Town of Castle Rock  
Development Services Building Division  
Contractors Luncheon  
Philip S Miller Park - Mill House  
1375 W Plum Creek Parkway  
May 10th 11:30 a.m. -1:00 p.m.  
Sponsored by Energy Logic

- Welcome-Joseph Montoya - Chief Building Official  
  Part 2. Water Meter Smart Device  
  Part 2. Washing Machine Emergency Drains
- Robby Schwartz - Energy Logic  
- Dena Paulin - eTrakit Dashboard  
  Document Loading & Tracking

Next Month’s Agenda
- Project Green Award Presented to Building Division  
- Electrical Trenches Who Inspects them?  
- Permit Specialists Review of Acceptable CO Documents

Next Luncheon:  
June 14 - Lokal Homes  
Contact: Buildingcounter@crgov.com  
Building Division Permit Specialists: Lynda Halterman
Welcome: Joseph Montoya, Chief Building Official.

A. Floor Drains vs. Pan Drains: Joseph Montoya, Chief Building Official presented and answered questions.
   - Will switch to the 2015 code soon.
     - Enforce code requirement of trap's for floor drains.
     - No floor drain as indirect waste.
     - Pan drain install will remain the same.


C. eTrakti: Joseph Montoya, Chief Building Official.
   - Effective June 1st, 2017
     - No longer accept documents via email.
     - Documents must be uploaded on eTrakti.
   - Certificates of Occupancy
     - Review of all documents for CO's. May take 3 days.
     - Issued within 24 hours once all documents have been approved.
     - Will not issue same day CO’s.
     - Review process starts with receipt of full report of building inspection (green card).

D. eTrakti Dashboard: Dena Paulin, Development Services Technician presented and answered questions.
   - All documents for Certificates of Occupancy must be uploaded via etrakti.
   - Documents can be verified via the site, Superintendent Dashboard.
   - Final Grade Certificates are uploaded to the DESC permit.
FLOOR DRAIN
VS.
PAN DRAIN

DIFFERENT REQUIREMENTS
2015 IRC DEFINITION OF FLOOR DRAIN

• **FLOOR DRAIN.**

A **PLUMBING FIXTURE** for recess in the floor having a floor-level strainer intended for the purpose of the collection and disposal of waste water used in cleaning the floor and for the collection and disposal of accidental spillage to the floor.
SECTION P3201.2012 IRC
FIXTURE TRAPS

• P3201.6 NUMBER OF FIXTURES PER TRAP.

EACH PLUMBING FIXTURE SHALL BE SEPARATELY TRAPPED BY A WATER SEAL TRAP. THE VERTICAL DISTANCE FROM THE FIXTURE OUTLET TO THE TRAP WEIR SHALL NOT EXCEED 24 INCHES (610 MM) AND THE HORIZONTAL DISTANCE SHALL NOT EXCEED 30 INCHES (762 MM) MEASURED FROM THE CENTER LINE OF THE FIXTURE OUTLET TO THE CENTERLINE OF THE INLET OF THE TRAP. THE HEIGHT OF A CLOTHES WASHER STANDPIPE ABOVE A TRAP SHALL CONFORM TO SECTION P2706.2. FIXTURES SHALL NOT BE DOUBLE TRAPPED.
<table>
<thead>
<tr>
<th>PLUMBING FIXTURE</th>
<th>TRAP SIZE MINIMUM (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathtub (with or without shower head and/or whirlpool attachments)</td>
<td>(1\frac{1}{2})</td>
</tr>
<tr>
<td>Bidet</td>
<td>(1\frac{1}{4})</td>
</tr>
<tr>
<td>Clothes washer standpipe</td>
<td>(2)</td>
</tr>
<tr>
<td>Dishwasher (on separate trap)</td>
<td>(1\frac{1}{2})</td>
</tr>
<tr>
<td>Floor drain</td>
<td>(2)</td>
</tr>
</tbody>
</table>
PAN DRAIN IS NOT DEFINED BY CODE
PAN DRAIN IS NOT CONSIDERED A PLUMBING FIXTURE
PAN DRAIN MAY BE RUN AS A INDIRECT WASTE IN ACCORDANCE WITH MANUFACTURER INSTALLATION INSTRUCTIONS
FLOOR DRAINS REQUIRE TRAP
FLOOR DRAINS REQUIRE READY ACCESS MEANING IT MUST BE VISIBLE NOT UNDER THE APPLIANCE
FLOOR DRAINS REQUIRE TRAP PRIMERS
2015 IPC / IRC ALLOW THE USE OF BARRIER TYPE P3201.2.1.4
QUESTIONS
The IECC Compliance Process

Presented By: Robby Schwarz

Agenda

- Back Ground
- Intent of the IECC
- Pathways
- Documentation
- Mandatory Requirements

Change is Hard ... Change is Good... Change can be Made Easier
Expectation
2012 International Energy Conservation code

- The code that got peoples attention
Energy Code

Isn’t your Daddy’s code?

- No longer building the minimum ___ house allowable!

Look how houses have changed

1910

2015
Why is this a 100 year old house?

- Drafty, uncomfortable, yet very durable houses
  - Why?
- Expectation?

