BUILDING CODE TRIAGE TEAM AFTER ACTION REPORT: HURRICANE DENNIS

Michael Ashworth, Building Code Triage Team Leader (850-922-6075):

I. PROCEDURES:

Deployment: The Building Code Triage Team deployed on July 10, 2005 to Niceville, FL under a Tracker 2000 Mission number, to begin our examinations of the impacted areas of Hurricane Dennis (a Cat II storm). The intended areas of interest were primarily the windborne debris regions of Santa Rosa and Okaloosa Counties, east of the track of the eye of the storm. Courtesy contacts were attempted with both county building officials, but they were out in the field performing damage assessments.

Logistics: Secondary roads were used between Tallahassee and Niceville because of the major traffic jams reported on I-10 in the EOC. Flood zone maps were obtained from the GIS section in the EOC for the impacted areas. As in the past, finding available hotel accommodations is always a challenge because of the recovery assistance teams inbound to the impacted area. Two industry representatives (Glass & Roofing) accompanied the Team, and their individual observations are included in this report. Access to areas behind police barricades was accomplished with personal SERT badges and Triage Team magnetic signs on the personal vehicles. Personal cell phones were the primary means of communication, having learned in the 2004 hurricane season that cell phone towers either remained operational or were the first to be placed back in operation with emergency generator power, following a major storm.

FINDINGS:

Numerous digital pictures are included on the website (www.floridabuilding.org) under "Publications" at the FBC icon, entitled, "Hurricane Dennis", but have been excluded from this report, in the interest of brevity. Observations from the 2004 Hurricane Ivan [and this visit] well established the vigorous enforcement of the Florida Building Code in both Okaloosa and Santa Rosa Counties. Redundant observations from individual Triage Team members have been excluded in the interest of brevity.

Rick Dixon, Executive Director, Florida Building Commission (850-921-2278):
The only major point/observation I have is that 1x2 battens, both metal and tile roof coverings, came off with the covering material. We may have something there that the commission needs to look into further.

Chuck Anderson, P.E., Code & Regulatory Affairs Manager, Simonton Windows (800-746-6687 x 4807):

After Hurricane Dennis came ashore near Navarre Beach, FL, the following observations were made. My focus was on the performance of opening protection if present, but other areas of interest will also be shared.

My most important point to make is to reinforce what the researchers, scientists, and other experts have already been stating for years. This storm provides perfect evidence that we need to protect openings from windborne debris for wind speeds in excess of 110 mph. Hurricane Dennis weakened significantly as it came ashore, but the forecasted track was extremely accurate. This meant that the scientist had their instrumentation in exactly the right place so that the damage can be attributed very closely to that wind speed. The early data from the instrumentation was that the highest gust were 110-120mph, sustained winds were

somewhat lower. These winds were at the threshold of where the building codes require windborne debris protection and the following photos show the criticality of that protection.

The residence above was about 12 years old and located in Navarre Beach. This community has covenants for architectural appearance that require a tile roof appearance, and many roof tiles were evident on the ground, decks, and porches. The duration of winds above 110 mph is not known, but evidently it was enough to begin removing the roof. Some of the homeowners had replaced their roofs, post Ivan, with metal roofs, but some had retiled. Perhaps the third time will be the charm!

My second observation is that windborne debris windows are working, although their use is not yet commonplace and finding them among the affected homes is still rare. The following picture shows an impact resistant door with the outer tempered lites impacted, but the inner lites maintaining the opening. This was within 100 yards of the first picture and no doubt would have threatened the integrity of the roof if non impact product had been used.

The above picture also depicts a futile effort to use siding panels as a shutter, which perhaps implies that the owner was unaware that the home had impact resistant doors. The deck was strewn with roof tiles and tile fragments.

