What’s a Rating?

Jaime Oldmixon
Home Energy Service, Inc.
# Energy Rating Index (R406)

<table>
<thead>
<tr>
<th>Prescriptive</th>
<th>Prescriptive</th>
<th>Simulated Performance</th>
<th>Energy Rating Index</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R-Value</strong></td>
<td><strong>U-Factor</strong></td>
<td><strong>Simulated</strong></td>
<td><strong>ERI</strong></td>
</tr>
<tr>
<td>(No Tradeoffs)</td>
<td>(component tradeoffs)</td>
<td><strong>Performance Approach</strong></td>
<td><strong>Compliance Alternative</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total UA</strong></td>
<td><strong>R405</strong></td>
<td><strong>R406</strong></td>
</tr>
<tr>
<td></td>
<td>(tradeoffs between components)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NEW
Energy Rating Index (ERI) (R406)

Completed by an approved third party with documentation, including compliance reports, that must be reviewed by the code official.

It makes sense that ERI Raters become ICC certified as Residential Energy Inspectors.
### Residential Energy Inspector/Plans Examiner - 79

<table>
<thead>
<tr>
<th>EXAM ID</th>
<th>CATEGORY</th>
<th>STATE</th>
<th>TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>79</td>
<td>Energy Conservation</td>
<td>National/All</td>
<td>National Certification</td>
</tr>
</tbody>
</table>

RESNET and ICC have a partnership to advance and coordinate the use of the ERI as a code compliance path.
It’s official:
ANSI/RESNET Standard 301-2014
How Ratings Are Used
Energy-Efficiency is Built Into Every Legend Home

**Average Legend Home HERS Rating**

Less Energy

<table>
<thead>
<tr>
<th>HERS® Index</th>
<th>Typical New Home</th>
<th>Typical Existing/Resale Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 - 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 - 150</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

More Energy

**HOME ENERGY RATING SYSTEM**

USES MORE ENERGY

USES LESS ENERGY

**TYPICAL EXISTING HOME FOR SALE**

**STANDARD NEW CONSTRUCTION HOME**

**ENERGY STAR RATED HOME**

**AVERAGE ENERGY ENGINEERED AMEDORE HOME**

The lower a home's HERS Index, the more energy efficient it is in comparison to the HERS Reference Home. Each 1-point decrease in the HERS Index corresponds to a 1% reduction in energy consumption compared to the HERS Reference Home.

An Amedore Homes, single family home has been proven to be 40 - 50% more energy efficient than the average home.
Builders use it ...

**Continuous Improvement in Average HERS Index Score**

**ResNet Home Energy Ratings Index**

- **Higher Energy Costs**
- **Typical Resale Home**: 130
- **Typical New Home**: 100
- **KB Home’s Zerohouse 2.0 Homes (Where Available)**: 65

**Lower Energy Costs**
Residential Energy Services Network (RESNET)

- Quality Assurance Providers
- HERS Raters & Rating Field Inspectors (RFI)
- Quality Assurance Designee (QAD)
- HERS Training Providers
- Software Companies
Home Energy Ratings

Quality Assurance 10%-1%
Approved Software:

- **REM/Rate 15.5, NORESCO**
- **EnergyGauge® US V6.0**
  - Florida Solar Energy Center
  - **Ekotrope HERS Module Version V2.2, Ekotrope**
  - **International Beacon Residential Version, ICF**
  - **Right-Energy HERS, Wrightsoft Corporation**
HERS Rater Requirements

- 5-6 Day Training Course
- National Rater Test (2-hour online)
- Rater Practical Test (2-hour online simulation)
- Combustion Appliance Zone (CAZ) Test (2-hr online simulation)
- CAZ Work Scope Test (2-hour online)
- Complete five supervised probationary ratings
- Associate with QA Provider
- Maintain continuing education requirements
Rating Key Concepts

Reference Design

Proposed Design

“Geometric Twins”
Rating Key Concepts

Asset Based – Occupant Behavioral Neutral
Energy Rating Index (ERI) (R406)

• 100 equates to the levels prescribed in the 2006 IECC
• Zero is equivalent to a net-zero-energy home
• RESNET’s Home Energy Rating System (HERS) Rating System – Only Current Option
• House must also meet the minimum envelope requirements of the 2009 IECC and all of the mandatory code provisions.
How Does HERS Index Work?

