



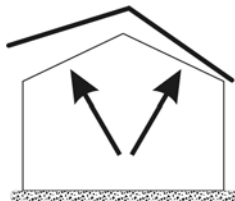
# How Wind Affects Homes<sup>1</sup>

**ABE379**

Kathleen C. Ruppert, Hal S. Knowles, III, and Karla A. Lenfesty<sup>2</sup>

Wind forces are complex. The effect of wind on a building depends on the interaction of many variables. Natural variables include wind speed, wind height, ground surface features, and the properties of the air. Building variables include the shape, location, and physical properties of structures. Together, these variables create differences in pressure that push and pull on the exterior surfaces of buildings.

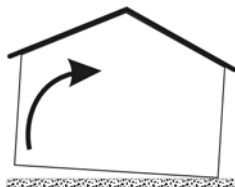
## How Wind Forces Affect Homes



**Uplift** occurs as wind flows over a roof. Similar to the effect on airplane wings, wind flow under a roof *pushes* upward while wind flow over a roof *pulls* upward.



**Tilting or sliding** occurs when horizontal wind pressures create a shearing action along the foundation.



**Overturning**, or rotating off the foundation, can also result from shearing action when a structure is otherwise unable to tilt or slide off the foundation.

## Only As Strong As The Weakest Link

A safe home is designed to resist these three effects of wind. The exterior surfaces of a home interact to function as the building envelope. Think of this envelope as a protective shield from the outdoor elements such as heat, humidity, and stormy weather. A stronger shield makes for a safer home and more comfortable occupants.

The structural components of a building envelope are the foundation, walls, and roof. A safe envelope has a **continuous load path**. This path connects all the structural parts of a building envelope much like how a human skeleton supports and connects parts of our body.

The non-structural components of a building envelope include windows, doors, garage doors, and other openings in the structural components. These parts protect the inside of a building much like how human skin protects our internal organs.

The weakest link in the building envelope is the point most likely to fail in a windstorm. When a hurricane or tornado strikes, a home is only as strong as the weakest link.

For more detailed information about wind resistant building envelopes, please read the other fact sheets in our **Education + Action = Wind Damage Mitigation Series**.

1. This document ABE379 is part of the Education + Action = Wind Damage Mitigation series. Publication date: April 2007.  
2. Kathleen C. Ruppert, Associate Extension Scientist, Program for Resource Efficient Communities; Hal S. Knowles, III, Coordinator, Program for Resource Efficient Communities; Karla A. Lenfesty, Windstorm Damage Mitigation Program Specialist, St. Lucie County Cooperative Extension, Institute of Food and Agricultural Sciences, University of Florida.

The Institute of Food and Agricultural Sciences (IFAS) is an Equal Employment Opportunity - Affirmative Action Employer authorized to provide research, educational information and other services only to individuals and institutions that function without regard to race, creed, color, religion, age, disability, sex, sexual orientation, marital status, national origin, political opinions or affiliations. For information on obtaining other extension publications, contact your county Cooperative Extension Service office. Florida Cooperative Extension Service / Institute of Food and Agricultural Sciences / University of Florida / Larry R. Arrington, Dean.

## How Wind Forces Cause Damage

Wind forces can break the building's load path or punch a hole in the building envelope. Sometimes the actual force of high winds can cause a door or window to break open.

Other times nearby debris can be picked up in the wind and projected against the building envelope. Roof shingles from a neighbor's home, branches from fallen trees, or unsecured yard furniture are examples of potentially dangerous wind-borne debris.

Once wind forces create an opening in the building envelope, the dangers of structural failure greatly increase. Water intrusion is another damaging effect of wind driven rain.

If your house is in an unobstructed location or within 1,500 feet of open water, you are more susceptible to damages caused by high winds. Proper landscaping may help to shield your home and divert winds around the building.

## Hurricane and Tornado Resistance

Check with your local building official to determine the wind-borne debris region of your location. Use the protections that will help your home resist the design wind speed of your region. It is a good investment to build or renovate beyond minimum code requirements. This may provide additional damage resistance, peace of mind, increased market value, and help you qualify for current or future incentives such as property wind insurance discounts.

- **Fortified...for safer living** is a home certification program of the Institute for Business and Home Safety (IBHS), a research and educational organization of property insurance companies. A *Fortified...for safer living* designation means that a qualified inspector has confirmed that the house is designed and built to withstand the perils commonly experienced in the area. Some insurance companies offer premium discounts on wind coverage for certified Fortified

homes. For more information, visit [www.ibhs.org](http://www.ibhs.org)



- **Blueprint for Safety** is an educational program of the *Federal Alliance for Safe Homes (FLASH)*, a non-profit, charitable education organization dedicated to promoting home safety. The program offers guidelines and builder training designed to provide reliable information about disaster-safety building techniques and features for floods, wildfires, and windstorms. For more information, visit [www.blueprintforsafety.org](http://www.blueprintforsafety.org) and [www.flash.org](http://www.flash.org)



## References and Resources

Federal Emergency Management Agency | Disaster Prevention and Preparation Library  
[www.fema.gov/library/prepandprev.shtm](http://www.fema.gov/library/prepandprev.shtm)

Florida Division of Emergency Management | Information Page  
[www.floridadisaster.org/DEMinformation.htm](http://www.floridadisaster.org/DEMinformation.htm)

Texas Tech University | Wind Science and Engineering Research Center  
[www.wind.ttu.edu](http://www.wind.ttu.edu)

University of Florida | Disaster Handbook  
<http://disaster.ifas.ufl.edu/>