Applied Building Science
Systems Thinking

- Holistic approach rather than a component approach.
- Synergy
  - The various parts work together
  - *Achieving* what could not be achieved before!
- Meeting the Expectations
  - Safe
  - Comfort
  - Durable
  - Efficient
  - Environmental

Focus on Housing
Fundamental Questions

Is It There?

Does It Work?

All of Alaska is in Zone 7 except for the following boroughs in Zone 6:
Bethel, Northwest Arctic, Dillingham, Southeast Fairbanks, Fairbanks N. Star,
Wade Hampton, Nome, Yukon-Koyukuk, North Slope

Zone 1 includes Hawaii, Guam, Puerto Rico, and the Virgin Islands
Fundamental Questions

<table>
<thead>
<tr>
<th>Is It There?</th>
<th>Does It Work?</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
</tbody>
</table>

Fundamental Questions

<table>
<thead>
<tr>
<th>Is It There?</th>
<th>Does It Work?</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
</tbody>
</table>
Fundamental Questions

Is It There?  Does It Work?

[Images of construction and insulation]

Fundamental Questions

Is It There?  Does It Work?

[Images of interior construction and insulation]
2015 IECC – Intent

- This code shall regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building

- Durability
2015 IECC – Intent

- This code is intended to provide flexibility to permit innovative approaches and techniques to achieve this objective.

"Learn the rules so you know how to break them properly"

Author: Dalai Lama
Date: Feb 25, 2008

2015 IECC – Intent

- The code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.
Pathways

Code Compliance Paths

- Prescriptive Path
- UA Compliance Path
- Simulated Performance Path
- Energy Rating Index Path
SECTION R402 BUILDING THERMAL ENVELOPE
Prescriptive path ways through code (3 choices)

- **R402.1 General (Prescriptive).**
  - The building thermal envelope shall meet the requirements of Sections R402.1.1 through R402.1.4.
- **Sections R402.1.1**
  - R-value table specification
- **Section R402.1.3**
  - U-Value table specification
- **Section R402.1.4.**
  - Total UA Alternative Approach
- **R402.1.2 R-value computation**
  - Insulation material used in layers, such as framing cavity insulation and insulating sheathing, shall be summed to compute the component R-value
  - The manufacturer’s settled R-value shall be used for blown insulation (Attics)
  - Computed R-values shall not include an R-value for other building materials or air films

### 2015 Prescriptive R-value Table Compliance Specification
Declare to the Code official that the pathway for compliance is the prescriptive path

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>FENESTRATION R-VALUE</th>
<th>SKYLIGHT U-FACTOR</th>
<th>CLAED FENESTRATION SHGC</th>
<th>CEILING R-VALUE</th>
<th>WOOD FRAME WALL R-VALUE</th>
<th>MASS WALL R-VALUE</th>
<th>FLOOR R-VALUE</th>
<th>BASEMENT WALL R-VALUE</th>
<th>SLAB R-VALUE &amp; DEPTH</th>
<th>CRAWL SPACE WALL R-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NR</td>
<td>0.75</td>
<td>0.25</td>
<td>30</td>
<td>13</td>
<td>3/4</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>0.40</td>
<td>0.65</td>
<td>0.25</td>
<td>38</td>
<td>13</td>
<td>4/5</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0.35</td>
<td>0.55</td>
<td>0.25</td>
<td>38</td>
<td>20 or 13+5°</td>
<td>8/13</td>
<td>19</td>
<td>5/13</td>
<td>0</td>
<td>5/13</td>
</tr>
<tr>
<td>4 except Marine</td>
<td>0.35</td>
<td>0.55</td>
<td>0.40</td>
<td>49</td>
<td>20 or 13+5°</td>
<td>8/13</td>
<td>19</td>
<td>10/13</td>
<td>10, 2 ft</td>
<td>10/13</td>
</tr>
<tr>
<td>5 and Marine</td>
<td>0.32</td>
<td>0.55</td>
<td>NR</td>
<td>49</td>
<td>20 or 13+5°</td>
<td>13/17</td>
<td>30</td>
<td>15/19</td>
<td>19, 2 ft</td>
<td>15/19</td>
</tr>
<tr>
<td>6</td>
<td>0.32</td>
<td>0.55</td>
<td>NR</td>
<td>49</td>
<td>20 or 13+5°</td>
<td>15/20</td>
<td>30</td>
<td>15/19</td>
<td>19, 2 ft</td>
<td>15/19</td>
</tr>
<tr>
<td>7 and 8</td>
<td>0.32</td>
<td>0.55</td>
<td>NR</td>
<td>49</td>
<td>20 or 13+5°</td>
<td>19/21</td>
<td>38</td>
<td>15/19</td>
<td>19, 2 ft</td>
<td>15/19</td>
</tr>
</tbody>
</table>

