Building Codes Helped Bolivar Peninsula Homes Survive

Full Mitigation Best Practice Story

Galveston County, Texas

Bolivar Peninsula, TX – Hurricane Ike tore across this 33-mile-long arm of land that juts out into Galveston Bay, leaving devastation in its path. Unprotected by a seawall or other barrier, the peninsula suffered arguably the worst of Ike's fury. Winds of up to 110 mph and a 14-foot storm surge hit the peninsula broadside from the gulf, crossed far inland, and then doubled back around.

The full impact of the September 2008 storm on the people of the Bolivar Peninsula may never be known. Officials with the Galveston County Office of Emergency Management said 20 people were either confirmed dead or still missing months after the storm. Some 5,300 buildings, most of them homes, were located on the peninsula before the storm. Afterwards emergency managers in aircraft could count 2,087 rooftops, including those on sheds and skeletons of shattered homes. Only 102 buildings were left unscathed.

The owners of a few surviving homes on Bolivar Peninsula, such as Jimmy and Debbie Bishop, have important stories to tell and lessons to share.

The Bishops came back to check on their vacation house a few days after the storm and had to circle through a field, maneuvering around downed power lines, pieces of buildings and twisted debris. Their subdivision had about 35 houses before the storm and no more than a dozen afterward. Many of their neighbors' houses, including the first two rows along the beachfront, had simply disappeared. The Bishops' had been on the third row back from the beach; now it is open to the sea. When they reached their house, they found the bottom-level breakaway walls gone, as the design had called for. Their stairs were a little askew but still sturdy enough to climb to the second-level living area.

"We opened the door and everything was just fine. Everything was just as it had been before the storm. If I had not been outside, I would not have known there was a storm," Mr. Bishop said. "The only thing out of place inside was one mirror that fell to the floor, and it wasn't even broken."

Why did the Bishops' house survive while neighbors' homes did not? The Bishops' house was the newest occupied home in the subdivision. Their builder has a nearby new house, still for sale, that also held up well in the storm. Both were built under the new coastal building codes and followed specifications provided by a structural engineer. In keeping with the letter and the spirit of the code, the Bishop house is elevated high above the water, located back from the coast, held together with steel connectors, fortified with sturdy materials, and shielded by a storm-resistant roof. Impact-resistant glass on windows also helps protect the interior.

The building elevation may have been the most important safety factor. The required elevation was 16 feet, but the house was raised an additional 7 feet, as a margin of safety. The additional amount of height above the required elevation is called "freeboard." It provides added protection and helps lower flood insurance premiums.

"That freeboard made all the difference," said Chris Jones, a building sciences expert working with the Federal Emergency Management Agency (FEMA). He explained that building higher than required by a Flood Insurance Rate Map (FIRM) or a community regulation adds relatively little to the cost of new construction, yet provides substantial financial returns to the homeowner, both in the form of reduced flood insurance premiums and reduced future flood damages. He added that the additional cost of building higher is usually recovered in a few years by a homeowner along the coast.

The builder was also pleased with the performance of impact-resistant windows in the storm. "I had a number of houses built with impact-resistant windows, and I didn't have a single one of them give me a problem," he said.

Mr. Bishop added, "If the windows had blown in, the house would have filled up with water." Luck also appears to have contributed to the home's survival. Floating debris did not cause more damage and FEMA experts noted that nearby "scour" could have undermined the Bishop home if it had been a little closer. Scour – an area where the erosive force of water eats away at land – is an inherent risk that can't be totally mitigated on the beach.

For the Bishops, the higher cost required to comply with the codes paid off. Mr. Bishop said complying with the codes "…doesn't cost that much more because the building will have a longer life. In the long run, you will have less maintenance expense and grief by paying a little more up front."

Activity/Project Location

Geographical Area:	**Single County in a State**
FEMA Region:	**Region VI**
State:	**Texas**
County:	**Galveston County**
City/Community:	**Gilchrist**

Key Activity/Project Information

Sector:	**Private**
Hazard Type:	**Hurricane/Tropical Storm**
Activity/Project Type:	**Building Codes**
Activity/Project Start Date:	**01/2005**
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 #:	**1791 , 09/13/2008**
Repetitive Loss Property?	**No**

Reference URLs

No URLs were submitted

Main Points

No Main Points were entered.

Jimmy and Debbie Bishop’s house, left, survived Hurricane Ike nearly unscathed.