Residential Requirements of the 2009 International Energy Conservation Code

Webinar:
Awareness, New Construction, Additions/Remodels, and Implementation
Introductions

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Overview

Project funded by the Missouri Department of Natural Resources (MDNR) with American Recovery and Reinvestment Act of 2009 (ARRA) funding.

3 Locations and Webinars:

• St. Louis (December 1st – 2nd)
• Springfield (December 5th – 6th)
• Kansas City (January 24th – 25th)

Objective of the Workshop: Work with municipalities and counties across the state to identify opportunities to adopt or enhance compliance with the 2009 International Energy Conservation Code (IECC) at a local level.
### Overview - Agenda

<table>
<thead>
<tr>
<th>Topic</th>
<th>Approx. Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>15 minutes</td>
</tr>
<tr>
<td>Awareness of the 2009 IECC</td>
<td>20 minutes</td>
</tr>
<tr>
<td>2009 IECC highlights</td>
<td>40 minutes</td>
</tr>
<tr>
<td>Tools to enhance compliance</td>
<td>30 minutes</td>
</tr>
<tr>
<td>Summary/Next Steps</td>
<td>15 minutes</td>
</tr>
<tr>
<td>Total</td>
<td>2 hours</td>
</tr>
</tbody>
</table>
Overview

• The International Code Council® (ICC) develops codes
• The IECC looks at energy consumption and cost savings in buildings
• Three year cycle for updates
• Several codes by the ICC
  – 2012 International Building Code®
  – 2012 International Fire Code®
  – 2012 International Mechanical Code®
  – 2012 International Property Maintenance Code®
Overview

2009 IECC

• Chapter 1 - Administration
• Chapter 2 - Definitions
• Chapter 3 - General Requirements
• Chapter 4 - Residential Energy Efficiency
• Chapter 5 - Commercial Energy Efficiency
• Chapter 6 - Referenced Standards
Overview

101.3 Intent. This code shall regulate the design and construction of buildings for the effective use of energy. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve the effective use of energy. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.
Overview

- IECC attempts to regulate energy use:
  - Thermal envelope (walls, windows, etc.)
  - Duct and house air sealing (less drafty)
  - Lighting (high-efficacy lamps)
- IECC does NOT regulate:
  - Mechanical system efficiencies (furnace, hot water heater, etc.)
  - Water consumption
  - Appliances (televisions, computers, refrigerator, etc.)
  - Those are federally mandated items
Topic 1

Awareness of the 2009 IECC
Topic 1 Objectives

• Current Implementation
• Benefits of the 2009 IECC
• Challenges of enforcing the 2009 IECC
• Cost impact of compliance
• Promote awareness of the 2009 IECC
Overview - Residential State Energy Code Status (*)

(*) as of November 1, 2011, DOE – Building Energy Codes Program
Overview - Missouri Residential Energy Efficiency

State Level:
• No mandatory efficiency code

Local Level:
• St. Louis City and County – 2009 IECC
• Clay County – 2006 IRC
• Springfield – 2006 IRC with 2012 IRC hopeful in January
Topic 1 Objectives

• Current Implementation
• Benefits of the 2009 IECC
• Challenges of enforcing the 2009 IECC
• Cost impact of compliance
• Promote awareness of the 2009 IECC
Benefits of the 2009 IECC

Important points about energy codes

• Marketplace does not guarantee energy-efficiency
  – Upfront cost vs. long-term, operating costs
• Comfort
• Energy consumption and emissions
• New construction is a unique opportunity
Benefits of the 2009 IECC - Municipality

- Optimal utilization of fossil fuels and non-renewable resources for communities\(^1\)
  - Reduces strain on energy and utility resources

- Create economic opportunities for business and industry by promoting new, energy-efficient technologies

- Shifts construction costs away from materials and towards labor\(^2\)
  - Job creation/enhance skills of workforce

- ISO rating and insurance rates

Benefits of the 2009 IECC - Homeowner

- Homeowners
- Utility savings
  - Average $2,150/yr on home energy bills
  - Average savings ~ $300/yr
- Improved thermal comfort
- Reduces the risk of long-term financial burden that can result from short-term design and construction decisions
  - Testing requirement, installation of “hidden” materials (e.g., insulation)

Benefits of the 2009 IECC - Contractor

• Customer satisfaction and recommendations
  – Increases comfort
  – Fewer call-backs
• Competitive advantage in the marketplace
  – Advertising can be used to explain energy-efficiency advantages
  – Can leverage available incentives and increase revenue
• Common basis for education and practice
Topic 1 Objectives

- Current Implementation
- Benefits of the 2009 IECC
- Challenges of enforcing the 2009 IECC
- Cost impact of compliance
- Promote awareness of the 2009 IECC
Potential for Challenges of the 2009 IECC

Affected Professions¹:

- Architects
- Carpenters
- Brick masons, stonemasons, block masons
- Cement masons and concrete finishers
- Roofers
- Electricians
- Engineers
- Insulation Workers
- Energy modelers

[¹] Institute for Market Transformation, IMT Research on Jobs for Energy Codes
Potential for Challenges of the 2009 IECC

- Limited municipal staff/availability to attend trainings
- Ability to accurately enforce the code
- Public perception of energy codes
- Added costs to homeowners
Potential for Challenges of the 2009 IECC

**Builder/Contractor:**
It’s always been done this way…deal with it.

**Builder/Contractor:**
Come on, that’s not necessary.

**Builder/Contractor:**
They won’t pay for that price!

**Homeowner:**
I’d rather have the granite countertops…
Topic 1 Objectives

- Current Implementation
- Benefits of the 2009 IECC
- Challenges of enforcing the 2009 IECC
- Cost impact of compliance
- Promote awareness of the 2009 IECC
Costs of the 2009 IECC

Analysis of Costs and Benefits of 2009 IECC

• Determine difference in construction costs and energy savings resulting from implementing IECC 2009 compared with the current practice

• The Building Codes Assistance Project (BCAP) estimates 18-26% in energy savings or annual savings between $337-559 (compared with current practices), money that could be spent on upgrading their house or fed into the local communities
Costs of the 2009 IECC

- Costs, savings and payback\(^1\)

<table>
<thead>
<tr>
<th>Incremental Construction Costs</th>
<th>IECC 2009 vs. Current Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1,608</td>
<td>$459</td>
</tr>
</tbody>
</table>

| Annual Energy Cost Savings     | $459                           |
| Simple Payback (years)         | 3.5                            |

