Energy Conserving Features of New Homes In Florida

2005 - 2006

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BACKGROUND

In January 2001, the Shimberg Center for Affordable Housing entered into an agreement with the Florida Department of Community Affairs to serve as the receiving point for Florida Energy Efficiency Code for Building Construction (FEECBC) Compliance forms submitted by local building officials across the state.

Upon receipt of the FEECBC Forms, the Shimberg Center draws a random sample of 1 out of 20 (5%) of the forms for manual entry into a database. If a jurisdiction submits less than 20 forms, one form is selected at random and entered in to the database. This procedure insures representation in the database of housing markets with low levels of construction activity. However, it also results in an over-sampling of the low-activity areas and results in a sample in excess of 5 percent. The Shimberg Center then issues a periodic report summarizing the energy conserving characteristics of Florida's housing stock.

The following analyses are focused on the data captured on the FEECBC compliance forms submitted for 231 single-family homes built between late 2005 and 2006. Also included in this periodic report are summaries of the energy conserving features of 747 of Florida's multi-family housing stock built between 2004 and 2006.

As can be seen, the sample is particularly small in this reporting period. Shortly after entering 2009, the Department of Community Affairs notified the Shimberg Center that it may not be possible to continue funding for the processing of the FEECBC forms due to the current economic climate. In response to this warning, the level of effort for the manual data entry was significantly reduced. The task of receiving and processing the FEECBC forms, however, had to be continued because of the continuous receipt of the forms from across the state.

The objective of this report is to provide the Department of Community Affairs and other interested organizations with a snapshot of the single-family detached and multi-family housing built in Florida. Part I of this report addresses single-family detached homes constructed in Florida in the 2005-2006 time frame and Part II of this report addresses the multi-family housing constructed between 2004 and 2006.

CHARACTERISTICS OF THE SAMPLE

Of the 298 forms randomly chosen as the sample of single-family detached homes, 9.1 percent were from the Southern Climatic zone of Florida, 55.4 percent were in the Northern zone, and 35.6% were in the Central zone as shown in Table 1.

The 761 multi-family housing units sample included 53.3 percent from the Northern zone, 8.8 percent from the Central zone, and 37.8 percent from the Southern zone. All forms in the sample were for newly constructed single-family or multi-family residential structures.

Table 1: Distribution of the Sample
Single-Family Detached and Multi-family Housing

Year built	Climate zone	Single-family detached	Multi-family housing
2004	Central	14	nde*
2004	Northern	160	35
2005	Central	53	53
2005	Southern	27	288
2005	Northern	5	346
2006	Central	39	nde*

* nde – No data entered for this cell

PART I – SINGLE-FAMILY DETACHED HOUSING

Conditioned Floor Area

The average conditioned floor area of the of the single-family detached homes built in the Central climatic zone were the smallest with and average conditioned floor area of 2163.7 square feet. The largest home were reported in the Northern zone with and average conditioned floor area of 2687.2 square feet. (See Table 2)

Table 2 – Conditioned Floor Area – Single Family Detached Homes

Year built	Climate zone	Average Conditioned Floor area (sq.ft.)
2005	Central	2163.7
2005	Southern	2484.8
2006	Central	2293.8
2006	Northern	2687.2

Exterior Wall Type & Insulation

Presented in Table 3 are the average R-values of the insulation installed in exterior walls of different construction methods. As may be seen, the wood-frame wall system had insulation material installed with an average R-value of about R-11.0. It is interesting to note that none of the FEECBC forms included in the 5% random sample included either steel framed homes or log homes.

Table 3 – Exterior Wall Type & Insulation Level*

Year built	Climate zone	Wood frame Brick veneer R-value	Concrete R-value	Wood frame R-value
2005	Central	4.1	4.5	11.3
2005	Southern	4.6	4.3	nde*
2006	Central	5.0	4.1	11.0
2006	Northern	nde*	nde*	nde*

***** nde – no data entered

Window Glazing

Table 4 presents the percent of homes that were constructed with various types of fenestration glazing. As may be seen, builders in a given region made window purchases independently resulting in a market for all types of window features. That is, the window glazing choices in a given Climate Zone appear to reflect traditional practice on the part of the specific builder. That is, the choice of fenestration features is likely related more to pricing than to climatic conditions.

Table 4 – Window Glazing

Year built	Climate zone	Single pane Clear glass	Double pane Clear glass	Single pane Tinted glass*	Double pane Tinted glass*
2005	Central	69.3%	67.9%	56.5%	58.8%
2005	Southern	11.7%	14.3%	2.2%	11.8%
2006	Central	16.9%	16.7%	39.1%	29.4%
2006	Northern	2.2%	1.2%	2.2%	0.0%

* - Indicates that the glass may be tinted, covered with a film, or covered by a solar screen.

Ceiling Insulation Under Attic

Presented in Table 5 are the average attic floor insulation levels installed in new single-family detached homes constructed in Florida in 2005 and 2006. As may be seen, these attic insulation levels are quite consistent across the state.

