

# Precast Concrete Wall Panels: *Industrial-Strength Homes for Everyday Living*

## Builder's Experience



**Challenges:** Convincing people to consider a different method of constructing homes.

**Would he do it again?** Yes

### Precast Concrete Home Attributes:

- 💰 Affordability
- ★ Quality and Durability

**Builder Tips:** Learn about new building methods and materials and how to use them before your competition does.

### Builder:

Brian Bock  
Mustang Construction  
Naperville, Illinois

### Builder Type:

Medium-sized Residential & Commercial Builder

### The Technology:

Precast Concrete Wall Panels

### The Project:

A 2,800-square-foot home built with precast concrete floor and wall panels. The home is certified by the Institute for Business and Home Safety's (IBHS) *Fortified... for safer living*® program, which aims to raise a new home's resistance to natural disasters. The home is built to withstand an F-4 rated tornado, yet it took only four days to construct the building shell. Built in partnership with IBHS, the American Red Cross of Greater Chicago, and the Illinois Emergency Management Agency, this is the first Fortified home in the Midwest.

*“Regardless of whether we are building a 9-story commercial building or a single-family home, the concrete strength of our structures is the same. In other words, we bring an industrial strength and quality approach to residential homes.”*

– Brian Bock on building with precast concrete panels.



Built with precast panels, this home is designed to withstand natural disasters, including an F-4 rated tornado.

put up even in extremely cold temperatures. Once the building shell is constructed, crews can install the windows, and then be protected from the elements in a very short period of time while they work on framing the interior walls.”

“For the client, the benefits include a home that is much more resistant to fire, hail, wind, and especially water; greater comfort due to the thermal properties of concrete; and better sound attenuation. Realtors sometimes focus on the quietness between floors because of the concrete.”

“We promote our homes as double-wall, disaster-resistant homes that improve life safety, energy efficiency, and environmental friendliness. We educate homebuyers on the structure’s ability to endure natural disasters while providing a comfortable and well-insulated home. We believe in building homes that will significantly outlast a conventional wood-framed house.”

## BOCK'S STORY

“When compared to conventional home construction, precast concrete allows us to deliver a superior product from many standpoints,” says Bock. “This newer methodology increases the speed of construction, which has made us more competitive on single-family and multifamily projects. Typical construction time ranges from 2 to 3 months, but the building shell can be erected in just a couple of days. Precast concrete wall panels can also be



Brian Bock studied civil engineering at the University of Illinois and designed highways before becoming vice president of sales and marketing for Mustang Construction. Mustang specializes in using precast concrete panels for both single and mixed-use multifamily housing. Mustang builds between 25 and 30 residential and commercial projects a year; single-family homes range in price from \$300,000 to \$620,000.

### Why he builds with precast:

“Precast wall systems increase the speed of construction, which has made us more competitive. The building shell can be erected in just a couple of days, and the panels can be put up even in difficult weather conditions.”



Concrete form liners are used to create exterior finishes ranging from brick to stone, which are painted in the field.

## PRECAST CONCRETE PANELS

Precast concrete panels are cast and cured in a controlled factory environment, which helps ensure panel quality and consistency. Panels can be installed quickly with the use of a crane and then immediately backfilled after waterproofing takes place. Precast panel construction also generates less waste than conventionally framed site-built housing.

Read the PATH Tech Spec.

"It's not yet commonplace for people to do what we are doing," says Bock. "Some people are resistant to change and don't always understand the many benefits associated with new housing technologies. Homebuilding industry information doesn't always trickle down to the homebuyer very easily either. Most homeowners have never seen this technology. The greatest challenge is just getting people comfortable with the idea of doing something different, and along the way, getting the experts in architecture, concrete, and insulation to explain why it makes sense."

## EXPANDING MARKETS

From affordable, workforce housing to luxury downtown condominiums, Mustang Construction uses precast concrete technology to provide a variety of housing options for its clients.

"This precast concrete system is able to address the low-end, middle-end, and high-end housing markets more than any other product I have seen throughout my building career," says Bock.

Although current economies of scale make precast concrete systems more cost-effective on larger projects, innovative builders like

Mustang are having no problem selling precast concrete homes.

"Our houses sell for a premium over their wood counterparts—about 10-12 percent higher—but we find that homebuyers are more than willing to pay a premium for a more durable, safer home," says Bock.

Some homebuyers have also received a discounted insurance rate for their home's disaster-resistant features.

The home is also equipped with hurricane strapping to securely connect the roof to the walls; tape-sealed roof sheathing joints; hail-resistant roof shingles; and impact-resistant windows, doors, and skylights. The wood truss roof was constructed to meet the same hurricane requirements used in Miami-Dade County, Florida.

## SAFETY, EFFICIENCY

"We use precast concrete panels from Dukane Precast ([www.dukaneprecast.com](http://www.dukaneprecast.com)) that include aggregate from recycled slag, bio-based insulating foam, and far fewer chemicals and potentially harmful toxins than other building methods."

"Our precast concrete homes have scored as high as a 91.6 using the Home Energy Rating System (HERS). Therefore, clients can expect a home that is not only safe and durable, but also extremely energy efficient. Because of the tightness of construction (air change rate = 0.07), we use energy recovery ventilation (ERV) or heat recovery ventilation (HRV) systems to circulate fresh air while improving energy efficiency."

