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BLUEPRINT FOR SAFETY NEWS

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Special Edition on the Damaging Effects of Wind

Strengthen Your Home Against High Winds

Inside this issue, you will find practical loss prevention measures to strengthen your home against the damaging effects of high winds.

Blueprint for Safety™ — an education program launched by the Federal Alliance for Safe Homes four years ago — instructs both professional contractors and homeowners on how to implement disaster-resistant construction techniques.

Blueprint for Safety News takes a similar approach to reach both professional and lay readers. The technical integrity of the information in this issue on windstorm loss prevention is not compromised by its across-the-board usability.

Like the Wind Basics section of the Blueprint for Safety curriculum, this issue takes a whole-house approach, focusing on doors, roofing systems, safe rooms, windows and more. There is a sample product list on the back page, highlighting some of the breakthroughs in impact- and wind-resistant products.



If you don't find exactly what you are looking for in this issue, please visit www.flash.org for more in-depth coverage and user-friendly tools for windstorm loss prevention.



“One Home At A Time”

By Leslie Chapman-Henderson, President & CEO, FLASH, Inc.

Severe winds come in many forms. Every region of the country is susceptible to them. Whether caused by thunderstorms, winter storms, hurricanes or tornadoes, severe winds often devastate entire communities. As we educate homeowners and homebuilders on the benefits of wind-resistant construction, we can strengthen communities, one home at a time. Blueprint for Safety News is one tool in the FLASH educational toolkit. The Federal Alliance for Safe Homes-FLASH Inc. offers free resources to homeowners interested in learning more about windstorm mitigation and property-loss prevention. Log on to www.flash.org for the latest tips and techniques to strengthen your home and safeguard your family from the damaging effects of wind.



Special Edition on the Damaging Effects of Wind

Protecting Your Home from Severe Winds

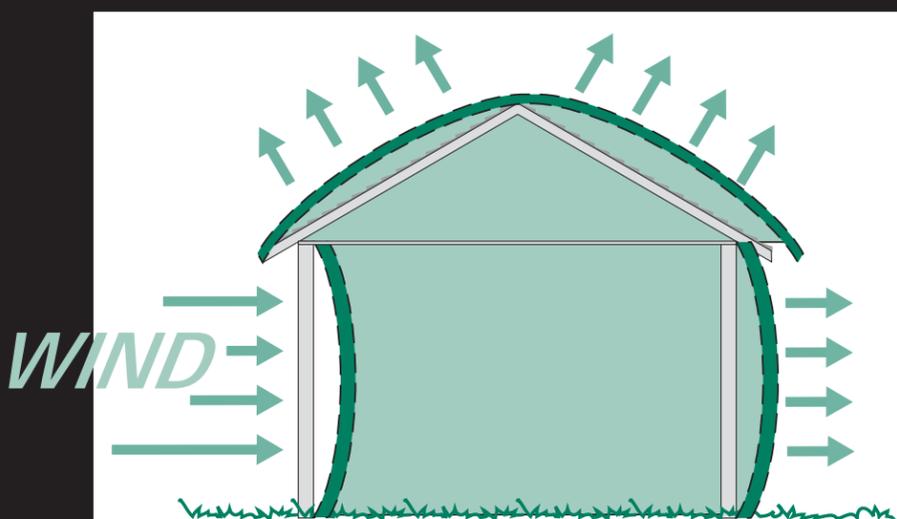
Damaging winds accompany many types of severe weather, including:

Hurricanes. Intense hurricanes produce winds over 110 mph that can completely destroy a home.

Thunderstorms often produce damaging winds caused by downbursts, or rapid downward rushes of air. When the air hits the ground it is forced to spread out, creating straight-line winds of up to 100 mph. These damaging winds are often mistaken for tornadoes.

Tornadoes. The most intense tornadoes, packing winds up to 318 mph, have been known to completely remove homes from foundations and carry objects several hundred yards.

While the intensity of those forces will vary, the construction techniques used to protect your home from them will not.



This diagram shows a generalized effect of wind forces on a home. The arrows pointing toward the home indicate winds that are pushing on the surface. The arrows pointing away from the home indicate winds that are pulling on the surface.

