



The Florida Building Code

Florida's Response to Hurricane Risk

Rick Dixon

Florida Building Commission

Florida Building Commission

- Architect
- Structural Engineer
- Mechanical Engineer
- Fire Protection Engineer
- AC or Mechanical Contractor
- Electrical Contractor
- Plumbing Contractor
- General Contractor
- Roofing Contractor
- Residential Contractor
- Swimming Pool Contractor
- Manufactured Building Rep
- Building Products Manufacturer
- Green Building Industry Rep
- Governor Appointed Chairman
- Three Municipal Building Officials
- One County Building Official
- Department of Financial Services Representative
- Persons with Disabilities Rep
- League of Cities Representative
- Building Owners and Managers Rep
- Insurance Industry Representative
- Public Education Representative

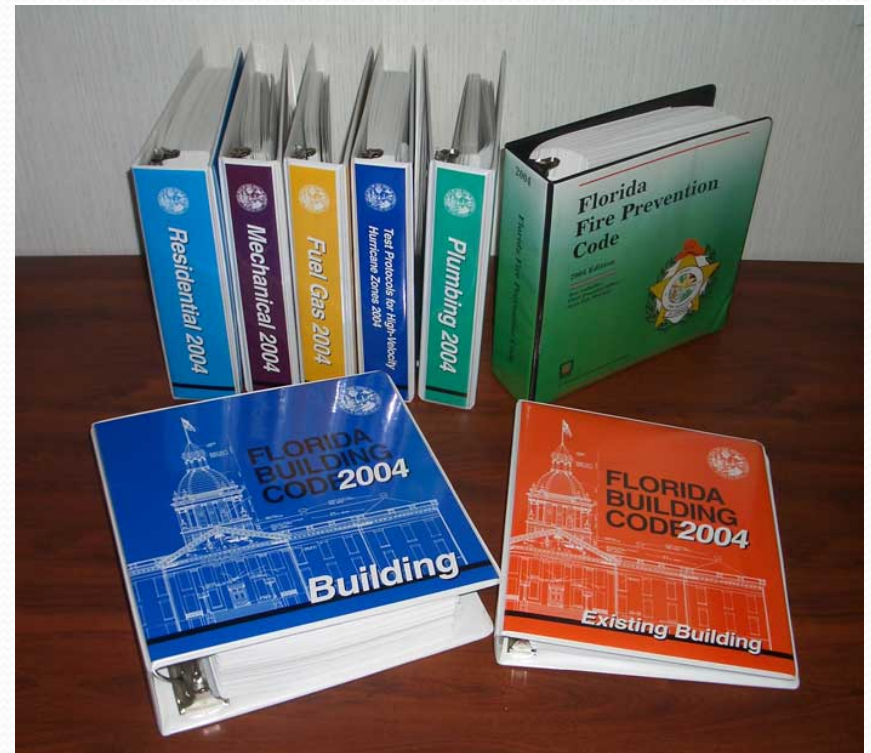
The Commission is Responsible for:

- Updating the Florida Building Code Triennially
- Interpreting the Code
- Maintaining a Product Approval System

Florida Building Code

Includes Multiple Volumes

- Building
 - Residential
 - Existing Building
 - Plumbing
 - Mechanical
 - Fuel Gas
 - Electrical
 - Energy and Accessibility
- Coordinated with the Florida
Fire Prevention Code



Code Characteristics

- Based on National Model Codes –
 The International Code Council's family of codes
- Updated every 3 years
- Can be Amended at any time to fix “Glitches”
- Modified for Florida Specific Needs
- Numerous Additions for Hurricane Protection
- Primary Wind Engineering Standard, ASCE 7-2005
- Alternative Design Methods Derived from ASCE 7 are allowed

Hurricanes and Florida Building Codes

1940's-50's hurricanes led to the South Florida Building Code in Dade and Broward Counties

1960's hurricanes and 1970's booming growth led to the state mandate for local adoption and enforcement of the State Minimum Building Code

1970's-80's hurricanes and coastal environmental concerns led to the hurricane protection specific "Coastal Building Code"