For SI. 1 foot = 304.8 mm

- a. R-values are minimums. U-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the labeled or design thickness of the insulation, the installed R-value of the insulation shall not be less than the R-value specified in the table.
- b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration. Exception: Skylights may be excluded from glazed fenestration SHGC requirements in Climate Zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.
- c. "13/19" means R-13 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
- d. R-5 shall be added to the required slab edge R-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Climate Zones 1 through 3 for heated slabs.
- e. There are no SHGC requirements in the Marine Zone.
- f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.
- g. Do insulation sufficient to fill the framing cavities R-10 minimum.
- h. First value is cavity insulation, second is continuous insulation or insulated topping, so “13/19” means R-13 cavity insulation plus R-5 continuous insulation in insulating siding. If structural sheathing covers 40 percent or less of the exterior, continuous insulation R-value shall be permitted to be reduced by no more than R-5 in the locations where structural sheathing is used – to maintain a consistent total sheathing thickness.
- i. The second R-value applies when more than half the insulation is on the exterior of the mass wall.
Floor Systems

Best Practices
- Insulation must be in contact with the surface it is intended to insulate
- Insulation completely fills the cavity

2012 IECC
- R402.2.7 Floors.
- Floor insulation shall be installed to maintain permanent contact with the underside of the subfloor decking
- R-30 climate zone 5

Ducts in Garage Ceiling

Code requirements
- Insulation in complete contact with subfloor
- Insulation encapsulates duct
- IECC Table 402.1.2 footnote G
- Minimum R-19 below duct
**R402.2.8 Exception**

Joseph Lstiburek Exception and details

1. Complete & tight air barrier system, **and**
2. R-30 Insulation on the bottom sheathing of the assembly, **or**
3. Continuous R-20 bathtub insulation Including floor rim joist insulation, **or**
4. Continuous insulation below framing with cavity insulation ≥ R-20

**Floor over Garage**
Ducts in Garage Soffits

An assembly with a U-factor equal to or less than that specified in Table R402.1.4 shall be permitted as an alternative to the R-value in Table R402.1.2.

Example: Climate zone 5 framed wall
- U = 0.060 = R-16.67
- R-value table requires cavity insulation at R20 or 13+5
- 1/20 = U.05 Plus sheathing, air film, etc.
R402.1.5 Total UA alternative

- A method for performing conductive energy trade offs
  - Trading off the R-values and U-values of the thermal envelope
  - Mathematically making the R-value and U-value paths equal

- If the total building thermal envelope UA (sum of U-factor times assembly area) is less than or equal to the total UA resulting from using the U-factors in Table R402.1.3 (multiplied by the same assembly area as in the proposed building), the building shall be considered in compliance with Table R402.1.1. **The UA calculation shall include the thermal bridging effects of framing materials.**

What is a Reference Design

- **Reference Design**
  - A standard set of house specifications that generate a specific level of quantifiable energy performance

- The concept Code uses to show compliance with the UA Trade Off (ResCheck) and the Simulated Performance Path

  The **Actual built homes performance will be less than or equal to the performance of the code standard reference design**

  **The Standard reference design for code is the prescriptive path of compliance built in Table 405.5.2 (1)**
Twin Houses

2015 IECC reference design house VS. Builder’s desired house

- Geometric Twin
- 2015 IECC prescriptive envelope U-values in (Table 402.1.4)
- Geometric Twin
- Envelope U-values based on Builder’s Specification

If the Builder’s house has the same or lower area weighted U-values then it meets the intent of code

Example

<table>
<thead>
<tr>
<th>Component</th>
<th>Assembly</th>
<th>Cross Area</th>
<th>Can't Insulation R-Value</th>
<th>Continuous Insulation R-Value</th>
<th>U-Factor</th>
<th>UA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling</td>
<td>Flat Ceiling or Soffit Truss</td>
<td>400</td>
<td>40</td>
<td>0.0</td>
<td>0.035</td>
<td>14</td>
</tr>
<tr>
<td>Roof</td>
<td>Wood Frame</td>
<td>640</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall</td>
<td>Wood Frame Double Pane</td>
<td>54</td>
<td>20</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door</td>
<td>Solid</td>
<td>20</td>
<td>20</td>
<td>6</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>AL Wood Joil/Truss/Gr.</td>
<td>400</td>
<td>30</td>
<td>0.0</td>
<td>0.047</td>
<td>19</td>
</tr>
</tbody>
</table>

Compliance: Passed

Max UA: 134
Your UA: 128
% Better Than Code: 4.5
Compliance Statement: The proposed building design described here is consistent with the building plans, specifications, and other calculation submitted with the permit application. The proposed building has been designed to meet the 2009 IECC requirements in RESCheck Version 4.3.0 and to comply with the mandatory requirements listed in the RESCheck Inspection checklist.

Simulated performance alternative
405 Performance

- This section establishes criteria for compliance using simulated energy performance analysis.
- Such analysis shall include
  - Heating
  - Cooling,
  - Service water heating energy only.
- Compliance with this Section requires that the (Mandatory) items still be met.
R405 Performance-based compliance

- Energy Analysis
  - A method for performing whole house performance energy trade offs
    - Conduction - Trading off R-values and U-values
    - Convection – Energy moving with air infiltration and exfiltration
    - Radiation – Trade offs created by energy moving form areas of high concentrations to low concentration through open space.

