Large homes also can be constructed using precast concrete insulated wall panels, as seen in this project that featured panels from Dukane Precast.

'Fortified Homes' Offer Concrete Protection

— Craig A. Shutt

Groups join to promote homes that protect against many dangers by using durable, resistant materials, including precast concrete

Wind-borne debris tests show the benefits of precast concrete.

A number of key groups, including insurance companies, builders and homebuyers are becoming aware of a new type of "fortified" home that can save money and lives. The homes feature a variety of disaster-resistant products, including precast concrete wall panels and floors, and they are gaining adherents around the country as more homeowners are drawn to designs that offer more protection from the weather.

The homes are so easy to construct that even a child can do it — or at least high-school students. This spring, students from the vocational-trade programs in three District 131 schools around Aurora, Ill., joined with a broad-based coalition of interested groups (including professional and union support) to build a fortified home. The students worked with contractors from The Joseph Corp., a nonprofit affordable-housing organization, to begin construction on the 1,400-square-foot home.

The home will be sold to a low-income family after it is completed in the fall, when the students return from summer break to finish the work. It will be the first inhabited home in Illinois to earn the "Fortified...for safer living" designation from the Institute for Business & Home Safety, a non-profit association of insurers and reinsurers. But it is not expected to be the last. Participating in IBHS's Fortified program can provide insurance benefits as well as peace of mind.

Future Standard?

"This is not just a fly-by-night project," LaForice Nealy, chief response officer for the Red Cross of Greater Chicago, told the *Daily Herald* in Illinois. "This is something we hope becomes the standard for what we can do that will not only help individuals be better protected but maybe ensure communities are better protected."

The group is one of the two key sponsors, with the Illinois Emergency Management Agency, of Safe Home Illinois. The group's goal is to educate government officials, industry professionals and the public about building products and techniques that can mitigate damage from tornadoes and wind storms.

IBHS's program specifies construction, design and landscaping guidelines to increase a new home's

A home meeting specifications for the "Fortified… for safer living" program by the Institute for Business & Home Safety is being built in Aurora, Ill., using precast concrete insulated wall panels and prestressed concrete flooring systems.

Concrete groups have been strong proponents of the program since the early days.

resistance to natural disasters from the ground up, explains Chuck Vance, Fortified Program manager for IBHS in Tampa, Fla. The program has existed for about six years and has been particularly popular in Florida, where hurricanes and other devastating weather conditions have increased building-code standards and made everyone sensitive to those needs.

Concrete A Popular Choice

The Fortified program sets performance standards for what the home should be able to withstand and allows the builders to achieve that standard using their best design techniques, he explains. As a result, the homes can be built using any building materials, including wood or brick. But concrete, including precast concrete wall panels, has been at the forefront of the designs.

"Concrete groups, particularly the Portland Cement Association (PCA) and the Precast/Prestressed Concrete Institute (PCI), have been strong proponents of the program since the early days," he says. To date, about 2,500 homes in 12 states have been completed or are planned by builders, he estimates, and 80% of them will feature concrete walls and flooring. "Concrete provides a number of advantages in building these homes." The materials used include masonry block, insulated concrete forms, poured walls and precast wall panels.

The home being constructed in Aurora features insulated concrete wall panels produced by Dukane Precast in Naperville, Ill. The panels are fabricated by creating two wall panels with a form finish which is filled with insulation after the panels are fabricated. This design creates a structural, load-bearing wall that saves material, can be constructed quickly and produces energy efficiency. Dukane's Single-Floor precast concrete floor system bears on the load-supporting walls to create the exterior shell for the home.

"The benefits that precast concrete walls provide in energy savings, green building techniques and durability have made it a popular choice for the program," says Vance. He has worked with several precasters in Florida, as well as Dukane and Prestress Engineering Corp. in Prairie Grove, Ill., both of whom are constructing single-family and multifamily homes using insulated precast concrete wall panels.

The speed with which precast concrete wall panels and flooring panels can be erected can be seen in the Aurora, Ill., home, where only a few components are needed to erect the entire shell of the home.

Standards Adapted To Regions

The program has taken off in recent months due to changes in the requirements that were made by IBHS this spring, Vance explains. Previously, standards had been set that required the home to withstand 130-mph winds. That proved to be too low for the dangerous coastal areas, but well above what builders would expect to face in other regions. "We revised our criteria to expand the capabilities and make it better meet the needs of everyone across the country."

