

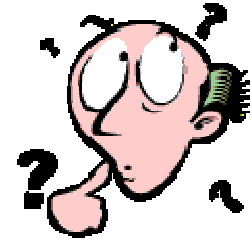
Codes, Ratings, Energy Star and Tax Credits... Oh My!

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David R. Roberts, P.E.
Architectural Energy Corporation

What the #!*& is going on?

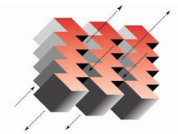


“This home has a HERS Index of 75 but doesn’t make ENERGY STAR!”

“I’ve got a home that meets ENERGY STAR, but it doesn’t pass code!”

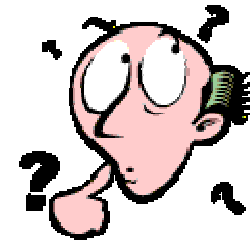
“Can you explain how this home meets the tax credit requirements, but doesn’t pass code?”

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What the #!*& is going on?



Quick Analysis

Energy | Surface Area | Compliance

Programs

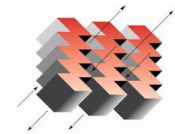
Energy Star:	<input type="checkbox"/>	Fails	HERS Index:	<input type="text" value="74"/>
Tax Credit:	<input type="checkbox"/>	Fails		

Codes

IECC 2006 Energy Code:	<input type="checkbox"/>	Fails	ECC of New York State:	<input type="checkbox"/>	Passes
IECC 2004 Energy Code:	<input type="checkbox"/>	Fails	ECC of Southern Nevada:	<input type="checkbox"/>	Passes
IECC 2003 Energy Code:	<input type="checkbox"/>	Passes	MEC 1995 Energy Code:	<input type="checkbox"/>	Passes
IECC 2001 Energy Code:	<input type="checkbox"/>	Passes	MEC 1993 Energy Code:	<input type="checkbox"/>	Passes
IECC 2000 Energy Code:	<input type="checkbox"/>	Passes	MEC 1992 Energy Code:	<input type="checkbox"/>	Passes
IECC 1998 Energy Code:	<input type="checkbox"/>	Passes	ASHRAE 90.2 Code:	<input type="checkbox"/>	Fails

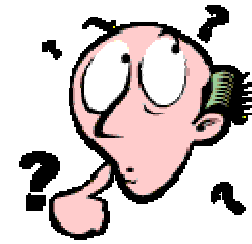
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What the #!*& is going on?



Quick Analysis

Energy | Surface Area | Compliance

Programs

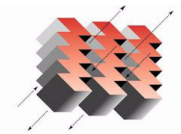
Energy Star:	Passes	HERS Index:	58
Tax Credit:	Passes		

Codes

IECC 2006 Energy Code:	FAILS	ECC of New York State:	Passes
IECC 2004 Energy Code:	FAILS	ECC of Southern Nevada:	Passes
IECC 2003 Energy Code:	Passes	MEC 1995 Energy Code:	Passes
IECC 2001 Energy Code:	Passes	MEC 1993 Energy Code:	Passes
IECC 2000 Energy Code:	Passes	MEC 1992 Energy Code:	Passes
IECC 1998 Energy Code:	Passes	ASHRAE 90.2 Code:	Passes

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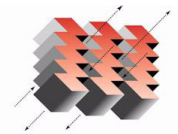


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I'm so confused!

