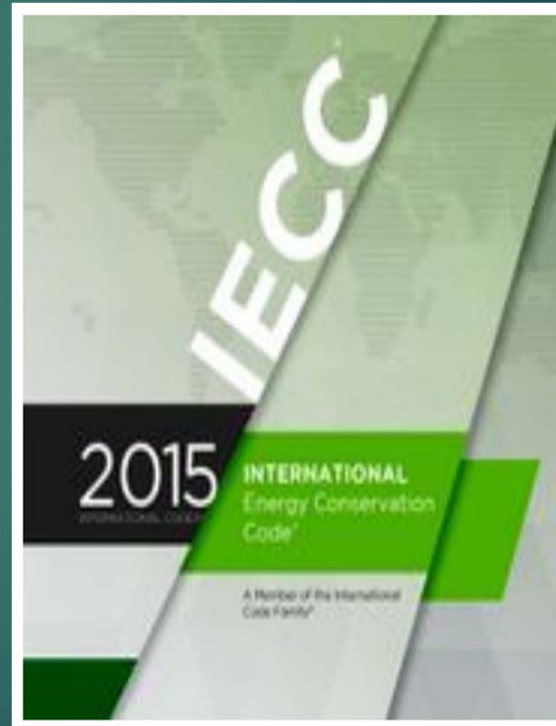


# Energy Rating Index(ERI)

**New opportunities for residential energy efficiency and code compliance in the 2015 IECC**

Polly Ledvina, PhD  
PSL Integrated Solutions  
[pledvina@pslintegrated.com](mailto:pledvina@pslintegrated.com)



# 2015 IECC Compliance Paths

- ▶ Prescriptive Path – 2009 & 2012 IECC
- ▶ UA Trade Off Alternative – 2009 & 2012 IECC
- ▶ Energy Cost Compliance – 2009 & 2012 IECC
- ▶ **Energy Rating Index (ERI) –  
new to 2015 IECC**





# What is the ERI?

The ERI score is defined as a numerical score where 100 is equivalent to the 2006 IECC and 0 is equivalent to a net-zero home.

Each integer value on the scale represents a 1% change in the total energy use of the rated design relative to the total energy use of the ERI reference design.



# ERI = RESNET's HERS Index

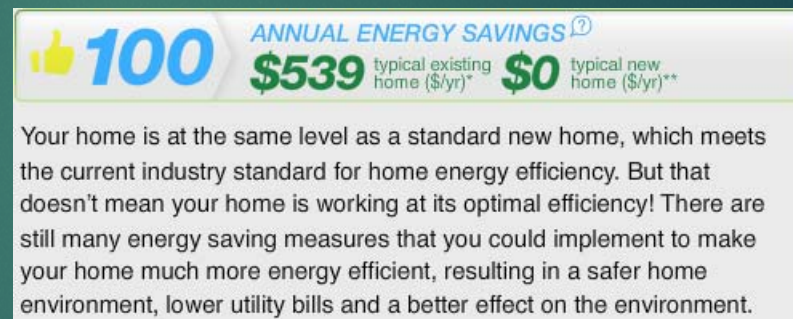
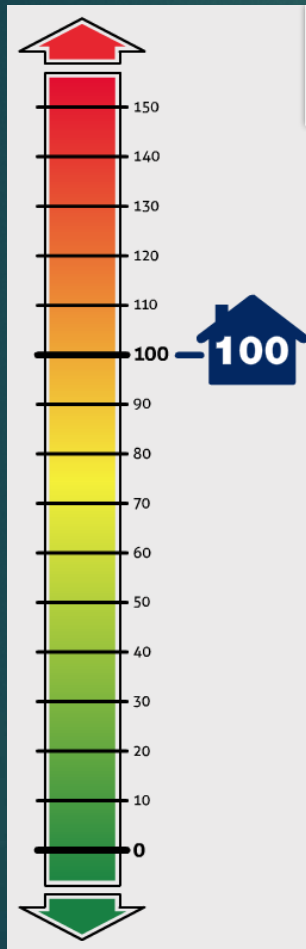
RESNET's HERS index, based on ANSI RESNET Standard 301-2014, is the existing compliant ERI method for inspecting and calculating a home's energy performance.



- ▶ RESNET = Residential Energy Services Network, a not-for-profit, standards-making body for residential energy efficiency rating and certification systems in the United States
- ▶ HERS = Home Energy Rating System



# The RESNET HERS Index



<http://www.resnet.us/hers-index-large-scale>

# ERI Rating Variables

- ▶ All exterior walls (both above and below grade)
- ▶ Floors over unconditioned spaces (like garages or cellars)
- ▶ Ceilings and roofs
- ▶ Attics, foundations and crawlspaces
- ▶ Windows and doors, vents and ductwork
- ▶ HVAC systems, water heating system, and your thermostat
- ▶ Appliances and lighting
- ▶ House and duct air-tightness

The ERI performance path also requires builders to follow the mandatory code requirements of the IECC and comply with the minimum insulation and window envelope performance requirements of the 2009 IECC.

