



# FACTS & ISSUES

March 2009

League of Women Voters of the Houston Area Education Fund

## COASTAL BUILDING CODES

### Introduction

Hurricane IKE, which hit Houston in 2008 causing widespread destruction, has spurred attention to the status of building codes in Texas coastal areas. This study speaks to those issues. A significant number of different building codes are used in residential and commercial construction; for example, the City of Houston uses the following:

- 2000 International Residential Code (IRC)
- Amendments to the Chapter 11 Energy Efficiency of the 2000 IRC. - Effective January 1, 2009
- 2003 International Building Code (Updated 01/06/06)
- 2000 Uniform Mechanical Code
- 2000 Uniform Plumbing Code
- 2008 National Electrical Code
- 2000 International Fire Code
- 2008 Commercial Energy Conservation Code
- 2006 International Energy Conservation Code  
(For Residential Structures) Effective January 1, 2009

The difficulty is that every level of government may use different codes! As we are interested in codes that apply to coastal areas, codes dealing with structural issues are the focus of this paper.

### State of Texas

The first statewide residential building code was adopted in Texas in 2001 and incorporated into the Texas Residential Construction Commission Act. The Act specifically sets the International Residential Code (IRC) as the one to be followed in both municipalities and unincorporated areas of the counties, although municipalities may set stricter standards. Section 214.212, Local Government Code, states that the International Residential Code as it existed on May 1, 2001, is adopted as the municipal building code of the state. Thus, the 2000 version of the International Residential Code was the one adopted.

However, Section 214.216, Local Government Code, states that the International Building Code "as it existed on May 1, 2003, is adopted as a municipal commercial building code in this state."

Title 16 of the Property Code, Section 430.001(d) states:

"(d) The International Residential Code for One- and Two-Family Dwellings that applies to nonelectrical aspects of residential construction for the purposes of the limited statutory warranties and building performance standards adopted under this section is:

- (1) For residential construction located in a municipality or the extraterritorial jurisdiction of a municipality, the version of the International Residential Code applicable to nonelectrical aspects of residential construction in the municipality under Section 214.212, Local Government Code;

- (2) For residential construction located in an unincorporated area not in the extraterritorial jurisdiction of a municipality, the version of the International Residential Code applicable to nonelectrical aspects of residential construction in the municipality that is the county seat of the county in which the construction is located.”

An example would be that the unincorporated areas of Harris County would have to follow the codes adopted for Houston, since Houston is the “municipality that is the county seat of the county in which the construction is located.”

Section 214.212 of the Local Government Code also states that a municipality may establish its own amendments to the International Residential Code:

“(c) A municipality may establish procedures:

- (1) To adopt local amendments to the International Residential Code; and
- (2) For the administration and enforcement of the International Residential Code.”

### **City of Houston**

Currently, the City of Houston is following the 2000 IRC with Houston Amendments, though it is working through the 2006 IRC for municipal updating. Houston is also currently using the 2003 International Building Code and the 2008 National Electrical Code, both required by Texas law.<sup>1</sup>

An important part of the Houston Amendments relates to wind speed. While Houston is in the wind speed area of 90-110 mph, the amendments indicate that the entire city is to be constructed using the 110 mph speed:

“**R301.2.1.1 Design Criteria.** Construction in regions where the basic wind speeds from Figure R301.2 equal or exceed 110 mph (177.1 km/h) shall be designed in accordance with one of the following:

1. American Forest and Paper Association (AF&PA) Wood Frame Construction Manual for One- and Two-Family Dwellings (WFCM); or
2. Southern Building Code Congress International Standard for Hurricane Resistant Residential Construction (SSTD 10); or
3. Minimum Design Loads for Buildings and Other Structures (ASCE-7); or
4. Cold-formed steel construction shall be designed in accordance with the provisions of this code.
5. Appendix L - Conventional light frame wood construction for high wind areas.”<sup>12</sup>

Additional criteria are shown in the following table:

**TABLE R301.2(1)  
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA**

ROOF SNOW LOAD	WIND	SEISMIC DESIGN CATEGORY <sup>a</sup>	SUBJECT TO DAMAGE FROM				WINTER DESIGN TEMP <sup>b</sup>	FLOOR HEADS <sup>c</sup>
	Speed <sup>a</sup> (mph)		Weathering <sup>a</sup>	Frost line depth <sup>a</sup>	Termite <sup>a</sup>	Decay <sup>a</sup>		
<u>0</u>	<u>110</u>	<u>Δ</u>	<u>Negligible</u>	<u>6"</u>	<u>Very Heavy</u>	<u>Moderate to Severe</u>	<u>28° F.</u>	

The Houston Amendments to the 2003 International Building Code also specify 110 mph.