Notice how wind forces impact every surface of your home, not just the ones facing the wind. In many cases, the pulling forces of wind are more critical than the push as evident by the loss of roof coverings in many severe wind events 

Roof

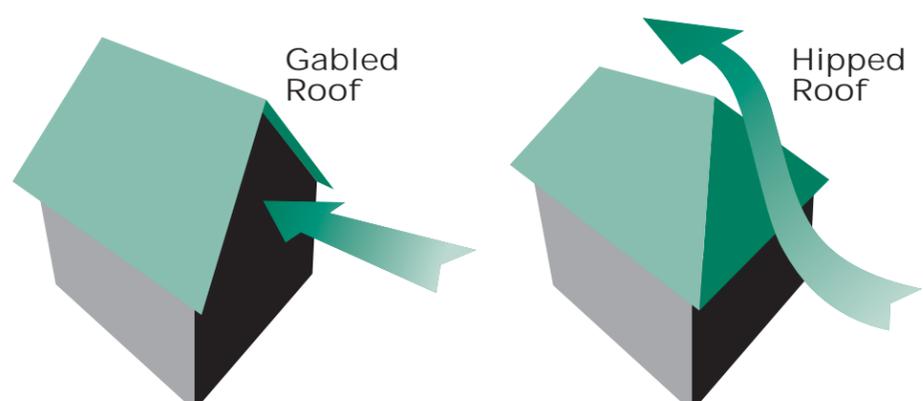
The roof of your home is one of the most critical lines of defense in protecting your family, pets and possessions from the violent forces of wind. The roof system consists of the roof covering (asphalt shingles, tiles, etc.), the decking (plywood), and the framing (rafters, trusses, etc.).

- **Roof Covering.** Install roof-covering products that have been tested to ASTM D 3161 for wind resistance; and UL 2218 for impact (hail) resistance. Be sure to specify these standards and look for labels on the product packaging because wind- and impact-resistant roofing products do not look much different than untested products.
- **Secondary Water Barrier.** Install a self-adhesive waterproofing material, such as flashing tape, over the joints in your roof deck. This will provide an effective secondary layer of protection from rainwater in the event the roof covering is damaged or removed by hail or wind.
- **Underlayment.** Make sure there is a layer of asphalt roofing felt underneath the roof covering. The felt acts as a drainage plane in the event water gets under the roof covering.
- **Roof Decking.** Install 5/8-inch-thick plywood roof decking panels with 10d nails spaced at 4 inches on center around the perimeter and 6 inches on center over intermediate framing. This will greatly improve the impact and wind resistance of your roof.

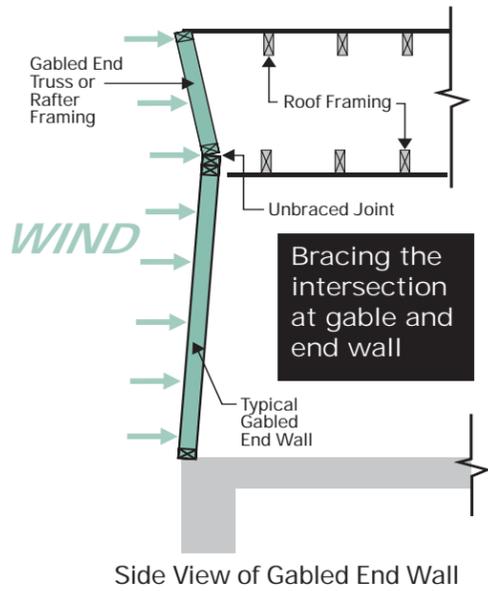
Gabled Roofs vs. Hipped Roofs

A gabled roof can be characterized as a roof with two slopes that come together to form a ridge or peak. A hipped roof is one that slopes upward from all sides of a building. Due to aerodynamic properties and conventional construction techniques, most hipped roofs will perform better in windstorms than most gabled roofs.

The intersection of the gable (triangular portion of the wall beneath the sloping roof surfaces) and end wall is a particularly weak point of gabled roofs unless full-height stud, concrete or masonry walls are used. If you have a gabled end wall, one of the following techniques should be used.



- **Balloon framing of the gable end wall.** The best technique is to use full height studs or solid masonry or concrete from the floor below all the way to the roof. This is often called balloon framing.
- **Brace the intersection of the gable and the end wall.** This point must be braced as it is extremely susceptible to failure from high winds. The amount and type of bracing should be determined by a professional engineer or see the *Blueprint for Safety™ Contractor's Field Manual*.