Dukane's double-wall precast concrete system consists of two form-finished concrete panels with reinforcing steel and a bio-based polyisocyanurate (polyiso) insulating foam sandwiched between each panel. Polyiso is also used for roofing and appliance insulation. It has a high R-value and good moisture resistance. Higher density foam is used on exterior



Workers maneuver a precast concrete wall panel before it is braced and welded in place.

## TECHNOLOGY HIGHLIGHTS

This project included the following PATH-profiled technologies:

- Precast concrete wall panels
- Composite window frames
- Energy and heat recovery ventilators (ERV/HRV)
- High wind- and impact-resistant asphalt roofing shingles
- HVAC equipment and duct in conditioned space
- Radiant floor heating

walls; lower density foam is used for sound attenuation on interior walls. The exterior walls have an insulating value equal to R-21 from the footing to the roofline.

Conventional waterproofing methods (backer rod and caulk with a ribbed plastic board and filter) are used to protect sub-grade portions of the wall panels. Maximum panel height is 12 feet and can be adjusted to accommodate ceilings from 9 to 11 feet. The standard interior and exterior wall finishes are form-finished smooth, but there are a variety of other wall options. For example, customers can request a form liner that resembles brick, stone, or a roughened slate-like surface. Another option is to use textured paint or simply a knockdown stucco finish.

## INSTALLATION AND TRAINING

"When using precast concrete panels, more planning and coordination is needed ahead of time," says Bock. "As with anything, the first attempt is the hardest and it gets easier from there."

"Pouring and insulating the panels for a typical single-family home takes the factory about 3 days. They can be delivered as soon as the footings are poured and cured. The panels achieve 3,000 psi overnight with an ultimate strength of 6,000 psi after a few days of curing. It's best to wait at least 30 days before painting the panels."

"When footings are being poured, we make sure to have the ¼" weld plates placed around the perimeter, 6 foot on center. The weld plates match up with equally spaced plates cast into the panels, which allows for temporary welds during erection and bracing, with locations accurately marked. We then arrange for the erection crew and the delivery of panel components. Depending on their length, we sometimes use telescoping trailers that accommodate up to 40-foot panels."

"Once the building is erected, the electrician makes the conduit connections, final adjustments are made, and then our grouting crew locks in all the floor and wall panel connections. Grouting a single-family house (with 5,000 psi grout) can usually be completed in one or two days. Windows and other materials can then be stored inside the building to protect against weather damage and theft. We have our own in-house erection crew and grout finishers, but Dukane can provide an experienced crew of erectors and grout finishers for builders who don't have personnel qualified to handle precast wall systems."

"One major attribute of this double-wall system is that the perimeter interior walls are prefinished and don't need to be furred, insulated, or even drywalled. Having a smooth, factory-finished wall that is paint-ready definitely has its advantages. Plus, wall systems manufactured at a plant, in a controlled environment, makes for a more predictable product."

"Of all the trades, electrical is affected most by the use of precast concrete walls. The concrete panels come from the factory containing electrical boxes and conduit, so electricians are required to make conduit hookups once the panels are erected."

"Sometimes we use commercial subcontractors since they tend to have more experience working with concrete."

Other times we find ourselves working with new subcontractors to teach them about building with precast concrete panelized systems. We have to instruct our painters on the proper materials and techniques. For example, we use an anti-carbonation elastomeric paint rather than a cheaper, nondescript paint and primer. Drywall contractors only have to focus on framing interior partition walls and soffits, rather than hanging drywall on all the interior walls."

"A certain percentage of building professionals are willing to adjust to new methods of construction. Some need more convincing and others simply refuse to change, regardless of the technology. We create relationships with contractors interested in building better quality homes with the latest technologies and we've had great success."

"The response from the building code enforcement agencies has been overwhelmingly positive. They view panelized concrete construction as cutting-edge technology that should be embraced for its ability to exceed minimum building and energy codes."

## WORKING WITH THE MANUFACTURER

"The pre-construction planning process usually takes a couple of months," says Bock. "The manufacturer has an early

role, meeting with the architect, engineers, electrician, plumber, HVAC, and other subcontractors to coordinate the design with the qualities of their precast products. Design iterations and component details for a precast home take about a month to complete."

"Dukane reviews mechanical and plumbing layouts to ensure a smooth installation and compatibility with specified equipment. In addition, they invite contractors to visit their factory so they can get a better understanding of how openings are cast and how wall panels are constructed. To minimize the amount of on-site core drilling, foam block-outs are used to accommodate plumbing vents, mechanical chases, and other penetrations. During the pre-planning process, each contractor signs off on the plans before the concrete panels are cast in the factory. It simply requires coordination that makes the entire job flow better anyway."

"The manufacturer also provides recommendations on which coatings to use, electrical outlet placements, and the size and location of openings."

"Precast construction is a somewhat regional market, given plant availability and transportation costs. We feel that it is usually cost-effective within a 150-mile radius of any production plant, therefore, our projects are focused strictly in the Chicago area."

The Partnership for Advancing Technology in Housing (PATH) brings together builders, manufacturers, researchers, government agencies, and other members of the housing industry. PATH partners work to improve the quality and affordability of new and existing homes. The program is administered by the U.S. Department of Housing and Urban Development's Office of Policy Development and Research.

To learn more about PATH, visit [www.pathnet.org](http://www.pathnet.org).  
To learn more about PATH-profiled technologies, visit [www.toolbase.org/techinv](http://www.toolbase.org/techinv).



The opinions expressed in this document represent those of the builder and do not necessarily reflect the views of PATH.



The erection crew positions a precast concrete floor panel with assistance from a crane.