

SPF and Hurricane-Proof Roofs

By Jennifer Frakes

Interior Application Helps Prevent Exterior Damage

In the past decade, numerous hurricanes have slammed the Gulf Coast and southeastern portions of the country, causing immeasurable loss of life and property. As a result, the need to protect homes from severe damage by hurricanes and other powerful windstorms has become big business in the United States.

In Florida, there are currently four training centers, called

"Hurricane Houses," that showcase the different technologies available to homeowners to protect their homes in the event of a hurricane. *SprayFoam Magazine* gives its readers the inside scoop on Foamseal Hurricane Adhesive, a spray polyurethane foam showcased at the Hurricane Houses, and how applying it to the roof of a home can mean the difference between little or no property damage and major destruction in hurricane-force winds.



Most homeowners who live in areas that have been ravaged by hurricanes would agree that protecting their homes is a top priority. However, finding technologies and products designed for such a purpose may seem like a daunting task. This is where the Windstorm Damage Mitigation Training and Demonstration Centers, or Hurricane Houses, come to the rescue. The purpose of these centers is to educate the public and the construction industry about options for protecting homes from the wind and water damage caused by hurricanes and other severe storms.

"The centers let the public know that the government, the construction industry and the university are concerned about property loss due to wind damage," said Robert Stroh, director of the University of Florida's Shimberg Center for Affordable Housing, based in the M.E. Rinker Sr. School of Building Construction. "This is a publicly visible effort to reduce the loss of life and property."

Some of the features of the Hurricane Houses include a reinforced concrete form wall system, hurricane shutters, roof straps and Foamseal Hurricane Adhesive, a spray polyurethane foam that is applied to the roof sheathing to increase wind and water resistance.

The Shimberg Center designs and oversees construction of the training centers, the building of which is funded by Florida's Department of Financial Services. Currently, there are four Hurricane Houses located in St. Lucie, Escambia, St. Johns, and Broward counties. Each training center is situated near an interstate highway for ease of public access, and each participating county funds the operating and maintenance costs for the center. According to Stroh, the Shimberg Center would like to build two more centers in Florida – one along the south Gulf Coast and one in the Big Bend area of the Florida Panhandle.

The Hurricane Houses are administered by the Cooperative Extension program that was started many years ago by the Department of Agriculture to help farmers raise their crops. There is a Cooperative Extension office in nearly every county of the United States. Funding for the Cooperative Extension programs comes from a combination of federal and local government and local universities. Today, there are Cooperative Extension programs covering a wide range



Working in conjunction with the University of Florida's Shimberg Center for Affordable Housing, several Florida spray foam contractors have contributed their time and materials to the building of Windstorm Damage Mitigation Training and Demonstration Centers, also known as Hurricane Homes (bottom left, page 24). In an effort to increase a structure's wind and water resistance, SPF adhesive is spray-applied to the roof sheathing of these demo homes (above and below).



Wind Uplift Resistance Testing

Every hurricane that strikes land costs millions of dollars of losses in property, not to mention the losses of life for which no price can be attached. Between 50 and 70 percent of hurricane-induced property losses are caused by roof failures and water intrusion through the roof after the roof covering fails.

Nails alone may hold in Category 1, 2, and 3 hurricanes, if the doors and windows are not blown out. If the windows and doors do not remain intact, the pressure inside the house can double and exceed the uplift resistance of the sheathing. Category 4 and 5 hurricanes may cause enough uplift to remove the roof sheathing, even if the doors and windows remain intact.

Testing at Clemson University's Civil Engineering Department showed that roofs with SPF adhesive can withstand 2 to 3.5 times more uplift resistance than roofs held together with nails alone. In one test sequence using 5/8 nailed OSB, the roof system had an uplift resistance of 87 pounds per square foot. The addition of SPF adhesive increased the uplift resistance to 314 pounds per square foot.

When Foamseal is properly applied by a trained applicator, in accordance with the manufacturer's recommendations, losses due to wind and water damage can be reduced up to 50 percent in residential structures (according to computer modeling conducted by Applied Research Associates of North Carolina). Testing at ITW Foamseal Technical Center also shows that the application of Foamseal reduces water intrusion by 99 percent compared to roofs left with open joints.

The SPF adhesive can be applied to nearly any roof, new or existing, that consists of wood framing and OSB. Application of Foamseal is covered under US Patent #5,890,327 entitled "Method of Reinforcing the Roof of a Building Against Hurricane-Force Winds."

of topics – from prenatal care to money management and home improvements for energy savings and windstorm mitigation.

