



Concrete House Stands up to Katrina

Full Mitigation Best Practice Story

Harrison County, Mississippi



Pass Christian, MS - The Sundbergs had been building their fully-mitigated home for eight years, and it was 85 percent complete, when Hurricane Katrina slammed into their area on August 29, 2005, with a huge storm surge and reported sustained winds of 125 mph. The water reached an elevation of 28 feet. The winds died down and the water retreated to the Gulf of Mexico, revealing that the Sundbergs' home had survived the storm. It was intact except for windows that blew out, some lost materials and tools, and some items including panels upstairs that blew away.

"This is where our heart is," said Scott Sundberg, a graduate of the University of Alabama and a structural engineer for 25 years. When building his home, called "Shadowlawn," he utilized his experience with structural physics and design. When they recover from the latest storm, Scott and his wife Caroline, a budget analyst, will be re-energized in an effort to finish building their home before the next one strikes.

Before breaking ground, Sundberg did his homework. He studied the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRMs) for his community to locate where his property is in the flood zone. He studied Florida Building Codes and the storm history of the area, and visited abandoned home sites where scars of Hurricane Camille were visible. The information from Sundberg's research, as well as the couple's own conviction, motivated them to build their home to withstand severe storms.

In 1998, Hurricane Georges dealt a glancing blow to the Sundbergs' area of Pass Christian in Harrison County, which is one of the three counties in Mississippi hardest hit by Katrina. When Georges hit, the Sundbergs had just put the forms up and rebar in place for the carport slab.

"I became even more convinced [after Georges] that it had to be right, that it had to withstand a Camille," Sundberg said. Hurricane Camille was a Category 5 that raged across the Gulf Coast in 1969, leaving a wide swath of destruction.

A native of Thornton, Illinois, where there is a major concrete quarry, Sundberg said "concrete has been in my blood since I was young." Accordingly, when it came to building the couple's dream house, he used concrete as the main building material. The result is a sturdy house constructed of Insulated Concrete Form (ICF) walls, reinforced both horizontally and vertically, post tension concrete slab, concrete columns, and a concrete roof on top of cold rolled metal panel sections.

The Sundbergs' house has spread footings, with concrete members to distribute the load to the soil, and a 4-foot-high beam-wall and a beam-wall down the center. There is connectivity through the house from the roof down to the third floor, on to the second floor, and then to the carport. The house is also built to 'perform elastically' and to withstand winds of between 180 and 200 mph. The bottom of the beam of the first floor living space is 25.4 feet above sea level according to the National Geodetic Vertical Datum (NGVD).

The FIRM indicates that the Sundbergs' home is located in an A-11 zone, which is "almost a V zone," according to Sundberg. The carport elevation is 14.8 feet. The base flood elevation (BFE) for their area is 14 feet. The slab-floor level of the house is the carport and has a small interior room. This space had breakaway walls which "blew away perfectly," said Sundberg.

When Hurricane Katrina hit the Gulf Coast of Mississippi, the Sundbergs' home was still under construction. The windows that were installed were vinyl gliders which are not hurricane resistant. The few windows that did blow out will be replaced and hurricane shutters installed as planned, adding another safety measure to the home.

Sundberg noted that the home also has a second floor area designed as a 'safer' room or room of refuge. The walk-in closets are sheathed in plywood and framed with six-inch 18 gauge metal studs at 12 inches on center, to make them safer than a typical room. The room is 'safer,' but it is not a Safe Room per FEMA 320 Guidelines. FEMA 320 is recommended because it provides homeowners guidance to assess their tornado risk.

Sundberg firmly believes that adopting proper codes, with respect to the BFE, “could prevent 75 percent of the damage.” He also stated that “as compliance increases, damage is less.” Sundberg is following the much-increased codes put into place in the mid-1990s in Florida following Hurricane Andrew’s damage to the Homestead area in 1992.

The Sundbergs’ home, which stands roughly 350 feet from the shoreline, is fully insured. The couple has yet to settle their flood insurance claim. They had renters insurance for the contents of their rental home in Long Beach, which was destroyed. Unfortunately, they did not have flood insurance, so they lost everything at that property and their belongings and precious records were not insured against flood. The Sundbergs had to replace their cars, and all of the finished landscaping at their new home was destroyed.

Since Katrina, the couple has been living in an 8-foot by 33-foot trailer, with two 3-foot slideouts parked next to their driveway.

When they visited their new home after Katrina, Sundberg looked for cracking, spawling, and displacement. He was relieved to find no signs that the structural integrity of the home was compromised. “Using concrete adds about 10 to 15 percent above the cost of conventional construction,” stated Sundberg. In this case, it proved to be a wise investment since using conventional methods of building may have led to greater losses.

Photo Caption 1: The water line was at 28 ft. as indicated by the red line in this photo. Photo Caption 2: This photo clearly shows the concrete post and beam construction that supports the 3,000 sq ft structure. Photo 1 courtesy of the Mitigation Assessment Team. Photo 2 courtesy of John Fleck.

Activity/Project Location

Geographical Area: **Single County in a State**

FEMA Region: **Region IV**

State: **Mississippi**

County: **Harrison County**

City/Community: **Pass Christian**

Key Activity/Project Information

Sector: **Private**

Hazard Type: **Hurricane/Tropical Storm**

Activity/Project Type: **Elevation, Structural**

Structure Type: **Concrete, Reinforced**

Activity/Project Start Date: **05/1997**

Activity/Project End Date: **Ongoing**

Funding Source: **Homeowner**

Activity/Project Economic Analysis

Cost: **Amount Not Available**

Activity/Project Disaster Information

Mitigation Resulted From Federal Disaster? **No**

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/>

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

Main Points

- Scott Sundberg used his structural engineering knowledge and extensive research to design and implement the mitigation of his Louisiana home.
- The house, built out of concrete and elevated above the base flood elevation for the area, is constructed to withstand wind speeds of 180 to 200 miles per hour.
- The partially mitigated home withstood the worst Hurricane Katrina could throw at it, proving the success of the mitigation efforts taken to date.



The water line was at 28 ft. as indicated by the red line in this photo.



Stronger building materials and techniques proved effective during Hurricane Katrina.



Concrete post and beam construction.



Scott and Caroline Sundberg, grateful their home was a survivor of Katrina.



Aerial View of the Surrounding Destruction in Pass Christian, Mississippi.