Table 5 - Ceiling Insulation Under Attic

Year built	Climate zone	Average R-value
2005	Central	25.9
2005	Southern	25.2
2006	Central	26.5
2006	Northern	nde*

*nde – No data entered

Supply Air Duct & Air Handler Location

Supply air duct and Air Handler location in single-family detached housing constructed in 2005 and 2006 is presented in Table 6. The percentage values shown in the table indicate the percent of homes built reporting that Supply Air ducts or Air Handler were located in the Attic, Garage, or in an Interior space.

Table 6 – Supply Air Duct & Air Handler Location

Year built	Climate zone	Attic	Garage	Interior
Supply air ducts				
2005	Central	5.1%	63.3%	31.6%
2005	Southern	1.9%	1.9%	96.2%
2006	Central	0%	79.7%	20.3%
2006	Northern	20.0%	40.0%	40.0%
Air handler				
2005	Central	12.2%	34.1%	53.7%
2005	Southern	0%	4.3%	95.7%
2006	Central	*nde	*nde	*nde
2006	Northern	*nde	*nde	*nde

* - No data entered

The Supply duct and return duct locations are interesting but the more important consideration is whether the locations are in a conditioned environment. It is relatively safe to assume that a Garage and an Attic location are unconditioned. Table 6 provides the answers to the question of whether the Air Ducts are in an unconditioned space.

Table 6 – Conditioned versus Unconditioned Duct Locations

Year built	Climate zone	Supply Ducts Unconditioned	Return Ducts Unconditioned
2005	Central	80.0%	49.8%
2005	Southern	10.0%	0.5%
2006	Central	0%	48.8%
2006	Northern	10%	1.0%

Central Air Conditioning System

Presented in Table 7 are data describing the average capacity and average Energy Efficiency Rating (EER) of the central air conditioning systems installed in new homes.

Table 7 – Average Capacity and EER of Central Air Conditioning Systems

Year built	Climate Zone	Capacity in Btuh	Avg. EER
2005	Central	41.4	11.9
2005	Southern	49.0	12.2
2006	Central	41.9	12.3
2006	Northern	45.3	10.9

Space Heating Equipment

The FEECBC Compliance form captures three types of heating system equipment: Heat pump, Electric strip, and Natural gas. Presented in Table 8 is a summary of the incidence of each of the three types of heating systems. The values presented in Table 8 represent the percent of homes built with each of the three heating systems.

Table 8 – Space Heating Equipment Installed

Year built	Climate zone	Heat pump	Elec. strip	Natural gas
2005	Central	80.9%	20.6%	100.0%
2005	Southern	0%	79.4%	0%
2006	Central	16.2%	0%	0%
2006	Northern	2.9%	0%	0%

Domestic Water Heating (DWH)

The energy powering domestic water heating systems in Florida is dominated by the electricity as shown in Table 9. The values presented in Table 9 are the percentages of homes that had the indicated DWH system installed.

Table 9 – Domestic Water Heating System Energy Source

Year built	Climate zone	Electric	Nat. gas	LP Gas
2005	Central	89.3%	8.8%	1.9%
2005	Southern	100%	0%	0%
2006	Central	100%	0%	0%
2006	Northern	100%	0%	0%

Domestic Water Heating (DWH) Capacity & Efficiency

Presented in Table 10 is the average capacity in gallons of the DWH systems installed in new single-family detached homes in 2005 and 2006 as well as the average efficiencies associated with the DWH system.

Table 10 – DWH Capacities and Efficiencies

Year built	Climate zone	DWH Capacity (in gal.)	DWH system Efficiency
2005	Central	46.1	0.86
2005	Southern	53.6	0.89
2006	Central	41.3	0.91
2006	Northern	59.2	0.92

Glass/Floor-Area Ratio

The ratio of the square feet of fenestration glass to the conditioned floor area of a home is a value that typically ranges from 0.12 to 0.18. The higher the ratio value the more glass area can be expected in the home. The statewide ratio for 2005 and 2006 was 0.18 with slight variation as shown in Table 11.

Table 11 – Ratio of Glass-Area to Floor-Area

Year built	Climate zone	Glass area/ Floor area
2005	Central	0.144
2005	Southern	0.177
2006	Central	0.151
2006	Northern	0.156
	Statewide	0.180

HVAC Credits

Evaluation of a building's degree of compliance with the Florida Energy Efficiency Code for Building Construction provides for credits for the inclusion in the building of certain energy conserving technologies. The five features for which credit was issued for single-family detached homes were: 4.0% of the homes in the sample included Ceiling Fans: 17.1% of the homes provided Programmable Thermostats, 3.2% of the homes employed multi-zone cooling, 3.2% of the homes employed multi-zone heating, and 3.2% of the homes reported having a whole-house fan installed..

PART II – MULTI-FAMILY HOUSING

Sample Distribution

A total of 761 multi-family units were included in the sample with nearly half located in the Northern climatic zone and nearly 40 percent located in the Southern zone as shown in Table 12.