# Table R406.4 Maximum ERI

Climate Zone	Energy Rating Index
1	52
2	52
3	51
4	54
5	55
6	54
7	53
8	53

Compliance based on an ERI requires the rated design to have an ERI less than or equal to the appropriate value listed in Table R406.3.



# Except in Texas....

Climate Zone	Energy Rating Index
1	52
2	52
3	51
4	54
5	55
6	54
7	53
8	53

65 until 9/2019  
63 until 9/2022  
59 after that

(HB1736)



# HERS Certification -- Who's doing it?

The screenshot displays the RESNET website header and a main content area. The header includes the RESNET logo (RESIDENTIAL ENERGY SERVICES NETWORK), navigation links for 'LEARN ABOUT HERS', 'ASK AN EXPERT', and 'RESNET PROFESSIONALS', social media icons for Google+, Twitter, and Facebook, and a search bar. Below the header is a navigation menu with links: 'Home Energy Efficiency', 'Financial Benefits', 'Ratings & Audits', 'Use a RESNET Certified Member' (highlighted in dark blue), 'About RESNET', and 'Contact'. The main content area features a map of the United States with a semi-transparent box in the center. The box contains the text '1,735,669 Homes Rated Nationally' in large blue font, followed by a magnifying glass icon and the text 'Search for a HERS-rated home now!'.

**RESNET**  
RESIDENTIAL ENERGY SERVICES NETWORK

[LEARN ABOUT HERS®](#) [ASK AN EXPERT](#) [RESNET PROFESSIONALS](#) [g+](#) [twitter](#) [f](#)

[Home Energy Efficiency](#) [Financial Benefits](#) [Ratings & Audits](#) [Use a RESNET Certified Member](#) [About RESNET](#) [Contact](#)

**1,735,669** Homes Rated Nationally

Search for a HERS-rated home now!

# HERS Certification -- Who's doing it?

## Looking for a HERS Rated Home?

Homes with HERS Index scores are more energy efficient, resulting in lower energy bills and higher home comfort. To find out if a home has been HERS-rated, enter its full address in fields below.

Street Address \*

City

State \*

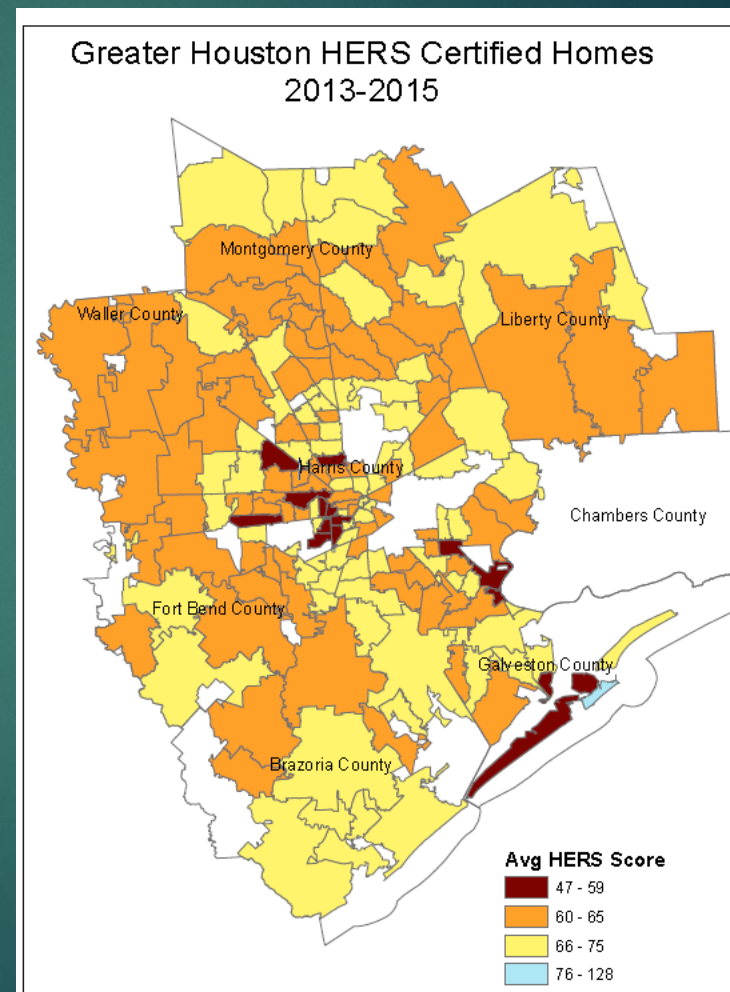
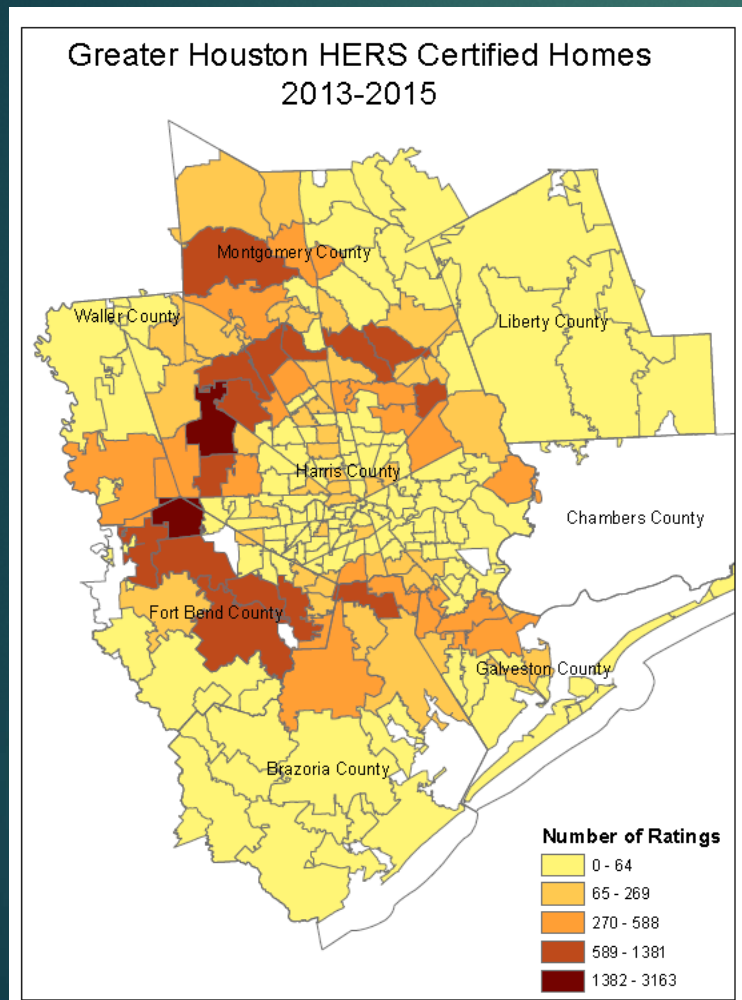
Zip Code