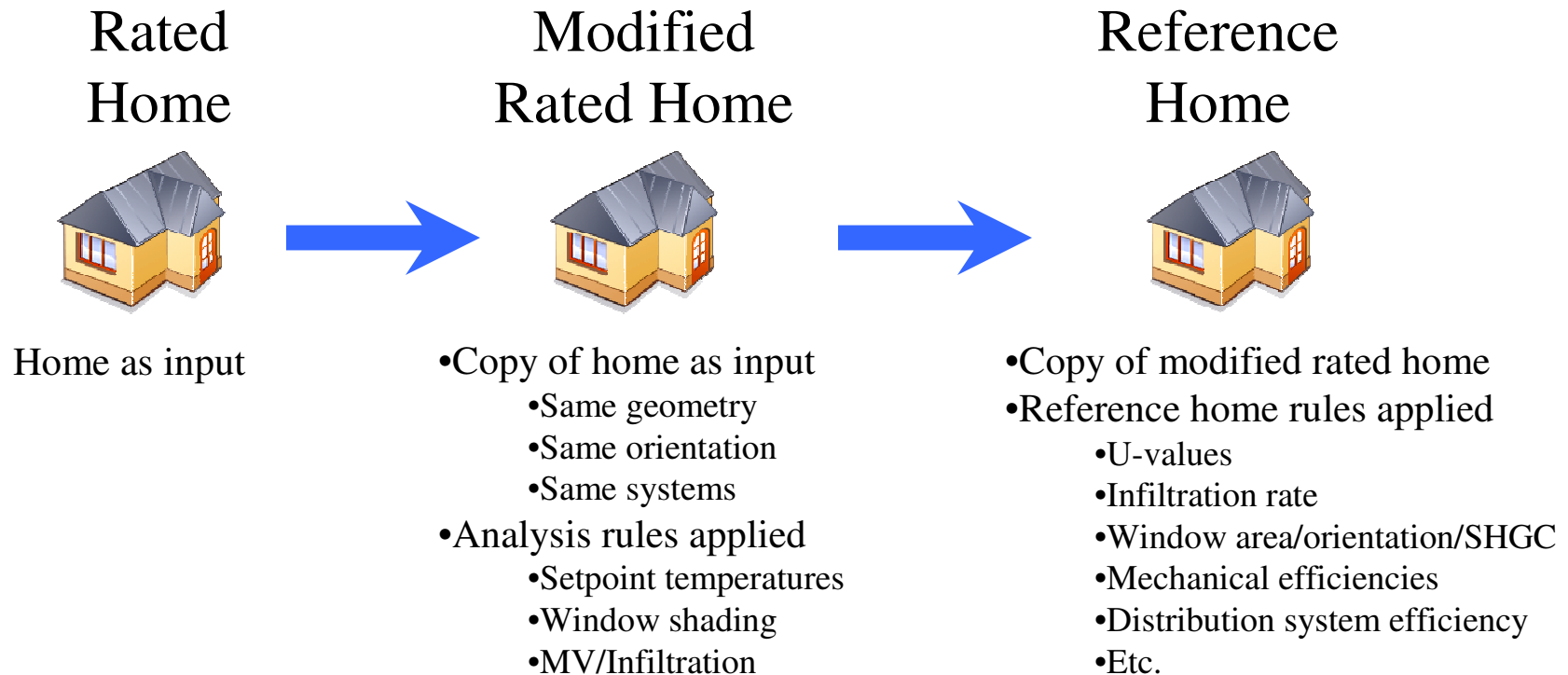


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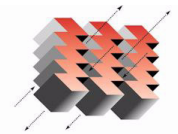


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Performance-Based Analysis Refresher



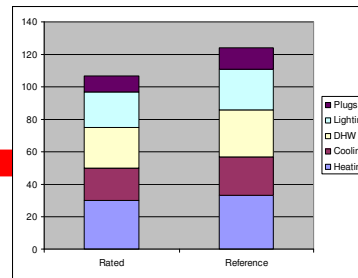
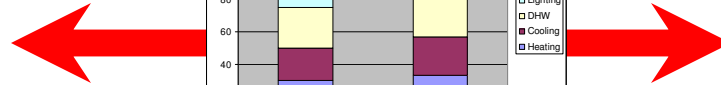
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Performance-Based Analysis Refresher

Modified
Rated Home

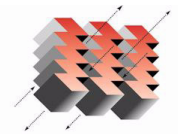


Reference
Home



- Energy use of homes is compared
- If Rated Home < Reference Homes: PASSES
- If Rated Home > Reference Home: FAILS

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Performance-Based Analysis Refresher

Modified
Rated Home



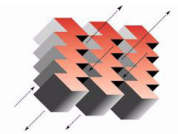
Called
Proposed Design
in codes

Reference
Home



Called
Standard Design
in codes

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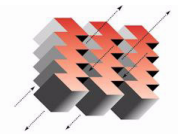
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Reasons We're So Confused...

Differing end-uses are considered

- **HERS Index includes all energy use and production**
- **ENERGY STAR does not count all CFLs or energy production**
 - *One reason why a sub-85 home might not qualify for ENERGY STAR*
- **Tax credit considers only space heating/cooling**
 - *This is why most tax credit homes have a HERS Index above 50*

