

The Hallet House on far right may just be the best argument for building to assure resilience. Throughout the storm and afterwards, the owner and the rest of her family enjoyed the uninterrupted comfort and security of the two-story, 4,000-square-foot ICF home during Superstorm Sandy in October 2012. Aid workers are shown cleaning up the debris of the traditional stick-built home that was less fortunate; it had to be condemned after the storm.



# SHINING A LIGHT ON SAFETY

Photo courtesy Steve and Linda Baxter.

## RESILIENCE STAR™ TACKLES IMPROVING WAYS WE BUILD SINGLE-FAMILY HOMES

By **Jamie Farny**, Portland Cement Association

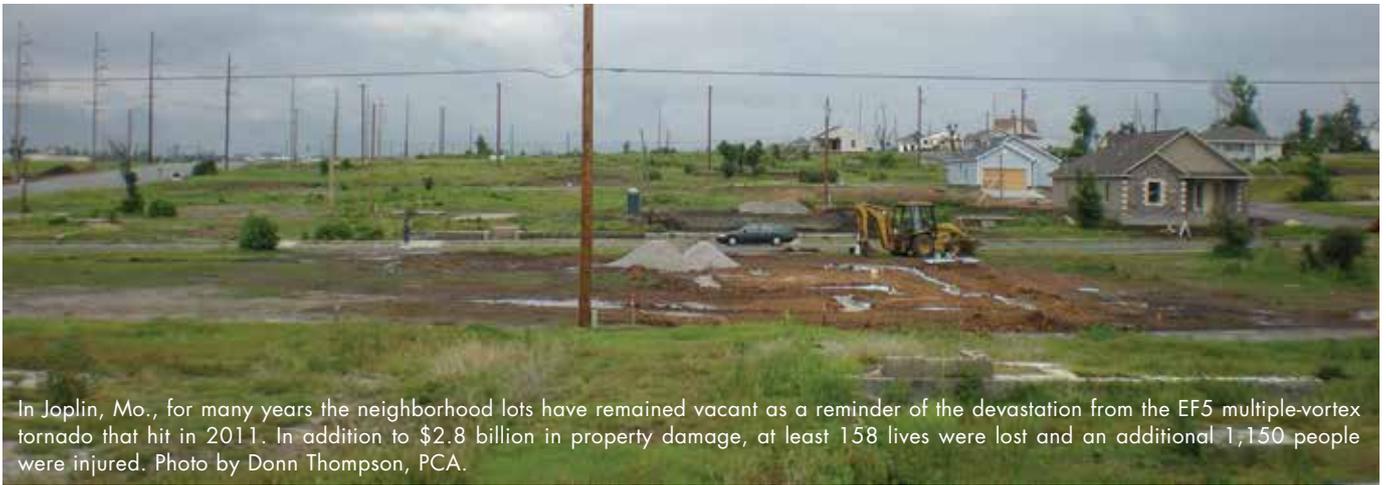
**AMERICANS** ARE KNOWN FOR THEIR CAN-DO ATTITUDE. WHEN FACED WITH ADVERSITY, WE RISE TO CHALLENGES. WITH GROWING RECOGNITION OF THE THREATS POSED BY SEVERE WEATHER, THE NATION IS BEGINNING TO UNDERSTAND THAT WE MUST TAKE STEPS TO IMPROVE THE WAY WE BUILD.

The Department of Homeland Security (DHS) has launched a program to avert both the human and financial impacts of destructive weather by changing construction for the better. The new Resilience STAR™ program is one component of a larger effort by the DHS to advocate for more stringent codes in order to reverse the trend toward less robust buildings. And there is growing evidence to support taking on this challenge. This article explains the importance of creating better building

stock, describes the Resilience STAR program, and discusses how consumers and the building industry each have important roles in creating safer homes and communities.

Although all properties are at risk—residential, commercial, and public—the DHS has chosen to start with residential. In late 2013/early 2014, DHS initiated a Home Pilot Project under its new Resilience STAR program to enhance the resilience of homes. The project will allow the private sector to voluntarily

*Resilience Star is a registered trademark of the Department of Homeland Security.*



In Joplin, Mo., for many years the neighborhood lots have remained vacant as a reminder of the devastation from the EF5 multiple-vortex tornado that hit in 2011. In addition to \$2.8 billion in property damage, at least 158 lives were lost and an additional 1,150 people were injured. Photo by Donn Thompson, PCA.

identify and designate homes that are built or remodeled in ways that could employ design features proven to enhance resilience to disasters, while also being affordable.

