Cost Effective Ways to Improve your HERs Scores

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2017

BMC

The ci team

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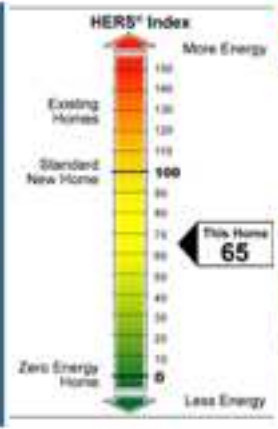
Primary focus:
Industry education, research, product development, consultation to manufacturers, App support
Audience personally reached: +25,000/yr
Audience reached via App: +150,000

The Agenda

- A little about HERs
- Their place in code
- Optimizing energy ratings to meet your goals
- Cost effective approaches to improve your scores

About HERs

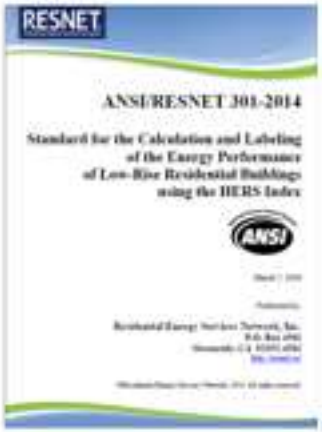
- History dates back to early 80's
- A consistent rating index by 2001
- RESNET formed in 1995, incorporated in 2002
- A network of about 10,000 pros
- Now a "Mortgage Industry National Home Energy rating Standard"



RESNET

About HERs

- Now an ANSI Consensus Standard
  - Software protocols
  - Rating protocols
  - Field verification protocols
  - Accreditation of raters
  - Codes of practice & ethics


RESNET

ANSI/RESNET 301-2014

Standard for the Calculation and Labeling of the Energy Performance of Low-Rise Residential Buildings using the HERS Index

ANSI

The Index

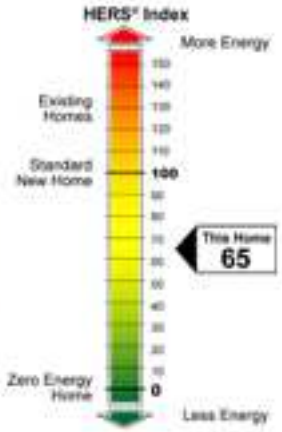
Takes into account

- Climate location
- House tightness
- Full thermal envelope
- Foundation type
- Window/door performance values
- Duct tightness and location
- HVAC
- Lights and Appliances
- Renewable energy systems

Includes:

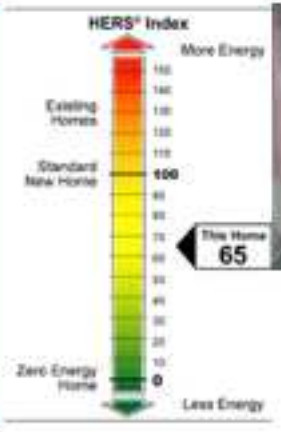
- **Energy for heating**
- **Energy for cooling**
- **Energy for normal hot water use**
- **Energy for normal lights and appliances**

Home Energy Rating System



The value of ratings

- Benchmark a starting point
- Verify performance
- Troubleshoot problems
- Educate & direct trades
- Validation of compliance
- R&D to find cost effective solutions



Code Adoption - January, 2017

2015 Code Compliance

- Energy Rating Index (ERI) = HERS score w/ new name
- Alternate to prescriptive code requirements
- Meet mandatory enclosure requirements of the 2009 IECC
- Sets maximum HERS/ERI scores by climate region
- Trade-offs with mechanical, lights and appliances are likely
- Trade-offs with air leakage, duct leakage, window improvements are likely.

Climate Zone	2015 HERS Target
1 & 2	52
3	51
4	54
5	55
6	54
7 & 8	53

IECC 2015 Offers Opportunities

Credits for:

- Advanced framing
- Air tightness
- Insulated sheathing
- Window specifications
- Ventilation

HERS Ratings - modeling & projected ratings

Performance Path vs. Prescriptive

Energy modeling approach -

- Work with your HERS rater
- Consider the synergies inherent to a high performance house.
- Can typically achieve goals at lower construction costs.

2015 Texas Code - Prescriptive Trade-off

ESL 4ACH[50] Prescriptive Tradeoff Code Equivalency Compliance [a]

Envelope Component	Option #1	Option #2
R402.4 Air Leakage	≤ 4ACH[50]	≤ 4ACH[50]
Wall Insulation *R*-value	R13 + R3[b]	R13 + R3[b]
Fenestration *U*-factor	≤ 0.32	≤ 0.32
Fenestration SHGC	≤ 0.25	≤ 0.25
Ceiling *R*-value	≥ R49	≥ R49
Duct insulation *R*-value	R8	R6
Radiant Barrier Required	No	Yes

[a] Except for the values listed in the table, all other mandatory code provisions are applicable.
[b] The first value listed is the *R*-value of cavity insulation, the second value is the *R*-value of the continuous insulation or insulated siding.