\(^1\)The Building Codes Assistance Project: Incremental Construction Cost Analysis for New Homes – Building to the 2009 IECC
Costs of the 2009 IECC

- Mortgage Details

<table>
<thead>
<tr>
<th></th>
<th>IECC 2009 vs. Current Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase of a 20% Down Payment</td>
<td>$322</td>
</tr>
<tr>
<td>Increase of Monthly Payment (30 year mortgage, 7% interest rate)</td>
<td>$8.56</td>
</tr>
<tr>
<td>Average Monthly Energy Savings</td>
<td>$38.25</td>
</tr>
<tr>
<td>Mortgage Becomes Cash Positive</td>
<td>11 months</td>
</tr>
</tbody>
</table>
Topic 1 Objectives

- Current Implementation
- Benefits of the 2009 IECC
- Challenges of enforcing the 2009 IECC
- Cost impact of compliance
- Promote awareness of the 2009 IECC
Promoting Awareness of 2009 IECC

- Where is our municipality relative to our neighbors?
- Utilizing your municipality’s website
- Distributing handouts/information to applicants as early as possible
## Promoting Awareness of 2009 IECC

**Resource Inventory**
- Compilation of resources
- Living document

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>REScheck and COMcheck</td>
<td>REScheck and COMcheck Presentation</td>
<td>Building Energy Codes Online Training</td>
<td>This website provides links to a variety of courses, including information about REScheck, the requirements of the 2009 IECC, etc.</td>
</tr>
<tr>
<td>REScheck and COMcheck</td>
<td>Presentation</td>
<td>2009 IECC, REScheck and COMcheck</td>
<td>IECC, REScheck and COMcheck presentation developed by U.S. DOE</td>
</tr>
<tr>
<td>Residential</td>
<td>Transcript</td>
<td>Residential Requirements of the 2009 IECC</td>
<td>Transcript for a presentation given by the U.S. DOE on the residential requirements of the 2009 IECC (pp. 7 is relevant to additions and renovations).</td>
</tr>
<tr>
<td>REScheck</td>
<td>Compliance Report</td>
<td>REScheck Compliance Report</td>
<td>Sample REScheck compliance report with sample energy efficiency certificate on pg 5.</td>
</tr>
<tr>
<td>Residential</td>
<td>Compliance</td>
<td>Frequently-Asked Questions - Module 3 provided by ICC</td>
<td>Frequently asked questions around the residential energy code. Includes answers to questions about the 2009 IECC and roofs, wood burning fireplaces, windows, thermal envelopes, etc.</td>
</tr>
</tbody>
</table>
| General Code Information| Fact Sheet                           | Policy Maker Fact Sheet, Building Energy Code Compliance: October 2010 | One-page tool that provides answers to questions such as:
(1) What are energy codes?
(2) What are the benefits of building energy codes?
(3) What can policy makers do to enhance code compliance and enforcement? |
| Mechanical              | Article                              | Bigger is not always better with HVAC systems | Article describes why sizing appropriately is of importance. Links to article regarding how to size equipment correctly, and to diagrams outlining the mechanical systems covered by the IECC. |
| Mechanical              | Articles, web tools, photos, presentations | Building Codes Energy Resource Center | Numerous sources for information regarding HVAC systems and the IECC. Use "browse topic" drop down menu at upper right to choose "Mechanical." |
Promoting Awareness of 2009 IECC

Resources:
- Presentations
- Pamphlets
- Factsheets
- Articles
- Guides
- Websites
- Reports
- Frequently-asked questions

Sources:
- U.S. Department of Energy
- International Code Council
- Other states and municipalities

Topics:
- Code requirements
- REScheck and COMcheck
- Additions/renovations
- Duct pressure testing
Promoting Awareness of 2009 IECC

Example of Resources

• [Top 10 Reasons for Building Energy Codes](#), U.S. Dept. of Energy
• [Duct Leakage Frequently-Asked Questions](#), U.S. Dept. of Energy
• [Bigger is not always better with HVAC systems](#), U.S. Dept. of Energy
Promoting Awareness of 2009 IECC

Maintaining the Resource Inventory

- Where will the Resource Inventory “live?”
- Who will update the Resource Inventory?
- Who will have access to the Resource Inventory?
Promoting Awareness of 2009 IECC

Contractor awareness

• Inform contractors with the energy code
  – Create cheat sheet, require short training, or take notes about failed inspections
• Identify and address knowledge gaps upfront to enhance compliance with the 2009 IECC
• Possible to require registration
• Create opportunities to promote awareness
Promoting Awareness of 2009 IECC

Summary of Mechanical Requirements

• Size and select appropriate heating and cooling systems – submit documents to city prior to installation
• Seal all duct connections
• Do not use cavities for supply ducts
• Install furnace and ducts in conditioned space

• If ducts cannot be fully located in conditioned space
  – Insulate supply ducts to R-8 and all others to R-6
  – Test for duct tightness and meet requirements
Topic 1 Summary

• There are several benefits that result from energy codes, to all stakeholders
• The challenges of implementing the 2009 IECC can easily be overcome
• The payback to homeowners is less than five years
• There are several options available which municipalities can use to promote awareness of the 2009 IECC
Topic 2

Highlights of the Residential portion of the 2009 IECC
Topic 2 Objectives

• Overview
• Compliance
  – Mandatory Provisions
• Compliance Paths
  – Prescriptive [402.1]
  – U-Factor [402.1.3]
  – UA Alternative [402.1.4]
  – Simulated Performance Alternative [405]
Overview

RESIDENTIAL BUILDING. For this code, includes R-3 buildings, as well as R-2 and R-4 buildings three stories or less in height above grade.

- Single family house
- Duplex/townhouse
- Triplex (or larger units if 3 stories or less in height above grade)
- Apartment Buildings (if 3 stories or less in height above grade)
- Assisted Living Communities (if 3 stories or less in height above grade)
COMMERCIAL BUILDING. For this code, all buildings that are not included in the definition of “Residential buildings.”
Overview

• An 10 unit, 2 story apartment complex?