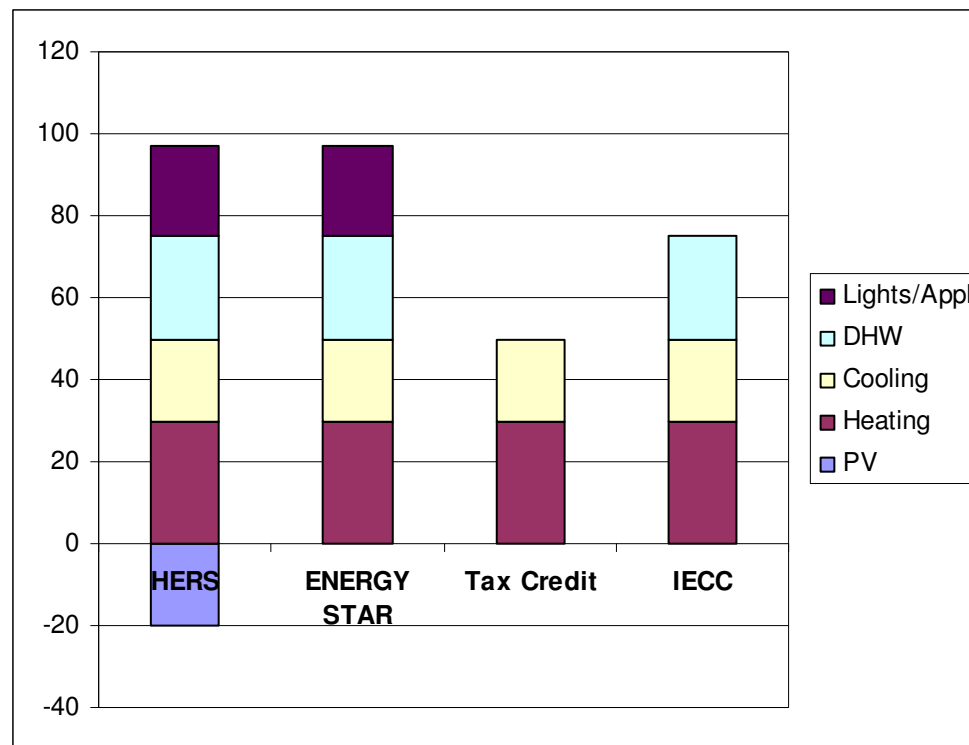
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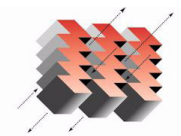
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Reasons We're So Confused...

Differing end-uses are considered



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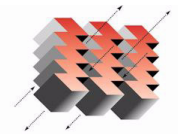
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Reasons We're So Confused...

Different metrics are used

- **HERS Index, tax credit use normalized, modified end-use loads (nMEUL)**
- **IECC uses energy cost**
- *This is one reason why a home with a HERS Index of 100 may or may not pass code.*

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Reasons We're So Confused...

Different metrics are used

HERS, ENERGY STAR, Tax Credit

Normalized, modified end-use loads (nMEUL)

$$\text{nMEUL} = \text{REUL} * (\text{nEC}_x / \text{EC}_r)$$

$$\text{nEC}_X = (a * \text{EEC}_x - b) * (\text{EC}_x * \text{EC}_x * \text{DSE}_r) / (\text{EEC}_x * \text{REUL})$$

$$\text{EEC}_x = 1 / \text{MEPR}$$

$$\text{DSE}_r = \text{REUL} / \text{EC}_r * \text{EEC}_r$$

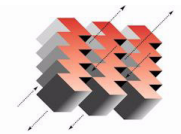
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IECC

Annual Energy Cost

\$

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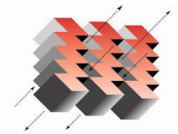
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Reasons We're So Confused...

Still recovering from last year's RESNET conference



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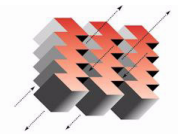
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Reasons We're So Confused...

Different Reference Homes are used

- **HERS Index, ENERGY STAR, tax credit use 2004 IECC**
- **2006 IECC is now being adopted by jurisdictions**
- **Differences:**
 - **Window area in Standard Design**
 - **2004: 18% of floor area**
 - **2006: floats up to 18%**
 - **Infiltration rate in Standard Design**
 - **2004: 0.00048 SLA**
 - **2006: 0.00036 SLA**
- *This is why a 100 point home may or may not pass 2006*

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Reasons We're So Confused...

Different Reference Homes are used

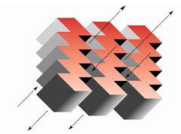
HERS, ENERGY STAR, Tax Credit



2006 IECC



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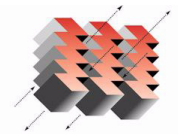
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Reasons We're So Confused...

The 2006 IECC requires R-8 ducts

- **An absolute requirement**
 - **Unless changed by local amendment**
 - **Even a zero-energy home cannot pass 2006 IECC w/o R-8 ducts**
- **Not a requirement for HERS, ENERGY STAR, tax credit**
 - *This is why you can meet ENERGY STAR or make tax credit, and fail code*

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Reasons We're So Confused...

The 2006 IECC requires R-8 ducts

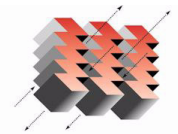
HERS, ENERGY STAR, Tax Credit



2006 IECC



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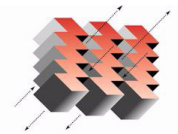
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Reasons We're So Confused...