Optimizing Performance

Interview and find a rater that understands your company

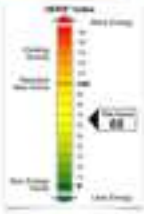
- Capacity
- Goals
- Training
- Knowledge
- Connections

Find a HERs rater that can coach your folks

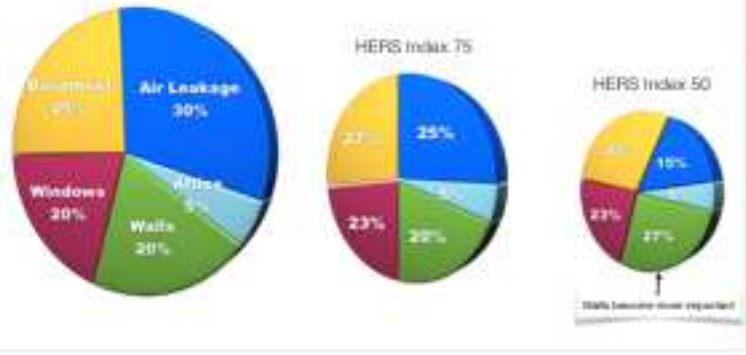
Optimizing Performance

Use the software as a tool

- It can guide specifications
- Work with your supply partners
- Know the sensitivity
- Compare it to HVAC calculations

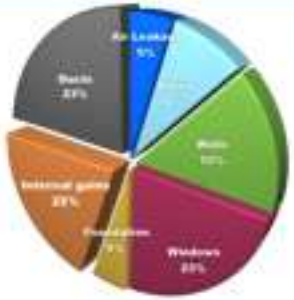


Components of Heat loss



Heat gain in buildings

- typical HERs 80 home



- What would you do first ?

Top 3 Energy Elements

Northern Climates	Southern Climates
1. Air Leakage	1. Windows
2. Foundations	2. Duct location
3. Walls	3. Internal loads

The Decision Matrix

How does our industry make decisions?

- *Do they help reduce material and /or labor costs?*
- *Are they an opportunity for more or higher value sales?*
- *Will they reduce long term risks or warranty costs?*
- *How many trades are affected and how much training will be required*
- *Will they improve cycle or process times – do they make building houses easier?*
- *Will they drive us NUTS?*

More Airtight?
How Tight?

2012 IECC - Changes

All homes are required to demonstrate more stringent air leakage requirements are met by a blower door test.

	Air leakage by climate zones ACH 50	
Code Version	2009 IECC	2012 IECC
Climate zones 1-2	NR	< 5 ACH
Climate zones 3-7	NR	< 3 ACH

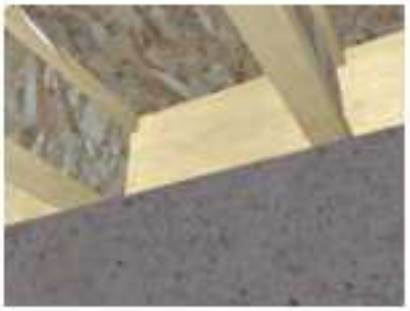
Is spray foam
the answer?

Do we know how to apply our resources?

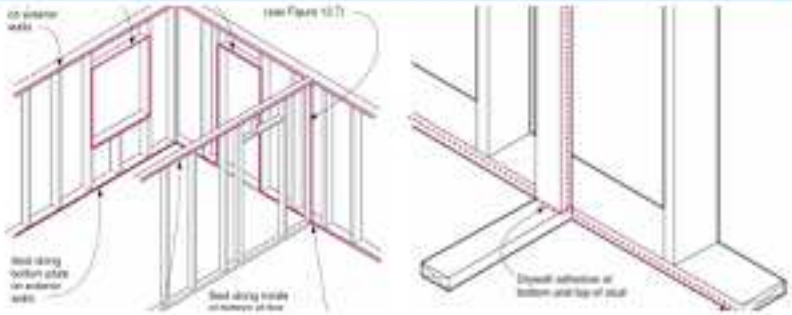
Do we know how to apply our resources?