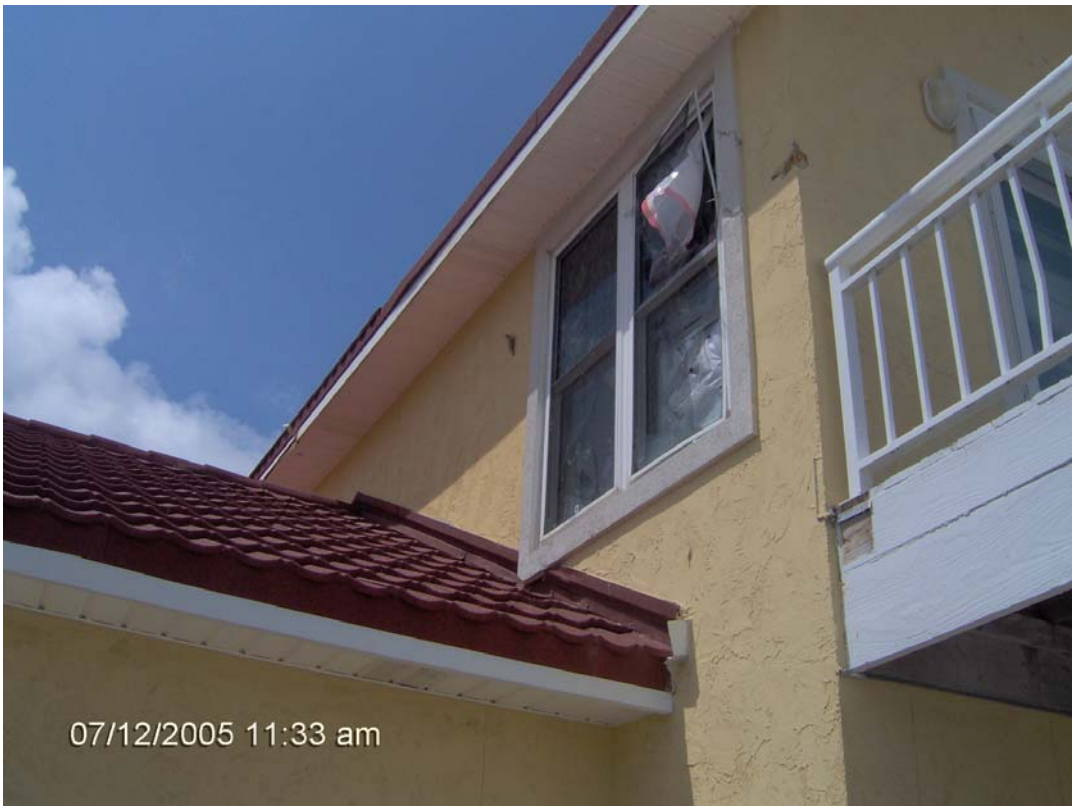
A third observation is that we consistently see elements that are meant to be windborne debris protection actually becoming the windborne debris. It is very commonplace to wade through and across debris piles that include plywood, OSB, and corrugated panels that were intended to save openings but instead inflicted damage as they became projectiles. The following picture shows one such piece of protection/projectile. Perhaps tested windborne debris protection should be the only permissible protection allowed on barrier islands?

A fourth observation is that there have been some manufacturers selling doors with annealed glass. Tempered glass has been required in doors for some time yet the picture below shows a fragment of annealed glass that was embedded in the left door casing after failure of the patio door.

Observations on issues other than fenestration include: advertising signage, termites, EIFS, and roof tiles. Although it was not captured in a photograph, we observed dozens of large steel poles snapped or pulled out of the ground and the attached billboard resting on the ground or a building if one was in the way. It would seem that a fabric designed to tear away would avoid such occurrences. Termite tracks and some quite

impressive damage were observed on a barrier island. The next two pictures shows the termite tracks after the wind removed the EIFS (note the lack of water control barrier, flashing?).

EIFS, Exterior Insulated Finish System, does not seem to remain adhered to wood sheathing and is easily penetrated by projectiles such as roof tiles. It would seem extremely dangerous to try and weather a windstorm in such a structure. Though it's difficult to see, the following photo shows an entry wound for a roof tile that passed through an exterior wall, an interior wall, and was imbedded in the opposite exterior wall.



Roof tiles have been under scrutiny for some time now and Hurricane Dennis with its marginal winds removed tiles from roofs that had been replaced since Hurricane Ivan. The following photos show the minimal contact of adhesive present and the removal of a ridge board.