• References the IBC (IRC is for one- and two-family dwellings or townhouses)

• Still the residential portion of the IECC per the ICC definitions
Overview

Relationship between IRC (International Residential Code) and IECC

- IECC addresses only energy (commercial and residential)
- IRC addresses all topics (structural, plumbing, etc.)
- IRC allows compliance with IECC as an alternative to Chapter 11 [N1101.2]
  - Energy requirements in IRC and IECC almost identical
  - Minor differences as they relate to Missouri
  - IRC does not have a simulated performance alternative path
Overview

Applicability

• Code applies to “residential buildings”
• New construction, additions, alterations, renovations or repairs [101.4.3]
• Additions can comply alone or in combination with existing building

Exempted Buildings

• Existing buildings
• Buildings designated as historic
• Buildings (or portions of) that are neither heated or cooled (e.g. garage)

Exempted Alterations

• Eight exemptions
Overview

8 Exceptions

1. Storm windows installed over (E) window.
2. Glass only replacements in an (E) window.
3. (E) cavities are filled with insulation.
4. (E) cavity is not exposed.
5. Roofing for roofs were neither the sheathing nor the insulation is exposed.
6. Replacement of (E) doors that separate conditioned space from the exterior shall not require the installation of a vestibule or revolving door.
7. Alterations that replace less than 50% of the luminaires in a space.
8. Alterations that replace only the bulb and ballast w/in the (E) luminaires in a space.

The IECC “is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.”
Overview

Mandatory Provisions

• Air-seal house and install “tight” fixtures in the building envelope
• Ducts must be sealed and building cavities may not be supply ducts
• If ducts are not in conditioned space they must be verified to be “tight”
• Heating and cooling equipment shall be sized to ACCA Manual J and S
• There are others but the above are the main items

ACCA - Air Conditioning Contractors of America
Manual J – Residential Load Calculation
Manual S – Residential Equipment Selection
Overview

Two options to meet the air sealing requirement [402.4.2]

• Testing option [402.4.2.1]
• Visual Inspection option [402.4.2.2], using Table 402.4.2 Air Barrier and Insulation Inspection Component Criteria

BEST PRACTICE: Testing is now required in the 2012 IECC. Third party testing might be easier than inspectors trusting builders and/or verifying each item on the checklist.
# Overview

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air barrier and thermal barrier</td>
<td>Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier. Breaks or joints in the air barrier are filled or repaired. Air-permeable insulation is not used as a sealing material. Air-permeable insulation is inside of an air barrier.</td>
</tr>
<tr>
<td>Ceiling/attic</td>
<td>Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed. Attic access (except unvented attic), knee wall door, or drop down stair is sealed.</td>
</tr>
<tr>
<td>Walls</td>
<td>Corners and headers are insulated. Junction of foundation and sill plate is sealed.</td>
</tr>
<tr>
<td>Windows and doors</td>
<td>Space between window/door jambs and framing is sealed.</td>
</tr>
<tr>
<td>Rim joists</td>
<td>Rim joists are insulated and include an air barrier.</td>
</tr>
<tr>
<td>Floors (including above-garage and cantilevered floors)</td>
<td>Insulation is installed to maintain permanent contact with underside of subfloor decking. Air barrier is installed at any exposed edge of insulation.</td>
</tr>
<tr>
<td>Crawl space walls</td>
<td>Insulation is permanently attached to walls. Exposed earth in unvented crawl spaces is covered with Class I vapor retarder with overlapping joints taped.</td>
</tr>
</tbody>
</table>
Compliance

Mandatory Provisions

AND

Compliance Path

(Four Options)
Compliance

Mandatory Provisions

AND

A. Prescriptive
B.1 U-Factor
B.2 UA Alternative
C. Simulated Performance Alternative

Prescriptive Approaches
Compliance Path – Prescriptive Approaches

There are a few additional requirements when doing a prescriptive approach (Prescriptive, U-Factor, and UA Alternative)

1. Supply ducts in attics shall be insulated to a minimum of R-8. All other ducts (outside of the conditioned space) shall be insulated to a minimum of R-6.

2. A minimum of 50 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps.

Alternative: The Simulated Performance Alternative path:
• No requirement for high-efficacy lighting
• All ducts to be insulated to a minimum of R-6
Lighting efficacy prescriptive requirement

• At least 50% of permanently installed lighting fixtures shall be high-efficiency [404.1]
• What is high-efficiency?
  – Defined in Chapter 2 Definitions - Compact fluorescent lamps, T-8 or smaller diameter linear fluorescent lamps, or lamps with a minimum efficacy of:
    » 60 lumens per watt for lamps over 40 watts,
    » 50 lumens per watt for lamps over 15 watts to 40 watts, and
    » 40 lumens per watt for lamps 15 watts or less
Allowances in the prescriptive path:

- One door (24 ft$^2$) can be exempt of the prescriptive requirements (e.g. decorative main entry wood panel door)
- 15 ft$^2$ can be exempt of the prescriptive requirements (e.g. block glass in shower instead of typical code compliant window)
- 500 ft$^2$ or 20% of the ceiling area, whichever is less, can be reduced to R-30 when ceiling assembly does not allow sufficient space for the required insulation (e.g. small sun room with a vaulted ceiling that the structural engineer wants sized with 2x10 rafters)
Compliance

Mandatory Provisions

AND

A. Prescriptive

B.1 U-Factor

B.2 UA Alternative

C. Simulated Performance Alternative

Prescriptive Approaches
Compliance Path - Prescriptive

- R-values and U-factors dependent on climate zone
- *Insulation and Fenestration Requirements by Component* [Table 402.1.1]
- Could cite values directly from code
- No software needed
- No trade offs
### Compliance Path – Prescriptive

