NORESCO REM/Rate™ and IECC compliance

November 3, 2016

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Senior Engineer
Sustainability Services
SESSION AGENDA

NORESCO Introduction

RESNET resources - website

REM/Rate™ - Brief History

REM/Rate™ - Energy Code Reports

Under the Hood

Q & A
NORESCO offers a full suite of consulting services to integrate sustainable design strategies into new construction and existing buildings.

NORESCO is a part of UTC Climate, Controls & Security, a unit of United Technologies Corp., a leading provider to the aerospace and building systems industries worldwide.

REM/Rate™ is a long-time product with a dedicated team and active involvement with RESNET®. NORESO is committed to continuing and expanding our support to RESNET® and to the residential code compliance community.
REM/RATE™ HISTORY

- Initial concept in mid-1980’s
- Simulation on home computers by mid-1990’s
- Supported HERS rating industry from inception
- Energy code compliance starting with MEC 1992
  - U_0 compliance / Consumption compliance reports
  - Now UA compliance / Cost compliance reports
  - ERI pathway beginning with 2015 IECC
  - Awaiting the 2018 IECC
Used for

- Design guidance Energy Code compliance HERS Ratings
- Weatherization guidance Utility Program compliance

Standards & Requirements behind REM capabilities:

- Weatherization programs / DOE – existing homes
- HERS industry (RESNET/Mortgage Industry) – new construction
  - ASHRAE 90.2
  - MEC
  - IECC
  - ASHRAE 62.2
  - ANSI/RESNET/ICC Standard 301-2014
Energy Code Reports

- Focused on IECC codes without amendments
- Some custom reports for amended versions of model codes
- In all cases, REM compliance reports
  - Provide compliance calculation results
  - Evaluate most Mandatory Requirements from model inputs
  - User asserts compliance for any remaining Mandatory Requirements via a checkbox specific to that energy code
2015 IECC Building UA Compliance

Property: I.M. Smith  
2342 Maybee Ave.  
Denver, CO 80333

Organization: L.A. Raters  
303 222 1111  
H.I. Scorer

HERS: Based on plans  
4/12/95  
Rating No: XYZ-22233  
Rater ID: 303 333 2222

Weather: Akron, CO  
DFHP HighEfficiency.bgl  
Builder: WeeBeeGood Builders

Elements

<table>
<thead>
<tr>
<th>Insulation Levels</th>
<th>2015 IECC</th>
<th>As Designed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell UA Check</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceilings:</td>
<td>28.6</td>
<td>22.1</td>
</tr>
<tr>
<td>Above-Grade Walls:</td>
<td>58.0</td>
<td>36.0</td>
</tr>
<tr>
<td>Windows and Doors:</td>
<td>76.8</td>
<td>79.5</td>
</tr>
<tr>
<td>Floors Over Uncond Crawl Space:</td>
<td>49.5</td>
<td>67.5</td>
</tr>
<tr>
<td>Overall UA (Design must be equal or lower):</td>
<td>212.9</td>
<td>205.1</td>
</tr>
</tbody>
</table>

Mandatory Requirements

The following Mandatory Requirements Fail:
Mandatory Requirements Check Box (IECC 15)

This home DOES NOT MEET the overall thermal performance requirements and verifications of the International Energy Conservation Code based on a climate zone of 5B. (Section 402, International Energy Conservation Code, 2015 edition.)

<table>
<thead>
<tr>
<th>Name</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.I. Scorer</td>
<td></td>
<td>28 October 2016</td>
</tr>
<tr>
<td>L.A. Raters</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# 2015 IECC Energy Cost Compliance

**Property**
I.M. Smith  
2342 Maybee Ave.  
Denver, CO 80333  

**Weather:** Akron, CO  
DFHP HighEfficiency.blg  

**Organization**
L.A. Raters  
303 222 1111  
H.I. Scorer  

**HERS**
Based on plans  
4/12/95  
Rating No: XYZ-22233  
Rater ID: 303 333 2222  

**Builder**
WeeBeGood Builders  

## Annual Energy Cost

<table>
<thead>
<tr>
<th></th>
<th>2015 IECC</th>
<th>As Designed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating</td>
<td>261</td>
<td>83</td>
</tr>
<tr>
<td>Cooling</td>
<td>103</td>
<td>99</td>
</tr>
<tr>
<td>Water Heating</td>
<td>124</td>
<td>69</td>
</tr>
<tr>
<td>SubTotal - Used to Determine Compliance</td>
<td>489</td>
<td>251</td>
</tr>
<tr>
<td>Lights &amp; Appliances</td>
<td>789</td>
<td>779</td>
</tr>
<tr>
<td>Photovoltaics</td>
<td>-0</td>
<td>-123</td>
</tr>
<tr>
<td>Service Charge</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1398</td>
<td>1027</td>
</tr>
</tbody>
</table>

## Mandatory Requirements

The following Mandatory Requirements Fail:  
Mandatory Requirements Check Box (IECC 15)

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This home DOES NOT meet the annual energy cost requirements of Section 405 of the 2015 International Energy Conservation Code based on a climate zone of 5B.