1990's hurricanes led to first statewide wind engineering code and the consensus exercise that authorized the Florida Building Code, the first State controlled code

2002 the State developed Florida Building Code preempted local codes

Building Codes Before 1993

- Before the mid-1970's building codes were a local option
- 1974 Florida law required local adoption, amendment and enforcement of State selected model codes - “State Minimum Building Code”
- Two main codes were adopted and enforced locally
 - South Florida Building Code – Dade and Broward Counties
 - Standard Building Code – Everywhere Else
- Hurricane protection requirements were derived empirically and provided “prescriptive” specifications for indigenous construction types

1986 Coastal Building Zone and Code

- Coastal beach and dune systems were damaged by construction practices
- Rapid development of coastal land increased risks to the public and local, state and federal governments
- The first engineering design based codes were applied to the coastal rim requiring elevated and wind resistant buildings
- The State regulated part of the zone and local governments the remainder
- The State began development of a “deemed-to-comply” prescriptive standard based on the engineering standard

1992 Hurricane Andrew !

- The first major test of the locally managed building code system and non-indigenous construction of the 1970'-80's boom
- The best hurricane code in the USA failed!
- Reaction was swift and demonstrative statewide

Miami-Dade Response to Andrew

- Improved Roof System Requirements 1993
- Major structural and building component upgrades 1994
 - Engineered design using ASCE 7-1988 required
 - New building product wind testing standards implemented
- Building Product Approval System Expanded and Enhanced

State of Florida Response to Andrew

1993

- New law requiring Licensing/Certification of Local Government Building Code Enforcement Officials
- Florida Board of Building Codes and Standards Adopts the “Deemed to Comply” Standard initiated in 1986 as the Minimum Standard for Wind Design Throughout the State Creating the First Wind Engineering Based Design Requirements in Florida building codes outside Dade and Broward

State of Florida Response to Andrew

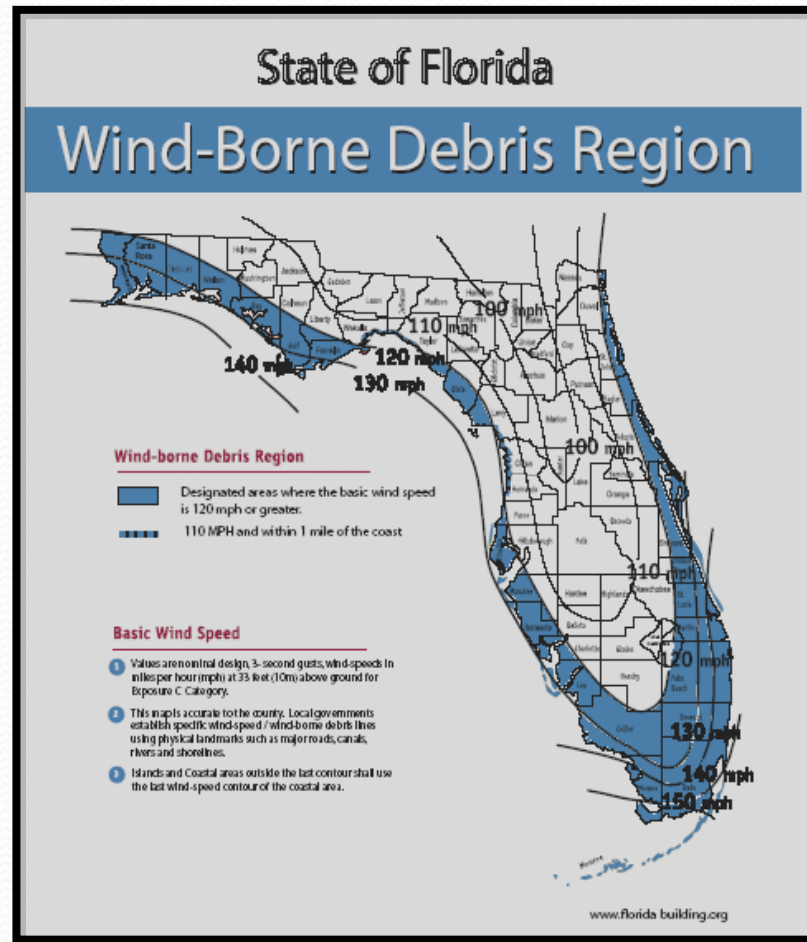
The Move to Take Over Building Codes from Local Control