Sprained brain taking RESNET Rater Test



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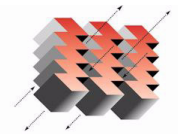
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Reasons We're So Confused...

ENERGY STAR homes require duct testing

- **No defaults, must be measured**
 - **Must be below 0.06 cfm25/cfa**
 - **Only exception is all ducts inside and very tight shell**
- **HERS, IECC, tax credit do not require duct testing**
 - **Can use IECC/RESNET defaults**
- *This is why a sub-85 point home might not make ENERGY STAR*
- *This is why a home might make tax credit, but not qualify for ENERGY STAR*

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Reasons We're So Confused...

ENERGY STAR homes require duct testing

ENERGY STAR



Mandatory



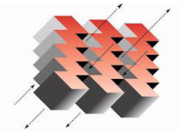
HERS, Tax Credit, IECC



Optional



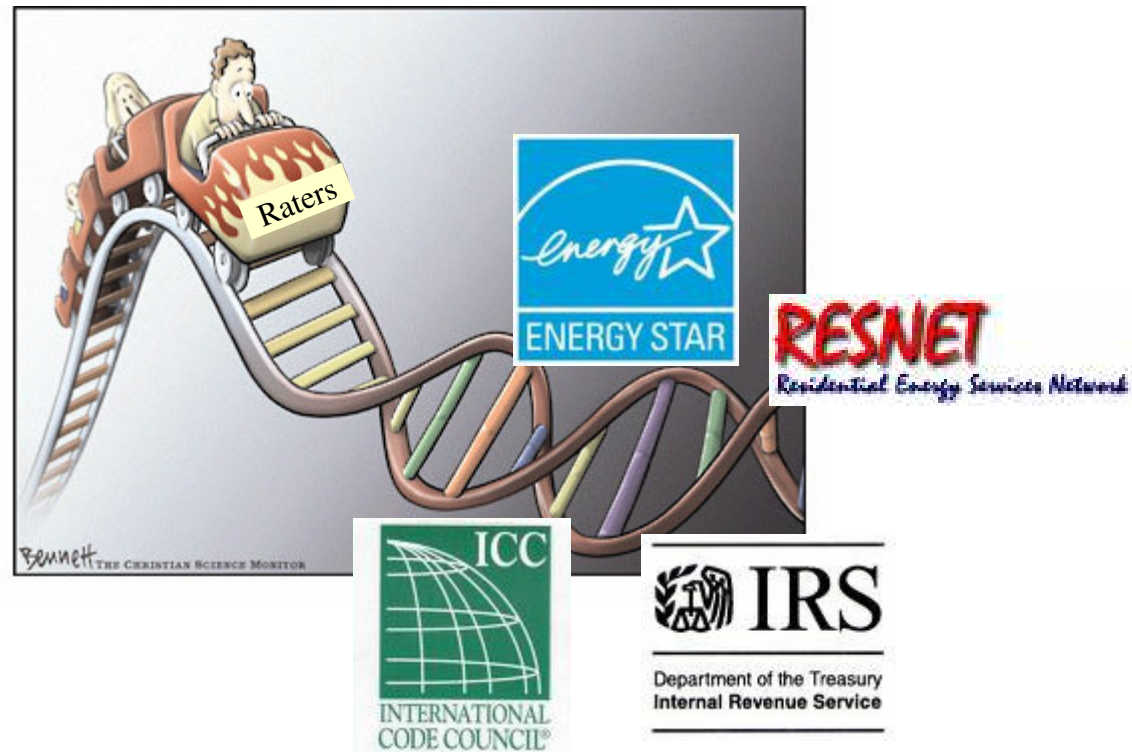
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Reasons We're So Confused...

The rules keep changing



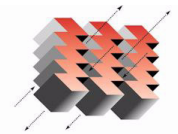
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HERS Rater's Guide to the Universe

Variability in Rules for Performance-Based Analysis

	HERS Index	ENERGY STAR	Tax Credit	2006 IECC
End-uses included	All	All, limited CFLs	Space heating and cooling	Space heating and cooling, hot water
Onsite power production	Yes	No	No	Yes
Metric	nMEUL	nMEUL	nMEUL	Cost
Reference	2004 IECC	2004 IECC	2004 IECC	2006 IECC
Reference window area	18%	18%	18%	<=18%
Reference infiltration	0.00048 SLA	0.00048 SLA	0.00048 SLA	0.00036 SLA
R-8 ducts mandatory?	No	No	No	Yes
Duct testing required?	No	Yes	No	No

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Sorting It Out (in REM/Rate)