<table>
<thead>
<tr>
<th>Name</th>
<th>H.I. Scorer</th>
<th>Organization</th>
<th>L.A. Raters</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
</table>

In accordance with IECC, building inputs, such as setpoints, infiltration rates, and window shading may have been changed prior to calculating annual energy cost. Furthermore, the standard reference design HVAC system efficiencies are set equal to those in the design home as specified in the 2015 IECC. These standards are subject to change, and software updates should be obtained periodically to ensure the compliance calculations reflect current federal minimum standards.
2015 IECC R-406 Projected Energy Rating Index Report

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>9.6</td>
<td>79</td>
</tr>
<tr>
<td>Cooling</td>
<td>4.7</td>
<td>110</td>
</tr>
<tr>
<td>Water Heating</td>
<td>8.9</td>
<td>-5</td>
</tr>
<tr>
<td>Lights &amp; Appliances</td>
<td>33.5</td>
<td>786</td>
</tr>
<tr>
<td>Photovoltaic</td>
<td>-5.3</td>
<td>123</td>
</tr>
<tr>
<td>Total</td>
<td>51.0</td>
<td>1916</td>
</tr>
</tbody>
</table>

*Based on standard operating conditions

ERI with PV: 45
ERI without PV: 51

Annual Estimates

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric(kWh)</td>
<td>10155</td>
</tr>
<tr>
<td>CO2 Emissions(Tons)</td>
<td>10</td>
</tr>
<tr>
<td>Energy Savings ($)</td>
<td>663</td>
</tr>
</tbody>
</table>

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

Maximum Energy Rating Index: 55
This Home's Energy Rating Index: 45
FAIL

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 58. In addition to the Energy Rating Index other mandatory measures must be met. (See Mandatory Requirements on second page.)

Provider Data and Seal

Title: L.A. Raters
Organization: RESNET
Address: WeeBasil плохая диапазонов
City, State, Zip: Denver, CO 80233
Phone #: 303 222 1111
Fax #: 303 333 2222
Date: 4/12/15

To determine if a provider is properly accredited go to: www.resnet.us/professional/programs/search_directory
GIGO? Or can you trust the reports?

Quality Assurance options:

- Ask for the Energy Code Inspection Checklist report
  - You or the Rater can use it to compare the actual home to the simulated home.
  - This shows what is in the simulation.

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**Energy Code Inspection Checklist**

<table>
<thead>
<tr>
<th>Property</th>
<th>Organization</th>
<th>HERS</th>
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<tbody>
<tr>
<td>L.M. Smith</td>
<td>L.A. Raters</td>
<td>Based on plans</td>
</tr>
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<td>303 222 1111</td>
<td>4/12/95</td>
</tr>
<tr>
<td>Denver, CO 80333</td>
<td>H. L. Sanner</td>
<td>Rating No: XYZ-22233</td>
</tr>
<tr>
<td>Weehawken, CO</td>
<td>Builder</td>
<td>Rater ID: 303 333 2222</td>
</tr>
<tr>
<td>DPHE High Efficiency, Inc.</td>
<td>WeeBeeGood Builders</td>
<td>Registry ID</td>
</tr>
<tr>
<td>Date: 11/1/2016</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Building Information**

- Conditioned Area (sq ft): 3000
- Conditioned Volume (cubic ft): 24000
- Insulated Shell Area (sq ft): 4206

The building assemblies and the energy features listed below have been modeled to demonstrate compliance with the International Residential Code. In some cases, the energy features listed below will change in the field during the simulation. The L.A. Raters field inspection process will identify any changes to ensure the home conforms to the intent of the IECC. Reports and certificates will be furnished before CO to ensure the house meets the intended requirements.

**Ceilings**

- Attic: R-50 Blown, Attic** (1100 s.f.)
- R-37.0 continuous insulation, R-13.0 cavity insulation.
  
  Name: Attic Insulation Grade: I II III Face / Inset

**Above-Grade Walls**

- Wall: R-22, R-10 Cont.** (1061 s.f.): Between conditioned space and ambient.
- R-10.0 continuous insulation, R-22.0 cavity insulation.
  
  Name: From SI Insulation Grade: I II III Face / Inset

**Windows and Skylights**

Window-to-Wall Area Ratio: 0.19
GIGO? Or can you trust the reports?

Ask for the Building File Report

- You can see ALL the model inputs for the actual building
  - NOTE: this shows all inputs, not just the code-relevant items.
  - The same model may be used for many purposes simultaneously:
    - ENERGY STAR certification
    - HERS Rating
    - Utility Rebate program
    - Code compliance

- Advice: do only to get familiar with a Rater’s work, then randomly thereafter.

- Most meaningful to do this after the official final HERS Rating results.
  - Projected reports prior to construction involve educated guesses
  - At final, duct leakage and infiltration are actually measured
GIGO? Or can you trust the reports?

Any report with the HERS Index (e.g. ERI path) has extra QA

- Can only be printed by a HERS Rater
- Projected Ratings are clearly labeled as such
- Final Ratings are blocked from printing until RESNET QA has occurred
How does it work?

- Physics calculations on how energy flows in residential buildings
  - Uses U-values and areas of dwelling envelope

- Calculates for Heating season and Cooling season, not hourly
  - This is the secret behind REM’s speedy results, since the mid-1990’s

- Automatically creates the Reference Home required for code
  - Happens for HERS, ENERGY STAR too
  - For IECC, most of the specs found in Table R405.5.2(1)

- We also build in ways to check Mandatory Requirements
  - Most can be checked using the normal inputs needed for simulation
• What general questions do you have?

• We ask that building file or user specific questions be sent to support@remrate.com
Email: support@remrate.com

Phone: (303) 459-7504 for REM technical support

Join the conversation at https://groups.google.com/forum/#!forum/remsupport