Over 10,000 people have passed through the Hurricane Houses in the five years since the first one opened in 1999. The public is able to see the protective technologies first-hand, as transparent panels cover cut-away

on the eaves and overhangs. When the wind is blowing perpendicular to the ridge of a roof, there is positive pressure on the windward side and negative pressure on the leeward side. Wind blowing around eave ridges and overhangs produces high uplift forces in these areas, causing all or parts of the roof to blow off. Applying Foamseal Hurricane Adhesive on the

Structurally, the Hurricane Houses were engineered for 150-mile-per-hour winds. The weak link is the shingles, which can only withstand winds of 110 miles per hour. This is where SPF comes into the picture.

sections of the wall, revealing the internal structure of the house. A visit to one of the training centers is akin to "going to a car dealership to test drive and kick the tires of a car before you buy it," says Stroh.

In addition to giving visitors an "inside look" into the construction of the Hurricane House, each house has a classroom complete with audio-visual equipment and detailed literature describing the products showcased in the House. The directors of each center, in conjunction with local building and construction officials, also provide educational programs promoting hurricane preparedness.

Each Hurricane House is a little over 3,000 square feet and is built to look like a typical, one-story, single-family residence. Structurally, the Hurricane Houses were engineered for 150-mile-per-hour winds. The weak link is the shingles, which can only withstand winds of 110 miles per hour. This is where Foamseal comes into the picture.

Keeping the Roof On

In hurricane-force winds, roof system failure occurs when the roof cannot withstand the uplift pressure exerted

joints and seams of the internal roof structure increases the uplift resistance of the roof systems by two to three-and-a-half times over a roof system held together with nails alone. (See sidebar for more information.)

Typically, when roof sheathing is installed, a 1/8- to 1/4-inch space is left between the sheathing panels. This leaves gaps for water to enter a structure if the external roof system (shingles or tile) is compromised. Thus, the external roof covering is typically the first part of a roof system to fail in hurricane-force winds. "Besides wind resistance, the secondary benefit of Foamseal is the protection from water damage if the shingles do blow away," explains Stroh. "And while the adhesive can obviously be used in new construction, it can also be applied to roofs of existing homes, a huge plus for homeowners in high-risk areas."

Inspiring Foam

When the first training center opened to the public in Fort Pierce, a city located in St. Lucie County along the central eastern coast of Florida, contractor Fred Espenschied paid a visit and was intrigued by the Foamseal in the attic. What began as

a casual visit to check out new technologies in hurricane mitigation ended up inspiring a new area of specialization for Espenschied's construction business — he even bought SPF equipment from the contractor who applied the SPF adhesive at the Fort Pierce training center. Espenschied now applies Foamseal to the roof decks of all his new construction projects, and he also applied the Foamseal in the Hurricane House in St. Augustine County, located in the northeastern county of St. Johns.

"Everyone thinks of protecting windows and doors from hurricane-force winds, and rightfully so," states Espenschied. "However, if you lose even a little bit of shingles or tiles, major problems will occur. The slightest leak can cause major damage. To repair all of the water damage, a family might have to move out of their home for up to a year. In an area where many hurricanes hit, it can be very difficult to find a house to rent while yours is being repaired because so many people

Each of Florida's four Hurricane Houses feature cut-away sections of walls and roofs. Covered by transparent panels, these sections reveal the internal structure — and SPF application areas — of the house. The houses also contain classrooms with audio-visual equipment and literature describing the products featured in the construction.



have been displaced. It is important to think about the roof above your head and protect it."

Jimmy Burgess, the foam contractor who applied Foamseal in the Escambia County Hurricane House near Pensacola, concurs. "I think the adhesive is an excellent product and will work on the Gulf Coast if it is properly installed by certified applicators."

The wind- and water-resistant properties of the SPF adhesive have also impressed Robert Fairless, the general contractor who applied the product to the Broward County training center, near Fort Lauderdale. "Foamseal waterproofs a house from the inside out," explains Fairless. "There is no reason for not building safer homes or making existing homes safer. We tend to focus a great deal on aesthetics, but it is also very important to invest in prevention and safety."

Quick and Easy Application for the Hurricane Houses

According to Art Goldman of ITW Devcon Futura Coatings, Foamseal Hurricane Adhesive is a plural-component spray polyurethane foamed sheathing adhesive, which is applied from inside the attic to the underside of the roof structure. Specifically, the product is applied to the truss (or rafter) sheathing joints and to the sheathing seams. It is applied as a liquid that quickly hardens into a watertight seal and increases the structural integrity of the building.

As with any plural-component system, these components are stored in two separate 55-gallon drums. The materials are pumped through the proportioning unit and then through the heated hoses. The materials mix in the mixing chamber and are dispensed through the tip of the gun as a liquid stream. Mechanical foam guns, such as the Graco D-Gun, or air purge guns, such the Graco Fusion and Glascraft Probler P2, can be used for the application of Foamseal.