My conclusions are pretty encouraging:

-Science has quantified the forces and identified the appropriate thresholds for protection. Areas prone to 110 mph winds need openings protected.
-Codes are in place that encourage construction that is quite capable of surviving these events
-The building industry has products for the envelope that meets the code requirements and Mother Nature's requirements as well
-Enforcement is still difficult, but signs of mandated and voluntary compliance are evident.

My suggestions for further improvement include:

-Find a way to restrict protective panels being allowed that become debris after they leave the opening
-Restrict the use of EIFS over wood framing in windborne debris (WBD) areas unless some protective layer is used and perhaps require some stringent licensing exam to insure qualification of the installers.
-Restrict the use of roof tiles in WBD areas and/or perhaps require a more stringent exam to insure that installers are qualified.
-Commercial signs should be a fabric material over a skeleton so that they can disintegrate and not damage anything else.
-From Ivan, it was amazing how many power connections could be destroyed, how many thousands of crews responded and how long residents were without power. It would appear that we need to mitigate this problem with mandatory underground power when possible. Treat it like flood insurance, move the power underground and out of harms way instead of rebuilding after each event.

Ralph B. Davis, II, President, Streamline Roofing & Construction, Inc., Tallahassee, FL (850-575-1168):

During the review of the damage from Hurricane Dennis (immediately following the hurricane) we entered the area of Navarre Beach on the outer barrier island where most of the extensive damage occurred. The road was covered with sand, telephone poles and electrical wires. The beach was eroded almost four to six feet in most places which was displaced approximately 200 to 300 yards back toward the main land filling the ground level structures with sand three to four feet high. The rising water (storm surge) rose four to six feet that we could tell pushing debris, decks, docks, trash and construction trailers all over the place.

Better tie-down procedures on temporary offices and storage buildings should be considered and enforced, even if for storms only. The breakaway walls worked well under the beach houses that had them.

As far as roofing is concerned, the tile roofs continue to be a large problem. The ridge and hip attachments are the largest part of the problem. These tiles break away and fly into the field of the roof breaking up the tiles in the field of the roof. Then all of it peels away creating large areas of windborne debris that destroys the house adjacent to them. Several houses might have been fine with minimal damage, but due to the broken tiles from the house next door their siding and windows were compromised causing massive water infiltration.

The newer shingles seemed to be doing well. The edges are the biggest failure point on this type of roof system. The eave drips are not getting enough nails and are pulling away. Properly installed new shingles held up surprisingly well.

Metal roofs did very well when they were installed properly. We observed several metal roofs that were retrofitted with wood battens over shingles but the battens were not secured down into the trusses; only through to the sheathing. The battens pulled out, thus pulling the entire roof off in complete sections. We feel as though the battens should be screwed or nailed off with ring shank nails into the trusses not just the sheathing. The connections failing on these roof systems are the sheathing to truss connection and the batten to sheathing connections; not the roof panel to decking connection. Better care should be taken by the installers and the field inspectors to look at the manufacturers installation instructions on detail flashings and attachment methods. This cannot be understated.

The products in the field are not being installed as the products were tested. There are many failures that did not have to occur but due to substandard installation practices and poor inspection procedures there is a lot getting through a big crack. We can build great structures that withstand some of the toughest storms but the weak link can ruin the whole house. After a storm more improper material installation violations should be handed out. Not necessarily to hurt the contractors but to send the message that installers will be held accountable for proper installation methods.

One last area I would like to bring attention to is the soffit and fascia systems of these structures. The roof siding and windows were intact on a lot of these houses but the one small item we saw overlooked was the soffit system on the underside of the overhangs and porch balcony areas. There were a lot of houses that would have gone untouched except the vinyl soffit systems blew out, and water went up the walls and into the attic cavity, pushing the roof decking up and/or the water destroying the interior ceilings, electrical, etc. We observed a house that had ¼" solid plywood up on the soffit areas and then