Quick Analysis

Energy | Surface Area | Compliance

Programs

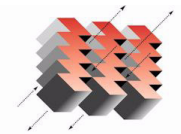
Energy Star:	<input type="checkbox"/> Fails	HERS Index:	<input type="text" value="74"/>
Tax Credit:	<input type="checkbox"/> Fails		

Codes

IECC 2006 Energy Code:	<input type="checkbox"/> Fails	ECC of New York State:	<input type="checkbox"/> Passes
IECC 2004 Energy Code:	<input type="checkbox"/> Fails	ECC of Southern Nevada:	<input type="checkbox"/> Passes
IECC 2003 Energy Code:	<input type="checkbox"/> Passes	MEC 1995 Energy Code:	<input type="checkbox"/> Passes
IECC 2001 Energy Code:	<input type="checkbox"/> Passes	MEC 1993 Energy Code:	<input type="checkbox"/> Passes
IECC 2000 Energy Code:	<input type="checkbox"/> Passes	MEC 1992 Energy Code:	<input type="checkbox"/> Passes
IECC 1998 Energy Code:	<input type="checkbox"/> Passes	ASHRAE 90.2 Code:	<input type="checkbox"/> Fails

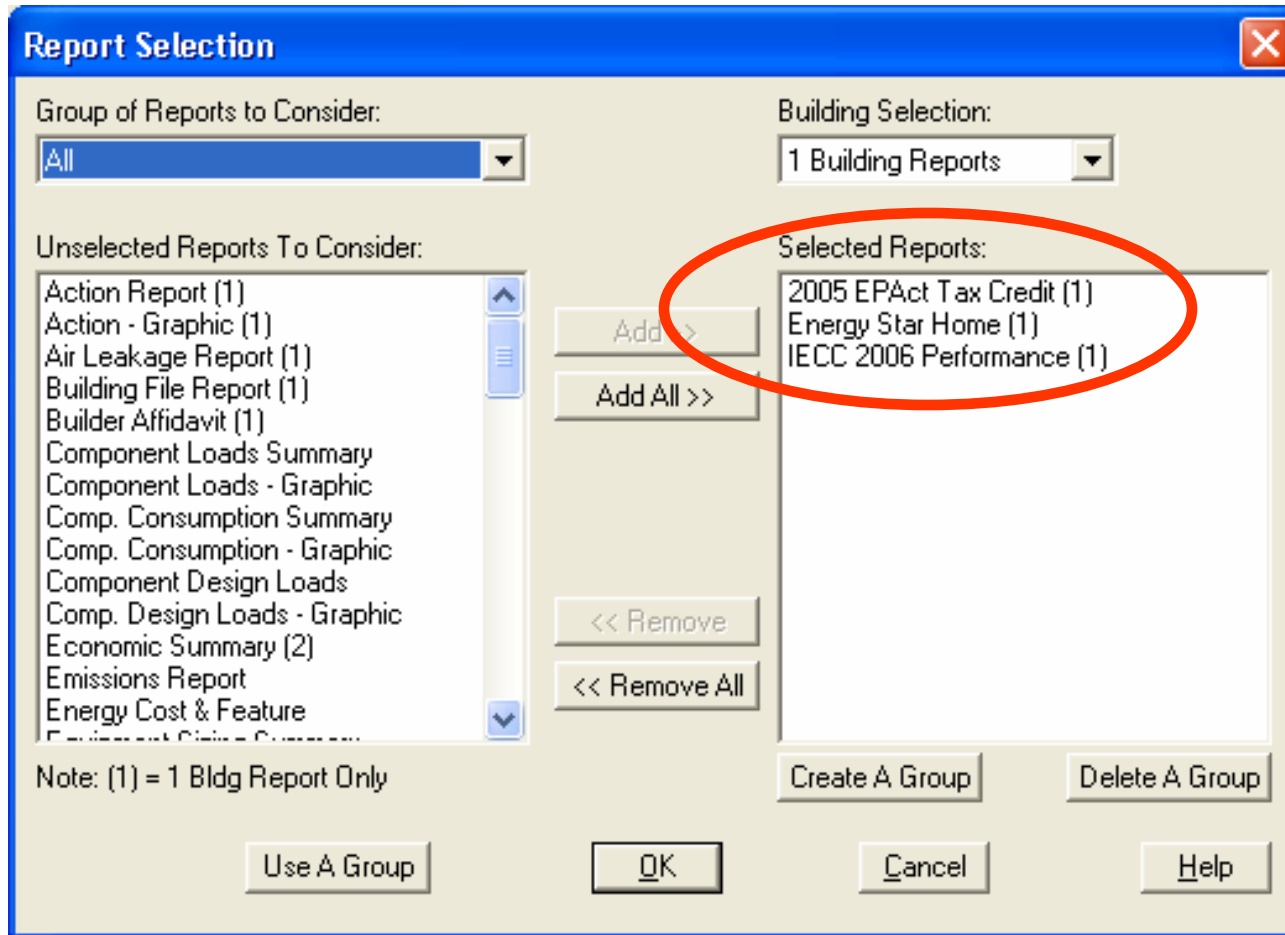
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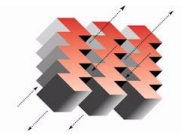