 FIND

\*required field

<https://www.resnet.us/public-access-to-resnet-national-registry#nr-form-title>

# HERS Certification -- Who's doing it?





# HERS Certification -- Who's doing it?

"Above Code" Energy and Green-building Programs



# HERS Certification -- Who's doing it?



KB Homes

Average HERS:

60

# HERS Certification -- Who's doing it?



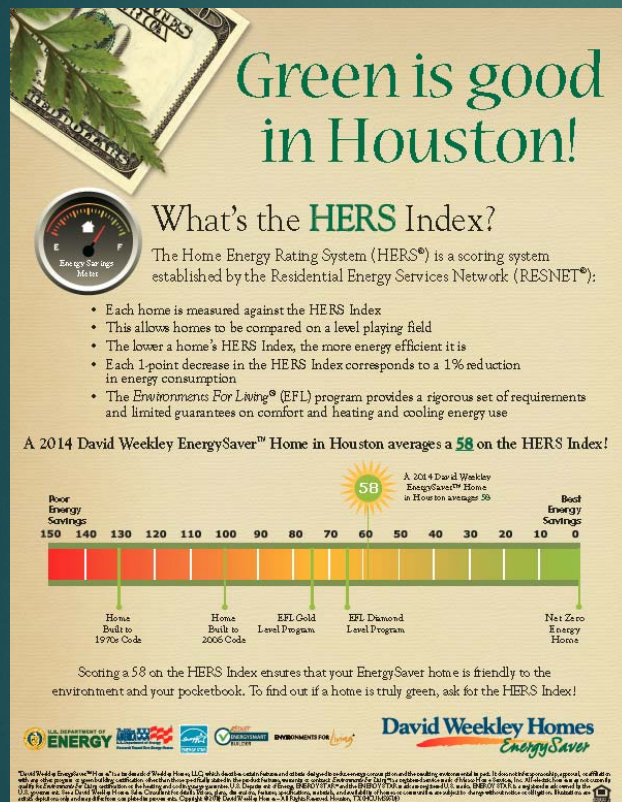
Beazer Homes

Average HERS:

65



# HERS Certification -- Who's doing it?

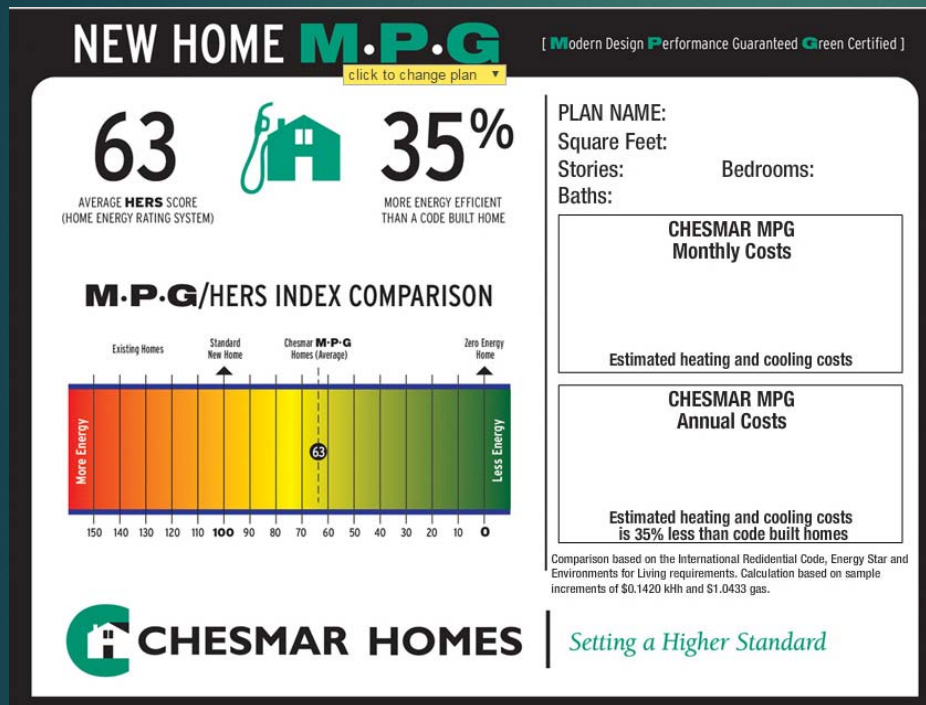


David Weekly

Average HERS:

58

# HERS Certification -- Who's doing it?



Chesmar Homes

Average HERS:


63



# HERS Certification -- Who's doing it?

**Texas Veterans  
Home Loan and Home  
Improvement Programs**

**Certification of Eligibility  
Application**

  
VETERANS LAND BOARD  
SERVING TEXAS VETERANS

**George P. Bush, Chairman**

For assistance, please contact the Texas Veterans Land Board  
Toll free at 1-800-252-VETS (8387)

Last Update: April 27, 2016

Texas Veterans Land Board • George P. Bush, Chairman  
Stephen F. Austin Building • 1700 North Congress Avenue • Austin, Texas 78701-1496  
P.O. Box 12873 • Austin, Texas 78711-2873  
512.463.5060 • 800.252.VETS  
texasveterans.com

To be eligible for a Texas Veterans Home Loan, all new-construction homes must

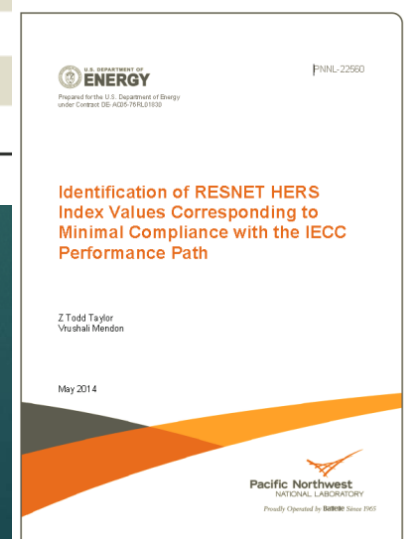
- ▶ meet the U.S. Environmental Protection Agency's ENERGY STAR® rating as an energy efficient home , or
- ▶ have a HERS Index score of 75 or less.



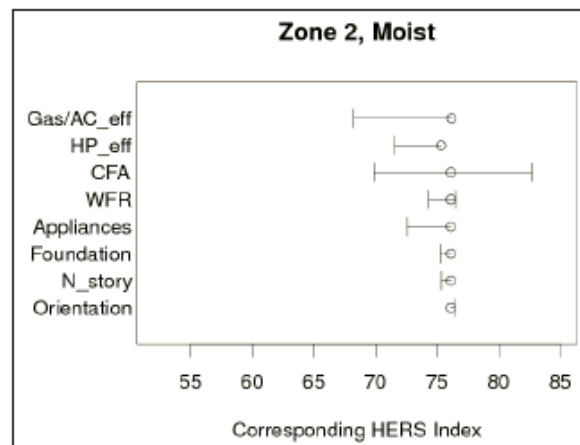
# What most affects the ERI?