- 1994- Preliminary study on a single State controlled code
- 1996- Florida Building Code Study Commission began work
- 1998- Study Commission recommendations adopted in law
- 2000- Legislature reviews Florida Building Code, modified the Code and authorized implementation
- 2002- All legal challenges resolved, the 2001 FBC takes effect March 1
- 2004- Hurricanes Charley, Frances, Jeanne and Ivan

2002, Florida Building Code Improvements

- Higher design wind pressures in South Florida and most coastal areas
- Wind-borne debris protection of windows in all coastal areas and South Florida
- Improved roof covering systems requirements
- Product approval system to ensure products comply with wind resistance and impact resistance requirements
- Improved window performance labeling requirements to improve enforcement of the code

Window Protection Requirement



Impact of Pre-1974 Florida Codes

Codes such as the South Florida Building Code were developed empirically and were appropriate to the construction practices they were based on. However, they are reactive and only adjusted for new construction methods after hurricanes revealed failures

Impact of Post-1993 Florida Codes

Overall –

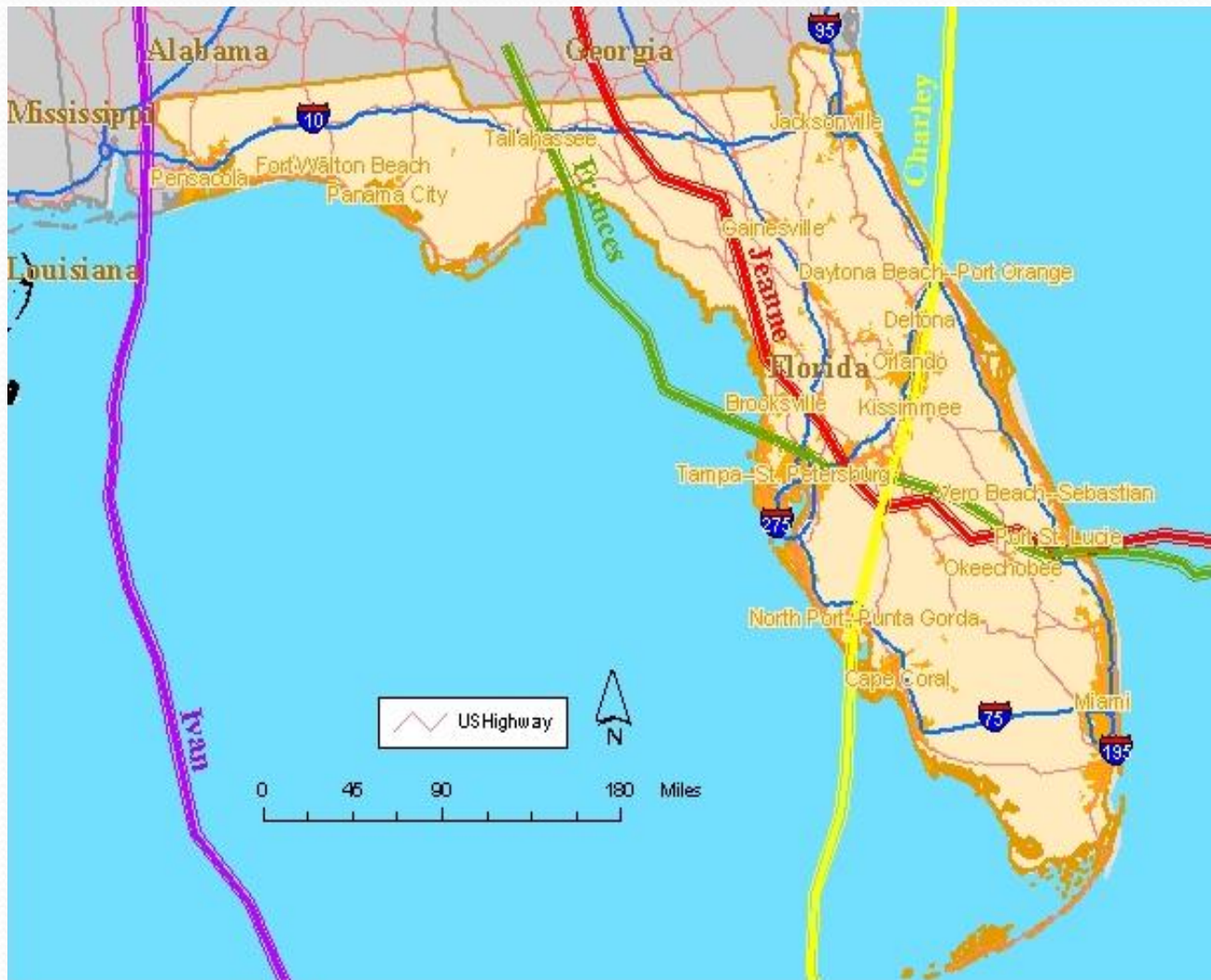
Most Catastrophic Structural Failures of Buildings Due to Wind Pressure Were Resolved

