



# *After the* **STORM**

**Rapid-response inspection teams speed hurricane recovery**

**I**n 2005, Katrina entered Florida in late August as a tropical storm, soon to be upgraded to hurricane status. Before the storm brought its headline-making damage to Louisiana and Mississippi, Katrina caused storm surges of 3 to 5 feet above normal tide levels along the western coast of Florida, as well as torrential rains and wind gusts of more than 70 miles per hour. Then in late October, Hurricane Wilma hit southern Florida with winds up to 120 mph. According to the National Hurricane Center's final report on the storm, Hurricane Wilma was blamed for 35 deaths and an estimated \$6.1 billion in insured losses in Florida.

*By Kate Paulson and Kay Kruse-Stanton*



In the wake of a hurricane, the recovery begins. The long procession of power trucks and other assistance begins to make its way to the hurricane-affected area. But before this help can arrive, the path needs to be cleared and made safe for travel. Jose Quintana, structures and facilities engineer for the Florida Department of Transportation's District 4, oversees this effort. It is the responsibility of his division to make sure that the infrastructure within primary travel routes is safe.

"Our office is responsible for the initial damage assessment, which is done as soon as it is deemed safe for our personnel. We have the responsibility of making sure that the roads are open and safe," Quintana said of the important role the Structures and Facilities Division plays in the aftermath of a hurricane. District 4 encompasses Broward, Indian River, Martin, Palm Beach, and St. Lucie Counties and includes the cities of West Palm Beach and Fort Lauderdale.

Recognizing the scope of the damage that a hurricane can cause, Quintana knows additional resources outside his staff are important. He knows his staff members also live in the hurricane-prone area and have their own homes and families to think about. "Our goal is to make sure that the roads are safe for the traveling public. But the fact is that we may not be in a position to do it ourselves," Quintana said.

As hurricane season 2005 approached, Quintana made sure preparations were in place. Lichtenstein Consulting Engineers worked with the District to develop a detailed plan for inspection crews from multiple firms around the state, including Ayres Associates.

Even with this framework in place, storms remain unpredictable. As one of the firms under contract, Ayres Associates reviewed the plans and prioritized routes. "One of our biggest challenges was the coordination of routes and crews," said Andrew Fickett, PE, CBI, manager of structural

inspection for Ayres Associates.

Because the exact path and intensity of each storm dictates where the needs are, mobility is a key element for emergency response inspection. Crews need to be ready to go where the damage is – and quickly. Ayres Associates has been inspecting structures within District 4 as part of a routine inspection contract since 1993. With this familiarity with the District's infrastructure, Ayres Associates is able to follow the details of the inspection routes, but also maintain the flexibility to respond as information comes in.

Hurricanes Katrina and Wilma had the most impact in District 4 during the record-breaking 2005 season. Hurricane Katrina made landfall in late August, and Wilma followed in late October. As each storm approached Florida, Quintana kept close watch, monitoring the track of the storm. "All day, all night long, I'll be watching The Weather Channel, keeping track of the storm's intensity and path toward our district,"

Quintana said.

It turned out that Quintana's concerns about the storm's effects for his local staff were right. "With Hurricane Wilma, we were really impacted," Quintana said. "Probably half of our employees were affected by the storm's intensity and had to be with their families, getting their own homes and lives together. If not for the consultants that worked for us from all over the state, it would have been impossible to get the information we needed."

Following both Hurricane Katrina and Hurricane Wilma, Ayres Associates had as many as six two-person inspection teams in the field at any given time.

Ayres Associates' teams performed more than 500 inspections after Hurricane Katrina and again after Hurricane Wilma. The structures they were responsible for in District 4 were along Interstate 95, a primary travel route in the area. One crew traveled northward along the shoulder, a second southward, and a third along

the median. Crews checked every overhead sign, every culvert, and every bridge, searching for any sign of damage or weakness.

Although there is a general emergency response plan in place, each storm affects land and structures differently. Each storm carried its own concerns. "Storms coming from the east have the possibility of storm surge damage, and that means more careful inspection of our coastal bridges and culverts," Quintana said. Crews used drop-weighted tapes, survey rods, or fathometers to determine changes in the bottom of waterways that could indicate scouring, rendering structures unsafe. Storms from the west generally do not affect the tidal action as much, and crews may give bridges and culverts only a visual inspection, unless scouring is evident.

