

## **The Wall Street Journal**

### *Lessons from the Ultimate Safe Houses*

The hard-core homeowners who fortify themselves against any possible calamity—from hurricanes to nuclear attack—are testing materials and technology that could change home building for the rest of us.

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September 3, 2012

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Candace Jackson looks at homes built to withstand every possible type of disastrous scenario imaginable, from storms to earthquakes to wildfires. Photo: Michal Czerwonka for The Wall Street Journal.

The Corbi family's house looks like many other modern homes in the Hollywood Hills, with white walls, large glass windows and views of downtown Los Angeles. But it has some key differences from its neighbors. The house has been built to withstand nearly every type of disaster scenario imaginable, from storms to high-magnitude earthquakes to wildfires to pandemic to a rare but potentially crippling high-frequency electromagnetic pulse attack triggered by a nuclear bomb, solar flare or specialized weapon. A wine cellar in the basement doubles as an underground bunker. If all else fails, a rooftop helipad allows for a last-ditch emergency exit.

### **Photos: The Ultimate Safe Homes**



*Michal Czerwonka for The Wall Street Journal*

The Corbi family's home in Hollywood Hills, Calif., pictured above, has been built to withstand nearly every type of disaster scenario imaginable.



*Pensmore*

Various stills of Pensmore, TF Forming Systems, and Helix technology

More home builders and buyers are chasing a new kind of security: homes equipped to handle everything from hurricanes, tornados and hybrid superstorms like this week's Sandy, to man-made threats ranging from home invasion to nuclear war. Some, rebuilding in frequently storm-tossed areas, are looking to better withstand the next disaster; others are hoping to create a safeguard against any possible calamity. Fueling the rise of these often-fortresslike homes are new technologies and building materials—which builders say will ultimately be used on a more widespread basis in storm- and earthquake-threatened areas.

Sean Murphy, of Miami-based Coastal Construction, is building a 40,000-square-foot waterfront estate for a client in South Florida that's designed to withstand a major hurricane or worse. The home's owner, whom he declined to identify, has ordered 12-inch-thick reinforced concrete walls wrapped in a rubberized material for added waterproofing, clad in 2-inch stone. Typical storm-resistant building techniques call for about 8 inches of concrete composite block to wind- and waterproof a home.

**The Everything-Resistant House**



Wine cellar doubles as an underground bunker.

A rooftop helipad allows for emergency exit.

Bedrooms contain bullet- and bomb-proof walls and doors.

Constructed atop 30-foot-deep steel-reinforced concrete to resist earthquakes.

**The Hurricane-Resistant House**



Important spaces elevated, to protect against flooding.

Windows imported from Germany are designed to resist 150-mile-per-hour winds.

## The Tornado-Resistant House



"It's basically a bunker-style home we're talking about," he says. "If you had a major storm, a major flood, a major anything, this home is not going anywhere."

Some new developments are marketing storm-resistant designs to a growing pool of buyers. Alys Beach is a 158-acre luxury seaside community on Florida's Gulf Coast. Its homes, which start at \$1.6 million, are designed to evoke Bermudan and Guatemalan homes with interior courtyards—and to withstand strong winds. The roofs have two coats of limestone and exterior walls have 8 inches of concrete, reinforced every 32 inches for "bunkerlike" safety, according to marketing materials.

In the Midwest, Steve Huff is aiming to build the ultimate tornado-proof home. Mr. Huff, a software entrepreneur, is building a 70,000-square-foot reinforced-concrete, chateau-style home in rural Christian County, Mo. The home, known as Pensmore, has 12-inch-thick walls and ballistic-proof windows that have been tested to withstand the equivalent of a two-by-four board traveling at 40 miles an hour, mimicking the speed at which debris can be hurtled during a big storm. "If a tornado came up, you'd be foolish to leave this house," Mr. Huff says.

Mr. Huff, who is an investor in a concrete company, says that the home will also be resistant to intruders: "It would be like trying to drill your way through a bank vault."

When it is completed in early 2014, it will be one of the largest private homes in America. Mr. Huff says he plans to have lots of extended family stay with him, as well as visiting writers, scientists and other students who may want to study the safety and environmentally sustainable technologies used to construct the home.

Mr. Huff says homeowners and builders can apply many of the same techniques on a broader scale to make homes more resistant to natural disasters. For example, helix fibers within the concrete blocks make them slightly bendable like rubber, and better able to withstand impact, with minimal additional cost.

### **Tornado Protection in Missouri**

The builders conducted a preconstruction test of the materials.