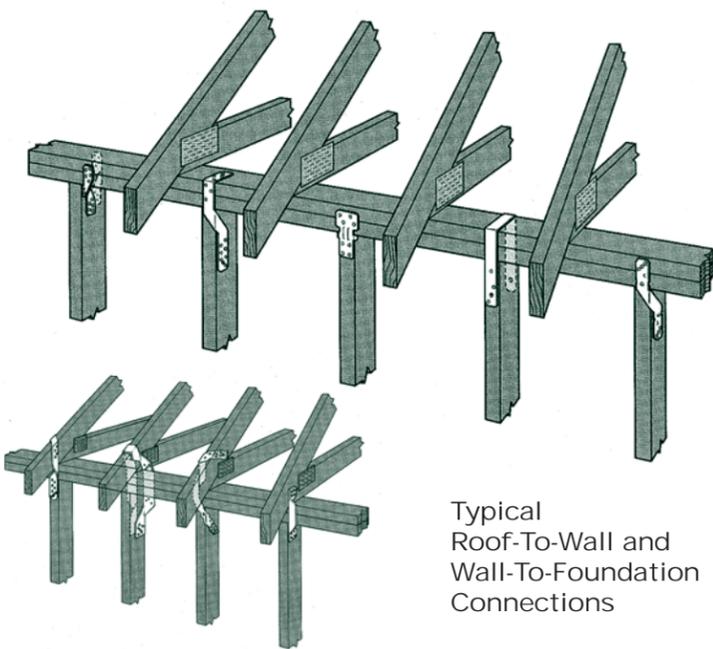
Side View of Gabled End Wall

Connections

Keeping the Roof from Blowing Off and Keeping the House on the Foundation

Severe winds can subject your home's roof to high uplift forces strong enough to remove the entire roof system or portions of it. To mitigate its vulnerability to this type of damage, the roof system has to be adequately attached to the exterior walls of your home. Conventional framing methods that use toe-nail connections to secure the roof framing to the exterior walls are not strong enough in most cases. The use of hurricane straps or clips are the most effective method for securing the roof.

While the roof is one of the most critical lines of defense in protecting your home, all joints—roof-to-wall, floor-to-floor, and wall-to-foundation—must be secured to create a “continuous load path” to the building's foundation. Your home's ability to resist wind forces is only as good as its weakest link. The only sure way to create a wind-resistant home is to secure the connections as described below:



Typical Roof-To-Wall and Wall-To-Foundation Connections

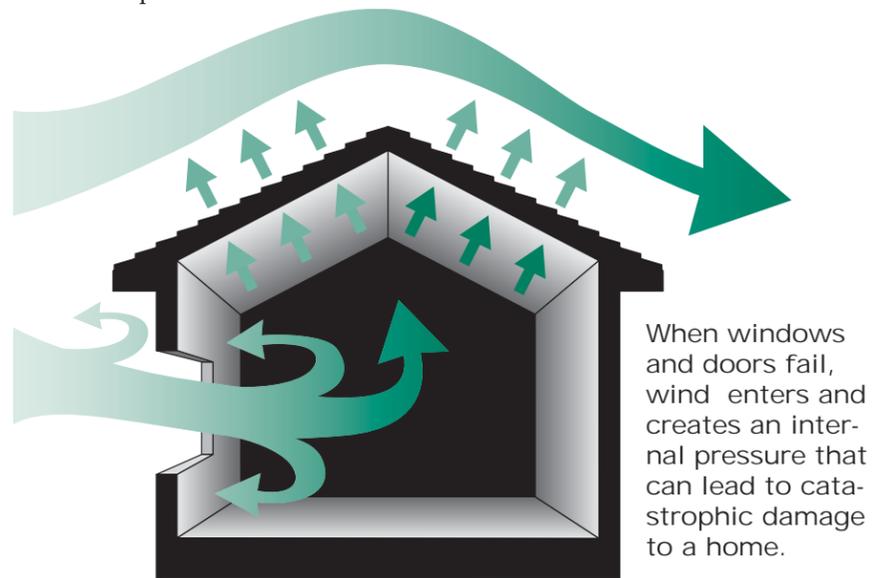
- **Roof-To-Wall Connections.** Use straps or clips, in addition to toe-nails, to connect the roof to the exterior walls.
- **Floor-to-Floor connections.** Make sure each floor is also connected to the floor below with straps or clips in addition to any other code required nailing schedule.

- **Wall-to-foundation connections.** Exterior walls should be securely anchored to the foundation (slab-on-grade, stem-wall) through the use of anchor bolts or mud-sill anchors.

Protecting Windows and Doors from Wind-borne Debris

Windows and doors are susceptible to damage from flying debris during severe windstorms. When windows and doors fail, the protective envelope of your home is breached. This allows debris, wind and wind-driven rain inside the home, potentially causing extensive damage to its contents and interior finishes.

Even more critical is the potential for internal pressurization. When windows and doors fail, the opening created in the building envelope allows wind to enter and push on all the interior walls and the roof. This internal pressurization is similar to what happens when a balloon is being filled with air. Coupled with the forces of wind outside the home, the increase in internal pressure can lead to a catastrophic failure. This scenario is depicted below.