The application does differ from other types of SPF, because it is applied as a stream to form a 1-inch-by-1-inch-thick fillet on both sides of the rafters and at each sheathing seam of the wood truss system.

"In contrast, spraying foam insulation is a solid application or thermal

blanket," explains Burgess, who used a Gusmer FF-1600 proportioner on the Escambia County training center.

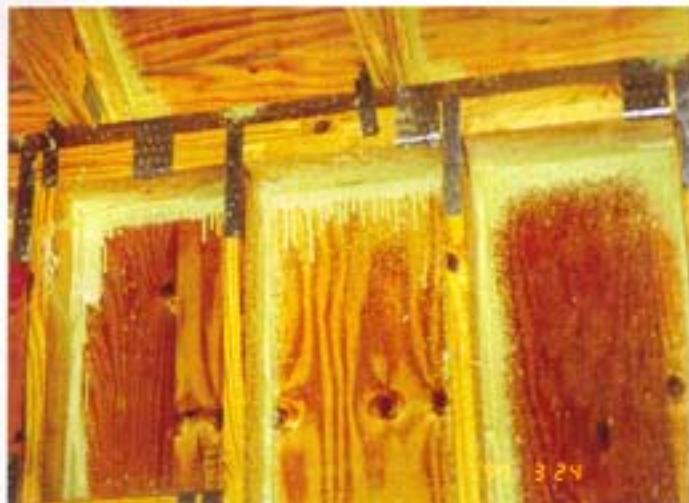
Typically, on a roof deck the size of that of the Hurricane Houses — about 3,000 square feet — Foamseal can be applied in one or two days using a crew of two or three men. Fairless had a crew of three on the Broward County training center — a lead applicator, a second applicator, and a "runner," who was responsible for prep and clean-up.

The crews on all three Hurricane Houses wore the same type of safety

equipment that any applicator of plural-component SPF would wear: full body suits, respirators with a full fresh air supply, eye protection, and gloves.

"Because the St. Augustine project was new construction, it was easy to maneuver. In existing homes, it can be challenging to move around the attic with the hose," says Espenschied.

Fairless agrees. "New construction, such as the Hurricane House, makes spray application a little easier. There is more room to move, and we don't have to worry about disturbing anyone living in the



house." It is extremely important to note, however, that Foamseal is non-toxic, and if it is being applied to an existing roof system, residents can remain at home during the application.

None of the crews encountered any major problems while spraying at the training centers. Burgess relates only one minor issue with which his crew contended. "The only problem that we experienced was that the temperature got down in the 30s at night, so we had to heat the product up to 80°F in the drum to keep the right yield," says Burgess.

When applied to the internal roof structure's joints and seams, the SPF adhesive has been proven to increase the roof's wind up-lift resistance by 2 ½ to 3 times over that of a traditional roofing system. A secondary benefit of the SPF adhesive is the added water protection it provides if the roof shingles are blown away during a storm.

Increasing Wind Resistance, Decreasing Insurance Premiums

Typically, Foamseal application to a home of 2,000 to 3,000 square feet will cost several thousand dollars. Considering the tens or even hundreds of thousands of dollars that it may cost to repair wind and water damage in the event of a storm, it is an investment for which many homeowners are willing to pay. Fairless points out another form of savings from the application of Foamseal: lower insurance premiums.

"Foamseal has been established as a mitigating factor by the Citizen's Property Insurance Corporation, the state organized insurance entity that serves high-risk areas such as the coasts of Florida," says Fairless.

In Florida's coastal areas, insurance costs can be reduced by about 12 to 17 percent when Foamseal is used alone and by about 50 percent when combined with hurricane-resistant shutters.

"Insurance discounts for superior sheathing attachment and secondary water resistance are very important when you consider that many of Florida's coastal homes can have windstorm insurance premiums of 10, 20 or \$30,000 per year. The savings that the application brings is huge," explains Espenschied.

SPF Making a Difference

Although the SPF adhesive and the other technologies showcased at the Hurricane Houses sound like a dream come true, do they really prevent extensive wind and water damage during an actual hurricane?

Espenschied's belief in Foamseal was put to the test when a client's home was hit by a hurricane. He had applied the adhesive to a newly constructed house on the Barrier Islands. During a hurricane a few years ago, between one third and half of all shingles and tar paper were blown off the house, potentially resulting in major water damage to the interior of the home. However, everything in the house stayed dry due to the Foamseal that reinforced the roof deck and provided protection from the driving rain. "It really makes a difference," he concludes. *SF*