The City of Houston has over 250 inspectors in its Code Enforcement Group and regulates all construction outside of right-of-ways within the city limits.<sup>2</sup> Four inspections are required:

- Foundation - To ensure the structural integrity of the foundation
- Wind storm - To verify the use of wind straps
- Frame - To ensure the structural integrity of the frame (Energy polyseal, Bricktie, or Lath inspections are subsets of the frame inspection that may need to be performed separately)
- Final - To ensure full compliance with the building code

### **County of Harris and the Texas Residential Construction Commission**

Harris County has only one building code that relates to fire and does no inspections except those relating to fire. As of September 1, 2008, residential inspections in an unincorporated area and in other areas not subject to municipal inspections are required by the Texas Residential Construction Commission (TRCC). (*Property Code, Title 16, Subtitle F, Ch. 446*)

The TRCC is comprised of nine members appointed by the Governor: four registered builders, three members of the general public, one engineer who practices in the area of residential construction, and one either architect or inspector who practices in the area of residential construction. TRCC members serve six-year staggered terms.

The TRCC requires new home construction to have three inspections:

- Prior to pouring of the foundation
- Prior to the installation of wall coverings for plumbing, electrical and mechanical inspections
- At substantial completion of the project

Since Harris County comes under the City of Houston Building Code (as the county seat is in Houston), the residential building code that is used in these areas is the 2000 International Residential Code with Houston Amendments.

Inspections of both new residential buildings and buildings that are being remodeled are done by “professional third-party inspectors,” who are paid by the builder/remodeler. Additionally, builders and remodelers are required to register with the TRCC. The TRCC “does not audit fee inspectors; however, builders and remodelers must keep inspection records. The commission randomly conducts audits on builders/remodelers once a year to verify inspection documentation ensuring that inspections were performed according to applicable codes and commission rules. However, if audit results show that a fee inspector repeatedly did not comply with the commission rules or apply the applicable code to construction projects inspected, the commission may withdraw the fee inspector’s registration.”<sup>3</sup>

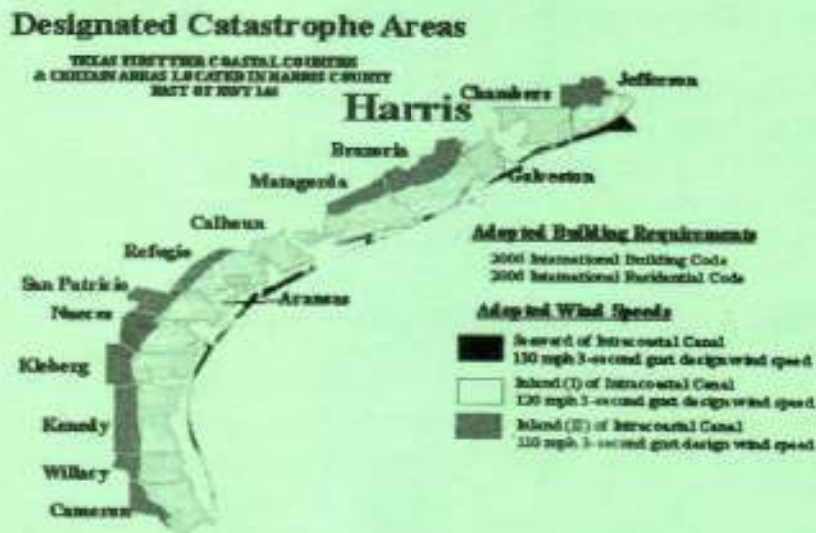
### **Texas Windstorm Insurance Association**

Building codes in some coastal areas are governed by the Texas Department of Insurance through the Texas Windstorm Insurance Association. The Texas Windstorm Insurance Association was created in 1971 in response to the aftermath of Hurricane Celia. It provides insurance to those in “designated catastrophe areas.”