### NATURAL HAZARDS CREATE A GROWING NEED

The Federal Emergency Management Association (FEMA) reports that Americans face more severe weather than citizens of any other country. National Weather Service figures indicate that in an average year, the United States experiences 2,500 floods, 1,000 tornadoes, and 10 hurricanes. And severe weather is only one source of disaster. In addition, earthquakes and wildfires may threaten a home (or business) with damage or destruction. In fact, FEMA estimates that “as much as 75 percent of the Nation’s housing could be at risk from natural hazards” (FEMA IS-394).

Starting in the 1970s, a gradual weakening of code requirements meant that new construction lost some robustness. Previous prescriptive requirements for non-combustible materials and sound attenuation were relaxed. Non-combustible, mass materials like concrete and masonry were gradually replaced by lighter frame construction made with wood or steel. Over time, it became evident that these buildings did not respond the same way to high winds, fires, and storm surge.

As the years wore on, weather events started causing greater damage and higher dollar losses in both single-family and multifamily properties. Property Casualty Services estimates that cost of damage was close to \$200 billion (2010 dollars) at the end of the first decade of 2000, from earthquakes, fire, hail, hurricanes, thunderstorms, tornadoes, tropical storms, wildland fires and winter storms—almost everything except flooding.

The reduced performance means that

building stock of the past several decades poses some liabilities in terms of weather and natural disasters. After just one event, communities can be disrupted for years, and some may never return to their former vibrancy. It’s been reported that for every \$1 spent on disaster mitigation, up to \$4 can be saved by preventing damage that would otherwise occur\*. From a financial perspective, prevention (spending money up front) can be seen as an investment because it’s often cheaper than repairs. Concrete homes would be one way to achieve robustness.

### DHS RESILIENCE STAR PROGRAM

The Department of Homeland Security (DHS) has led an intensive effort to develop an approach to bolster the resilience of private residences through a pilot project that utilizes a DHS issued trademark called Resilience STAR. The Pilot Project currently underway is a government-led, public-private initiative to promote and recognize resilient building design and practices. The Pilot aims to confer a standardized and objective



In the wake of Superstorm Sandy, homes were torn asunder. This one was featured on the cover of Newsweek. Photo courtesy Bill Naegeli.

\* Based on a report by the National Institute of Building Sciences Multi-Hazard Mitigation Council entitled, “Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities,” 2005.

designation of resilience on homes in select high-risk communities that comply with DHS approved resilience programs. By committing resources to studying home performance relative to disasters, DHS is hoping to reduce the effects of damage that U.S. homes will experience as a result of disasters. There is an opportunity for both new and existing homes, so retrofitting techniques will be considered as well.

DHS selected the Insurance Institute for Business & Home Safety (IBHS) as its partner in the Resilience STAR program. Superior construction programs from IBHS already contained many of the pieces for the type of performance the DHS was promoting: FORTIFIED for Safer Living® is a comprehensive all-hazard program; FORTIFIED Home—Hurricane is a hazard-specific program for both new and existing homes targeting hurricane resistance; and FORTIFIED Home—High Wind & Hail also is a hazard-specific program for both new construction and retrofitting aimed at providing wind and hail resistance. Splitting out different requirements for different weather events allows IBHS (and now Resilience STAR) to focus on the most effective techniques for resisting any given disaster.

Hurricane resistance was chosen for the first phase of the Pilot Project. In all, nine single-family homes situated in counties in Mississippi and Alabama will be designated in the Gulf Coast, and the initial pilot may be expanded to the East Coast region hit by Superstorm Sandy. As of September 22, 2014, six homes will be ready to receive Resilience STAR designations – five new construction and one retrofit.

In addition to assessing the construction techniques to achieve improved resilience, the Pilot Program is designed to test the concept of forming a voluntary partnership with the private sector and, “has the potential to create business opportunities in the construction industry.”

### SOLUTIONS FOR SAFER HOUSING

Any building system can be strengthened to perform better. The intent is to use existing “code-plus” construction techniques and industry standards that have been scientifically proven to reduce deaths, injuries, human suffering, economic losses, and property damage caused by disasters. For the first phase of the Pilot Program that addresses hurricane resistance, IBHS’ FORTIFIED Home™ - Hurricane standards are the sole criteria used by the Resilience STAR program. The pilot homes will be awarded their certificates on September 22. For some building systems, increased performance comes with a price tag for the upgrade. For concrete systems, modifications to improve the home’s resilience are often minimal, making concrete construction more cost competitive when compared to wood-framed systems that have been upgraded to disaster resilience.