• Reference Building is given an Index of 100
• A 1% improvement in building energy performance results in a one index point reduction

For Example:

- Index of 120 means the building uses 20% more energy than the Reference Building
- Index of 50 means the building uses half the energy of the Reference Building
- Index of zero means the building produces exactly as much energy as it uses.
Renewables in the ERI Compliance Path

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>2018 ERI Score</th>
<th>2015 ERI Scores</th>
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</thead>
<tbody>
<tr>
<td>1 – 2</td>
<td>57</td>
<td>52</td>
</tr>
<tr>
<td>3</td>
<td>57</td>
<td>51</td>
</tr>
<tr>
<td>4</td>
<td>62</td>
<td>54</td>
</tr>
<tr>
<td>5</td>
<td>61</td>
<td>55</td>
</tr>
<tr>
<td>6</td>
<td>61</td>
<td>54</td>
</tr>
<tr>
<td>7-8</td>
<td>58</td>
<td>53</td>
</tr>
</tbody>
</table>

Renewable Energy May Now Be Included

- Without renewables backstop is 2009 IECC for thermal envelope.
- With renewables backstop is 2015 IECC for thermal envelope.
HERS Rating Index – Standard Assumptions

- Impact of Occupant Behavior
- Thermostat Set Points
- Hot Water Temperature and Usage
- Interior Window Shading

Standard assumptions are used for these factors when the HERS Index is calculated.
Energy Rating Index (ERI) (R406)

NEW

ANSI/RESNET/ICC 301-2014

Basis of ERI approach
Two Types of Ratings

Projected Ratings – Ratings performed prior to the construction (from plans) of a home or prior to the installation of energy improvements to an existing home (site inspection).

Confirmed Ratings – Ratings completed using data gathered from an on-site inspection, which usually includes performance testing of the home.

For Code Compliance
REM/Rate™ IS
THE MOST WIDELY
USED RATING SOFTWARE
IN THE U.S.
Rating Software Data Inputs
Data Input Owner, Builder, Address Info

Building Name: HortonMiller House

Property Information:
Owner's Name: Dale Horton and Jody Miller
Property Address: 3713 Creekwood Road
City: Missoula
State: MT, Zip: 59802
Phone Number: 406/549-7081

Builder Information:
Builder's Name: Southwall Builders
Builder's Address: Missoula, Montana
Builder's Email: 
Phone Number: 
Plan/Model Name: 
Community/Development: 
Permit Date/Number: 
Location

Select Location

By Zip Code
First 3 Digits: [field]
Find

By State and City
State/Province: MT
And City:
- Billings
- Cut Bank
- [current selection is Dillon]
- Glasgow
- Great Falls
- Helena
- Kalispell
- Lewistown
- Miles City
- Missoula

Current Selection and Data

Dillon, MT

The following values are from ASHRAE Fundamentals or Std 169-2013 for the selected location.

- HDD, Base 65F: 8184
- CDH, Base 74F: 5168
- IECC Climate Zone: 6B
- ASHRAE wsf: 0.65
- Design Heating Temp: -8
- Design Cooling Temp: 89

[Buttons: OK, Cancel, Help]
Data Inputs
Energy Costs

Utility Rates Library

<table>
<thead>
<tr>
<th>Utility</th>
<th>Fuel</th>
<th>State</th>
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<tbody>
<tr>
<td>NWE Elec Feb 2016</td>
<td>Electric</td>
<td></td>
</tr>
<tr>
<td>NWE NG Feb 2016</td>
<td>Natural gas</td>
<td></td>
</tr>
<tr>
<td>Default Propane Provider</td>
<td>Propane</td>
<td></td>
</tr>
<tr>
<td>Default Oil Provider</td>
<td>Fuel oil</td>
<td></td>
</tr>
<tr>
<td>Default Gas Provider</td>
<td>Natural gas</td>
<td></td>
</tr>
<tr>
<td>Default Electric Provider</td>
<td>Electric</td>
<td></td>
</tr>
</tbody>
</table>

