Building Codes and Mitigation Activities Related to Weather Catastrophes


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IBHS Mission:
“To conduct objective, scientific research to identify and promote effective actions that strengthen homes, businesses, and communities against natural disasters and other causes of loss.”
Areas where Building Codes Require Engineering Based High-Wind Residential Construction

Location of Wind Damage Reports in the US, 2012*

There were 14,351 “Wind Damage” reports through Dec. 31, causing extensive damage to homes and businesses.

Hurricane Sandy resulted in a large volume of wind damage reports.
Location of Large Hail Reports in the US, 2012*

There were 7,033 “Large Hail” reports through Dec. 31, 2012, causing extensive damage to homes, businesses and vehicles.

Location of Tornadoes in the US, 2012*

1,119 tornadoes killed 68 people through Dec. 31.
Engineering Based High-Wind Codes Can Make a Difference in Certain Areas

- Plus: American Samoa, Guam, Hawaii – special wind regions, Puerto Rico, Virgin Islands

Claim Frequency by Age of Home

Average = 41%
Average = 17%

Year of Construction
1995 High Wind Standards
Effect of Engineering Based Design and Construction on Claim Frequency and Severity - Residential

Pre 1996:
- $24/sf
- 41 claims/100 policies

1996 - 2004:
- $14/sf
- 17 claims/100 policies

-42%  -60%

Pre 1996:
- 4,453 Policies
- 1,843 Claims

1996 – 2004:
- 1,151 Policies
- 192 Claims

Amount of Roof Damage

Pre 1996 1996 - 2004

Building Code Category

- No Roof Damage
- Partial Covering
- Whole Covering
- Whole Covering with Decking

% of Total Claims

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Interior Damage and ALE by Year of Construction

The Good News from Hurricane Research

- Newer engineering-based wind design standards can produce buildings that perform well structurally
  - In Hurricane Charley
    - No loss of whole roofs on homes built to new standards
    - No documented loss of roof sheathing from homes built in the last 5 years
    - No structural failures except for screen enclosures, carports and add-on structures
    - No post 1997 homes where families out for > 1 month
The Bad News about Building Performance in Hurricanes

Building Envelope Performance Issues Remain Key to Further Reductions in Losses

- **Roof coverings** are still a major problem area (95+% of homes with claim had roof covering damage)
- 75% of homes with claims had some soffit damage (**vinyl and aluminum soffits**)
- When gust wind speeds exceeded 120 mph, approximately 1/3 of homes without shutters had at least one broken window – UF study of Hurricane Charley Damage.

Characteristics of an Extreme Weather Resistant Building

- Properly installed wind/impact rated building envelope products
- Minimize water intrusion
- Protection of openings – windows and doors (primarily hurricane)
- Continuous load path from roof to foundation
Helpful Provisions of Building Codes Used in the Middle of the Country (weather related)

- Wind rated asphalt shingles required (2003 and later editions of IRC)
- Pressure ratings of windows, doors, & garage doors may be checked (enforcement?)
- Minimal strapping requirement for roof-to-wall connection if trusses are used (2006 & 2009 IRC)
- Appropriate strapping required for roof-to-wall connections when loads >200 lbs (2012 IRC)

When Engineering Based High-Wind Standards are not Used

- Current construction practices produce brittle buildings that are very poorly connected
  - Strength already paid for is wasted
  - Typical construction = a house of cards
  - Little or no attention to selecting wind rated products or to careful installation
Continuous load path

Continuous Load Path To Resist Uplift Forces

Roof to Wall Connection
- Roof member to top plate connections
- Top plate to stud connections

Upper Wall to Lower Wall Connection
- This connection is not required for a single-story home.

Lower Wall to Foundation Connection
- Shear to sill plate connections
- Sill plate to foundation connections

- These connections are not required for uplift but may be required to transfer shear loads.

Re-Roofing = Opportunity for Improvement

- Roof cover is first Line of defense against many natural hazards
- Is part of building that gets replaced / repaired most frequently
- When roof cover is replaced - simple but significant low-cost improvements are possible
  - Re-fasten sheathing
  - Seal roof deck
  - Installing wind-resistant, fire-resistant and/or impact-resistant roof cover
Loss of Roof Sheathing Allows a Tremendous Amount of Water to Enter

Older Attachment Schedules were Grossly Inadequate

New High-Wind Schedules Still Inadequate

What to do if you are replacing your roof covering

Options if you have access to your attic
Re-nailing Deck

If existing fasteners are 8d or larger smooth shank nails:
- Add 8d ring-shank nails as indicated to bring to 6” edge and 6” field spacing of fasteners.

Roof Covering Failures

95% of Homes w/ Claims
52% of $ in Claims
Water Intrusion: Exposed Roof Sheathing

Water Intrusion Video
Wind-Driven Water Intrusion Research

**Duplex damage estimates**

Unsealed roof deck side = $16,935  
Sealed roof deck side = $5,408

Sealed Roof Deck
Sealed Roof Deck

Water Intrusion through Soffits

Covered

Open
Water Intrusion: Gable End Vent

At a wind speed of 30 mph+
Water Entry Rate for Open Vent = Wind-driven Water Deposition Rate

Achieving Shared Goals

Getting consumers, designers, builders, contractors, policyholders, and lenders to recognize the benefits of resilient construction.

FORTIFIED homes can lower the total cost of ownership and reduce risk for vulnerable clients.
IBHS Voluntary, Superior Construction Standards

Risk-specific New and Existing Homes
Designation Level Basics - Hurricane

- FORTIFY Roof and Attic Ventilation System
- FORTIFY the Openings
- FORTIFY the Structure

Why FORTIFIED? ... Because little things matter
FORTIFIED Roof – Roof Covering Shingles

Meets standards

FORTIFIED Gable Ends

Meets standards
Does not qualify
FORTIFIED Estimate Using Xactimate

- Comparing code compliant re-roof with FORTIFIED Roof
  - Pricing for Tampa
  - 1400 s.f. roof
  - Simple Gable with turned gable
  - Shingle roof cover

Difference approx. +$700

FORTIFIED Home™ Project Cost: Actual

Upgrading to FORTIFIED Bronze on this home cost less than $800
IBHS FORTIFIED for Existing Homes Program Windstorm Loss Relativities in RMS US Hurricane Model

- Analysis of wood or masonry residential construction in high-hazard areas in Florida.
- Relativities for other locations and configurations may be different than those shown here.

High Wind Commercial Construction Test

Full-scale, strip mall-type structures

Test was designed to demonstrate that building performance can be significantly improved in several key areas with relatively modest increases in costs.
Focus areas included:

- Perimeter edge flashing and roof membrane anchorage
- Load path and connections
- Roof-mounted equipment anchorage
- Roll-up door wind resistance

Cost Differences to Create Stronger Building

- Flashing and membrane attachment enhancements: $850
- Roll-up Door – wind locks: $350
- Wall reinforcing and concrete (to code): $1,250
- Anchorage of roof top equipment: $650

TOTAL (without “to code” costs) $1,850
Result: $44,769 vs. $4,660

10 times more damage to “Common” than “Stronger” building

Narrowing the path of damage
DHS Pilot Program

FORTIFIED is only qualifying standard for Pilot

Pilot began Q1 2014

Thank you.

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