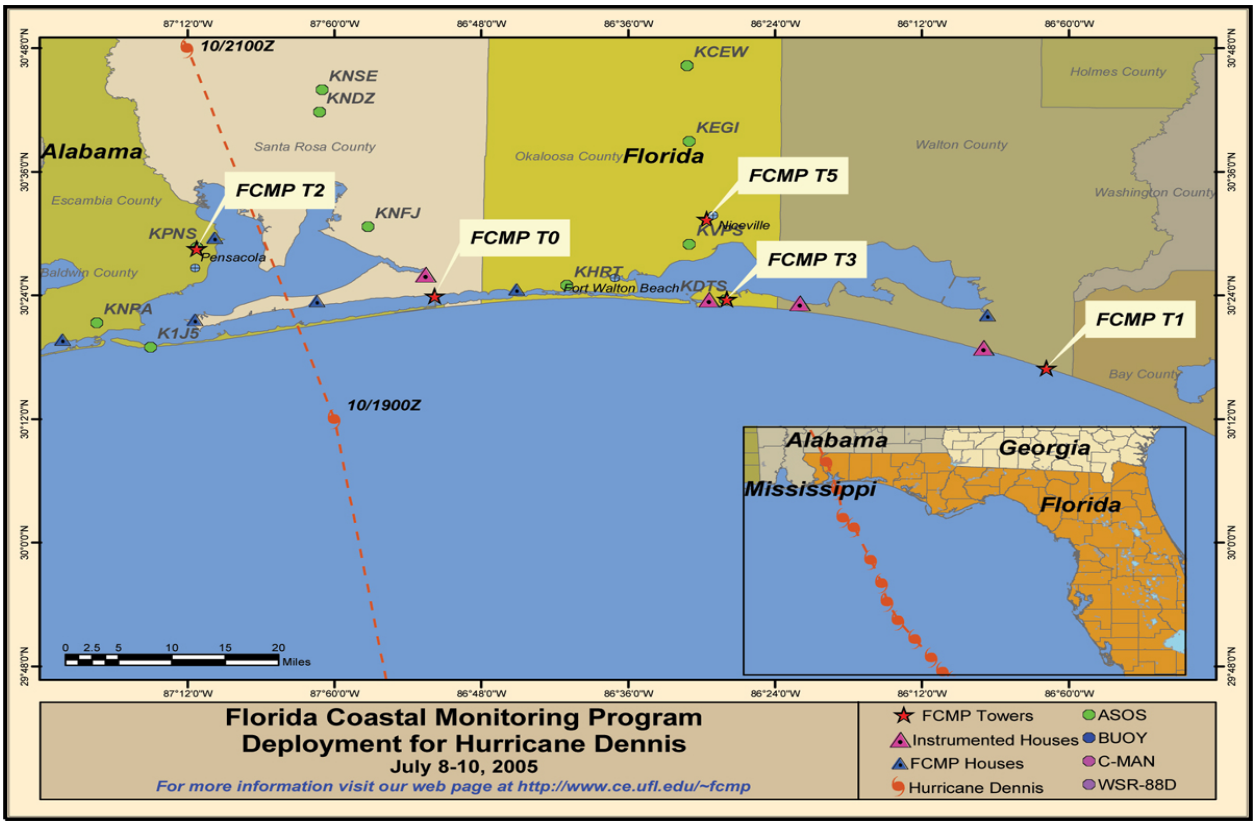
the vinyl. Even though the vinyl blew off, the house interior was saved. The issue of a stronger soffit system should be addressed or excessive failures will continue.

It should be noted that hurricane glass windows [impact resistant windows] worked great. They did their job on the houses that had them installed.

I would be happy to discuss any of these items in further detail at any time in the future. I have enclosed photo's showing some of the items discussed. We appreciate the opportunity to be involved in this process.

Dr. Kurt Gurley, Coastal Monitoring Program, University of Florida:

The Coastal Monitoring Program at the University of Florida maintains instrumented house along the coast specifically for the recording of actual wind speeds, gusts and barometric pressure and other data to better analyze the performance of the Florida Building Code, code enforcement and the performance of building materials. The graph below illustrates the location of these houses used to record data for hurricanes that impact the Panhandle area of Florida.



Dennis_T0_5mGills.pdf Dennis_T1_10mGills.pdf Dennis_T2_10mGills.pdf
Dennis_T5_10mGills.pdf

NOTE: See additional photos and charts at http://www.floridabuilding.org/ under the FBC icon, under "Publications", "Hurricane Reports".

END OF REPORT