Utility Name: NWE Elec Feb 2016
Fuel Type: Electric

Seasons:

<table>
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<tr>
<th>Start</th>
<th>Through</th>
</tr>
</thead>
<tbody>
<tr>
<td>JAN</td>
<td>DEC</td>
</tr>
</tbody>
</table>

Rates for Selected Season:

<table>
<thead>
<tr>
<th>Min</th>
<th>Max</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1000000</td>
<td>0.1066</td>
</tr>
</tbody>
</table>

Service Charge ($/Month): 5.30
Block Range: 0 to 1000000
Rate ($/kWh): 0.1066
Detailed Inputs: Slab Floors

Note that REM's depth below grade differs from the criteria used by Manual J, and by the IECC codes.

**Walkout Basements**
These basement slabs should be subdivided in REM, with one slab being the below-grade slab, and the other being slab-on-grade. (Refer to the diagrams below to clarify this description). The transition from type “slab-on-grade” to type “below-grade” occurs where the floor is approximately 1’ below grade (why has the REM definition has been changed?).

To subdivide a slab, draw a convenient line or lines that divide it. You will need to find the area of the sub-slabs, and the length of the common perimeter (where the two sub-slabs touch each other). Then model each sub-slab by the rules described above. For each sub-slab, the Full Perimeter will always include the common perimeter where they touch each other, and the Exposed Perimeter will never include this shared line of contact.
### Window and Glass Door Properties Summary

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Type</th>
<th>Area</th>
<th>Orient</th>
<th>Wall#</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a</td>
<td>U.30/.45</td>
<td>48.9</td>
<td>North</td>
<td>AGW1</td>
</tr>
<tr>
<td>2</td>
<td>b</td>
<td>U.30/.45</td>
<td>49.2</td>
<td>East</td>
<td>AGW1</td>
</tr>
<tr>
<td>3</td>
<td>c</td>
<td>U.30/.45</td>
<td>12.0</td>
<td>East</td>
<td>AGW1</td>
</tr>
<tr>
<td>4</td>
<td>d</td>
<td>U.30/.45</td>
<td>18.0</td>
<td>East</td>
<td>AGW1</td>
</tr>
<tr>
<td>5</td>
<td>e</td>
<td>U.30/.45</td>
<td>175.8</td>
<td>South</td>
<td>AGW1</td>
</tr>
</tbody>
</table>

### Window Properties

- **Name**: a
- **Type**: U.30/.45
- **Area (sq ft)**: 48.9
- **U-Value**: 0.300
- **Orientation**: North
- **SHGC**: 0.450

### Overhang
- **Depth (ft)**: 0.0
- **To Top Of Window (ft)**: 0.0
- **To Bottom Of Window (ft)**: 0.0

### Interior Shading
- **Winter**: 0.67

### Adjacent Shading
- **Winter**: Some
- **Summer**: 0.67
- **Summer**: Some

### Wall Assignment
- **Wall #**: AGW1
- **Wall Name**: AGW1
- **Wall Area**: 2451.0
## Ceiling Properties Summary

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Type</th>
<th>Area</th>
<th>Style</th>
<th>Radiant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R-36, Vaulted g1****</td>
<td>1255</td>
<td>Vaulted</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>R-36, Attic g1****</td>
<td>294</td>
<td>Attic</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

### Ceiling Properties

- **Name:**
  - R-36, Vaulted g1****  U=0.030
  - R-36, Attic g1****    U=0.030
  - R-36, Vaulted g1****  U=0.021

- **Ceiling Area (sq ft):**
  - R-36, Vaulted g1****  U=0.030
  - R-36, Attic g1****    U=0.021