#### TABLE 402.1.1
**INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT**

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>FENESTRATION U-FACTOR^b</th>
<th>SKYLIGHT U-FACTOR</th>
<th>GLAZED FENESTRATION SHGC^c,^e</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>1.2</td>
<td>0.75</td>
<td>0.30</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>0.65^d</td>
<td>0.75</td>
<td>0.30</td>
<td>30</td>
<td>13</td>
<td>4/6</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0.50^d</td>
<td>0.65</td>
<td>0.30</td>
<td>30</td>
<td>13</td>
<td>5/8</td>
<td>19</td>
<td>5/13^f</td>
<td>0</td>
<td>5/13</td>
</tr>
<tr>
<td>4 except Marine</td>
<td>0.35</td>
<td>0.60</td>
<td>NR</td>
<td>38</td>
<td>13</td>
<td>5/10</td>
<td>19</td>
<td>10/13</td>
<td>10, 2 ft</td>
<td>10/13</td>
</tr>
<tr>
<td>5 and Marine 4</td>
<td>0.35</td>
<td>0.60</td>
<td>NR</td>
<td>38</td>
<td>20 or 13+5^h</td>
<td>13/17</td>
<td>30^g</td>
<td>10/13</td>
<td>10, 2 ft</td>
<td>10/13</td>
</tr>
<tr>
<td>6</td>
<td>0.35</td>
<td>0.60</td>
<td>NR</td>
<td>49</td>
<td>20 or 13+5^h</td>
<td>15/19</td>
<td>30^g</td>
<td>15/19</td>
<td>10, 4 ft</td>
<td>10/13</td>
</tr>
<tr>
<td>7 and 8</td>
<td>0.35</td>
<td>0.60</td>
<td>NR</td>
<td>49</td>
<td>21</td>
<td>19/21</td>
<td>38^g</td>
<td>15/19</td>
<td>10, 4 ft</td>
<td>10/13</td>
</tr>
</tbody>
</table>
Compliance Path – Prescriptive

Window performance data

Slab-on-grade examples

![Window Performance Data]

- **U-Factor (USK):** 0.34
- **Solar Heat Gain Coefficient:** 0.29
- **Visible Transmittance:** 0.53

![Slab-on-grade Examples]

- Slab
- Rigid Insulation
- Flashing
- Protection Board
- Rigid Insulation
Compliance Path – Prescriptive

- Mandatory notes
- Insulation schedule
- Building Sections specifying insulation
- High-efficacy lighting

### Efficiency Schedule

<table>
<thead>
<tr>
<th>Energy Details - Climate Zone 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009 IECC Compliance - Prescriptive</td>
</tr>
<tr>
<td>Basement Walls</td>
</tr>
<tr>
<td>Above Grade Walls</td>
</tr>
<tr>
<td>Floor Over Garage</td>
</tr>
<tr>
<td>Ceiling - Attic</td>
</tr>
<tr>
<td>Windows</td>
</tr>
<tr>
<td>Lighting</td>
</tr>
</tbody>
</table>

FB - Fiberglass Batt (R-3.7/inch)
BC - Blown Cellulose (R-3.66/inch)
Compliance Path – Prescriptive

Example Building Sections

Foundation/floor connection

http://www.greenbuildingadvisor.com

Wall/roof connection
Compliance

Mandatory Provisions

AND

A. Prescriptive
B.1 U-Factor
B.2 UA Alternative
C. Simulated Performance Alternative
Compliance Path – U-Factor

- U-factors dependent on climate zone
- Alternative to the R-value in Table 402.1.1
- *Equivalent U-Factors* [Table 402.1.3]
- Could cite values directly from code
- Can use software for help with basic U-Factor calculations
- No trade offs
### Compliance Path – U-Factor

#### TABLE 402.1.3
**EQUIVALENT U-FACTORS**

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>FENESTRATION U-FACTOR</th>
<th>SKYLIGHT U-FACTOR</th>
<th>CEILING U-FACTOR</th>
<th>FRAME WALL U-FACTOR</th>
<th>MASS WALL U-FACTOR</th>
<th>FLOOR U-FACTOR</th>
<th>BASEMENT WALL U-FACTOR</th>
<th>CRAWL SPACE WALL U-FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.20</td>
<td>0.75</td>
<td>0.035</td>
<td>0.082</td>
<td>0.197</td>
<td>0.064</td>
<td>0.360</td>
<td>0.477</td>
</tr>
<tr>
<td>2</td>
<td>0.65</td>
<td>0.75</td>
<td>0.035</td>
<td>0.082</td>
<td>0.165</td>
<td>0.064</td>
<td>0.360</td>
<td>0.477</td>
</tr>
<tr>
<td>3</td>
<td>0.50</td>
<td>0.65</td>
<td>0.035</td>
<td>0.082</td>
<td>0.141</td>
<td>0.047</td>
<td>0.091</td>
<td>0.136</td>
</tr>
<tr>
<td>4 except Marine</td>
<td>0.35</td>
<td>0.60</td>
<td>0.030</td>
<td>0.082</td>
<td>0.141</td>
<td>0.047</td>
<td>0.059</td>
<td>0.065</td>
</tr>
<tr>
<td>5 and Marine 4</td>
<td>0.35</td>
<td>0.60</td>
<td>0.030</td>
<td>0.057</td>
<td>0.082</td>
<td>0.033</td>
<td>0.059</td>
<td>0.065</td>
</tr>
<tr>
<td>6</td>
<td>0.35</td>
<td>0.60</td>
<td>0.026</td>
<td>0.057</td>
<td>0.060</td>
<td>0.033</td>
<td>0.050</td>
<td>0.065</td>
</tr>
<tr>
<td>7 and 8</td>
<td>0.35</td>
<td>0.60</td>
<td>0.026</td>
<td>0.057</td>
<td>0.057</td>
<td>0.028</td>
<td>0.050</td>
<td>0.065</td>
</tr>
</tbody>
</table>
Compliance Path – U-Factor

• Mandatory notes
• Insulation schedule
• Wall Sections specifying insulation
• High-efficacy lighting

<table>
<thead>
<tr>
<th>Efficiency Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Details - Climate Zone 4</td>
</tr>
<tr>
<td>2009 IECC Compliance - Prescriptive/U-Factor</td>
</tr>
<tr>
<td>Basement Walls</td>
</tr>
<tr>
<td>Above Grade Walls</td>
</tr>
<tr>
<td>Floor Over Garage</td>
</tr>
<tr>
<td>Ceiling - Attic</td>
</tr>
<tr>
<td>Windows</td>
</tr>
<tr>
<td>Lighting</td>
</tr>
</tbody>
</table>

FB - Fiberglass Batt (R-3.7/inch)  
BC - Blown Cellulose (R-3.66/inch)  
PI - Polyisocyanurate Rigid Foam (R-6.25/inch)
Compliance

Mandatory Provisions

AND

Prescriptive Approaches

A. Prescriptive
B.1 U-Factor
B.2 UA Alternative
C. Simulated Performance Alternative
Compliance Path – UA Alternative

Total UA Alternative [402.1.4]

- Total UA is the sum of all the construction type areas multiplied by their respective U-factor
- Allows for trade-offs between different portions of building envelope
- There is a hard limit on trade-offs
  - Area-weighted U-Factor of windows must be 0.48 or less
- REScheck – Department of Energy
Compliance Path – UA Alternative