**Table 4.1.** Baseline Characteristics Used in Assessing Volatility of Individual Building Characteristics

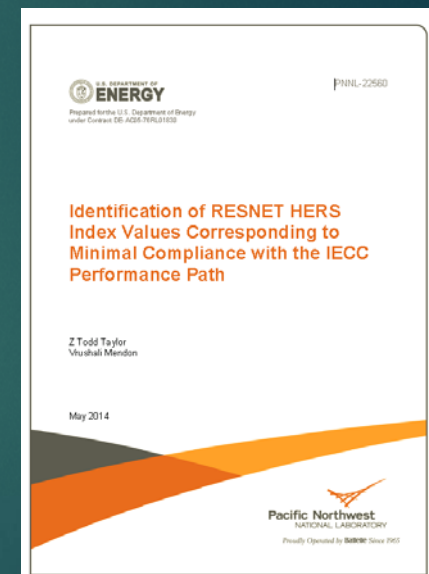
Building Characteristic	Baseline Values Held Constant when Assessing Volatility of Corresponding HERS Index Values
Gas/AC equipment efficiency	AFUE 78, SEER 13
Heat pump equipment efficiency	HSPF 7.7, SEER 13
Conditioned Floor Area (CFA)	2400 ft <sup>2</sup>
Window-Floor Ratio (WFR)	16%, except for HVAC efficiency runs, for which 15% was used
Appliances	Standard appliances (no ENERGY STAR)
Foundation type	Crawlspace
Number of stories (N_story)	2
Orientation	Neutral (glazing equally distributed)



# What most affects the ERI?



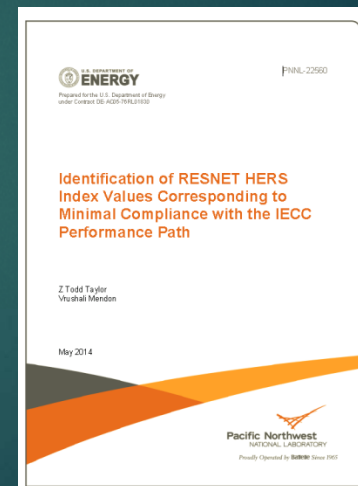
**Figure 4.2.** Volatility of Corresponding HERS Index to Individual Characteristics: Zone 2, Moist



# What most affects the ERI?

## Conditioned Floor Area (CFA)

- ▶ At CFA = 2400 sf, HERS Index is about 76.
- ▶ At CFA = 5000 sf, HERS Index is about 70
- ▶ At CFA = 1200 sf, HERS Index is about 82





# What most affects the ERI?

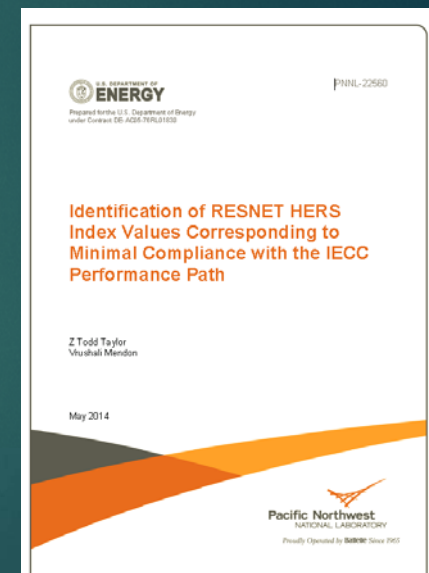
## HVAC Equipment

- ▶ Gas/AC Efficiency      Base = 78 AFUE, 13 SEER
- ▶ Heat Pump Efficiency      Base = 7.7 HSPF, 13 SEER

**Table 4.3.** Impact of HVAC Efficiency on Corresponding HERS Index for Zone 2, Moist

System Type	Efficiency Level	Change in Corresponding HERS Index
Gas/AC Efficiency Level	Base (AFUE 78, SEER 13)	0
	High-efficiency 1 (AFUE 80, SEER 14)	-2
	High-efficiency 2 (AFUE 80, SEER 16)	-5
	High-efficiency 3 (AFUE 80, SEER 20)	-8
Heat Pump Efficiency Level	Base (HSPF 7.7, SEER 13)	0
	High-efficiency (HSPF 8.2, SEER 15)	-3

Equipment efficiency is directly accounted for in the HERS Index calculation but is ignored in the IECC Compliance Ratio.



# What most affects the ERI?

- High efficiency appliances

ENERGY STAR  
Appliances  
3-4 points

The screenshot shows the 'Rating' tab of the RESNET software. The interface is organized into sections for different appliances, each with various input fields for energy consumption, efficiency, and location. The 'Refrigerator' section shows a total consumption of 727 kWh/yr. The 'Dishwasher' section shows an energy factor of 0.46. The 'Range/Oven' section shows it is a natural gas unit. The 'Clothes Washer and Dryer' section shows a washer with a MEF of 0.817 and a dryer with an efficiency factor of 2.67. The 'Lighting' section shows CFL and Pin-Based FL percentages. The 'Ceiling Fan(s)' section shows a CFM/Watt ratio of 0.0. A 'Restore RESNET Defaults' button is located at the bottom right.