The Reference Home/Twin Home Concept
Used by modeling software for Code

- The reference home is the geometric twin of the rated home configured to a standard set of thermal performance characteristics:
  - I.e. The 2015 IECC Prescriptive path
- The home you are building and evaluating, compared to the “Reference” home in order to quantify performance and demonstrate compliance with the Energy code.
Energy Costs?

- **405.3 Performance-based compliance.** Compliance based on simulated energy performance requires that a proposed residence (proposed design) be shown to have an **annual energy cost** that is less than or equal to the annual energy cost of the standard reference design.
Section R406 of the 2015 IECC

Energy Rating Index Compliance Alternative

- **ERI Index Score = HERS Index Score**

Quantifying Energy Use

**ERI vs. HERS**

- [Image of energy rating certificate and energy feature summary]

- [Diagram of HERS Index with energy ratings for zero energy home, reference home, and existing homes]

- [Table showing annual savings and detailed home feature summary]

This home meets or exceeds the criteria of the following:
- Energy Star v. 8
- Energy Star v. 8.1
- 2009 International Energy Conservation Code
- 2008 International Energy Conservation Code
- 2012 International Energy Conservation Code

Rating Completed by:
- [Provider information]

The Energy Rating Index Standard is a comprehensive method for rating new homes and existing homes based on energy performance.
Code Book misprint and the Errata

**Erratum**

i’rätəm,-’rā-,-'rat-/ noun
plural noun: *errata*
An error in printing or writing.
A list of corrected errors appended to a book or published in a subsequent issue of a journal.

- **R406.2 Mandatory requirements.** Compliance with this section requires that the mandatory provisions identified in Sections [R401.2](#) [R401 through R404 labeled](#) as ‘mandatory’ and Section R403.5.3 be met. The building thermal envelope shall be greater than or equal to levels of efficiency and Solar Heat Gain Coefficient in Table 402.1.2 or 402.1.4 of the 2009 *International Energy Conservation Code*.

Mandatory sections of the 2015 IECC

- **R402.4 Air leakage (Mandatory)**
  - Table R402.4.1.1
  - R402.4.1.2 Testing
    - Air leakage rate not exceeding 5 air changes per hour in Climate Zones 1 and 2, and 3 air changes per hour in Climate Zones 3 through 8
R406.1 Mandatory Requirements

- The building thermal envelope shall be **greater than or equal** to levels of efficiency and Solar Heat Gain Coefficient in Table 402.1.1 or 402.1.3 of the 2009 International Energy Conservation Code.

### 2009 IECC vs. 2015 IECC Prescriptive Table

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>Window U-Factor</th>
<th>Window SHGC</th>
<th>Ceiling R-Value</th>
<th>Wood Framed Wall R-Value</th>
<th>Mass Wall R-Value</th>
<th>Floor R-Value</th>
<th>Basement Wall R-Value</th>
<th>Slab R-Value and Depth</th>
<th>Crawl Space Wall R-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.2 NR</td>
<td>0.30 0.25</td>
<td>R-30 R-13</td>
<td>R-3/4 R-13</td>
<td>0 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.65 0.40</td>
<td>0.30 0.25</td>
<td>R-30 38</td>
<td>R-13 R-4/6</td>
<td>R-13 0 0 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.35 0.35</td>
<td>0.30 0.25</td>
<td>R-30 38</td>
<td>R-13 20 or 13+5 R-5/8 8/13</td>
<td>R-19 R-5/13 0</td>
<td>R-5/13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 except Marine</td>
<td>0.35 0.35</td>
<td>NR 0.40</td>
<td>R-38 49</td>
<td>R-13 20 or 13+5 R-5/10 8/13</td>
<td>R-19 R-10/13 R-10, 2ft</td>
<td>R-10/13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 and Marine 4</td>
<td>0.35 0.32</td>
<td>NR 0.40</td>
<td>R-38 49</td>
<td>R-20 or 13+5 R-13/17 R-30</td>
<td>R-10/13 15/19 R-10, 2ft</td>
<td>R-10/13</td>
<td>R-15/19 R-10/13 15/19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Zone 6</td>
<td>0.35 0.32</td>
<td>NR 0.49</td>
<td>R-49 R-20 or 13+5 20+5 or 13+10</td>
<td>R-15/20 R-15/20 R-30</td>
<td>R-15/20 15/19 R-10, 4ft</td>
<td>R-10/13</td>
<td>R-10/13 15/19 15/19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate Zone 7 &amp; 8</td>
<td>0.35 0.32</td>
<td>NR 0.49</td>
<td>R-49 R-21 20+5 or 13+10</td>
<td>R-19/21 R-15/19 R-38</td>
<td>R-15/19 R-10, 4ft</td>
<td>R-10/13</td>
<td>R-10/13 15/19 15/19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
R406.3.1 ERI reference design

2015 IECC
- The ERI reference design shall be configured such that it meets the minimum requirements of the 2006 International Energy Conservation Code prescriptive requirement

2018 IECC
- The Energy Rating Index will be developed in accordance with ANSI/RESNET/ICC 301-2014
- The proposed residential building shall be shown to have an annual total normalized Modified Loads that are less than or equal to the annual total Loads of the ERI reference design