- Gable end failures were resolved with bracing criteria
- Wood frame wall racking failures were resolved by bracing with a complete layer of plywood sub-sheathing
- Pulling apart at roof-to-wall, wall-to-wall and wall-to-foundation intersections were resolved by metal connector requirements for wood walls and reinforced concrete column and beam requirements for concrete block walls to create a “continuous load path”
- Roof deck detachment failures were resolved by enhanced nailing requirements

2004 and 2005 Hurricane Seasons

Charley	High Winds, Fast Moving, Moderate Rain
Jeanne	Moderate Winds, Slow Moving, Heavy Rain
Francis	Moderate Winds, Slow Moving, Heavy Rain
Ivan	Coastal High Winds and Storm Surge Event
Wilma	Moderate Winds, Fast Moving, Moderate Rain
Dennis	Coastal Moderate Winds and Storm Surge Event

2004 Hurricanes



Lessons for Post 1993 and Pre-Florida Building Code Houses

- Catastrophic structural failures generally solved *HOWEVER*
- Building components and claddings continued to fail
 - Roof coverings – Asphalt Shingle and Roof Tiles
 - Exterior Insulation and Finish Systems – EIFS
 - Vinyl Siding
 - Windows and Entry Doors
 - Garage Doors
- Aluminum screen enclosures and structures continued to fail

Lessons for 2001 Florida Building Code Houses

Successes:

- No Catastrophic Structural Failures
- Windows and Doors Resisted Wind Pressures Better
- Garage Doors Resisted Wind Pressures Better
- Window Protection Reduced Wind-Borne Debris Damage
- Shingle Roof Covering Performed Better
- Metal Roof Coverings Performed Well
- Overall, the Building Structure Performed Well in High Winds and Components and Cladding Wind Resistance Were Improved

HOWEVER

Several Problems Were Identified

Lessons for 2001 Florida Building Code Houses

Problems Identified:

- Roof Tile Detachment at Hips, Ridges and Eaves
- Extensive Soffit Damage
- Better Aluminum Screen Enclosure Performance *but* Still Failures
- Wind-Borne Debris
- Water Intrusion
 - At the interface of first story masonry and second story wood walls
 - At attic vents
 - At the interface of windows and doors to walls
 - Through windows
 - Through masonry walls