As an example of the inherent robustness of concrete and masonry, FEMA’s plans for safe rooms include prescriptive designs for these materials. FEMA publication P-320, “Taking Shelter from the Storm,” includes designs for concrete masonry,

insulating concrete form, and conventionally formed enclosures. All are intended to provide “near absolute protection” from injury or death caused by high wind hazards.

According to the Federal Emergency Management Agency’s “Natural Hazards and Sustainability for Residential Buildings,” (FEMA P-798), there is a way to retain or improve natural hazard resistance while incorporating green building practices. “While most common green building practices provide sustainability advantages with little or no effect on structural performance or durability, others require reevaluation of the building’s structural design or detailing to retain its integrity during natural hazard events. Often, only minimal design modifications are required to maintain natural hazard resistance.” For instance, the document also notes that “Green building practices that improve energy efficiency by using thermal mass can also increase resistance to certain natural hazards. For example, the use of properly detailed concrete or masonry walls can improve resistance to windborne debris in high-wind events.”

“Home Builder’s Guide to Coastal Construction,” Technical Fact Sheet Series, FEMA P-499, provides technical guidance and recommendations concerning the construction of coastal residential buildings. These fact sheets present information aimed at improving the performance of buildings subject to flood and wind forces in coastal environments.



The orange notice of a condemned house deemed unsafe for occupancy precedes demolition. Photo of Union Beach neighborhood courtesy Bill Naegeli.

### DHS RAISES AWARENESS

Mitigating disaster destruction will not have a one-size-fits-all solution. The strength of the Resilience STAR program lies in its ability to look at various alternatives for upgrading performance. The DHS is considering different approaches, evaluating performance, and will report results.



In the risky area known as tornado alley, the Russell Residence in Edmond, Okla., was built to withstand tornado force winds using Tilt-Up concrete construction methods. Photo courtesy Tilt-Up Concrete Association (TCA).



Although it is not readily apparent, cast-in-place concrete methods were used by Hancock Building & Design to construct safe tornado-resistant walls for this Oklahoma home. Photo courtesy Concrete Foundation Association (CFA).

That information will be available to the public and ultimately; each market can decide what's best for their homes and communities.

The goal is to help homeowners be informed consumers, understanding the risks of building one way versus another, and they'll be able to choose from proven techniques to create safer living spaces. IBHS standards describe these techniques. Concrete systems common to single-family home construction include masonry and insulated concrete forms (ICFs). Florida has 1350 miles of coastline and a long history of building with concrete masonry.

There is also an economic case to be made for Resilience STAR. In addition to the \$1/\$4 potential societal savings stated earlier, individual insurance companies have shown a willingness to offer reduced premiums and other incentives to homeowners who take specific measures to make their homes more disaster-resistant, particularly in high risk areas. The investment in making a home resilient does not have to be exorbitant, and Resilience STAR designations may even improve a home's overall value. This varies by location, but several states already offer incentives and some states require insurance discounts for homes that meet higher standards.

Along with the consumer education, builders get validation for the work they do because homes with FORTIFIED and Resilience STAR designations must be inspected by third-party inspectors ("evaluators") and re-inspected every 5 years. The validation gives builders an opportunity to talk to consumers about the importance of resilience in a way that leads to a better end product. Their marketing efforts will be able to include resilience to demonstrate that homes built or retrofitted to the new standards are tangibly different and will be able to resist certain weather events better than homes that do not meet the standards. That offers greater peace of mind to inhabitants.

## STRONGER HOMES, STRONGER COMMUNITIES

The DHS has selected hurricanes as a starting point for Resilience STAR, but the program is broad enough that other hazards can and will be included as the program matures. There are plenty of resources to draw from as Resilience STAR expands its scope. For example, FEMA report (P-908) was developed to provide information to communities, businesses, and individuals so that they are able to rebuild safer, more robust structures and minimize future losses of life, injuries, and property damage from tornadoes.

U.S. homes and communities are already at risk of severe weather and natural hazards. One home at a time, the momentum that is created by informed purchasers and builders could have a significant impact, eventually strengthening entire

communities. With Resilience STAR drawing attention to the problem and promoting effective solutions, Americans will have the knowledge and means to make lasting changes. 

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### Study Course:

"Protecting your Home or Small Business from Disaster," Independent Study Course, IS-394.a, Federal Emergency Management Agency (FEMA), Emergency Management Institute, Washington, D.C., October 31, 2013. (Replaces Course IS-394 "Mitigation for Homeowners".) <https://www.training.fema.gov/EMIWeb/IS/courseOverview.aspx?code=IS-394.a>



Beneath the inviting brick veneer, precast concrete walls and floors from Dukane Precast protect condominium occupants at Melrose 48 in Illinois from wind, storm and fire risks. Photo courtesy Dukane Precast.