<table>
<thead>
<tr>
<th>Component</th>
<th>U-Factor</th>
<th>Gross Area</th>
<th>UA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaulted Ceiling</td>
<td>0.030</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>ABG Walls</td>
<td>0.082</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Basement Walls</td>
<td>0.059</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>AGW Walls</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Vaulted Ceiling</td>
<td>0.3</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Window 1</td>
<td>0.6</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Window 2</td>
<td>0.5</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Door 1</td>
<td>0.3</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Basement Wall 1</td>
<td>0.238</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Basement Wall 2</td>
<td>0.3</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

Max UA: 423

Design UA: 410
Compliance Path – UA Alternative

- Project Details (optional): This information will appear on the compliance certificate.
- Location:
  - State: Missouri
  - City: Jefferson City
- Project Type:
  - New Construction
  - Addition/Alteration
- Building Characteristics:
  - 1- and 2-Family, Detached
  - Multifamily
  - Conditioned Floor Area: 3500 ft²
  - All ducts and air handlers located within conditioned spaces
- Owner/Agent
- Designer/Contractor
- Notes
Compliance Path – UA Alternative

[Description of the image showing a software interface with selected options for compliance method, project details, and building characteristics.]

Missouri Home UA.rck - REScheck 4.4.2
Code: 2009 IECC

Project Details (optional):
Title/Site/Permit:
Jefferson City Home
1234 ABC Lane
Jefferson City, MO 65101

Owner/Agent:

Designer/Contractor:

Notes:

Explanation of duct testing requirements...
Compliance Path – UA Alternative

<table>
<thead>
<tr>
<th>Component</th>
<th>Assembly</th>
<th>Gross Area</th>
<th>Cavity Insulation R-Value</th>
<th>Continuous Insulation R-Value</th>
<th>U-Factor</th>
<th>UA</th>
<th>SHGC</th>
<th>Wall Height (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling 1</td>
<td>Cathedral Ceiling</td>
<td>779 ft²</td>
<td>30.0</td>
<td>5.0</td>
<td>0.029</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceiling 2</td>
<td>Flat Ceiling or Scissor Truss</td>
<td>385 ft²</td>
<td>25.0</td>
<td>13.0</td>
<td>0.026</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall 1</td>
<td>Wood Frame, 16&quot; o.c.</td>
<td>2571 ft²</td>
<td>20.0</td>
<td>0.0</td>
<td>0.059</td>
<td>124</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Window 1</td>
<td>Wood Frame:Double Pan...</td>
<td>271 ft²</td>
<td>0.3</td>
<td>81</td>
<td>0.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Window 2</td>
<td>Wood Frame:Double Pan...</td>
<td>146 ft²</td>
<td>0.6</td>
<td>88</td>
<td>0.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door 1</td>
<td>Solid</td>
<td>54 ft²</td>
<td>0.5</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall 2</td>
<td>Wood Frame, 16&quot; o.c.</td>
<td>50 ft²</td>
<td>0.0</td>
<td>0.0</td>
<td>0.238</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Window 3</td>
<td>Wood Frame:Double Pan...</td>
<td>48 ft²</td>
<td>0.3</td>
<td>14</td>
<td>0.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basement Wall 1</td>
<td>Solid Concrete or Masonry</td>
<td>573 ft²</td>
<td>13.0</td>
<td>0.0</td>
<td>0.075</td>
<td>43</td>
<td></td>
<td>7.0</td>
</tr>
</tbody>
</table>
Compliance Path – UA Alternative

CONDITIONED SPACE. An area or room within a building being heated or cooled, containing uninsulated ducts, or with a fixed opening directly into an adjacent conditioned space.
Compliance Path – UA Alternative

Compliance with the 2009 IECC can be demonstrated using the Total UA (‘Trade-Off’) Alternative or the Performance Alternative. The UA Alternative is currently selected. The compliance method can be changed in the Options menu.

The UA Alternative does not consider mechanical systems so mechanical inputs are not available. Under the Performance Alternative, mechanical systems can be specified and may impact the results, however no trade-off credits for high efficiency mechanical equipment are allowed.

Press F1 for more information.
Compliance Path – UA Alternative
Compliance Path – UA Alternative

REScheck Software Version 4.4.2

Compliance Certificate

Project Title: Jefferson City Home

Energy Code: 2009 IECC
Location: Jefferson City, Missouri
Construction Type: Single Family
Glazing Area Percentage: 18%
Heating Degree Days: 6300
Climate Zone: 4

Construction Site: 1234 ABC Lane
Jefferson City, MO 65103

Owner/Agent: Designed/Contractor:

Compliance: Passes using UA trade-off
Compliance 3.1 R, Rated Rough Date:
Minimum UA: 423

Your UA: 416

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Gross Area or Perimeter</th>
<th>U-Value</th>
<th>R-Value</th>
<th>Cont. R-Value</th>
<th>Glazing or Door U-Factor</th>
<th>UA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling 1: Cathedral Ceiling</td>
<td>770</td>
<td>0.03</td>
<td>20.0</td>
<td>5.0</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Ceiling 2: Flat Ceiling or Semi-Truss</td>
<td>235</td>
<td>0.05</td>
<td>13.0</td>
<td></td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Wall 1: Wood Frame, 16&quot; o.c.</td>
<td>377</td>
<td>0.01</td>
<td>9.0</td>
<td></td>
<td>124</td>
<td>124</td>
</tr>
<tr>
<td>Window 1: Wood Frame/Double Pane with Low-E</td>
<td>271</td>
<td>0.009</td>
<td>81.0</td>
<td></td>
<td>81</td>
<td>81</td>
</tr>
<tr>
<td>Window 2: Wood Frame/Double Pane with Low-E</td>
<td>146</td>
<td>0.009</td>
<td>89.0</td>
<td></td>
<td>89</td>
<td>89</td>
</tr>
<tr>
<td>Door 1: Solid</td>
<td>94</td>
<td>0.00</td>
<td>27.0</td>
<td></td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Wall 2: Wood Frame, 16&quot; o.c.</td>
<td>60</td>
<td>0.00</td>
<td>0.0</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Window 3: Wood Frame/Double Pane with Low-E</td>
<td>45</td>
<td>0.009</td>
<td>14.0</td>
<td></td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Basement Wall 1: Solid Concrete or Masonry</td>
<td>573</td>
<td>13.0</td>
<td>0.0</td>
<td></td>
<td>43</td>
<td>43</td>
</tr>
</tbody>
</table>