Florida Building Code Improvements 2004 - 2007

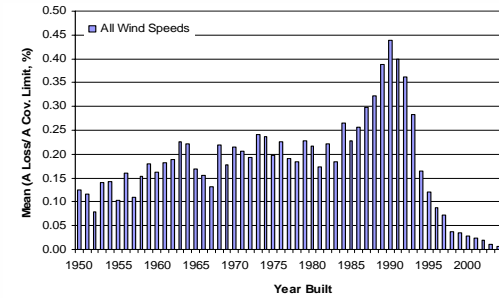
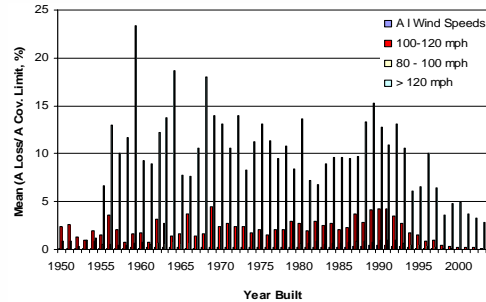
- Improved requirements for wood to masonry wall interfaces
- Allow unvented attics under certain conditions
- Improved requirements for roof tile attachment
- Adopt standard that rates asphalt shingles based on wind speed
- Require improving roof deck nailing when reroofing
- Adopt wind pressure criteria for soffits
- Adopt requirements for labeling of windows, garage doors and shutters for wind pressure
- Eliminate partially enclosed design option
- Amend panhandle wind-borne debris requirement

Research and Future Code Improvements

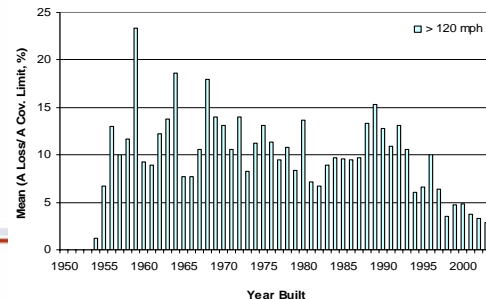
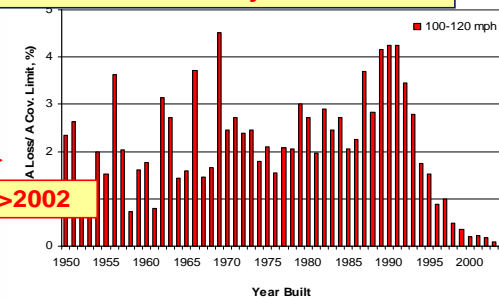
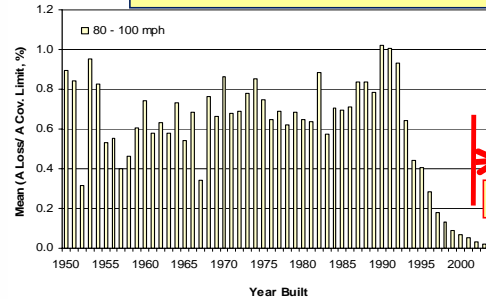
- Improved Window Water Leakage Standard
- Improved Window/Wall Interface Construction Criteria
- Improved Soffit Installation Requirements
- Soffit Water Leakage Test Standard
- Improved Understanding of Wind-Borne Debris Characteristics and Window Protection Systems Capacities
- Improved Analytical Models for Wind Effects in Treed and Open Terrain and at the Water to Land Interface
- Improved Analytical Models for Wind-Borne Debris Characteristics and Impacts
- Wind Tunnel Testing for Wind Pressure Characteristics on Structures
- Large Scale and Full Scale Testing of Building Assemblies and Buildings
- Advancement of Roof Covering Systems Attachment and Wind Resistance
- Improved Prediction of Wind Speeds for Building Design Standards

Impact of Florida Building Codes

Mean Loss vs Year Built



There is a noticeable reduction in loss for recently built homes.



>120 mph winds include some envelope failures.



Summary

- The State Building Codes have a dramatic impact on reducing hurricane damage and losses
- Beginning with the first wind engineering standards based codes in the mid-1990's and improving steadily over time
- Catastrophic structural failures as seen in Hurricane Andrew have been solved
- Performance of roofing systems that reduce water damage have improved significantly
- Other components and cladding resistance to wind have improved and steps have been taken to improve resistance to water intrusion
- Component and cladding performance can be improved more with improved understanding of wind characteristics and its effect on building surfaces
- Research and code evolution are continuing