Appliance	Parameter	Value	Unit
Refrigerator	Total Consumption	727	kWh/yr
	Location	Conditioned	
Dishwasher	Energy Factor	0.46	
	or kWh/yr	0	
	Place Setting Capacity	12	
Range/Oven	Fuel	Natural gas	
	Induction Range	<input type="checkbox"/>	
	Convection Oven	<input type="checkbox"/>	
Clothes Washer and Dryer	Location	Conditioned	
	Washer Presets	RESNET Default	
	Dryer Fuel	Natural gas	
	Washer MEF	0.817	
	Elec Rate	0.0803	
	Washer LER	704	kWh/yr
	Gas Rate	0.58	
	Dryer Eff. Factor	2.67	
	Capacity Cu.Ft.	2.874	
	Annual Gas Cost	23.00	
Lighting	CFL (%)	90.0	
	Pin-Based FL (%)	10.0	
	Interior Fixtures		
	Exterior Fixtures(%)	0.0	
Ceiling Fan(s)	CFM / Watt	0.0	(at Med. speed)
	Garage Fixtures(%)	0.0	

# Additional features to Improve the ERI

- ▶ More R-value than required by the 2009 IECC
- ▶ House orientation and window shading
- ▶ House tightness below 5 ACH50
- ▶ Reduced duct leakage to the outside
- ▶ Duct location (conditioned vs unconditioned space)
- ▶ Solar



# Additional features to Improve the ERI

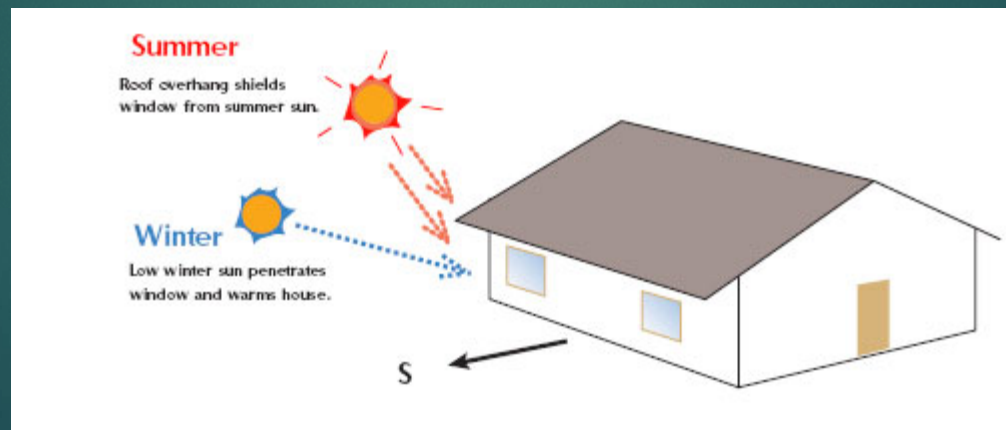
## 2009 IECC vs. 2015 IECC Prescriptive Table

Climate Zone	Window U-Factor	Window SHGC	Ceiling R-Value	Wood Framed Wall R-Value	Mass Wall R-Value	Floor R-Value	Basement Wall R-Value	Slab R-Value and Depth	Crawl Space Wall R-Value
1	1.2 NR	0.30 0.25	R-30	R-13	R-3/4	R-13	0	0	0
2	0.65 0.40	0.30 0.25	R-30 38	R-13	R-4/6	R-13	0	0	0
3	0.35 0.35	0.30 0.25	R-30 38	R-13 20 or 13+5	R-5/8 8/13	R-19	R-5/13	0	R-5/13
4 except Marine	0.35 0.35	NR 0.40	R-38 49	R-13 20 or 13+5	R-5/10 8/13	R-19	R-10/13	R-10, 2ft	R-10/13
5 and Marine 4	0.35 0.32	NR	R-38 49	R-20 or 13+5	R-13/17	R-30	R-10/13 15/19	R-10, 2ft	R-10/13 15/19
Climate Zone 6	0.35 0.32	NR	R-49	R-20 or 13+5 20+5 or 13+10	R-15/20	R-30	R-15/19	R-10, 4ft	R-10/13 15/19
Climate Zone 7 & 8	0.35 0.32	NR	R-49	R-21 20+5 or 13+10	R-19/21	R-38	R-15/19	R-10, 4ft	R-10/13 15/19