Compliance Statement: This proposed building design described here is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the 2009 IECC requirements in REScheck Version 4.4.2 and to comply with the mandatory requirements listed in the REScheck Inspection Checklist.
Compliance Path – UA Alternative

REScheck Software Version 4.4.2
Inspection Checklist

Ceilings:
- Ceiling 1: Cathedral Ceiling, R-30.0 cavity + R-8.0 continuous insulation
  Comments:
- Ceiling 2: Flat Ceiling or Ceiling Truss, R-25.0 cavity + R-13.0 continuous insulation
  Comments:

Above-Grade Walls:
- Wall 1: Wood Frame, 10' o.c., R-20.0 cavity insulation
  Comments:
- Wall 2: Wood Frame, 10' o.c., R-0 (uninsulated)
  Comments:

Basement Walls:
- Basement Wall 1: Solid Concrete or Masonry, 7.0' Ht. / 3.5' bg / 7.0' Insul. R-13.0 cavity insulation
  Comments:

Windows:
- Window 1: Wood Frame Double Pane with Low-E, U-factor: 0.300
  For windows without labeled U-factors, describe features:
  Panes ______ Frame Type _________ Thermal Break? ______ Yes ______ No
  Comments:
- Window 2: Wood Frame Double Pane with Low-E, U-factor: 0.800
  For windows without labeled U-factors, describe features:
  Panes ______ Frame Type _________ Thermal Break? ______ Yes ______ No
  Comments:
- Window 3: Wood Frame Double Pane with Low-E, U-factor: 0.500
  For windows without labeled U-factors, describe features:

MISSOURI DEPARTMENT OF NATURAL RESOURCES
Compliance Path – UA Alternative

This document or a similar one needs to be installed near the main electrical panel.
Compliance

Mandatory Provisions

AND

A. Prescriptive

B.1 U-Factor

B.2 UA Alternative

C. Simulated Performance Alternative

Prescriptive Approaches
Compliance Path – Simulated Performance

- Simulated performance analysis [405]
  - Heating, cooling, service water heating energy only
- Design shown to have less than or equal to annual energy cost of standard reference design [405.3]
- Standard reference design [Table 405.5.2(1)]

<table>
<thead>
<tr>
<th>BUILDING COMPONENT</th>
<th>STANDARD REFERENCE DESIGN</th>
<th>PROPOSED DESIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above-grade walls</td>
<td>Type: mass wall if proposed wall is mass; otherwise wood frame.</td>
<td>As proposed</td>
</tr>
<tr>
<td></td>
<td>Gross area: same as proposed</td>
<td>As proposed</td>
</tr>
<tr>
<td></td>
<td>U-factor: from Table 402.1.3</td>
<td>As proposed</td>
</tr>
<tr>
<td></td>
<td>Solar absorptance = 0.75</td>
<td>As proposed</td>
</tr>
<tr>
<td></td>
<td>Emittance = 0.90</td>
<td>As proposed</td>
</tr>
<tr>
<td>Basement and crawl space walls</td>
<td>Type: same as proposed</td>
<td>As proposed</td>
</tr>
<tr>
<td></td>
<td>Gross area: same as proposed</td>
<td>As proposed</td>
</tr>
<tr>
<td></td>
<td>U-factor: from Table 402.1.3, with insulation layer on interior side of walls</td>
<td>As proposed</td>
</tr>
<tr>
<td>Above-grade floors</td>
<td>Type: wood frame</td>
<td>As proposed</td>
</tr>
<tr>
<td></td>
<td>Gross area: same as proposed</td>
<td>As proposed</td>
</tr>
<tr>
<td></td>
<td>U-factor: from Table 402.1.3</td>
<td>As proposed</td>
</tr>
<tr>
<td>Ceilings</td>
<td>Type: wood frame</td>
<td>As proposed</td>
</tr>
<tr>
<td></td>
<td>Gross area: same as proposed</td>
<td>As proposed</td>
</tr>
<tr>
<td></td>
<td>U-factor: from Table 402.1.3</td>
<td>As proposed</td>
</tr>
<tr>
<td></td>
<td>Type: composition shingles or wood sheathing</td>
<td>As proposed</td>
</tr>
<tr>
<td></td>
<td>Gross area: same as proposed</td>
<td>As proposed</td>
</tr>
</tbody>
</table>
Compliance Path – Simulated Performance

Climate Zone 4

Vaulted Ceiling
U-Factor – 0.030
Eq. to R-38 cav

ABG Walls
U-Factor – 0.082
Eq. to R-13 cav

Basement Walls
U-Factor – 0.059
Eq. to R-13 cav

Vaulted Ceiling
2x12 w/ R-30 cav

AGW Walls
2x6 w/ R-20 cav

Basement Walls
2x4 w/ R-13 cav

Reference Design
2009 IECC

Proposed Design
Compliance Path – Simulated Performance

No skylights

15% Window to floor area ratio or proposed if below

40 sq.ft. of door

Climate Zone 4

16 sq.ft. of skylights

25% Window to floor area ratio

54 sq.ft. of door

Reference Design
2009 IECC

Proposed Design
Compliance Path – Simulated Performance

**Climate Zone 4**

- ACH of 0.00036 SLA
- ACH not tested then same as reference OR actual value down to 0.35 OR actual value if mechanically ventilated
- Mechanical same as proposed
- Mechanical as proposed

Reference Design
2009 IECC

Proposed Design
Compliance Path – Simulated Performance

Reference Design
2009 IECC

Proposed Design

Heat + Cool + Hot Water = $917

Heat + Cool + Hot Water = $770
Compliance Path – Simulated Performance

Differences between UA and Performance

• Performance takes into consideration weather
• Performance does not require 50% high efficacy lighting
• Performance allows for R-6 duct insulation, instead of R-8 for supply ducts
• Performance has limits to doors and windows
  – Glass house could be compliant in the prescriptive paths but not compliant in the performance path

Main Software

• REScheck
• REM/Design or REM/Rate (considers air infiltration and duct tightness)
Compliance Path – Simulated Performance
Compliance with the 2009 IECC can be demonstrated using the Total UA Alternative (Section 402.1.4), or the Performance Alternative (Section 106). However, neither of these alternatives allow credit for high efficiency mechanical equipment.