*Pensmore*

1. A test structure before the test



*Pensmore*

2. The test blast



*Pensmore*

3. The aftermath

Doug Buck, the governmental-affairs director for the Florida Home Builders Association, says some "extreme" building techniques don't make financial sense for most homeowners. "You get to a point of diminishing returns," he says. "You're going to spend so much that honestly, it would make more sense to let it blow down and rebuild it."

That doesn't stop some wealthy homeowners from trying to insulate themselves from every conceivable threat. Chris Pollack, the president of Pollack + Partners, a New York-based design-and-construction adviser that works with wealthy clients, says a client recently hired him to help build a home that came with a dirty-bomb shelter, complete with its own air and water supply. "The family could live pretty comfortably without subjecting themselves to outside air," he says, including food stockpiles and other provisions. Also growing in popularity: escape tunnels that allow residents to exit to another point on their property or, in urban townhomes, to a nearby building. He estimates that clients are spending on average at least 50% more on security and safety features than they were five years ago.

In Camarillo, Calif., just north of Malibu, Don Boehm built his hillside home to withstand both earthquakes and intruders. It has a complex concrete-and-steel bolting system to keep the retaining walls anchored to a concrete base. A 600-foot-long, 15-foot-high wall surrounds the property. The home is currently on the market for \$6.9 million.

Al Corbi, the owner of the Hollywood Hills house and founder of a company called Strategically Armored and Fortified Environments, or SAFE, says he can outfit homes with underground bunkers up to 30 stories below ground. He has designed one bunker in the style of Caesars Palace in Las Vegas, with ceilings painted with clouds to give the impression of being outside, as well as spas and movie theaters and enough provisions to keep families entertained for months of underground living. The cost can be upward of \$10 million for the most elaborate facilities.



*Kerri Price*

At the Alys Beach resort, the decor is Bermudan but the exterior walls have 8 inches of concrete, reinforced every 32 inches.

Mr. Corbi built his own Los Angeles home both for his family and to show potential clients the latest in high-tech, high-end disaster protection and security. Constructed atop 60 steel-caged concrete caissons, each 30 feet deep and 30 inches in diameter, his house is designed to survive a high-magnitude earthquake.

A facial-recognition system, including multiple cameras, has also been placed throughout his house. A James Bond-esque fog system can be activated with the blink of an eye as a way to shock intruders. The fog ranges from a harmless-but-disorienting haze to pepper spray to a noxious gas that can debilitate whoever inhales it for up to 24 hours.

Also inside his home is what Mr. Corbi calls a "safe core," a 2,000-square-foot, ballistic-proof suite that encompasses the master bedroom and children's rooms. It was designed to isolate homeowners and minimize contact with intruders, a common feature in his clients' homes. Mr. Corbi previously put the home on the market for \$5.8 million but has since taken it off the market.

Mr. Corbi says many of the techniques he uses can easily be applied to any home. For example, spending a couple hundred dollars to add an extra 3/4-inch layer of plywood before adding drywall can make walls significantly more storm- and intrusion-resistant, he says. To safeguard against airborne disease, adding HEPA filters along with a slight excess of airflow from air-conditioning units creates a positive-pressure system where a surplus of air is emitted from a house to prevent outside air from coming in.



*Michal Czerwonka for The Wall Street Journal*

The interiors pictured here look ordinary, but they're designed to withstand a multitude of disasters.



*Michal Czerwonka for The Wall Street Journal*

The home's iPad-controlled security system



*Michal Czerwonka for The Wall Street Journal*

A bird-flu kit

Homeowners on a smaller budget—particularly those in disaster-prone areas—are also using more advanced techniques and materials to protect their homes against damage.

Vicki Adjmi of New Orleans lost her home to flooding after the levees broke following Hurricane Katrina in 2005. Though her plans to build a new home in New Orleans's Lakeview neighborhood were already under way before the storm, she scrapped her original design in favor of a more storm-resistant structure. Her architect brother, Morris Adjmi, decided to raise the midcentury-modern-inspired house by several feet, building on top of a hill several feet above the flood line from Hurricane Katrina.

Her builder, Scott Morse, says many of his New Orleans clients are now elevating their main living spaces—putting kitchens and living rooms on the second floor, and using the first floor for nonessential features like rec rooms—to protect important belongings against flooding. He recommends several different types of roofing strengtheners, including one that doesn't involve shingles, which can easily fly off during storms.

Ms. Adjmi didn't want to sacrifice some prized design elements—which included large walls of glass—so she tracked down hurricane-resistant windows from Germany that were designed to withstand 150-mile-per-hour winds. During Hurricane Isaac, earlier this year, Ms. Adjmi said she decided to ride out the storm at home. "I didn't hear anything," she says. "We were very insulated."