# Additional features to Improve the ERI

Orient house with highest percent of glazing on North and South sides

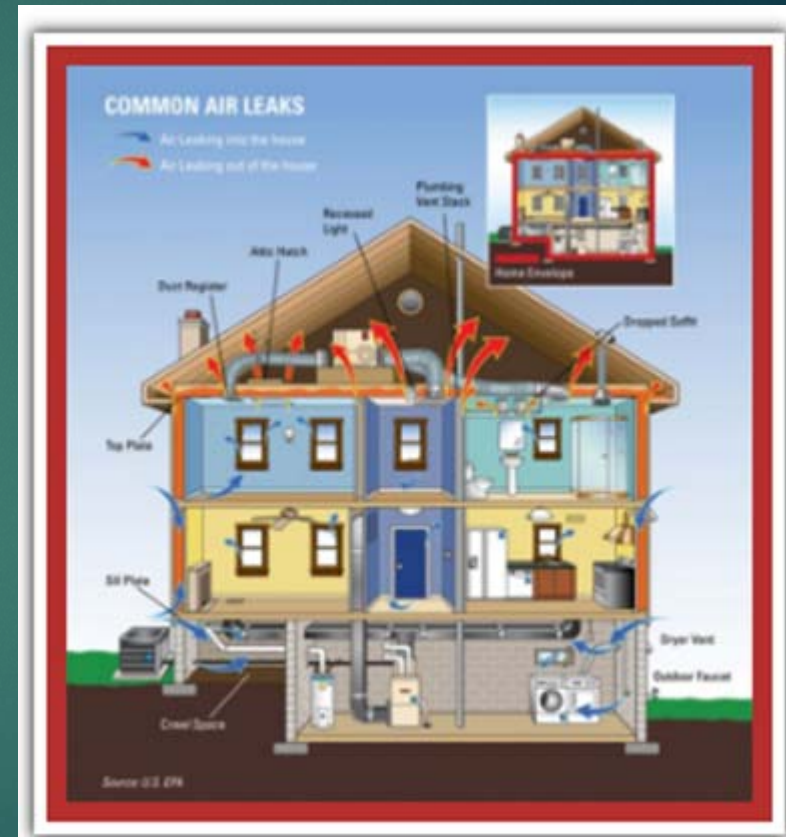
Use overhangs above south-facing windows ideally sized to shade glass in spring and fall, but not winter.



[www.buildingtips.net](http://www.buildingtips.net)

# Additional features to Improve the ERI

Reduce Infiltration  
below 5 ACH50





# Additional features to Improve the ERI

Reduce duct-leakage–  
there are no duct-  
leakage limits using  
2015 IECC  
performance pathways  
(unlike 2012 IECC)!

Locate ducts in  
conditioned space –  
and no duct-leakage  
testing will be required



# HERS < 52 is not so easy without photovoltaics

HOME CERTIFIED TO MEET THE PROVISIONS OF THE  
2015 INTERNATIONAL ENERGY CONSERVATION CODE

This home built at  
Property Address, Houston, TX  
by Builder's Name  
exceeds the minimum requirements for the 2015 International  
Energy Conservation Code

**DRAFT**

**Building Features**

Ceiling Flat	R-38.0	Duct	R-6.0
Sealed Attic	NA	Duct Leakage to Outside:	0.04 CFM25 / CFA
Vaulted Ceiling	NA	Total Duct Leakage:	0.04 CFM25 / CFA
Above Grade Walls	R-20.0	Infiltration:	1mg: 3.00 Cfg: 3.00 ACH50
Foundation Walls	NA	Window	U-Value: 0.200, SHGC: 0.200
Exposed Floor	R-23.6	Heating	Fuel-fired air distribution, Natural gas, 96.0 AFUE
Slab	None	Cooling	Air conditioner, Electric, 21.0 SEER
		Water Heating	Instant water heater, Natural gas, 0.92 EF, 0.0 Gal.

The organization below certifies that the proposed building design described herein is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the 2015 IECC requirements in compliance with Chapter 4 based on Climate Zone 2A and with all mandatory requirements.

Name: Polly Ledvina  
Organization: PSL Integrated Solutions

Signature: \_\_\_\_\_  
Date: July 27, 2016

The 2015 International Energy Conservation Code is a registered trademark of the International Code Council, Inc. ("ICC").  
No version of this software has been reviewed or approved by ICC or its affiliates.  
REM/Rate - Residential Energy Analysis and Rating Software v15.1

**2015 IECC ENERGY RATING INDEX REPORT**

Property: Owner's Name  
Property Address  
Houston, TX 77008

Organization: PSL Integrated Solutions  
Polly Ledvina

HERS: Based on Plans  
2016-06-28  
Rate# ID4948517

**HERS® Index**

Existing Homes  
Standard Home  
Zero Energy Home  
Less Energy  
More Energy

**Annual Energy Consumption**

	HERS Reference Home (HERS®)	Rated Home (HERS®)	Rated Home Cost (\$/sq ft)
Heating	20.9	4.1	62
Cooling	51.5	23.4	248
Water Heating	9.5	3.5	79
Lights & Appliances	34.9	30.5	712
Photovoltaics	0	-0.0	-0
Total	116.7	61.5	1222

**Annual Estimates**

Electric (kWh):	9152	CO2 Emissions (Tons):	7
Natural Gas (therms):	264	Energy Savings (\$/yr):	1167

\*Based on standard operating conditions  
\*\*Based on U.S. DOE designation of a HERS Index of 130 as the Typical Existing Home

**TARGET INDEX: 52** **HERS INDEX: 53** **FAIL**

This home DOES NOT meet the 2015 IECC Home Energy Rating Index requirements of Sections 406.3 and 406.4 of the 2015 International Energy Conservation Code based on a climate zone of 2A.

