



White Paper:
**Hurricane Preparedness:
Criticality and Susceptibility of
Building Envelope Components to Wind Damage**

Prepared by:

Bracken Engineering, Inc.
2701 W. Busch Blvd, Ste 200
Tampa, Florida 33618

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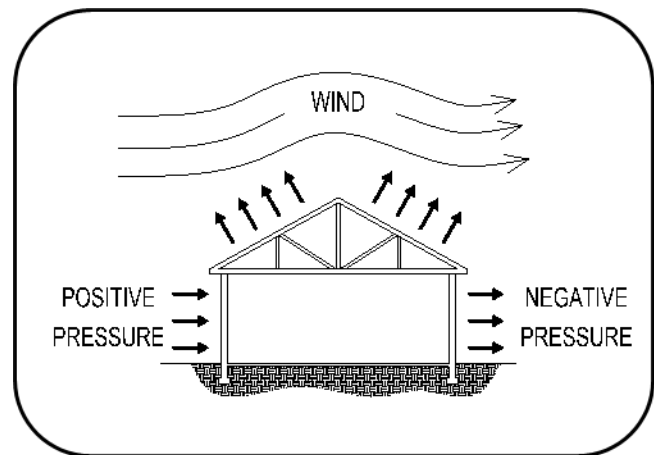
Introduction

This paper is intended to help building owners and homeowners identify those components of their building's exterior envelope that are the most susceptible to wind damage and the most critical to protect for the sake of the structure. Simply put, when the building's envelope is protected and wind pressure is prevented from entering, the structure will, in nearly every instance survive the wind event.

Damages associated with wind result from either wind pressure or wind borne debris. Wind pressure will always be present on the exterior of the building during a wind event and limited damages associated with wind scour are to be expected. However, wholesale failure of the envelope and/or structure result when the building envelope becomes breached, most often by wind borne debris, and the wind pressure is allowed to then enter the structure.

Wind Pressure

Wind pressure resulting from a high wind event, such as a hurricane, is developed by the rapid movement of air toward, away from, over and around objects. The wind pressures that act on a building's exterior envelope are determined based on the building's size, configuration, exposure and surrounding topography.



Wind, like water, can develop greater speed, and hence greater pressure, when the upwind areas are free of obstructions. In addition, pressures acting on the face of a building will vary depending upon the location of interest within the respective face of the building. For example, wind pressures will be greater at the corner of the wall than at the center of the wall.

Highly susceptible systems not part of the building envelope include aluminum screen enclosures and roof-top fixtures. Highly susceptible building envelope components include roof coverings, overhead doors and some claddings.

- **Systems And Components Highly Susceptible To Wind Pressure Damage**
 - Aluminum Screen Enclosures
 - Roof Fixtures, Gutters And Antennas
 - Aged Or Deteriorated Roof Coverings
 - Older Windows & Overhead Doors
 - Aged Or Deteriorated Claddings
- **Systems And Components Moderately Susceptible To Wind Pressure Damage**
 - Unsecured Roof Gable Ends
 - Unsecured Tile Roof Covering
 - Deteriorated Wood Frame Construction
 - Soffits and Overhangs
 - Storefront & Picture Windows

Wind Borne Debris

While breaches within a building's envelope can occur as a result of deficient design or aged and deteriorated construction, the most common cause of breaches within a building's exterior envelope is wind borne debris.



Wind-borne debris can be anything that the high speed winds of a hurricane can lift and carry. Debris can take the form of unsecured items left in the yard to those building components removed from upwind structures. Wind borne

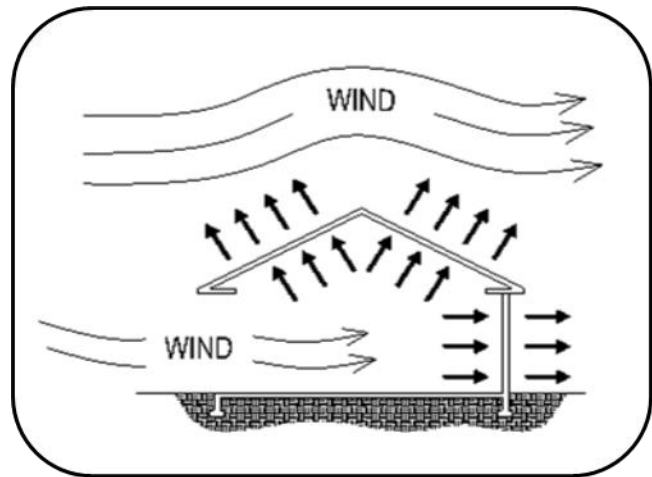
debris typically causes the greatest amount of damage to aluminum screen enclosures, tile roofs, and unprotected openings in buildings.

- **Systems And Components Highly Susceptible To Wind Borne Debris Damage**
 - Aluminum Screen Enclosures
 - Non-Impact Rated Storefront Glass
 - Non-Impact Rated Picture Windows
 - Non-Impact Rated Sliding Glass Doors
- **Systems And Components Moderately Susceptible To Wind Borne Debris Damage**
 - Tile Roof Coverings
 - Metal Building Components and Roofing
 - Older Unrated Shutters
 - Older Overhead Doors

Building Envelope Breaches

Protection of a building's larger openings (windows, sliding glass doors, overhead doors and gable roof ends) is without a doubt the most important thing that a building owner can do to prevent wholesale failure.

Breaches in the building envelope result in internal pressurization of the structure similar to air being blown into a balloon. Given that most structures are designed to withstand external pressures but not internal pressures, it follows that once the air is able to enter the structure the pressure will build until ultimately the roof or other portions of the structure will fail.



Breaches and ensuing failures within the building's exterior envelope will also lead to damage resulting from water intrusion. Specifically, as portions of the building envelope fail the interior is no longer protected from the elements and wind driven rain is free to enter. Even limited failure of the building's exterior envelope can result in significant damage to interior spaces and or contents.

Protection

Therefore, protection of the building's larger openings (windows, sliding glass doors, overhead doors and gable roof ends) is critical to preventing wholesale failure. Protections against building envelope failure resulting from wind pressure include:

- Older Windows & Overhead Doors – Investigate what reinforcing options exist and replace when able
- Unsecured Roof Gable Ends – Secure in place and fortify from within the attic space
- Deteriorated Wood Frame Construction – Restore and reconstruct as necessary so as to return the structure to its original construction condition
- Soffits and Overhangs – Secure and replace as necessary

Protections against building envelope failure resulting from wind borne debris include:

- Non-Impact Rated; Storefront Glass, Picture Windows or Sliding Glass Doors – Install a shutter system capable of resisting both debris impact and anticipated design wind pressures
- Older Unrated Shutters Doors – Remove and replace with a shutter system capable of resisting both debris impact and anticipated design wind pressures

To further minimize building envelope damages resulting from wind and/or wind borne debris include:

- Aged Or Deteriorated Roof Coverings – Remove and replace roof coverings with appropriate wind rated roof coverings

- Unsecured Tile Roof Covering – Remove and replace roof coverings with appropriate wind rated roof coverings
- Aged Or Deteriorated Claddings – Remove and replace roof coverings with appropriate wind rated roof coverings

Closing

By identifying and protecting those components of the building's exterior envelope that are the most susceptible to wind damage, wind pressure is prevented from entering the structure thereby insuring its survival in a wind event. In other words, when the building's envelope is protected and wind pressure is prevented from entering, the structure will, in nearly every instance survive the wind event.