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Sorting It Out (in REM/Rate)



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Sorting It Out (in REM/Rate)

Preview - Energy Star Home Report

	ENERGY STAR	As Designed
Heating:	45.3	25.9
Cooling:	11.1	5.9
Water heating:	10.5	11.7
Lighting & Appliances:	20.7	23.6
Total:	87.6	67.0
HERS Index:	80	61

ENERGY STAR Mandatory Requirements

<input checked="" type="checkbox"/> Thermal Bypass Inspection Checklist*	<input checked="" type="checkbox"/> ENERGY STAR Products*
<input type="checkbox"/> Ductwork Requirements	<input checked="" type="checkbox"/> ENERGY STAR Scoring Exceptions

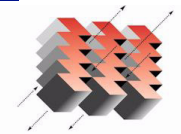
* Thermal Bypass Checklist and ENERGY STAR Products are not checked in REM/Rate at this time.

THIS HOME DOES NOT MEET the energy efficiency requirements for designation as an EPA ENERGY STAR Qualified Home.

Pollution Prevented		Energy Cost Savings (\$/year)	
Type of Emissions	Reduction (lb/year)		
Carbon Dioxide (CO ₂)	0.0	Heating:	\$0
Sulfur Dioxide (SO ₂)	0.0	Cooling:	\$0
Nitrogen Oxides (NO _x)	0.0	Water Heating:	\$0
		Lights & Appliances:	\$0
		Total:	\$0

