



## Only House Left Standing: Building Code Saves House

### Full Mitigation Best Practice Story

#### *Jackson County, Mississippi*



**Pascagoula, MS** - Robert and Sandra Harris safely waited out Hurricane Katrina at their son's home. They were stunned at what they found after the storm when they traveled 20 miles back to their neighborhood in Pascagoula. The Harrises were met by a local law enforcement officer who said, "Robert, your house is the only one left standing." According to Robert, "It looked like a bomb had gone off with scattered debris and fallen trees covering the neighborhood." Except for their intact house, Wiggins Street was lined with slabs where houses once stood, including those of their next door neighbors.

As soon as it was safe to enter Wiggins Street, Robert examined his house. He found everything considerably intact, except for windows that were blown out, some missing roof shingles, torn away steps, and other minor damage. "I'm just happy I had a house left to repair, although I am saddened for others," he said. Their daughter and son-in-law, who lived several streets away, returned to find their house submerged in four feet of water.

After experiencing flooding from Hurricanes Frederick in 1979, Elena in 1985, and George in 1998, as well as flooding from rain storms, the Harrises decided to demolish and build a new home in 1999. Flood-conscious and determined to protect against the next hurricane or flood, they decided to build an elevated house. The Harrises did not simply comply with the stronger post-Camille coastal building code, they far exceeded it. Their house was built to withstand winds of 160 mph. On the morning of August 29, 2005, Hurricane Katrina slammed into the Gulf Coast with winds of 135 mph and 27-foot storm surge. The conditions were less severe in Pascagoula, but still significant with 104 mph winds and 16-foot storm surge. This was the first test for the Harris' new elevated, hurricane-resistant home – and it passed.

"The Harris family is a shining example of how citizens can build or rebuild smarter," said Robert Latham, Director of the Mississippi Emergency Management Agency. "We have a tremendous opportunity now for our communities to rebuild stronger than before and reduce future damage costs."

Sitting on Pascagoula Bay and overlooking the Gulf of Mexico, the Harris house is a 2,300 square-foot wooden structure. The Harrises designed their home based on inspirations from traditional southern architecture in Mississippi. They wanted an attractive house that was strong enough to protect them and their possessions.

The Harrises took advantage of Increased Cost of Compliance (ICC) funds from a previous flood loss to pay for mitigation measures to build their new house above code. The cost to mitigate was approximately \$20,000. "This is the best money we ever spent. During Hurricane Katrina the house did what it was supposed to do. It withstood the storm," said Robert.

The National Flood Insurance Program offers ICC coverage for all new and renewed standard insurance policies. If eligible, policy owners can collect up to \$30,000 to help cover the cost of bringing their home or business into compliance with local floodplain ordinances.

A local builder constructed the house under the Harris' guidance. Robert, a program engineer and a stickler for detail, guided the builder all the way through design and construction. He worked closely with city officials, making sure proper wind and flood resistance measures were followed. He also ensured that recommended codes and standards were incorporated correctly, even exceeding the building codes in most instances. Robert and Sandra elevated their house 17.2 feet above sea level, which exceeded the current 13.1-foot requirement. They also exceeded building code requirements by placing roof trusses closer together to make the house more wind resistant. The trusses were connected to supporting load-bearing walls using galvanized hurricane straps.

The Harris' house was constructed using both pile and pier foundations. Pier foundations are located along the sides and center of the house, while pier foundations spread across the front and rear of the house. Both are reinforced with rebar for additional strength. The concrete piers are eight feet in height and rest on spread footings. The piles consist of 10-inch by 10-inch posts made of pressure-treated solid pine. They are embedded six feet into the ground and are continuous to the top of wall elevation. This method of construction provides greater strength by eliminating the need for joints or connections. By embedding the posts deep into the ground, the surrounding soil aids in the prevention of overturning. The piles and piers work

together to distribute the load to the ground, as well as provide an open foundation system that allows flood water to flow through.

Connectivity is an important element of any building's construction. There is connectivity in the Harris' house from the foundation to the roof. The posts were connected to other structural components using the proper size galvanized bolts and hurricane straps. Hurricane straps can be used to connect the top of the wall to the roof as well as connect the bottom of the wall and flooring to the post. Harris credits the large posts and the connectivity method of construction for saving his house from serious hurricane damage.

Robert is a sentimentalist who understands that there are some things that cannot be replaced, such as family photos. He said, "You cannot make your children be two-years old again, so family photos are valuables that you want to keep forever." He spoke of debris and household items scattered in his yard, including photos of families that he did not know. The wind and water from Hurricane Katrina had taken these irreplaceable items from houses destroyed by the hurricane. "It was a sad situation," Robert said. "It was such an overwhelming loss for families."

When asked what he will do differently when repairing, Robert said, "I am certainly going to take additional measures to strengthen the house. I have already installed open risers for the steps and I will consider hurricane-resistant windows and shutters." As an extra precaution, the Harrises will add more hurricane straps to the back porch. "The back porch is my favorite place to relax, view the city, and overlook the Gulf of Mexico," he added.

### Activity/Project Location

Geographical Area: **Single County in a State**  
FEMA Region: **Region IV**  
State: **Mississippi**  
County: **Jackson County**

### Key Activity/Project Information

Sector: **Public/Private Partnership**  
Hazard Type: **Flooding; Hurricane/Tropical Storm; Coastal Storm**  
Activity/Project Type: **Building Codes; Elevation, Structural; Floodplain Management**  
Structure Type: **Wood Frame; Concrete, Reinforced**  
Activity/Project Start Date: **01/1999**  
Activity/Project End Date: **07/1999**  
Funding Source: **National Flood Insurance Program (NFIP); Private funds; U.S. Small Business Administration (SBA)**  
Funding Recipient: **Property Owner - Residential**

### Activity/Project Economic Analysis

Cost: **\$20,000.00 (Estimated)**

## Activity/Project Disaster Information

Mitigation Resulted From Federal Disaster? **Yes**

Federal Disaster #: **1251 , 10/01/1998**

Federal Disaster Year: **1998**

Value Tested By Disaster? **Yes**

Tested By Federal Disaster #: **No Federal Disaster specified**

Year First Tested: **2005**

Repetitive Loss Property? **No**

## Reference URLs

Reference URL 1: <http://www.fema.gov/business/nfip/index.shtm>

Reference URL 2: <http://www.msema.org>

## Main Points

- Robert and Sandra Harris' house was the only one on Wiggins Street in Pascagoula, Mississippi, that remained standing after Hurricane Katrina hit.
- After experiencing flooding from Hurricanes Frederick, Elena and George, as well as flooding from rain storms, the Harrises decided to demolish and build a new home in 1999.
- Flood-conscious and determined to protect against the next hurricane or flood, they used Increased Cost of Compliance funds to build an elevated house.
- Several construction techniques to mitigate against wind and flood damage were incorporated into the Harris home.
- The Harrises did not simply comply with the stronger post-Camille coastal building code, they far exceeded it.



Robert and Sandra Harris' elevated house was the only one left standing on Wiggins Street after Hurricane Katrina hit.