The performance alternative is based on the simulated performance of your proposed building as compared to an equivalent code building. Both simulations are based on the proposed mechanical equipment efficiency that you enter. The compliance index may not always seem consistent with changes you make in equipment efficiency due to the complex interactions between the building envelope (including window SHGCs and U-factors), the building and wall orientation, and mechanical equipment efficiency.

Using the performance alternative requires additional input including conditioned floor area, orientation of the building, a minimum of four walls having unique orientations, and a minimum of one roof and floor.

Press 'F1' or see Help for additional information.
Compliance Path – Simulated Performance

<table>
<thead>
<tr>
<th>Building</th>
<th>Project</th>
<th>Envelope</th>
<th>Mechanical</th>
<th>Component</th>
<th>Assembly</th>
<th>Orientation</th>
<th>Gross Area</th>
<th>Cavity Insulation R-Value</th>
<th>Continuous Insulation R-Value</th>
<th>U-Factor</th>
<th>LR</th>
<th>UHCC</th>
<th>Wall Height (ft)</th>
<th>Depth Below Grade (ft)</th>
<th>Depth of Insulation (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ceiling 1</td>
<td>Cathedral Ceiling</td>
<td></td>
<td>Ceiling 1</td>
<td>Cathedral Ceiling</td>
<td></td>
<td>794</td>
<td>ft</td>
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<td>5.6</td>
<td>0.020</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Ceiling 2</td>
<td>Flat Ceiling or Slanted</td>
<td></td>
<td>Ceiling 2</td>
<td>Flat Ceiling or Slanted</td>
<td></td>
<td>399</td>
<td>ft</td>
<td>25.0</td>
<td>23.0</td>
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<td></td>
</tr>
<tr>
<td>3</td>
<td>Wall 1</td>
<td>Wood Frame, 16&quot; x 16&quot;</td>
<td></td>
<td>Wall 1</td>
<td>Wood Frame, 16&quot; x 16&quot;</td>
<td></td>
<td>48</td>
<td>ft</td>
<td>9.9</td>
<td>0.6</td>
<td>0.020</td>
<td>0</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
<td></td>
<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
<td></td>
<td>48</td>
<td>ft</td>
<td>9.9</td>
<td>0.6</td>
<td>0.020</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Wall 1</td>
<td>Wood Frame, 10&quot; x 10&quot;</td>
<td></td>
<td>Wall 1</td>
<td>Wood Frame, 10&quot; x 10&quot;</td>
<td></td>
<td>429</td>
<td>ft</td>
<td>20.0</td>
<td>0.6</td>
<td>0.055</td>
<td>18</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6</td>
<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
<td></td>
<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
<td></td>
<td>105</td>
<td>ft</td>
<td>0.3</td>
<td>36</td>
<td>0.30</td>
<td></td>
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<td></td>
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<tr>
<td>7</td>
<td>Door 1</td>
<td>Solid</td>
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<td>Door 1</td>
<td>Solid</td>
<td></td>
<td>20</td>
<td>ft</td>
<td>0.3</td>
<td>6</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>8</td>
<td>Wall 1</td>
<td>Wood Frame, 10&quot; x 10&quot;</td>
<td></td>
<td>Wall 1</td>
<td>Wood Frame, 10&quot; x 10&quot;</td>
<td></td>
<td>429</td>
<td>ft</td>
<td>20.0</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
<td></td>
<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
<td></td>
<td>105</td>
<td>ft</td>
<td>0.3</td>
<td>36</td>
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<td>10</td>
<td>Door 1</td>
<td>Solid</td>
<td></td>
<td>Door 1</td>
<td>Solid</td>
<td></td>
<td>20</td>
<td>ft</td>
<td>0.3</td>
<td>6</td>
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<td></td>
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<tr>
<td>11</td>
<td>Wall 1</td>
<td>Wood Frame, 10&quot; x 10&quot;</td>
<td></td>
<td>Wall 1</td>
<td>Wood Frame, 10&quot; x 10&quot;</td>
<td></td>
<td>187</td>
<td>ft</td>
<td>20.0</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
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<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
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<td>73</td>
<td>ft</td>
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<td>26</td>
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<tr>
<td>13</td>
<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
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<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
<td></td>
<td>95</td>
<td>ft</td>
<td>0.3</td>
<td>31</td>
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<td></td>
</tr>
<tr>
<td>14</td>
<td>Wall 1</td>
<td>Wood Frame, 10&quot; x 10&quot;</td>
<td></td>
<td>Wall 1</td>
<td>Wood Frame, 10&quot; x 10&quot;</td>
<td></td>
<td>187</td>
<td>ft</td>
<td>20.0</td>
<td>0.6</td>
<td>0.055</td>
<td>44</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>15</td>
<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
<td></td>
<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
<td></td>
<td>73</td>
<td>ft</td>
<td>0.35</td>
<td>26</td>
<td>0.40</td>
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<tr>
<td>16</td>
<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
<td></td>
<td>Window 1</td>
<td>Wood Frame, Double Pane</td>
<td></td>
<td>95</td>
<td>ft</td>
<td>0.3</td>
<td>31</td>
<td>0.50</td>
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<td></td>
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<tr>
<td>17</td>
<td>Door 1</td>
<td>Solid</td>
<td></td>
<td>Door 1</td>
<td>Solid</td>
<td></td>
<td>20</td>
<td>ft</td>
<td>0.3</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>18</td>
<td>Basement Wall 1</td>
<td>Solid Concrete Masonry</td>
<td></td>
<td>Basement Wall 1</td>
<td>Solid Concrete Masonry</td>
<td></td>
<td>95</td>
<td>ft</td>
<td>13.0</td>
<td>0.6</td>
<td>0.075</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Basement Wall 1</td>
<td>Solid Concrete Masonry</td>
<td></td>
<td>Basement Wall 1</td>
<td>Solid Concrete Masonry</td>
<td></td>
<td>95</td>
<td>ft</td>
<td>13.0</td>
<td>0.6</td>
<td>0.075</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Basement Wall 1</td>
<td>Solid Concrete Masonry</td>
<td></td>
<td>Basement Wall 1</td>
<td>Solid Concrete Masonry</td>
<td></td>
<td>146</td>
<td>ft</td>
<td>13.0</td>
<td>0.6</td>
<td>0.075</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>21</td>
<td>Basement Wall 1</td>
<td>Solid Concrete Masonry</td>
<td></td>
<td>Basement Wall 1</td>
<td>Solid Concrete Masonry</td>
<td></td>
<td>146</td>
<td>ft</td>
<td>13.0</td>
<td>0.6</td>
<td>0.075</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Compliance Path – Simulated Performance