As a result, the new standard states that the home must be able to withstand winds that are 20 mph above the design speed set in the ASCE-7 Design Loads criteria from the American Society of Civil Engineers. That reset the requirements to as much as 170 mph in some coastal areas and reduced it to 110 mph for interior regions. "That's more realistic and encourages more builders to participate."

Costs for building Fortified homes are only about 1 to 3% more in coastal areas if IBHS structural code requirements are adopted, Vance notes, and where there is no code provision to encourage this construction, it costs about 10 to 15% more. Discounts are available from some insurance companies, based on area of the country and design approach.

The Fortified home standards address a wide range of housing construction techniques, including roofing, connections, hardware, foundations, walls, water barriers, and other components designed to ensure that the home can withstand almost any type of weather disaster (for more details, see the sidebar).

"The program is being embraced by a lot of builders, and I expect that to grow, because the public is recognizing they can get a more disaster-resistant home by constructing it this way."

Debris Tests Favor Precast

Part of that recognition comes from wind-borne debris tests similar to those performed during a press conference this spring at the home's site. During the tests, lengths of 2x4s were shot from an air cannon at a panel featuring brick, drywall, precast concrete, and other materials. The tests replicated the potential debris that could become missiles during a tornado or hurricane and indicated how deeply into the material the stud would penetrate. Although most tornadoes have wind speeds of less than 100 mph, a devastating 1999 Oklahoma tornado had winds as high as 320 mph just above the ground — where 2x4s could be stacked.

Debris tests show the benefits that precast concrete panels can provide.

During the tests, the 2x4 penetrated directly through vinyl siding and a wood frame, not even slowed down by the materials. Two shots through a brick wall with wood frame cracked the brick and left a large hole. Brick with steel framing also didn't hold up, allowing the 2x4 to penetrate the panel. The Dukane precast panel, with a brick embossing created with a formliner, not only withstood the 2x4 barrage, but the mark left after the stud bounced off could be covered with touch-up paint to look as good as new.

The homes in the IBHS "Fortified… for safer living" program are inspected by independent auditors, who verify the construction techniques. "They focus on the structural system from foundation to roof peak, including the building envelope, components and cladding," Vance explains. "The goal is to help the home better withstand the elements of that area in every way possible. We emphasize a Code-Plus approach, and it is being recognized by insurance companies, government organizations, and the public." ■

Fortified Homes

The "Fortified…for safer living" standards encouraged by the Institute for Business & Home Safety offers a package of affordable code-plus upgrades that focus on key components, including door and window openings, roof construction, foundations and even landscaping. The improvements in the design can help reduce a home's exposure to disasters that include high winds, wildfires, floods, freezing weather, hail and earthquakes, as well as water damage afterward.

"Decades of experience have given insurers, designers, engineers and builders valuable insight into how homes are damaged or destroyed," the group says. The information was incorporated into the Fortified program with a key focus on:

Protective windows and doors: Keeping wind out of the house ensures it won't blow up the house trying to get back out. In tornado areas, windows and doors with higher design-pressure ratings are needed.

Better connections: The goal is to create a continuous load path by using straps, connectors, bolts and, in concrete structures, additional reinforcing steel. This hardware ties the roof to the walls and walls to the foundation, allowing the structure to withstand higher-strength gusts.

Thicker roofs: Thicker deck sheathing or hollow-core precast concrete planks are used, and they are secured with more connectors. Waterproofing protection is designed to provide a secondary moisture barrier. Thicker felt goes directly under the wind-rated roofing materials.

Protective landscaping: The standards prescribe fire-resistant materials for the outside of the home, as well as landscaping advice for placing bushes, shrubs, and other plants to minimize potential structural damage.

Water intrusion: Standards for dealing with heavy snow and especially wet weather are established with the goal of keeping water out and directing it away from the home as it gathers.

Additional information

For progress on the Aurora, Ill., home and the Safe Home Illinois program, visit *www.safehomeillinois.org*.

For information on the IBHS "Fortified…for safer living" program, visit *www.ibhs.org*.


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GRACE
Ice & Water Shield
GRACE
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WeatherGuard HP
WeatherGuard HP
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HOUSTON