To prevent internal pressurization and the entrance of wind-driven rain and debris, protect windows and doors, including garage doors, by covering them with **hurricane shutters** or installing **impact-resistant windows and doors**. Use products that have been tested to the following standards and are designated as such:

- ASTM E 1886 and ASTM E 1996
- SBCCI SSTD 12
- Miami-Dade PA 201, 202 and 203

Emergency Board-Up Procedures

FLASH recommends that you install tested and certified impact-resistant devices to provide the highest level of protection from wind-borne debris. However, in an extreme emergency where a temporary measure is the only option, FLASH recommends use of the following emergency board-up procedure:

- Measure and cut 5/8 inch, exterior grade plywood that will overlap the wall framing and cover windows and doors.
- Attach the plywood to cover the opening with 10d common nails, 12d box nails, or 2 1/2-inch #8 wood screws. (If installed over masonry or stucco, vibration-resistant anchors should be used.)
- If the shortest dimension of the window or door is 4 feet or less, space fasteners at 6 inches on center. If the shortest dimension of the window or door is more than 4 feet and less than or equal to 6 feet, space fasteners at 4 inches on center.
- Plywood shutters should not be used where the shortest dimension of the window or door exceeds 8 feet. ⚠

Safe Rooms: The Ultimate Protection from High Winds

A safe room, or storm shelter, provides the ultimate in life safety protection for you and your family from the dangerous forces of severe winds produced by hurricanes and tornadoes. Consider the following information for building or installing a safe room in your home.

- Safe rooms can be site-built or manufactured and can be installed in new or existing homes.

- Safe rooms can be located anywhere on the first floor of your home, in a basement, or outside.
- Safe rooms must be designed for wind speeds up to 250 mph and debris impacts from a 15 lb 2x4 board traveling at 100 mph.
- Issues critical to performance:
 1. *Safe rooms must be structurally isolated from the main structure of your home.*

2. *Safe rooms must be securely anchored to the foundation.*
 3. *Safe rooms installed in or over a crawl space must have a separate foundation.*
 4. *All components of safe rooms, including walls, ceilings, and door assemblies, must be designed and tested to resist the specified wind forces and prevent perforation by wind-borne debris.*
 5. *Safe rooms must have adequate ventilation.*
- Site-built safe rooms can be



constructed in accordance with the prescriptive designs of the FEMA 320 Publication, *Taking Shelter From the Storm: Building a Safe Room Inside Your House*. Deviations from FEMA 320 and manufactured safe rooms must be tested at an approved laboratory such as the Wind Science and Engineering Research Center at Texas Tech University.



- Verification of compliance with the National Storm Shelter Association's "Association Standard" provides the highest level of shelter quality. ★

COMMON WINDSTORM MYTHS

Myth #1

When a tornado warning is issued, you should immediately open all your windows.

Reality

Keep all windows and doors, all parts of the building envelope closed. From damage documentation of tornado strikes, many homes look as though they had exploded from the inside - roof blown off, exterior walls blown out, etc. This type of damage led many people early on to believe the building exploded due to the pressure differential. The latest research suggests that the pressure differential is not great enough to

cause the home to explode, and that in fact the loss of a window or door allowed wind to enter the home and cause internal pressurization. As the wind enters the building, it tries to expand the building like blowing up a balloon. High internal pressures combined with high external pressures caused failures that appeared similar to those that would be expected from high pressure differences. The latest advice: **Keep all windows and doors closed.**

Myth #2

When preparing for a hurricane strike, I only need to protect the windows and doors facing the ocean.

Reality

Wind can come from any direction, particularly with hurricanes and

tornadoes. These storms' winds generally move in a circular direction rotating about a central point (eye). So depending on where the eye of the storm is located, wind could come from virtually any direction. Additionally, winds from hurricanes are usually very turbulent and may change directions quickly, cycling in several directions. **All areas and components of your home should be designed and constructed to reduce wind damage.**

Myth #3

The southwest corner of your house is the safest place to be during a tornado.

Reality

Wind from a tornado can come from any direction. One side of your

home is not inherently safer than the other. **Seek shelter in your safe room, or a windowless interior room or basement.** ★

Sample Product List for Wind Protection

- Anchor Bolts
- Impact- and Wind-Resistant Roofing
- Impact-Resistant Windows & Doors
- Impact-Resistant Garage Doors
- Metal Connectors
- Plywood
- Safe Rooms
- Shutters

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