimeter. To achieve the fortified house designation, Dukane had to upgrade the windows to a high impact-resistant variety capable of withstanding peak gusts of 250 mph, and design a roof tie-down system that assured the structural wood trusses would not blow off in a tornado. The roofing had to be hail-proof and a secondary waterproofing barrier installed to keep water out of the house in the event of a major storm.

Dukane built a small subdivision of precast concrete houses in Bolingbrook, Ill. One of the 2,800-square-foot units contained all of the "Fortified for safer living" construction assemblies. With promotional help from the AAA-Chicago Motor Club, the notion of safer living caught the attention of the local media, which arrived in droves. The timeliness of the home's features — super energy efficiency matched with unparalleled weather-resistance — enticed newspaper reporters, magazine writers, talk radio hosts and several television news channels. It was a dream come true for Dukane's vice president of marketing. Not that these houses needed much in advertising to sell, but the media blitz pushed Dukane into the regional and national spotlight. It also brought the building inspectors to observe and learn about this new building technology, something that helped Dukane gain immediate code acceptance for his new product.

**Insurance savings**

Although precast concrete construction and the higher-grade window and roof systems required of a truly storm-resistant home can add about 10 percent to the cost of construction, the certification provided by IBHS reduces insurance costs. For example, AAA-Chicago Motor Club provides a discounted policy for certified houses, and many other national insurers have followed suit. Beyond cost, "The fortified house provides the benefit of knowing your belongings won't be wiped out in a storm," Vance said.

The precast concrete panel homes built in Bolingbrook all had basements. "This is basement country," Vance said. "And you can't sell a single-family house without one." Nevertheless, the concrete panel floors with radiant heat and super-insulated concrete panel ceilings actually provide above-ground shelter suitable for a slab-on-grade home built to withstand an F-4 tornado, making this technology a natural for areas with a high water table and storm threat.

This precast technology has immediate applications on the Gulf
Coast and southern Florida, where houses are routinely built out of concrete block,” Vance said. Precast goes up quickly compared with other building methods, plus the Bolingbrook homes required less than a week to erect and frame, and they provide superior storm resistance.

The added cost of construction might make it harder to gain broad market acceptance of precast concrete houses, but the media exposure with Bolingbrook piqued the interest of commercial developers as well as homebuyers. “Precast works great for single-family housing, but its real advantages make it more suitable for multifamily and mid-rise construction.” Bock said. That’s where the cost factor suddenly makes precast more attractive than conventional construction. To wit, the Chicago Dept. of Housing has enlisted Dukane to build an advanced precast concrete multifamily project, and several condominium developers have done the same.

Nevertheless, the experience of building a precast concrete residential subdivision was not just for public relations. “Building the houses not only gave us exposure, but it helped us learn about how to work with the new technology. Now we can provide a value-added service, helping the builder to organize a team of knowledgeable subcontractors,” Bock said. The advanced technology is now paying dividends as architects and builders realize the many advantages of a precast concrete wall, floor or roof panels filled with insulation and mechanical and electrical conduits. “If you can put it together for a house, it’s easy to do on a larger project,” Bock said.

A 21st century precast plant

Dukane still makes precast, prestressed building components the old-fashioned way: using stationery, 400 foot long casting beds segmented to accommodate the desired wall sections as specified by the plans. If the section requires insulation after pouring a 3-inch concrete slab, 2 inches of high-density foam board insulation floats on top and another 3-inch pour finishes the panel. About 6 inches of solid concrete would connect the two panels around the perimeter and at door and window bucks. The system works well and has produced thousands of excellent buildings.

Like an automobile assembly line, instead of employees moving around, workers stay in place as large segments of precast concrete move from station to station in the new Dukane plant.

Depending on the complexity of the component, the panels may make five or more stops before being loading onto large flatbeds with a special dropped trailer section that allows trucks to transport wider panels along the highway.

The first stop on the assembly line is the form station, where robotic arms set magnetized forms in precise locations for casting. The laser station follows. Here CAD drawings are precisely marked on the form table, indicating exact locations for windows, doors, structural steel, electrical conduit, ducts and piping.

“Computers optimize the section layouts and locations to assure efficiency,” Bock said.

At the next station, workers place door and window bucks. Then comes the steel, electrical and mechanical lines, and then the spacers — the alignment pins that will eventually receive a sister panel mounted on top. The steel is prestressed, the form is filled with high-strength concrete and then a shaking table settles the mix. In
the next step, the panel moves into a kiln, where it cures overnight in controlled temperature and humidity. While this panel sets, a second panel goes through the same process. Then the first panel comes back onto the line and something remarkable happens: The flipping table, equipped with vacuum pads that hold the concrete firmly in place, flips 180 degrees and comes over the second panel waiting at the shaking table. The two panels settle precisely on the spacing pins. Technicians adjust any discrepancies before the second panel has a chance to harden. The mated pieces go back to the kiln to finish curing. Afterward, the space between the panels receives an injection of bio-based, ecologically benign polyisocyanurate foam that fills the cavity completely, creating a concrete sandwich stuffed with high-density insulation.

For the contractor, this represents a complete wall section ready for erection and finish. The challenge comes with finding electricians, plumbers and mechanical contractors familiar enough with the process to price bids reflecting the advantages of this value-added system. Thanks to the exposure garnered by the Fortified for safer living home and the precast concrete house subdivision constructed in Bolingbrook, Dukane has developed a stable of experienced subcontractors ready to take on any job. Better yet, the building departments of the greater Chicago area have become familiar with Dukane’s innovative precast concrete system, making the permitting and inspection a breeze.

Developer Clifton F. Crawford heard about Dukane’s project and called Back for more information. Crawford liked what he heard, so he made a field trip to see the Bolingbrook homes. As president of Crawford Development Partners, Crawford sought an edge to best the competition in Chicago’s crowded luxury condominium market.

“I was looking for a way to build affordable, high-quality buildings fast,” Crawford said. In the development business, bringing product to market while demand remains strong can mean success, while languishing in construction adds market risk and carrying costs eat up profits. Crawford brought his team of subcontractors to the Dukane plant so they could become familiar with the system. What Crawford sought, he finally found: a means to build his six-unit, low-rise flats in about three months. “On the first unit with precast, I had my shell up and completely done in six days,” he said.

Crawford explained that he had to invest a little more time up front, converting his architectural drawings to accurate shop drawings. “When you’re working with precast, there’s no making changes on the job site, so you have to make sure every detail is right up front,” he said.

But construction moves quickly. While a neighboring developer, who had started before Crawford, struggled with a masonry and wood frame structure, Crawford’s first units were coming on line.

“It’s great to walk people through a concrete building that gives buyers the solid, quiet investment they’re looking for in a high-end condominium,” Crawford said. With walls and ceilings rated at R-21 and R-35 respectively, the super-insulated structure allowed Crawford to open his first models during a sharp Chicago winter with no heating in the units. “It was about 60 degrees in the units during the coldest days, even though we had no heat. In summer, the units stayed at 74 degrees without air conditioning,” Crawford said.

Best of all, Crawford was able to turn a 12-unit complex in 12 months. “Four months for construction, eight months to sell out,” Crawford said. And he’s not alone in seeing the benefits of building with precast concrete. Since Dukane’s residential precast concrete subdivision first appeared in the Chicago Tribune, then on the evening news and in several articles in the national press, Dukane has seen remarkable growth in major projects.

Meanwhile, calls keep coming from homebuyers interested in building a safer, more energy efficient house, and Dukane, a commercial supplier of precast concrete building components, has suddenly found a new and very profitable niche in the homebuilding business.