R406.3.1 ERI reference design

- The ERI reference design shall be configured such that it meets the minimum requirements of the 2006 International Energy Conservation Code prescriptive requirements
- The proposed residential building shall be shown to have an annual total normalized Modified Loads that are less than or equal to the annual total Loads of the ERI reference design
- 100 meets the minimum requirements of the 2006 International Energy Conservation Code prescriptive requirements

Twin Houses

<table>
<thead>
<tr>
<th>ERI reference design house</th>
<th>vs.</th>
<th>Builder’s desired house</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Geometric Twin</td>
<td></td>
<td>• Geometric Twin</td>
</tr>
<tr>
<td>• 2006 IECC prescriptive requirements</td>
<td></td>
<td>• Mandatory 2009 IECC Envelope R-Values</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 2015 IECC Mandatory Requirements</td>
</tr>
</tbody>
</table>

The Builder’s house must have the Energy Rating Index Required by code, or lower, to meet the intent of code
Table R406.4 Maximum Energy Rating Index

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>2015 IECC Energy Rating Index</th>
<th>Climate Zone</th>
<th>2018 IECC Energy Rating Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>52</td>
<td>1</td>
<td>57</td>
</tr>
<tr>
<td>2</td>
<td>52</td>
<td>2</td>
<td>57</td>
</tr>
<tr>
<td>3</td>
<td>51</td>
<td>3</td>
<td>57</td>
</tr>
<tr>
<td>4</td>
<td>54</td>
<td>4</td>
<td>62</td>
</tr>
<tr>
<td>5</td>
<td>55</td>
<td>5</td>
<td>61</td>
</tr>
<tr>
<td>6</td>
<td>54</td>
<td>6</td>
<td>61</td>
</tr>
<tr>
<td>7</td>
<td>53</td>
<td>7</td>
<td>58</td>
</tr>
<tr>
<td>8</td>
<td>53</td>
<td>8</td>
<td>58</td>
</tr>
</tbody>
</table>

- Compliance based on an ERI analysis requires that the rated design be shown to have an ERI less than or equal to the appropriate value listed in Table R406.3, when compared to the ERI reference design.

Features that Impact the ERI (Lower the score)

- Mechanical equipment
  - High efficiency furnace
  - High efficiency AC
  - High efficiency water heater
- More R-value than required by the 2009 IECC
- House orientation with the ERI
- House tightness below 3 ACH50
- Duct leakage to the outside
- Duct location
- Whole house fan
- CFL or LED Lighting above 75%
- High efficiency appliances
- Solar
Will the ERI path be used?

- In 2015
  - 190,180 homes were rated
  - Average HERS Index 62

- In 2016
  - 206,583 homes were rated
  - Average HERS Index 61
Code Compliance Paths

Prescriptive Path  UA Compliance Path  Simulated Performance Path  Energy Rating Index Path

End Goal

Prescriptive Path  UA Compliance Path  Simulated Performance Path  Energy Rating Index Path
Base Case Compliance

2015 Compliance Reality
- 2 story
- 2800 Square Feet
- Single Family Detached
- Conditioned basement

UA Alternative
- Pass by 6.3%

Simulate Performance
- Pass by 1.8%

Corresponding HERS Index
- HERS 72

House Specs
- Foundation R-15
- Slab R-0
- Floor over garage R-30
- Rim R-19
- Walls blown R-20
- Windows U-32/SHGC.32
- Doors R-5/ R-2.2
- Attic R-49 flat R-38 edge
- Furnace 80 AFUE w/ 150 CFM LTO & 10% in attic R-8
- Water Heater 62 EF
- AC 13 Seer
- 3 ACH50 & Exhaust Ventilation
- Default appliances 75% CFL

Typical Code House in Colorado

2015 Compliance Reality
- 2 story
- 2800 Square Feet
- Single Family Detached
- Conditioned basement

UA Alternative
- Pass by 3%

Simulate Performance
- Pass by 6.9%

Corresponding HERS Index
- HERS 61

House Specs
- Foundation R-11
- Slab R-0
- Floor over garage R-50
- Rim R-19
- Walls blown R-23
- Windows U-34/SHGC.32
- Doors R-5/ R-2.2
- Attic R-38 flat R-30 edge
- Furnace 92.5 AFUE w/ 50 CFM LTO & 10% in attic R-8
- Water Heater 62 EF
- AC 13 Seer
- 2.5 ACH50 & Exhaust Ventilation
- Default appliances 100% CFL
## Four Steps of IECC Performance Compliance
### Simulated Performance Path or Energy Rating Index