Section 2210.005 of Title 10 of the Insurance Code states:

“DESIGNATION AS CATASTROPHE AREA OR INADEQUATE FIRE INSURANCE AREA; REVOCATION OF DESIGNATION. (a) After at least 10 days’ notice and a hearing, the commissioner may designate an area of this state as a catastrophe area if the commissioner determines that windstorm and hail insurance is not reasonably available to a substantial number of the owners of insurable property located in that territory because the territory is subject to unusually frequent and severe damage resulting from windstorms or hailstorms.”

The designated catastrophe areas are shown below:



Additionally, Sec. 2210.209 provides for "WINDSTORM AND HAIL INSURANCE: COVERAGE FOR CERTAIN PROPERTY LOCATED OVER WATER. (a) A windstorm and hail insurance policy issued by the association may include coverage for: "a building or other structure located in the seacoast territory that is built wholly or partially over water..."

As can be seen by the above map, the counties in the "catastrophe" area are: Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kenedy, Kleberg, Matagorda, Nueces, Refugio, San Patricio, and Willacy. Only five municipalities in Harris County are included: La Porte, Morgan's Point, Pasadena, Seabrook, and Shoreacres. These counties are also identified as "first tier" counties.

However, all of Harris County is part of the "seacoast territory," which includes the second tier coastal counties of: Bee, Brooks, Fort Bend, Goliad, Hardin, Harris, Hidalgo, Jackson, Jim Wells, Liberty, Live Oak, Orange, Victoria and Wharton. Thus, if you have a building built over water in any part of Harris County, you are eligible for windstorm insurance!

The Windstorm Association typically has from 20-23 code inspectors. This number has essentially doubled since Hurricane Ike. Also, there are over 700 fee engineers on their list of approved inspectors. In addition, there are seven staff and field engineers who oversee the code inspectors and fee inspectors. They randomly select structures to inspect, with residential structures being more frequent. Additionally, complaints lead to further oversight.

Building codes for the Texas Windstorm Association are stricter than those of the City of Houston. Instead of the 2000 International Residential Code, buildings must be built by the 2006 International Residential Code. Similarly, the 2006 International Building Code is required.

## Wind Speed

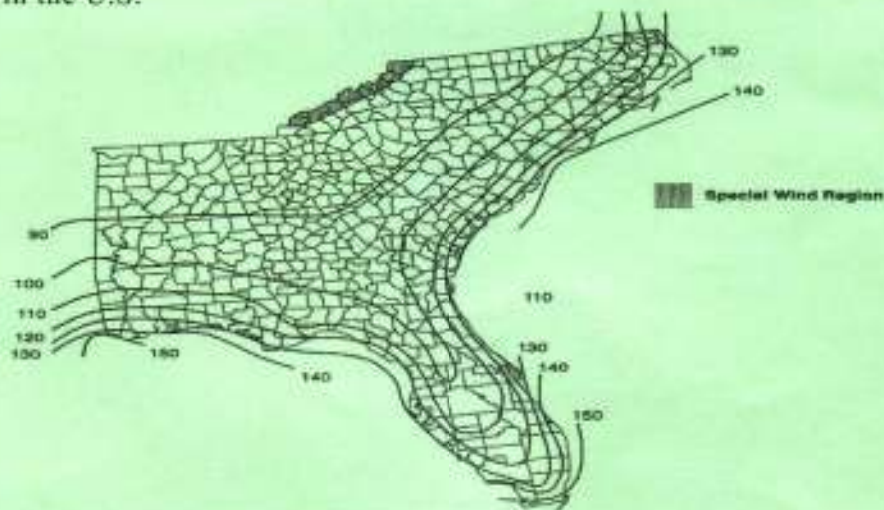
In coastal areas the speed of the wind is critical. As can be seen from the following map, building codes differ according to wind speed. Notice that the speed is calculated using "basic wind speeds for 50-year mean recurrence interval."<sup>5</sup>



For SI: 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.

