



House of Steel Survives Charley

Full Mitigation Best Practice Story

Charlotte County, Florida



Punta Gorda, FL – When Bob and Robin Leonard built their home in 2004 on a canal off Pirate Harbor in Charlotte County they wanted a beautiful, low-maintenance building. They chose a highly engineered, above code steel-panel construction that would endure a major storm.

The structural sandwich panel home was engineered to withstand 150 mph sustained winds, exceeding the current 130 mph required by the Florida Building Codes. When neighbors rebuilt after Hurricane Charley, many asked the Leonards about their house of steel. The Leonards gladly told their story.

“We were in the northeast quadrant of Hurricane Charley. Winds went well beyond 140 mph and this house did what it was supposed to do; it swayed,” Leonard said. “The only damage came after the wind pushed the front door open and we nailed wood braces to the floor to close it.”

After Hurricane Charley, Leonard called on his 30 years of experience in the property-casualty insurance business as he examined his home’s foundation, walls and windows.

“There was no structural damage to the house,” Leonard said. “Even the loose shells on the table, less than 10 feet from the door, stayed put.”

Contractors drove past the Leonard home after the hurricane to see how this non-traditional construction weathered the storm. While the hurricane destroyed many homes in the neighborhood, the Leonard home fared well.

The Leonards used a consumer software package to design their home. They brought the drawings to their steel-panel manufacturer for engineered plans, permit prints, and manufacturing specifications. After the city’s building department approved the plans, Leonard said, the eight-month project started.

Three-and-a-half feet of compacted fill material served as the base for the steel-reinforced reinforced concrete footings. Six-inch steel I-beam posts anchored to reinforced concrete footings held up the cupola and main frame. Surrounding the ground floor, a grade beam added stability to the building as it swayed when pushed by winds.

Steel panel fabricator, Scott Bartels said the building’s design gives it both strength and flexibility.

“The building was engineered to sway in high winds,” Bartels said. “The steel that fortified the foundation secured the main posts so they could sway three to four inches without cracking the walls or foundation, and to counteract uplift.”

The structural sandwich panel assembly consisted of a lightweight foam core securely laminated between two relatively thin metal facings. The manufacturer bonded a pre-formed expanded polystyrene board to the metal skins with adhesive.

Composing the outer structure, the design specified top and bottom channels that anchored six-inch thick structural sandwich panels to create walls. These channels had plates that connected them and supported the roof system’s I-beam rafters. The floor system layered nine-inch structural panels supported by I-beams, topped with sub-floor and finished with hardwood flooring.

“Inside you can do anything with the design,” Leonard said, “The whole interior is open, held together with steel posts and panels and is all tied into the foundation.”

The Leonards used heavy-duty windows and hardi-board siding to finish the outside walls, adding to the strength of the structural steel panels.

The Leonard’s home boasts its height as an additional strength. Floodplain regulations adopted by the city required building the lowest floor of the house on or above the 11-foot base flood elevation (BFE)*, but the house exceeds that requirement.

"We wanted to be out of the way of storm surge,**" Leonard said. "We raised the house to 17.5 feet, 6.5 feet over the required base flood elevation."

With the house elevated to that height, the design allowed for parking and storage underneath. And as the Leonards have lived in the home, they have experienced other benefits.

"I've never had a termite inspection because there's nothing for them to eat," Leonard said. "My utility bills for this 2000-square-foot living space average \$100 a month. The building was easy to build because all the support beams are on the outside. The high elevation means, my flood insurance is very low, about \$300 a year – and my lot is on the water."

Since they lost power as a result of Hurricane Charley, the Leonards added a propane-fueled generator. To keep intense wind from opening the front door, they bought shuttering to cover the outside and bracing for inside the door.

"I trust this house. My wife trusts this house," Leonard said. "Hurricane Charley threw all he had at it, and the only reminder is a couple of nail holes in the entry. After seeing how easy this was to build and how quickly it went up, we wouldn't change a thing."

For additional information about steel-panel construction, search the Web or visit <http://www.fabs.us>.

*Base Flood Elevation: The elevation that indicates the water water-surface elevation resulting from a flood that has a one one-percent or greater chance of being equaled or exceeded in any given year.

**Storm Surge – Storm surge is water pushed toward the shore by the force of the winds swirling around a storm.

Activity/Project Location

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

FEMA Region: **Region IV**

State: **Florida**

County: **Charlotte County**

City/Community: **Punta Gorda**

Key Activity/Project Information

Sector: **Private**

Hazard Type: **Hurricane/Tropical Storm**

Activity/Project Type: **Building Codes; Elevation, Structural**

Structure Type: **Steel Frame**

Activity/Project Start Date: **01/2002**

Activity/Project End Date: **09/2002**

Funding Source: **Property Owner, Residential**

Activity/Project Economic Analysis

Cost: **\$275,000.00 (Estimated)**

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: **2002**

Repetitive Loss Property? **No**

Reference URLs

Reference URL 1: <http://www.fabs.us>

Reference URL 2: <http://www.fema.gov/hazard/hurricane/index.shtm>

Main Points

- The Leonard's chose a highly engineered, above code steel-panel construction that would endure a major storm over traditional construction.
- They brought the drawings to their steel-panel panel manufacturer for engineered plans, permit prints, and manufacturing specifications.
- Three-and-a-half feet of compacted fill material served as the base for the steel-reinforced reinforced concrete footings.
- Six-inch steel I-beam posts anchored to reinforced concrete footings held up the cupola and main frame.
- Surrounding the ground floor, a grade beam added stability to the building as it swayed when pushed by winds.
- House put to the test and survived Hurricane Charley.



View from inside the Leonard's home.



View from outside the Leonard's home.