<table>
<thead>
<tr>
<th>Step 1 From Plan Analysis:</th>
<th>Step 2 Rough Inspection:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Demonstrates that the proposed design will comply with the IECC.</td>
<td>- Action item reporting after each inspection.</td>
</tr>
<tr>
<td>- Determine the most cost effective way to comply with the IECC.</td>
<td>- EnergyLogic will perform IECC required rough inspections for compliance, quality assurance, and builder risk.</td>
</tr>
<tr>
<td>- Develop required permitting submittal documents.</td>
<td>- Our inspections allow us to generate final documentation that is needed to obtain the certificate of occupancy.</td>
</tr>
<tr>
<td>- Assistance with other required documents such as air sealing details.</td>
<td>- Insulation, air barrier, windows, HVAC, Duct leakage, moisture management and more will be inspected.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 3 Final Inspection:</th>
<th>Step 4 Modeling and Certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Inspection:</td>
<td>Making the from plans analysis address and lot specific including the details of what has been inspected at rough and final.</td>
</tr>
<tr>
<td>- Action item reporting after each inspection.</td>
<td>- Generate required code compliance certificates and reports for C.O.</td>
</tr>
<tr>
<td>- Diagnostics - Blower door air tightness and duct leakage to outside.</td>
<td>- Homes using the Simulated Performance Path receive a cost compliance report, ERI/HERS Index score, and other required report.</td>
</tr>
<tr>
<td>- Attic and foundation insulation</td>
<td>- Homes using the Energy Rating Index Path receive an ERI/HERS score and other required report.</td>
</tr>
<tr>
<td>- Controlled whole house mechanical ventilation</td>
<td></td>
</tr>
</tbody>
</table>
Submittal Documents

- Need to release building permit
- Document the predicted performance of the proposed design

This home MEETS the annual energy cost requirements and verifications of Section 405 of the 2012 International Energy Conservation Code based on a climate zone of 5B. In fact, this home surpasses the requirements by 15.9%.
R103

Construction Documents

R103.1 General
- Construction documents prepared by a design professional
- i.e. set of plans
- Different from compliance documents

R103.2 Information on Construction documents
- Details shall include but are not limited to:
  - Insulation location and R-values
  - Window U-value & SHGC
  - Mechanical System design criteria
  - Mechanical and water heater
    - Type, size and efficiency
  - Duct sealing, insulation and location
  - Air sealing details

Example Details

Diagram showing air sealing details and insulation practices.
New in the 2015

- R103.2.1 Building Thermal Envelope depiction:
  - The buildings thermal envelope shall be represented on the construction documents
    - Blue – Exterior air barrier
    - Yellow Thermal Barrier
    - Red Interior air barrier
ENERGY COMPLIANCE FOR A NEW SINGLE FAMILY RESIDENCE AT 442 SOUTH VINE STREET

1. PROJECT SHALL COMPLY WITH THE 2018 IECC RESIDENTIAL PROVISIONS AND THE 2018 IRC, CHAPTER 11
2. ALL MINATORY REQUIREMENTS IN IECC SECTIONS R402.3 THROUGH R402.6 AND IRC SECTIONS N1101.14 THROUGH N1104.1.4 SHALL BE MET
3. COMPLIANCE SHALL BE SHOWN USING METHOD 2 (SIMULATED PERFORMANCE ALTERNATIVE, IECC SECTION R405.1 AND IRC SECTION N1105
4. THE ENERGY COMPLIANCE SUBMITTAL SHALL INCLUDE:
   A. COMPLIANCE REPORT SUBMITTED BY:
      EnergyLogic
      Roby Schwartz
      720-838-0877
      robys@energylc.com
      3605 West 50th Avenue
      Denver, CO 80212
   B. ENERGY COMPLIANCE CERTIFICATE, RE: SHEET A101X
   C. BUILDING SECTIONS SHOWING THE BUILDING THERMAL ENVIRONMENT, RE: SHEET A101X
   D. AIR SEALING DETAILS AND NOTES, RE: SHEET A101X
   E. HVAC MANUALS 1, 2, AND 3
5. UPON COMPLETION OF THE BUILDING, A COMPLIANCE REPORT BASED ON THE AS-BUILT CONDITION OF THE BUILDING SHALL BE SUBMITTED TO THE BUILDING OFFICIAL BEFORE A CERTIFICATE OF OCCUPANCY CAN BE ISSUED. THE COMPLIANCE REPORT MUST INCLUDE ALL REQUIREMENTS OUTLINED IN IECC SECTION R405.1.2.2 AND IRC SECTION N1105.3.2.2.
6. AS REQUIRED IN IECC SECTION R405.1.1 AND IRC SECTION N1105.1.4, A PERMANENT CERTIFICATE SHALL BE COMPLTED BY THE BUILDER AND POSTED ON A WALL IN THE SPACE WHERE THE FURNACE IS LOCATED. THE CERTIFICATE MUST BE POSTED BY THE TIME OF THE PROJECT’S FINAL INSPECTION AND SHALL USE THE INCLUDED ENERGY COMPLIANCE CERTIFICATE FOR POSTING.

PLEASE NOTE: IN ADDITION TO THE AIR SEALING DETAILS SHOWN ON SHEET A101X, THE FOLLOWING CONSTRUCTION METHODS SHALL BE EMPLOYED WHERE APPLICABLE TO COMPLY WITH THE REQUIREMENTS OF IECC R402.1.1 AND R402.2.1:

1. 2 OR 3 STUD INSULATED CORNERS
2. LADDER BLOCKING WHERE INTERIOR WALLS MEET EXTERIOR WALLS TO FULLY INSULATE THEM
3. INSULATED HEADERS
4. SEALING THE DRYWALL TO THE TOP PLATE ADJACENT TO THE VENTILATED ATTIC
5. RAISED HEEL TRUSSES TO ENSURE THAT INSULATION CAN FULLY COVER THE TOP PLATE

Compliance Documents
Needed to release the certificate of occupancy

Certificate of Occupancy
PARK COUNTY, COLORADO

Certificate No. 46411

This Certificate certifies that the building, hereinafter described, is ready and proper for occupancy and may be occupied as described.