Name: Polly Ledvina  
Organization: PSL Integrated Solutions

Signature: \_\_\_\_\_  
Date: 27 July 2016

**Mandatory Requirements**

HERS Target	FAIL	Duct Insulation (Ducts outside R-6, inside 16 R-0)	PASS
2009 IECC UA	PASS	Maximum Fenestration U-Factor (2012)	PASS
Duct Testing (2015)	PASS	Maximum Fenestration SHGC (2012)	PASS
Mechanical Ventilation	PASS	Air Leakage (5 ACH50 for CZ-2, 3 ACH50 for CZ-3)	PASS
Mechanical Ventilation (Efficiency)	PASS	Mandatory Requirements Checklist (2015 IECC)	PASS

**Emissions Data**

Relution Presented	TITLE
Carbon Dioxide (CO2) - lbs/yr	4.7 Company
Sulfur Dioxide (SO2) - lbs/yr	10.1 Address
Nitrogen Oxides (NOx) - lbs/yr	8.4 City, State, Zip
	Phone #
	Fax #

**Provider Data and Seal**

REM/Rate - Residential Energy Analysis and Rating Software v15.1  
This information does not constitute any warranty of energy cost or savings.  
© 1989-2016 homeco, Boulder, Colorado.



# 5 kW PV Array HERS < 22

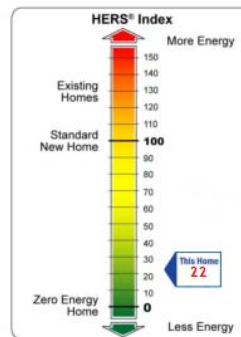


## 2015 IECC ENERGY RATING INDEX REPORT

Property  
Owner's Name  
Property Address  
Houston, TX 77005

Organization  
PSL Integrated Solutions  
713-524-8352  
Polly Ledvina

HERS  
Based on Plans  
2016-06-28  
Rater ID:6948517



### Annual Energy Consumption

	HERS Reference Home (MBTU)	Rated Home nMUEL (MBTU)	Rated Home Cost (\$/yr)
Heating	20.9	4.1	62
Cooling	51.5	23.4	248
Water Heating	9.5	3.5	79
Lights & Appliances	34.9	30.5	712
Photovoltaics	0	-24.3	-713
Total	116.7	37.2	509

### Annual Estimates

Electric (KWh):	2027	CO2 Emissions (Tons):	3
Natural gas (Therms):	264	Energy Savings (\$)**:	1910

\*Based on standard operating conditions

\*\*Based on U.S. DOE designation of a HERS Index of 130 as the 'Typical Existing Home'

TARGET INDEX: 52

HERS INDEX: 22

PASS

This home MEETS the RESNET Home Energy Rating Index requirements of Sections 406.3 and 406.4 of the 2015 International Energy Conservation Code based on a climate zone of 2A.

Name | Polly Ledvina  
Organization | PSL Integrated Solutions

Signature |  
Date | 27 July 2016

### Mandatory Requirements

HERS Target	PASS	Duct Insulation (Ducts outside R-6, inside is R-0)	PASS
2009 IECC UA	PASS	Maximum Fenestration U-factor (2012)	PASS
Duct Testing (2015)	PASS	Maximum Fenestration SHG C (2012)	PASS
Mechanical Ventilation	PASS	Air Leakage (5 ACH50 for CZ1-2, 3 ACH50 for CZ3-8)	PASS
Mechanical Ventilation Efficacy	PASS	Mandatory Requirements Checkbox (2015 IECC)	PASS

### Emissions Data

Pollution Prevented	
Carbon Dioxide (CO2) - tons/year	9.1
Sulfur Dioxide (SO2) - lbs/year	26.4
Nitrogen Oxides (NOx) - lbs/year	14.3

### Provider Data and Seal

TITLE
Company
Address
City, State, Zip
Phone #
Fax #

REM/Rate - Residential Energy Analysis and Rating Software v15.1

This information does not constitute any warranty of energy cost or savings.

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# Features to Improve Efficiency of Existing Homes

- ▶ Mechanical equipment
  - ▶ High efficiency furnace
  - ▶ High efficiency AC
  - ▶ High efficiency water heater
- ▶ More R-value than required by the 2009 IECC
- ▶ House orientation and window shading
- ▶ House tightness
- ▶ Reduced duct leakage to the outside
- ▶ Duct location (conditioned vs unconditioned space)
- ▶ CFL or LED Lighting
- ▶ High efficiency appliances
- ▶ Solar

Immediately  
Soonest Opportunity

# Thank You!

Call or email:

Polly Ledvina

PSL Integrated Solutions

[pledvina@pslintegrated.com](mailto:pledvina@pslintegrated.com)

713-825-7136