### Roof Properties (optional)

- R-50 Blown, Attic
- R-50 Blown, Attic G1
- R-35, Vaulted
- R-30 Blown, Attic
- R-30, Vaulted
- R-38 Blown, Attic

### Exterior Color:
- No

### Radiant Barrier:
- No
## Data Inputs

### Mechanical

#### Mechanical Equipment Properties Summary

<table>
<thead>
<tr>
<th>#</th>
<th>Type</th>
<th>Htg Eff</th>
<th>Clg Eff</th>
<th>Dhw Eff</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>94AFUE Gas Furn 40k****</td>
<td>94.0 AFUE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>50 gal. 0.93EF Elec</td>
<td></td>
<td></td>
<td>0.93 EF</td>
</tr>
</tbody>
</table>

#### Mechanical Equipment Properties

- **Library Type:** Space Heating
- **Equipment:** 94AFUE Gas Furn 40k****
- **Location:** Conditioned area
- **Performance Adj. (%):** 100.0
- **Load Served (%):** Heating: 100.0, Cooling: 0.0, DHW: 0.0

#### System-Wide Properties

- **Setpoint Temperature (F):** Heating: 68.0, Cooling: 78.0
- **Programmable Thermostat:**
  - Heating: Yes
  - Cooling: No
- **Capacity Weight % of Load Served:**
  - Heating: 100%
  - Cooling: 0%
  - DHW: 100%
- **Total Load Served (must total 100%):** 100%
Data Inputs Duct System
Data Inputs
Ventilation

**Whole House Infiltration**
- Measurement Type: Blower door test
- Heating Season Infiltration Value: 954 CFM @ 50 Pascals
- Cooling Season Infiltration Value: 954
- Shelter Class: 4
- Code Verification: Tested

**Mechanical Ventilation System for IAQ**
- Type: Exhaust Only
- Sensible Recovery Efficiency (%): 0.0
- Total Recovery Efficiency (%): 0.0
- Rate (cfm): 360
- Hours/Day: 1.0
- Fan watts: 96.8

**Usage of Operable Windows**
- Cooling Season Strategy: Natural Ventilation
### Whole House Infiltration

**Measurement Type:** Blower door test

- **Heating Season Infiltration Value:** 954 CFM @ 50 Pascals
- **Cooling Season Infiltration Value:** 954

**Shelter Class:** 4

**Code Verification:** Tested

### Mechanical Ventilation System for IAQ

- **Type:** Exhaust Only
- **Sensible Recovery Efficiency (%):** 0.0
- **Total Recovery Efficiency (%):** 0.0
- **Rate (cfm):** 360
- **Hours/Day:** 1.0
- **Fan watts:** 96.8

**Usage of Operable Windows**

- **Cooling Season Strategy:** Natural Ventilation
Quick Graphs

Heating Cost

$/yr

Heating Cost

HortonMiller House

Ceilings/Roofs
Rim/Band Joists
Above Grade Walls
Foundation Walls
Doors
Windows/Skylights
Slab Floors
Infiltration
Mechanical Ventilation
Ducts
Internal Gains

All buildings use the current location and energy costs.
# 2015 IECC R-406 Projected Energy Rating Index Report

**Property:** Southwall Builders  
**Address:** 3713 Creekwood Road  
**City:** Missoula, MT 59802

**Organization:** NCAT  
**Phone:** 406/721-9908  
**Rater:** Dale Horton  
**Rating No:** NA  
**Rater ID:** Pending  
**Date Rated:** 2/1/16

---

### Estimated Annual Energy Consumption

<table>
<thead>
<tr>
<th>Service</th>
<th>Rated Home Calculated Energy Use (MBTU)</th>
<th>Rated Home Cost ($/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating</td>
<td>61.2</td>
<td>468</td>
</tr>
<tr>
<td>Cooling</td>
<td>3.8</td>
<td>117</td>
</tr>
<tr>
<td>Water Heating</td>
<td>12.2</td>
<td>381</td>
</tr>
<tr>
<td>Lights &amp; Appliances</td>
<td>24.4</td>
<td>761</td>
</tr>
<tr>
<td>Photovoltaics</td>
<td>0.0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Total:** 101.5 MBTU  
**Energy Use:** 1889 MBTU