Description:

Address: 442 South Vine Street

City: Elizabeth
County: Park
State: CO

This Certificate is subject to the conditions set forth in the regulations of the Colorado Department of Public Health and Environment.

Issued by: Colorado Department of Public Health and Environment

Yours sincerely,

[Stamp]

[Signature]

[Date: May 20, 2020]
Design exceeds requirements for IECC 2016 Performance compliance by 1.9%.
Home Energy Rating Certificate

Confirmed Report

HERS® Index Score: 47
Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.HERSindex.com

Annual Savings: $5,912
*Relative to an average U.S. home

Home:
123 Fake St, Anytown, CO
Builder:
Ekotrope

Your Home's Estimated Energy Use:

<table>
<thead>
<tr>
<th>Service Use (MBHs)</th>
<th>Annual Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating</td>
<td>77.0</td>
</tr>
<tr>
<td>Cooling</td>
<td>0.9</td>
</tr>
<tr>
<td>Hot Water</td>
<td>26.0</td>
</tr>
<tr>
<td>Lights/Appliances</td>
<td>26.0</td>
</tr>
<tr>
<td>Service Charges</td>
<td>29.1</td>
</tr>
<tr>
<td>Total</td>
<td>181.1</td>
</tr>
</tbody>
</table>

This home meets or exceeds the criteria of the following:
- Energy Star v3.1
- 2006 International Energy Conservation Code
- 2009 International Energy Conservation Code
- 2012 International Energy Conservation Code

Home Feature Summary:
- Home Type: Single family detached
- Conditioned Floor Area: 4,000 sq ft
- Number of Bedrooms: 4
- Primary Heating System: Furnace - Natural Gas - 95 AFUE
- Primary Cooling System: Air Conditioner - Electric - 16 SEER
- Primary Water Heating: Water Heater - Natural Gas - 607 Energy Factor
- House Tightness: Infiltration / Envelope: 0.02915/0.02915
- Duct Leakage to Outdoors: 0.075
- Above Grade Walls: R-19
- Ceiling: R-30
- Window Type: R-Wall: 0.316; SHGC: 0.256
- Foundation Walls: R-11

Rating Completed by:
- Energy Rater/Test Rater: ekotrope (ID: 545306)
- Rating Company: Ekotrope Rating Co.
- Rating Provider: Ekotrope Provider

Test Rater, Certified Energy Rater

Air Leakage Report

Property
Ekotrope Rating Co.
123 Fake St
Anytown, CO 01234
Confirmed Rating
Ekotrope Rating Co.

Organization
Ekotrope Rating Co.
Verification
Ekotrope Rating Co.
HERS Rating Information
Rating ID: 545306
HERS Index: Confirmed
Builder
Ekotrope

Air Leakage

Test Value
Sealed at 0.5 Pa
Infiltration Rate
49.7
ACH50 (Calculated)
0.7

Duct Leakage

Leakage to Outdoors (CFM @ 0.15 Pa) 0.0
Leakage to Outdoors (CFM / 100 sq ft) 0.0
Total Leakage Test Type Post-Construction
Total leakage 0.0
Total leakage 0.0

Mechanical Ventilation

CFM per 300
25.3
CFM per 500
41.4
CFM per 750
57.5
CFM per 1,000
73.6
Recovery Efficiency %
100
Room ventilation rate: 3.0
Av. Airchange Rate (CFM)
4.5
2012 ASHRAE-62.2 MQ: Cost Ventilation
32.5

Other Reporting

Ekotrope HERS Rating Tool - Version 2.04.1 (EoA)
Compliance Reports Mandatory?

- Compliance reports for permitting
  - Prescriptive: Declaration to the Code official
  - Total UA Alternative: RESCheck type report
  - Simulated Performance: Annual Energy Cost Compliance Report
- Inspections
  - Prescriptive/UA Trade off
    - Through the code official or possible 3rd party
  - Simulated performance path
    - 3rd party for sure and possibly code official as well
- Compliance reports for Certificate of occupancy
  - Duct leakage report
  - Air leakage report
  - Simulated performance path
    - 405.4.2 Performance compliance report
    - From Plans analysis to final reporting
    - “making it site and address specific”

Code Requirements
Regardless of the Pathway

International Energy Conservation Code

Mandatory Requirements

R104 Inspections – New in the 2015 IECC

- Construction or work for which a permit is required shall be subject to inspection
- The code official or his/her agent shall inspect....
- Footing and foundation
- Framing and rough-in inspection
- Plumbing rough-in inspection
- Mechanical rough-in inspection
- Final inspection
- Re-inspection
Required Inspections

R104.2.2 Framing and rough-in inspection
- Inspections at framing and rough-in shall be made before application of interior finish and shall verify compliance with the code as to types of insulation and corresponding \textit{R-values and their correct location and proper installation}; fenestration properties (\textit{U}-factor and \textit{SHGC}) and proper installation; and \textit{air leakage controls as required by the code} and approved plans and specifications.