Interior air barrier - Air Tight Drywall (ADA)

Creating air barriers in difficult locations



Air sealing



Knee walls - Six sided encapsulation

Small holes do count

Simple Materials

- Less than $500 to get 25% better

Your goal:

- Under 3 ACH@50

Exterior air barrier are very effective

Effective leakage area

Air Sealing is important and Inexpensive

Example Opportunity - 3000 ft2, 2 storey - Zone 2

	HERs	Annual Energy $
Base Case	90	$2460
Air Leakage to 7-3 ACH	86	$2330
Ducts in Conditioned Space	82	$2265

Effective R-Value Calculator - Walls

23% framing-no windows	R-Value	
	Cavity	Studs
Outside air film	0.17	0.17
Exterior insulation	0	0
½" OSB	0.62	0.62
2 x 6 stud-wood	n/a	3.83
cavity insulation	19	n/a
½" gypsum	0.45	0.45
Inside air film	0.68	0.68
Sub-Totals	14.92	5.75
Total Wall R- Value	10.39	

3 Ways to improve Effective R-values

- More cavity insulation
- Advanced / Optimized framing
- Continuous insulation

Effective R-Value Calculator - Walls

23% framing-no windows	R-Value	
	Cavity	Studs
Outside air film	0.17	0.17
Exterior insulation	0	0
½" OSB	0.62	0.62
2 x 6 stud-wood	n/a	5.83
cavity insulation	19	n/a
½" gypsum	0.45	0.45
Inside air film	0.68	0.68
Sub-Totals	20.92	7.75
Total Wall R- Value	16.42	

Is spray foam the answer?

Effective R-Value Calculator - Walls

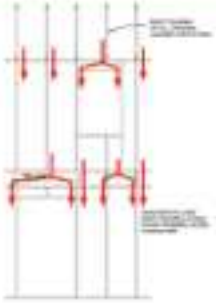
23% framing-no windows	R-Value	
	Cavity	Studs
Outside air film	0.17	0.17
Exterior insulation	0	0
½" OSB	0.62	0.62
2 x 6 stud-wood	n/a	0.83
cavity insulation	22	n/a
½" gypsum	0.45	0.45
Inside air film	0.68	0.68
Sub-Totals	24.92	7.75
Total Wall R- Value	17.33	

Optimize the Amount of Wood

There are cost savings you might be missing

Is there room for insulation?

Simplified framing



Reduce project costs and improve the thermal enclosure

- Wider, Uniform bays
- 2 / 3 stud corners
- Ladder framing at intersecting walls
- Properly sized headers
- Single top plates

Wall intersections

Engineered Solutions

Ease the process
Optimize skilled labor
Reduce training time
Reduce implementation
Optimize costs and performance

READY-FRAME.
PRECISION PACKAGES BY BMC STOCK HOLDINGS

Effective R-value of 2 x 6 wall
- Advanced framing

19% framing in windows	R-Value	
	Cavity	Studs
Outside air film	0.17	0.17
Exterior insulation	0	0
½" OSB	0.62	0.62
2 x 4 stud wood	n/a	5.83
cavity insulation	19	n/a
½" gypsum	0.45	0.45
Interior air film	0.68	0.68
Sub-Totals	20.92	7.75
Total Effectice Wall R- Value	15.21	

Exterior insulation will be normal

Effective R-Value Calculator - walls

33% framing-no windows	R-Value	
	Cavity	Studs
Outside air film	0.17	0.17
Exterior insulation	9	9
½" OSB	0.62	0.62
2 x 6 stud-wood	n/a	3.83
cavity insulation	19	n/a
½" gypsum	0.45	0.45
Interior air film	0.68	0.68
Sub-Totals	25.92	12.75
Total Wall R- Value	19.42	

Effective R-Value Calculator - Walls

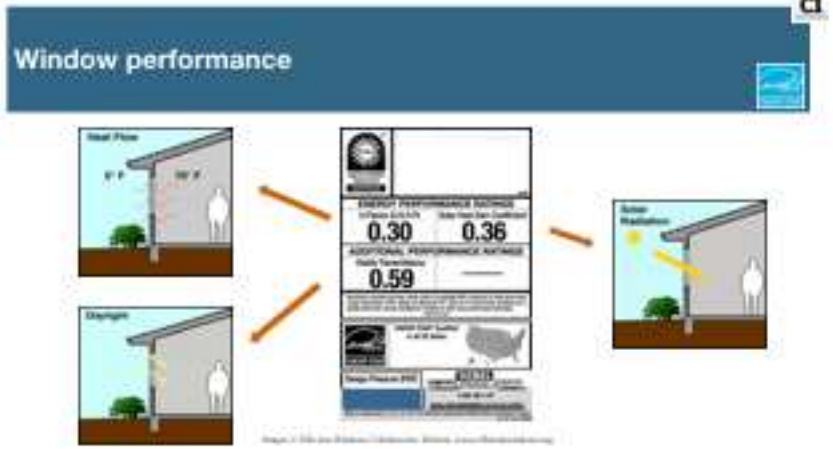
33% framing-no windows	R-Value	
	Cavity	Studs
Outside air film	0.17	0.17
Exterior insulation	19	19
½" OSB	0.62	0.62
2 x 6 stud-wood	n/a	3.83
cavity insulation	19	n/a
½" gypsum	0.45	0.45
Interior air film	0.68	0.68
Sub-Totals	26.92	15.75
Total Wall R- Value	20.39	