*Based on standard operating conditions

**ERI with PV:** 66  
**ERI without PV:** 66

### Annual Estimates

- **Electric (kWh):** 12200  
- **CO₂ Emissions (Tons):** 12  
- **Natural Gas (Therm):** 398  
- **Energy Savings ($):** 602

*Based on the 2015 IECC Energy Rating Index Reference Design Home

---

**Maximum Energy Rating Index:** 54  
**This Home’s Energy Rating Index:** 66  

This home DOES NOT MEET the Energy Rating Index Score requirements of Section 406 of the 2015 International Energy Conservation Code based on a climate zone of 68. In addition to the Energy Rating Index other mandatory measures must be met. (See Mandatory Requirements on second page.)

**Name:** Dale Horton  
**Organization:** NCAT  
**Signature:** [Signature]  
**Date:** 8 February 2018

---

**Provider Data and Seal**

- **Title:**  
- **Company:**  
- **Address:**  
- **City, State, Zip:**  
- **Phone #:**  
- **Fax #:**

To determine if a provider is properly accredited go to: www.resnet.us/professional/programs/search_directory

---

REM/Rate - Residential Energy Analysis and Rating Software v15.5  
This information does not constitute any warranty of energy code or savings.  
2015 IECC R-406 Projected Energy Rating Index Report

Property
Builder: Southwall Builders
Address: 3713 Creekwood Road
Missoula, MT 59802

Organization
Company: NCAT
Phone: 406/721/9908
Rater: Dale Horton

Energy Rating Index Information
Site Visit
Rating No: NA
Rater ID: Pending
Date Rated: 2/1/16

HERS® Index
More Energy

Existing Homes

Standard New Home

Zero Energy Home

Less Energy

This Home 66

Estimated Annual Energy Consumption*

|                     | Rated Home Calculated Energy Use (MBTU) | Rated Home Cost ($) | yr |
|---------------------|-----------------------------------------|---------------------|
| Heating             | 61.2                                    | 468                 |
| Cooling             | 3.8                                     | 117                 |
| Water Heating       | 12.2                                    | 381                 |
| Lights & Appliances | 24.4                                    | 761                 |
| Photovoltaics       | 0.0                                     | 0                   |
| Total               | 101.5                                   | 1869                |

*Based on standard operating conditions

ERI with PV: 66
ERI without PV 66

Annual Estimates

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric (kWh)</td>
<td>12209</td>
<td>CO2 Emissions (Tons)</td>
</tr>
<tr>
<td>Natural gas (Thermes)</td>
<td>598</td>
<td>Energy Savings ($) **</td>
</tr>
</tbody>
</table>

**Based on the 2015 IECC Energy Rating Index Reference Design Home
Performance Report

Property
Dale Horton and Jody Miller
3713 Creekwood Road
Missoula, MT 59802

Organization
NCAT
406/721-9908
Dale Horton

Weather:Dillon, MT
Horton Miller House
Horton Miller House in Butte Jan
2016. blg

Builder
Southwall Builders

HERS
Site Visit
2/1/16
Rating No:NA
Rater ID: Pending

Annual Energy Cost

<table>
<thead>
<tr>
<th>$/yr</th>
<th>Heating</th>
<th>Cooling</th>
<th>Water Heating</th>
<th>Lights &amp; Appliances</th>
<th>Photovoltaics</th>
<th>Service Charges</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>0.00</td>
<td>250.00</td>
<td>500.00</td>
<td>750.00</td>
<td>1500.00</td>
<td>2000.00</td>
<td>0.00</td>
<td>4750.00</td>
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</tbody>
</table>

Design Loads

<table>
<thead>
<tr>
<th>kwh/hr</th>
<th>Space Heating</th>
<th>Space Cooling</th>
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</thead>
<tbody>
<tr>
<td>35.00</td>
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<tr>
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Presentations Online

www.ncat.org
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/Energy Code
Training
Presentations