



Wet Floodproofing Reduces Damage to Popular Beach Restaurant

Full Mitigation Best Practice Story

Monroe County, Florida

Key West, FL - The Duval Beach Club sits on the only natural stretch of beach in Key West. In 2005, it was hit by Hurricanes Rita and Wilma. Thanks to the mitigation efforts initiated by the restaurant's owner, Fred Tillman, worries about flood damage have been reduced.

"We've been through seven storms...and so far, we've sustained little to no serious damage," noted Mr. Tillman.

The building that houses the popular restaurant, as well as the land it occupies, is owned by the City of Key West. According to John Jones, Assistant City Manager, the building was originally constructed on a concrete slab and leased as a small hot dog stand. Over the years, restrooms were added and, eventually, the building was expanded into a full-size restaurant. When Hurricane Georges made landfall in September 1998, the building sustained so much damage that the previous leaseholders were forced to abandon it. The City of Key West then leased the property to Mr. Tillman and his partners. Mr. Tillman proposed the idea of wet floodproofing the restaurant and completed the retrofit. So far, his efforts have protected the property from hurricane damage.

The concept of wet floodproofing is simple: provide means to allow floodwaters to enter, flow through, and exit a building, thereby preventing more severe damage to the building as a whole. Non-absorbent materials and/or coatings are used to allow easier cleaning and sanitizing of interior surfaces after a flood event.

"Utilizing the old wall structure, we opened it up a little bit more, so we'd be able to get better penetration for water," Mr. Tillman said. "The center wall is a break away wall, so if we really have big water, it would just push out."

The walls for the restrooms, which are perpendicular to the ocean, are poured concrete and anchored to the concrete slab. The walls facing the ocean are designed to break away when inundated by storm surge. Another mitigation measure was to elevate the electrical system. Wiring runs from the top of each wall down to the outlets, which are elevated 42 inches from the floor. Extra wiring coiled at the top of the walls can be pulled down for use after flooded outlets are cleaned and damaged wiring removed.

When designing the Duval Beach Club, Mr. Tillman utilized his experience as a marine surveyor who once inspected damaged buildings in the Caribbean. He recalled, "most of the time, tiki huts, with their basic pole construction, were still standing when everything else around them was gone."

The roof of the restaurant has a hip design and is built to withstand the winds of a Category 5 hurricane. A hip roof is somewhat of a pyramid in shape, sloping upward from all four sides of a building. Wind flows better over this type of roof than other types, such as gable designs, and is therefore recommended in hurricane-prone regions. Because a gable roof has overhangs, high winds can create an upward force that pries the roof off the wall. The restaurant's hip roof is sheathed with $\frac{3}{4}$ -inch marine plywood to resist moisture and covered with aluminum-zinc alloy coated steel sheeting. The eaves hang low to the ground, and the supports and roof structure are connected with hurricane clips for added strength. The design provides a continuous load path from the slab on one side of the building through the top roof members and down to the slab on the other side of the building. In other words, the pieces of the building are tied together from the top down so that the entire structure resists wind forces.

Appliances and furniture in the restaurant were installed for quick removal when storms threaten. They can be disconnected, rolled out, and stored in containers away from the beach.

"When hurricanes come, [restaurant personnel] evacuate," said Mr. Jones. "They remove barstools, stoves, and other equipment that would be damaged by flooding. They open the place up, and let it flood. When the storm has passed, they shovel the sand out and put it back into shape."



According to Mr. Tillman, cleanup after a storm does not take long. The Duval Beach Club is usually open for business within 10 to 20 days. The cleanup involves shoveling sand back out onto the beach, cleaning and sanitizing surfaces and fixtures, repainting, and simple repairs. Mr. Tillman keeps his staff on the payroll to assist with the cleanup. Although other businesses in the area are sometimes closed for months, the Duval Beach Club is operational within days, providing a much-needed service to the community and ensuring that the restaurant's staff has continued employment following a storm.

Mr. Tillman asserts that the mitigation efforts were worth it. "The money that we originally invested in the mitigation has been recouped many times over. When storms approach, we no longer have to worry about repairing the building, replacing the equipment, or losing revenue due to being closed."

Activity/Project Location

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

FEMA Region: **Region IV**

State: **Florida**

County: **Monroe County**

City/Community: **Key West**

Key Activity/Project Information

Sector: **Public**

Hazard Type: **Flooding**

Activity/Project Type: **Flood-proofing**

Structure Type: **Masonry, Reinforced**

Activity/Project Start Date: **10/1998**

Activity/Project End Date: **01/1999**

Funding Source: **Property Owner, Commercial**

Activity/Project Economic Analysis

Cost: **\$140,000.00 (Estimated)**

Non FEMA Cost:

Activity/Project Disaster Information

Mitigation Resulted From Federal
Disaster? **Unknown**

Value Tested By Disaster? **Yes**

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

Year First Tested: **1999**

Repetitive Loss Property? **No**

Reference URLs

Reference URL 1: <http://www.fema.gov/pdf/rebuild/mat/sec6.pdf>

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

Main Points

- In 2005, the Duval Beach Club was hit by Hurricanes Rita and Wilma. Thanks to the mitigation efforts initiated by the restaurant's owner, worries about flood damage have been reduced through wet floodproofing.
- The concept of wet floodproofing is simple: provide means to allow floodwaters to enter, flow through, and exit a building, thereby preventing more severe damage to the building as a whole.
- Appliances and furniture in the restaurant were installed for quick removal when storms threaten. They can be disconnected, rolled out, and stored in containers away from the beach.
- The money originally invested in the mitigation has been recouped many times over.



John Jones (left) and Fred Tillman



The wide-open design of the Duval Beach Club