Table 12 – Multi-family Sample Distribution

Year built	Climate zone	Count	Percent
2004	Central	14	1.8%
2004	Northern	35	4.6%
2005	Central	53	7.0%
2005	Northern	346	45.5%
2005	Southern	288	37.8%
	Total	761	

Floor Areas & Number of Bedrooms

As shown in Table 13, the average floor areas of multi-family units ranged from 1,252.4 square feet up to 2,768.2 while the number of bedrooms ranged from 2.4 to 4.1. The overall average square footage of these housing units was nearly 1800 square feet and they contained an average of 2.9 bedrooms.

Table 13 – Multi-Family Housing Average Floor Areas and Number of Bedrooms

Year built	Climate zone	Avg. sq. feet	Avg. No. Bedrooms
2004	Central	1837.9	2.9
2004	Northern	2768.2	4.1
2005	Central	1517.6	2.6
2005	Northern	1726.2	2.8
2005	Southern	1587.3	2.5
2006	Northern	1252.4	2.4

Window Glazing

The FEECBC Form captures information about the nature of the glass used in the building's fenestration. Presented in Table 14 are the percentage of units with the various types of glazing. Note that "Tinted" refers to glass that may be tinted, covered by a plastic film, or covered by a solar screen.

Table 14 – Percent of Homes with Different Type Glazings

Year built	Climate zone	Single pane Clear glass	Double pane Clear glass	Single pane Tinted glass*	Double pane Tinted glass*
2004	Central	42.9%	0.0%	21.4%	35.7%
2004	Northern	20.0%	31.4%	0.0%	48.6%
2005	Central	79.2%	20.8%	0.0%	0.0%
2005	Northern	10.7%	42.8%	0.3%	40.8%
2005	Southern	95.8%	36.1%	3.8%	0.0%
2006	Northern	0.0%	24.0%	0.0%	52.0%

* - Indicates that the glass may be tinted, covered with a film, or covered by a solar screen.

Attic Insulation

Presented in Table 15 are summary data describing the installed levels of attic insulation in multi-family units.

Table 15 – Attic Insulation Levels

Year built	Climate zone	Attic Insulation Average R-value
2004	Central	24.0
2004	Northern	26.6
2005	Central	19.0
2005	Northern	23.4
2005	Southern	19.0
2006	Northern	19.0

Supply and Return Ductwork

The information presented in Table 16 represents the percent of responses that indicated that the supply or return ducts was mounted in conditioned space in the home.

Table 16 – Supply/Return Ducts in Conditioned Space

Year built	2004	2004	2005	2005	2005	2006	
Climate zone	Central	Northern	Central	Northern	Southern	Northern	Total
Supply ducts	50.0%	50.0%	50.0%	58.0%	62.8%	55.3%	58.5%
Return ducts	50.0%	50.0%	50.0%	42.0%	37.2%	44.7%	41.5%

Central Air Conditioning

Both the cooling capacity and the efficiency of the central air conditioning systems are presented in Table 17.

Table 17: Central Air Conditioning System Capacity & Efficiency

Year built	Climate zone	Capacity Btuh	Efficiency EER
2004	Central	27.6	11.3
2004	North	32.3	10.6
2005	Central	31.6	11.8
2005	North	31.5	10.6
2005	Southern	30.2	11.5
2006	Northern	24.1	10.3

Space Heating

Electric heat pump systems were the heating system of choice in the 2004 – 2006 time frame. In this period the electric heat pump had 54.0% of the new construction market share and electric resistance heating made up 44.4 % of the market. The remaining less than two percent of the market was served by Natural gas and L.P. gas systems.

Domestic Water Heating

Presented in Table 18 is a summary of the characteristics of the domestic water heating systems installed in new homes in 2004-2006. As may be seen, the electric water heating system dominated the market, with Natural Gas and L.P. Gas a distant second and third, respectively.

The average capacity of the Electric water heating systems was reported as 47.9 gallons, the average natural gas system had a capacity of 52.1 gallons, and the average L.P. Gas system capacity was 53.1 gallons.

The average efficiency of the electric water heating systems was reported to be 0.88, the average efficiency of the natural gas systems was reported as 0.68 and the L.P. Gas systems were reported to have an average efficiency rating of 0.65.

Table 18 – Characteristics of Domestic Water Heating Systems

DWH energy source	Capacity (gal.)	System efficiency	Percent of market
Electric	47.9	0.88	94%
Natural gas	52.1	0.68	4.5%
L.P. Gas	53.1	0.65	1.4%

Ratio of Glass Area/Floor area

Presented in Table 19 are the average ratios of fenestration glass area divided by the square feet of conditioned space in the homes. As may be seen the values range from 0.0.075 to 0.120. It appears that the homes in the Northern portion of Florida have smaller ratios while the southern portions of the state have larger ratios.

Table 18 - Ratio of Glass Area to Floor Area

Year built	Climate zone	Glass/Floor area Ratio
2004	Central	0.106
2004	Northern	0.119
2005	Central	0.111
2005	Northern	0.108
2005	Southern	0.124
2006	Northern	0.073

HVAC Credits

Evaluation of a building's degree of compliance with the Florida Energy Efficiency Code for Building Construction provide for credits for the inclusion in the building of certain technologies. The two features for which credit was issued were 7.9% of the homes in the sample included Ceiling Fans and 26.2% of the homes provided Programmable Thermostats.