The inspectors worked with the same challenges as people living in the affected areas and tried to be as self-sufficient as possible.

"Crews encountered countless challenges, from hazardous debris to

flat tires to a lack of resources. Basic resources such as food and water were extremely scarce post-storm," Quintana said. "They needed creativity to find the solutions to get the job done as quickly as possible."

With widespread power outages, crews could not be assured of a ready supply of gasoline. They filled as many containers as would fit in the back of inspection trucks and replenished them when possible. What food was available locally was for area residents; crews packed in their own provisions for the trip. When possible, crews carried extra water and ice to distribute to residents affected by the storm.

Crews were in the field for up to a week at a time and usually had to drive two or three hours from the work area to find the nearest place to sleep.

*Battered bridges, culverts, and overhead signs in southeast Florida were carefully inspected after Hurricanes Katrina and Wilma.*



Office staff made telephone call after call to locate vacant rooms and then relayed the information to crew members via cell or satellite phone. Crew members carried sleeping bags and air mattresses and fit as many people into one room as possible, as room vacancies are often scarce – particularly room vacancies with power.

Communication was among the biggest challenges of the operation. Cell phones were unreliable. Residents were trying to contact loved ones or report their concerns to officials. Airtime access was hard to get. Meanwhile, inspection crews needed to communicate what they were finding in the field and receive instructions.

“We want as much information flow as possible,” Quintana said. “We need to know as soon as possible what damage has been done, what must be repaired to keep people safe.”

Ayres Associates designated a senior staff member to be the point of contact. Having one person responsible for the flow of communication between crews and the District helped to eliminate confusion and limit the amount of time on the telephone.

Communication challenges are one focus of discussion and planning for Quintana and others involved in the emergency response process.

“We are always learning. We’re always updating our plans and coming up with ideas of how to better respond,” he said.

Self-containment was the key lesson learned from previous hurricane emergency inspection. “We knew that we needed to be self-sufficient,” Fickett said. Crews were prepared with kits to repair flat tires, rather than having to carry several spares or hope they could find an operating repair shop. Communications concerns led to an investment in satellite phones so teams were able to stay in touch with each other.

The emergency inspection assessments were an important first step toward a return to normalcy. But once

the needs were identified and the safety hazards were removed, the repairs began. With so many repairs, the District needed a way to organize and set priorities. And, although hurricanes were responsible for much of the damage, some repairs were needed before the storm even hit. The source of the damage would determine the source of the funding for the repairs.

“We’ve been conducting the routine sign inspections for District 4 for more than 10 years,” Fickett said. This experience turned out to be important not only to mapping out the plan for the inspections, but also later in organizing the storm-related repairs.

The inspection and repair reports came from multiple firms. With the knowledge and documentation from the routine inspections, Ayres Associates developed an intelligent database to increase the efficiency of interpreting the information. The database inventoried and detailed the repair and replacement needs. It categorized the repairs to determine whether the repair would be eligible for federal assistance.

The immediate response ensured the safety of important corridors within District 4, most of which were being used by emergency services for providing relief to the residents of the area. Because of the efficiency of the documentation process, structural survey reports for District 4 were generated quickly and replacements and repairs were implemented with unprecedented speed. This resulted in faster recovery and full availability of these corridors to motorists.

A year later, although some repair needs remain, much of the damage that the hurricanes caused is repaired and recovery is progressing.

“The whole operation was really remarkable,” Quintana said. “We were really fortunate to have the foresight to implement our consultant damage assessment program. That initial quick response was instrumental toward the recovery and rebuilding of our community.” ■

# The SAFFIR/SIMPSON HURRICANE SCALE

## Category 1

**Winds : 74-95 mph**

### "Hurricane"

*Damage primarily to unanchored mobile homes, shrubbery, and trees. Some coastal flooding and minor pier damage.*

## Category 2

**Winds : 96-110 mph**

### "Strong Hurricane"

*Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings.*

## Category 3

**Winds : 111-130 mph**

### "Major Hurricane"

*Some structural damage to small residences. Mobile homes are destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by floating debris. Terrain may be flooded well inland.*

## Category 4

**Winds : 131-155 mph**

### "Major Hurricane"

*More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.*

## Category 5

**Winds : 155+ mph**

### "Major Hurricane"

*Complete roof failure on many residences and industrial buildings. Some complete building failures. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.*

According to National Oceanic and Atmospheric Administration