



## Affordable Housing Engineered to 160 mph Winds

### Full Mitigation Best Practice Story

#### *Multiple Counties, Florida*



**Port Charlotte, FL.** – The Otero brothers survived the widespread devastation of Hurricane Andrew in 1992 only to see similar damage when Hurricane Charley came through Charlotte County in the summer of 2004. Witnessing the extensive debris from homes destroyed by the hurricane, Osvaldo and Yhovanni Otero decided to put their business and contracting skills to work to build stronger homes – ones the average working family could afford.

The Oteros knew that homes built to the 2004 Florida Building Code for only 130 mph winds averaged in excess of \$250,000 in southwest Florida. Since Hurricane Charley made landfall with sustained winds in excess of 145 mph, the Oteros resolved to build homes priced under \$200,000 that were able to withstand 160 mph winds. The brothers commissioned plans for the homes. They hired an engineering firm to review and certify the designs to the higher wind loads.

Osvaldo Otero, said, “When my brother and I drove through Port Charlotte after Hurricane Charley, we saw debris from home after home littering the streets. We dedicated our skills and resources to make homes that hurricanes like Charley wouldn’t pull apart and that the average working family could afford to buy.”

Osvaldo’s business background included experience in project management, operation efficiency and commercial marketing. Yhovanni brought general contracting and building experience to the company. These skills allowed them to find ways to reduce construction time and thereby decrease overall building costs. The research into homes that survived Florida’s hurricanes led to specific building designs.

“After Hurricane Andrew in 1992, we noticed concrete homes with the outside masonry intact, but high winds removed roofs and broke windows,” Osvaldo Otero said. “Learning from Andrew, we started with concrete structures, but added stronger windows, doors and roofs.”

The engineer-certified plans specified fiber-reinforced concrete for the house structure and foundation, making the outside shell stronger and better able to resist windborne debris. Reinforced steel rods fortified the walls vertically and reinforced steel grids bolstered the building horizontally.

After researching roof systems, the team chose engineered trusses with heavy-duty bracing, two-by-six framing lumber and two-by-eight end pieces with reinforced gable ends to add strength. This option provided the Oteros with a cost-effective way to maintain consistency and meet the 160 mph windload certification.

In reviewing damaged homes after wind disasters, the engineers learned that reinforcing the openings around windows provided a solution to current building weaknesses. When violent winds pushed and pulled windows during a hurricane or tornado, the frames bent and allowed the windows to break or fall out. By adding steel reinforcement to the window openings and using longer fasteners to install the casings in the concrete blocks, the window frames can survive greater windloads. Impact-resistant windows further reduce the possibility of broken glass.

The design for the garage door specified a vertical bracing system to strengthen the doors against strong winds. This system locks into the door header and floor. In addition, the doors feature a horizontal reinforcement. These two systems strengthen the door against strong winds and include bolts sunk deep into the building on the sides and top.

The soffits of the home permit airflow through the attic, exhausting through a roof vent, as required by code. The enclosed soffit allows air to pass into the attic and out the roof, but keeps water from entering the wall cavity when blown by high-force wind.

The designers also engineered an option that converts the bathroom into a safe room based on designs from the Federal Emergency Management Agency. This room has reinforced walls, a poured concrete ceiling, a hurricane-resistant door, and a hurricane shutter that covers a window that can double as an exit even with the shutter in place.

In addition, a quick-plug generator connector lets the homeowner secure a generator and select the circuits fed by that external power source.

The Oteros have a series of design plans for different living styles: duplexes, condominiums, single family homes, and adjoining duplexes where family members can enjoy their independence but share a common doorway for emergency access. The homes start at \$150,000, considered affordable for the average working family.

“Homes like these have survived many hurricanes,” Osvaldo Otero said. “When technology exists to build to Category Five standards...builders should choose to build that way.”

#### Activity/Project Location

Geographical Area: **Multiple Counties in a State**  
FEMA Region: **Region IV**  
State: **Florida**  
County: **Charlotte County; Lee County**

#### Key Activity/Project Information

Sector: **Public**  
Hazard Type: **Tornado; Hurricane/Tropical Storm**  
Activity/Project Type: **Safe Rooms/Community Shelters**  
Structure Type: **Concrete, Reinforced**  
Activity/Project Start Date: **01/2005**  
Activity/Project End Date: **Ongoing**  
Funding Source: **Private funds; Property Owner, Commercial**

#### Activity/Project Economic Analysis

Cost: **\$300,000.00 (Estimated)**  
Non FEMA Cost:

#### Activity/Project Disaster Information

Mitigation Resulted From Federal  
Disaster? **Unknown**  
Value Tested By Disaster? **No**  
Repetitive Loss Property? **Unknown**

## Reference URLs

Reference URL 1: <http://www.ibhs.org>

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

## Main Points

- After witnessing the extensive damage caused by Hurricanes Andrew and Charley, the Osvaldo brothers set out to design affordable homes that were hurricane resistant.
- The Oteros have a series of design plans for different living styles: duplexes, condominiums, single family homes, and adjoining duplexes where family members can enjoy their independence but share a common doorway for emergency access. The homes start at \$150,000, considered affordable for the average working family.



Reinforced trusses



Enclosed soffits