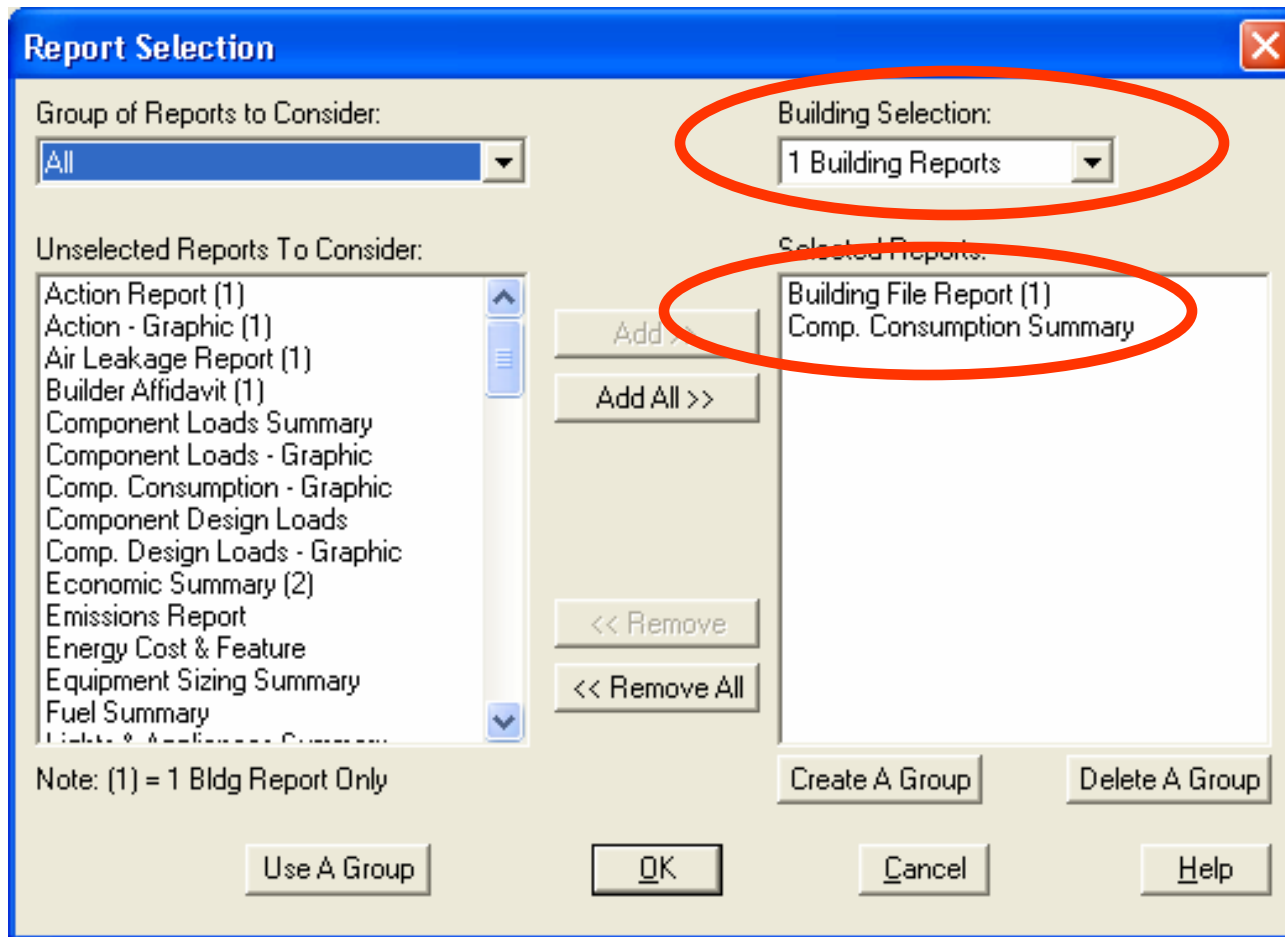
Energy Star Home Report

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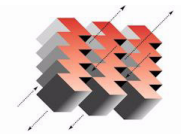


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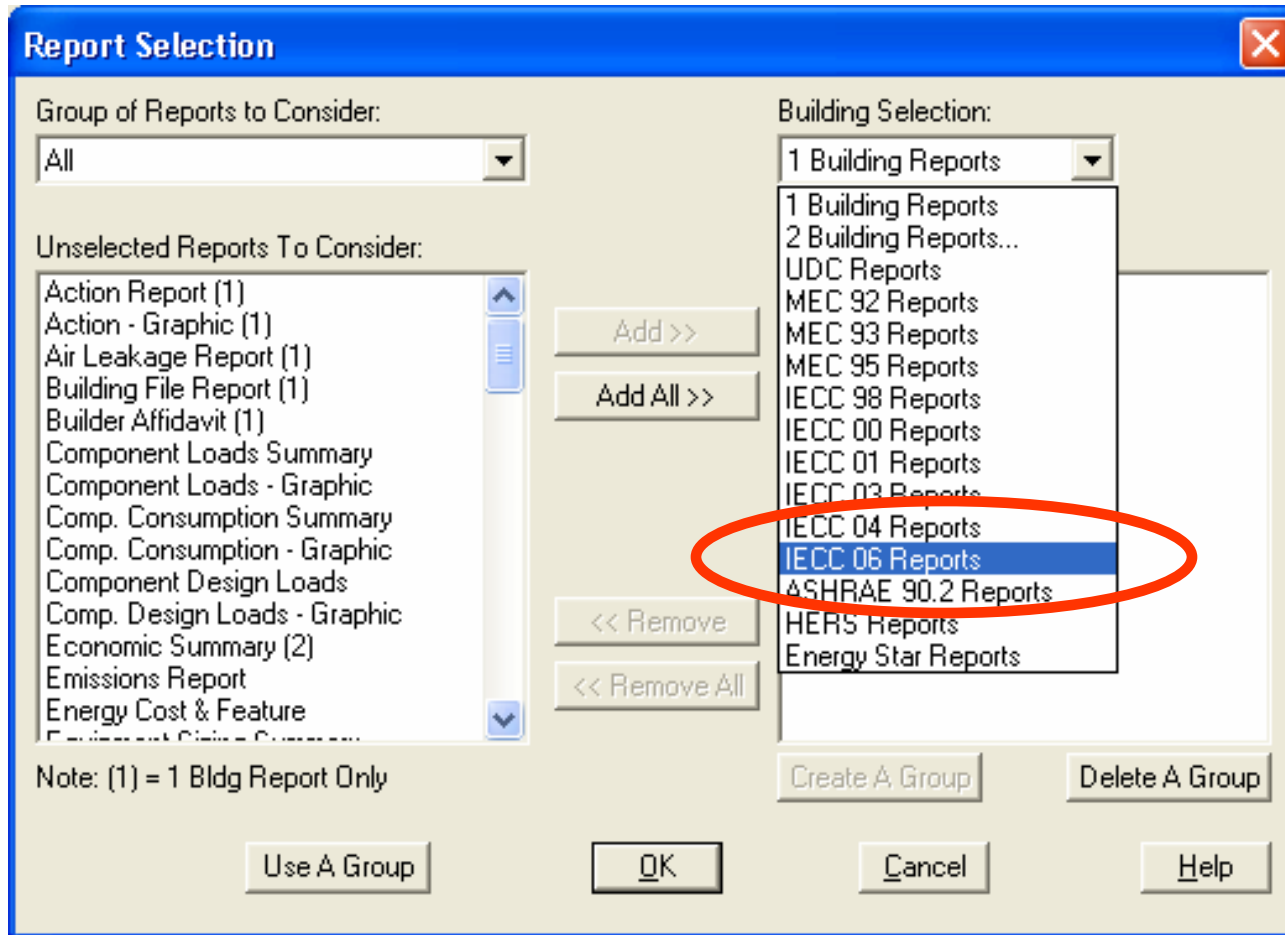