- Values are nominal design 3-second gust wind speeds in miles per hour at 33 feet above ground for Exposure C category.
- Linear interpolation between wind contours is permitted.
- Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
- Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

Contrast the Texas wind speeds with those of Florida<sup>6</sup>. Miami-Dade building codes are considered the "gold standard" in the U.S.



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FIGURE R301.2(4)—continued  
BASIC WIND SPEEDS FOR 50-YEAR MEAN RECURRENCE INTERVAL

## Conclusions

Roofs and windows suffered significant damage due to Hurricane IKE, resulting in over 900,000 insurance claims. While Houston has an ongoing program of updating its building codes, the codes in force lag the new 2009 codes by at least six years. (The International codes are updated every three years.) The question is whether the codes should be more current—and required by the dozens of incorporated cities in the surrounding areas. In addition, one must consider if the 50-year averages of wind speeds is sufficient in times of global warming and accelerated change. Perhaps a trend graph would be better, or a 10- or 20-year average.

Another basic question is what standard will protect property from future storms? Is the 110 mph standard adequate? Should the "gold standard" of Miami-Dade be adopted? Testimony to the House Select Committee studying Hurricane IKE found that asphalt shingles replaced after Hurricane RITA were blown off again by Hurricane IKE. One reason was that the shingles were nailed with only four nails instead of six.

If climate change means larger hurricanes, is the Houston standard of 110 mph sufficient? Hurricane IKE was a high Category 2 storm, which has winds up to 110 mph. A Category 3 storm will produce winds up to 130 mph, which is the wind standard used by NASA in Webster. The wind maps above show that Houston is mostly in a CAT 2 zone (Winds 96-110 mph); however, the southern part of Harris County has winds of 110-120, a CAT 3 storm. Florida is mostly in a Cat 4 (winds 131-155 mph). Yet due to current law, all of Harris County building codes are for a Category 2 storm as they have to use the City of Houston codes. Should Harris County have authority for a CAT 3 storm and/or should Houston go to a CAT 3? Remember, Hurricane Rita was a CAT 5 before landing as a CAT 3.

The House Select Committee on Hurricane Ike has recommended that counties be given the authority to enact and enforce building codes, and that new buildings within 80 miles of the coast be designed to withstand a Category 3 hurricane's winds. On the same day the report was released, the board of the Texas Residential Construction Commission empowered its executive director, Duane Wadill, to seek the same authority for that agency. Consumer advocates and the staff of the Texas Sunset Advisory Commission have criticized the commission as beholden to home builders.<sup>7</sup>

We interviewed professionals who stated that one defect in the present system is the lack of inspectors, especially in areas of the county outside the city. The inspection program of the Texas Residential Construction Commission is literally a "paper tiger."

Another deficiency is that counties only have a fire code but no authority to adopt other building codes. Furthermore, in the current system if a person does not apply for a building permit, the city (and county) have no idea that construction is occurring, and can't inspect it, unless it is somehow brought to the attention of inspectors. The result is that builders in counties like Harris and Fort Bend can build substandard buildings that will incur major damage in the next hurricane-force wind event.

Another issue that is not adequately addressed by the codes is damage to windows by hurricane-force winds that result in extensive internal damage to buildings. Once wind-borne debris breaches a window, the wind rushes in, destabilizes the structure and often pulls off the roof as it exits. Hurricane IKE blew out windows in high rise buildings as far as fifty miles from the coast. Had these buildings had a protective cover over windows or security window film, millions of dollars in damages would have been avoided, sharply diminishing the damage and costs of repair. The Chase Tower was one of many buildings that lost windows in a CAT 2 storm.

Imagine the damages from a Category 3 storm. Many houses with large glass windows also had window failure, subjecting those inside to high winds, flying glass, and structural damage. Yet, some building owners/managers actually prohibit protection that would prevent windows from being blown out.

Much work needs to be done to prepare our buildings for future storms that are an annual threat.

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5. 2000 International Residential Code, p. 30
6. 2000 International Residential Code, p. 32
7. *Houston Chronicle*, Feb. 12, 2009

--Michael Fjetland and Laura Blackburn