Insist on Grade I insulation

Properly installed insulation

Blown Insulation, like Cellulose, completely fills cavities

Foam is not a cure-all…it requires careful installation too



Conduction Heat Flow
- Attics in summer

HF = Exposed area x Temp. difference
R-Value

Heat flow through 1000' attic floor =

1000 x (135 - 75) / R-30 = 2000 BTU/hr

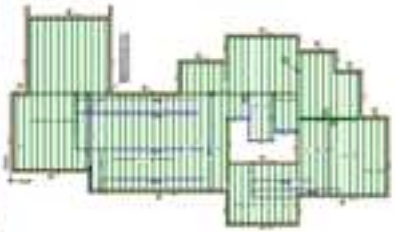
Heat flow through 100' of 8" dia. AC duct =

100 x 2 x (135 - 55) / R-8 = 2000 BTU/hr

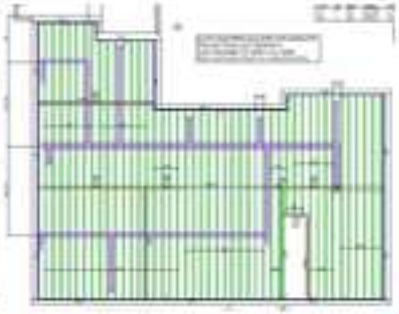
Ducts & equipment in conditioned space

5 Strategies

- Ducts in the floor system
- Condition the attic
- Dropped or raised ceilings
- Bury the ducts
- Radiant barriers



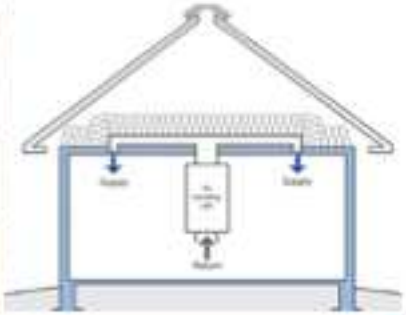
Layout Floors to Accomodate HVAC



It requires partnerships & patience

Conditioned attics are an option
It can raise the value of a home

Dropped or raised ceilings



Buried Ducts are an Option

Radiant Barriers are Helpful

Value in hot climates

Lowers attic air temperatures

Easy process change

Cost effective

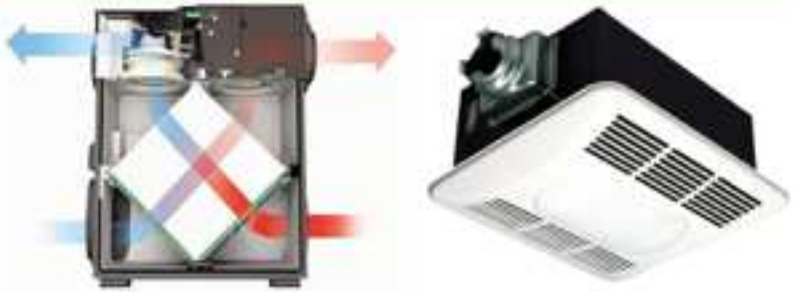
Example Opportunity - 3000 ft2, 2 storey

	HERs	Cooling Load
Base Case	90	54,000 BTUs/hr
Ducts in Conditioned Space	82	37,000 BTUs/hr
Radiant Barrier	86	42,000 BTUs/hr

Example Opportunity
- 3000 ft2, 2 storey

	HERs	Annual Energy $
Base Case	90	$2460
Ducts in Conditioned Space	82	$2265
Radiant Barrier	86	$2405

Efficient Ventilation



Advanced Water Heating

The HVAC opportunities
2000 ft²

	Comparison of Future Homes		
	HERs 100	HERs 75	HERs 50
Design Heat Loss	63,500 BTUs/hr	51,000 BTUs/hr	28,000 BTUs/hr
Heat Gain	3.5 tons	2.5 Tons	2 Tons
Annual Energy $	$3750/yr	$2675/yr	$1700/yr

Key Concepts & Opportunities

Not if... but when

Building science & HERs ratings help
- Find opportunities & avoid risks
- Appropriate material choices

Strategic partnerships

Continuous improvement

Thank You

Gord Cooke

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