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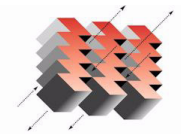


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Sorting It Out (in REM/Rate)



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Sorting It Out (in REM/Rate)

Preview - Component Consumption Summary - 2006 IECC

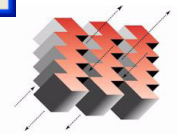
COMPONENT CONSUMPTION SUMMARY - 2006 IECC

Date: February 16, 2008 Rating No.: XYZ-22233
Building Name: Rated Home Rating Org.: Oakland Rates
Owner's Name: I.M. Smith Phone No.: 303 222 1111
Property: 2342 Maybee Ave. Rater's Name: H.I. Scorer
Address: Green Bay, WI 80333 Rater's No.: 303 333 2222
Builder's Name: WeeBeeGood Builders
Weather Site: Green Bay, WI Rating Type: Based on plans
File Name: Energy Star.blg Rating Date: 4/12/95

	REFERENCE	Rated Home	DIFF	% DIFF
HEATING SEASON (MMBtu/yr)				
Ceilings/Roofs	7.1	4.7	2.4	34.4%
Rim/Band Joists	0.0	0.0		
Above Grade Walls	25.8	23.0	2.8	11.0%
Foundation Walls	0.0	0.0		
Doors	4.4	2.7	1.7	38.2%
Windows/Skylights	2.2	1.7	0.5	24.6%
Frame Floors	0.0	0.0		
Crawl Space/Unht Bsmt	23.0	4.9	18.1	78.6%

<< Page Page >> << Report Report >>
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Component Consumption Summary - 2006

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Sorting It Out (in REM/Rate)

Preview - Building File Report - 2006 IECC

BUILDING FILE REPORT - 2006 IECC

File Name: Energy Star.blg Date: February 16, 2008

Property/Builder:		Rating	
Building Name:	Energy Star	Org. Name:	Oakland Raters
Owners Name:	I.M. Smith	Phone No:	303 222 1111
Prop. Address:	2342 Maybee Ave.	Rater's Name:	H.I. Scorer
City, St, Zip:	Green Bay, WI 80333	Rater's No.:	303 333 2222
Phone No:	303 444 4444	Rating Date:	4/12/95
Bldr's Name:	Wee Bee Good Builders	Rating Type:	Based on plans
Model:	The Jubilee ES	Reason:	New home
Development:	Lake View	Rating No.:	XYZ-22233
Phone No:	303 111 2222		

General Building Information

Area of Cond. Space(sq ft):	2000
Floors on or Above Grade:	1
Volume of Cond. Space:	16000
Number of Bedrooms:	3

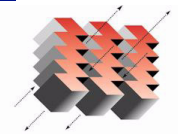
City: Green Bay, WI

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Building File Report - 2006 IECC

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Sorting It Out (in REM/Rate)

Preview - REFERENCE Building File Report - 2006 IECC

REFERENCE BUILDING FILE REPORT - 2006 IECC

File Name: Energy Star.blg Date: February 16, 2008

Property/Builder:		Rating	
Building Name:	Energy Star	Org. Name:	Oakland Raters
Owner's Name:	I.M. Smith	Phone No:	303 222 1111
Prop. Address:	2342 Maybee Ave.	Rater's Name:	H.I. Scorer
City, St/Zip:	Green Bay, WI 80333	Rater's No.:	303 333 2222
Phone No:	303 444 4444	Rating Date:	4/12/95
Bl'd's Name:	Wee Bee Good Builders	Rating Type:	Based on plans
Model:	The Jubilee ES	Reason:	New home
Development:	Lake View	Rating No.:	XYZ-22233
Phone No:	303 111 2222		

General Building Information

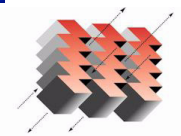
Area of Cond. Space(sq ft):	2000
Floors on or Above Grade:	1
Volume of Cond. Space:	16000
Number of Bedrooms:	3
Number of Bathrooms:	2
Number of Units:	1
City, State, Zip:	Green Bay, WI 80333

<< Page Page >> << Report Report >>

Close Print... Print All... Help

REFERENCE Building File Report - 2006 IE

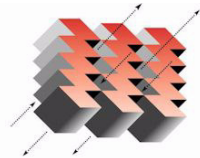
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Thanks!

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