R104.2.4 Mechanical rough-in inspection
- Inspections at mechanical rough-in shall verify compliance as required by the code and \textit{approved plans} and specifications as to installed HVAC equipment type and size, \textit{required controls, system insulation and corresponding R-value, system air leakage control}, programmable thermostats, dampers, \textit{whole-house ventilation}, and minimum fan efficiency.

What / Where is the Thermal Envelope?

- Control
  - Air Flow
  - Moisture Flow
  - Thermal Flow
Thermal Envelope vs. HVAC

- Is it there and does it work?
General R303

R301.1.1 Identification Building thermal envelope insulation

- An R-value identification mark shall be applied by the manufacturer to each piece of building thermal envelope insulation 12 inches (305 mm) or greater in width.
- Alternately, the insulation in-stallers shall provide a certification listing the type, manufacturer and R-value of insulation installed in each element of the building thermal envelope.
- For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled R-value, installed density, coverage area and number of bags installed shall be listed on the certification.

R301.1 Installation
All materials, systems and equipment shall be installed in accordance with the manufacturer’s instructions and this code.

R401.3 Certificate (Mandatory)

- A permanent certificate shall be completed and posted on or in the electrical distribution panel by the builder or registered design professional
- The certificate shall list....
  - R-values of insulation
  - R-values of ducts outside conditioned spaces
  - Window U-value and SHGC
  - Results of duct system and building envelope air leakage testing
  - Types and efficiencies of heating, cooling and service water heating equipment.
2015 IECC Certificate
1234 Place to Live, Denver, CO 80221

Building Envelope Insulation
- Ceiling: R-49.0
- Above Grade Walls: R-20.0
- Foundation Walls: R-15.0
- Exposed Floor: R-30.0
- Slab: R-0.0 Edge, R-0.0 Under
- Infiltration: Htg: 3.00 Clg: 3.00 ACH50
- Duct: Uninsulated
- Total Duct Leakage: 80.00 CFM @ 25 Pascals

Window Data
- U-Factor: 0.320
- SHGC: 0.320

Mechanical Equipment
- HEAT: Fuel-fired air distribution, Natural gas, 92.1 AFUE.
- COOL: Air conditioner, Electric, 13.0 SEER.
- DHW: Conventional, Natural gas, 0.62 EF, 40.0 Gal.

Builder or Design Professional
Signature

Air leakage Testing

Air out = Air in

The principle behind
the blower door

Blower Door Depressurizing House
To 50 Pascals

Leaky House

Tight House

REM/Rate - Residential Energy Analysis and Rating Software v14.6
Air Leakage Reports

R403.3.3 Duct testing (Mandatory).

Leakage testing required when any portion of ductwork is in unconditioned space

- Attic
- Unconditioned crawl space
- Isolated mechanical room with natural draft appliance
- Floor over garage?
- Exterior wall?
N1103.3.3 Sealing (Mandatory)
Duct tightness shall be verified by either of the following:

**Total Duct Leakage**

- **Rough In Test**
  - ≤ 4 CFM 25 per 100 sqft of conditioned floor area
  - 2000 sqft house ≤ 80 CFM 25 total

- **Post Construction**
  - ≤ 4 CFM 25 per 100 sqft of conditioned floor area
    - 2000 sqft house ≤ 80 CFM 25 total
  - ≤ 3 CFM 25 per 100 sqft of conditioned floor area is air handler has not been installed
    - 2000 sqft house ≤ 60 CFM 25 total

**Exception:** if the air handler and All ducts are entirely within the building thermal envelope

---

Duct Leakage to Outside
Not included in the 2015 IECC / Kinda??
Thank you!
Robby Schwarz
Robby@nrglogic.com
www.nrglogic.com

720-838-0677
https://thecraftsmanblog.com/how-to-tell-if-you-have-a-balloon-frame-house/
CO DOCUMENT REVIEW
INFORMATION FROM YOUR DASHBOARD
DASHBOARD

This is the first screen you will see.

The Superintendent for the project should be linked to the permit at Permit Submittal or Permit Issuance.

If you change projects or need to be added to a permit please contact the Front Counter Team to assist you with linking to the Building Permit and the DESC Permit.
From your dashboard select the permit you have attached documents for Certificate of Occupancy Review.

Clicking on the paperclip opens the permit to the attachments page.
The Attachment page has 2 sections.

Attachment Upload
Attachment Review
After uploading your documents for CO Review in eTrakiT you will be able to verify they have been received by looking in the attachments.

Clicking on the document name allows you to view any document that has been attached to the Building Permit.
DASHBOARD

For DESC permits the process is the same.

Upload the Final Grade Certificate to the DESC permit not the Building Permit.

The Improvement Location Certificate should be uploaded to the house permit.
It is not necessary to contact the Front Counter Team to verify we have received the attachments.

If you can see the attachment in your Dashboard we have it!