![Image of Compliance Path - Simulated Performance](image)

**Table: Compliance Method - Performance Alternative**

<table>
<thead>
<tr>
<th>Component</th>
<th>Assemblies</th>
<th>Orientation</th>
<th>Gross Area</th>
<th>U-Factor</th>
<th>SHGC</th>
<th>Depth Below Grade (Ft)</th>
<th>Depth of Insulation (Ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling 1</td>
<td>Cathedral Ceiling</td>
<td>Left Side</td>
<td>105</td>
<td>0.3</td>
<td>2</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Ceiling 2</td>
<td>Flat Ceiling or Sloped Truss</td>
<td>Left Side</td>
<td>90</td>
<td>0.3</td>
<td>2</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Wall 1</td>
<td>Wood Frame, Left Side</td>
<td>Front</td>
<td>429</td>
<td>0.2</td>
<td>2</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Wall 2</td>
<td>Wood Frame, Left Side</td>
<td>Front</td>
<td>429</td>
<td>0.2</td>
<td>2</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Wall 3</td>
<td>Wood Frame, Left Side</td>
<td>Front</td>
<td>429</td>
<td>0.2</td>
<td>2</td>
<td>20</td>
<td>5</td>
</tr>
</tbody>
</table>

**Compliance Method: Performance Alternative**

- % Better Than Code: 5.4%
Compliance Path – Simulated Performance

REScheck Software Version 4.4.2

Compliance Certificate

Project Title: Jefferson City Home

Energy Code: 2009 IECC
Location: Jefferson City, Missouri
Construction Type: Single Family
Building Orientation: Bldg. faces 90 deg. from North
Conditioned Floor Area: 3508 sq ft
Glazing Area Percentage: 18%
Heating Degree Days: 5302
Climate Zone: 4

Construction Site: 1234 ABC Lane
Jefferson City, MO 65101

Compliance: Passes using performance alternative
Compliance: 5.4% Better Than Code

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Gross Area or Perimeter</th>
<th>Cavity R-Value</th>
<th>Cont. R-Value</th>
<th>Glazing or Door U-Factor</th>
<th>UA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling 1: Cathedral Ceiling</td>
<td>779</td>
<td>30.0</td>
<td>5.0</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Ceiling 2: Flat Ceiling or Scissor Truss</td>
<td>385</td>
<td>25.0</td>
<td>13.0</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Wall 1: 1000 R-Factor</td>
<td>7</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
BEST PRACTICE: Homeowners and Builders should push for a third party inspector or HERS rater that is looking out for the owner, similar to an owner’s representative. A HERS rating is the standard that most homes striving for ENERGY STAR or LEED follow and is the standard tool that is currently used to certify tax rebates from the IRS. HERS raters will typically use REM/Rate as their software.

• REScheck [405.6.1] minimum capabilities of the software
• REM/Design or REM/Rate
Compliance Path – Simulated Performance
Compliance Path – Simulated Performance
# Compliance Path – Simulated Performance

## 2009 IECC Annual Energy Cost Compliance

<table>
<thead>
<tr>
<th>Building Name:</th>
<th>Jefferson City Home</th>
<th>Date:</th>
<th>November 18, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owners Name:</td>
<td>Jefferson City Home</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>1234 ABC Lane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Address</td>
<td>Jefferson City, MO 65101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Builder's Name:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weather Site:</td>
<td>Columbia, MO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>File Name:</td>
<td>Missouri_Home_REM.lbl</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Annual Energy Cost ($)

<table>
<thead>
<tr>
<th></th>
<th>2009 IECC</th>
<th>As Designed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating</td>
<td>593</td>
<td>483</td>
</tr>
<tr>
<td>Cooling</td>
<td>239</td>
<td>208</td>
</tr>
<tr>
<td>Water Heating</td>
<td>95</td>
<td>70</td>
</tr>
<tr>
<td><strong>SubTotal - Used to Determine Compliance:</strong></td>
<td>917</td>
<td>770</td>
</tr>
<tr>
<td>Lights &amp; Appliances</td>
<td>751</td>
<td>751</td>
</tr>
<tr>
<td>Photovoltaics</td>
<td>-0</td>
<td>-0</td>
</tr>
<tr>
<td>Service Charge</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1788</strong></td>
<td><strong>1641</strong></td>
</tr>
</tbody>
</table>

Window U-Factor Check (Section 402.6):
- Window U-Factor (Design must be equal or lower): 0.480 / 0.330

Home Infiltration (Section 402.4.2): **PASSES**
Duct Leakage (Section 403.2.2): **PASSES**

This home **MEETS** the annual energy cost requirements and verifications of Section 405 of the 2009 International Energy Conservation Code based on a climate zone of 4A. In fact, this home surpasses the requirements by 16.0%.
Topic 2 Summary

- Difference between the IECC and the IRC in how they pertain to residential buildings
- Applicability of the IECC
- Clarified some points of confusion about the IECC, building and duct tightness, and lighting efficacy
- Discuss compliance paths for applicants to meet the code
  - Actually four paths for compliance
Topic 3
Tools to Enhance Compliance throughout Permit Review Process and Inspection
Topic 3 Objectives

• Review examples of tools to enhance compliance with the code prior to submittal
• Review the plans review process
• Review the inspections required
Topic 3 Objectives

- Review examples of tools to enhance compliance with the code prior to submittal
  - Pre-application meetings
  - Code determination worksheet
  - Permit submittal checklist
  - Compliance form
  - Energy efficiency certificate
Pre-Application Meetings

- Discuss compliance paths, and review code requirements
- Point applicants to information
- Review common misconceptions
- Identify a point-of-contact, which carries through review process
Tools Prior to Submittal

Use of a “Determination Worksheet”

• Chicago Energy Conservation Code Compliance Determination Worksheet
  – Determine compliance requirements
  – Determine occupancy classification

General requirements for all projects:

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Use the check boxes below to determine the classification for the project.

- Is the building 5 stories or more above grade?
  - If you checked “YES”, please complete the Commercial Compliance Form.

- Is the building 4 stories or less above grade and contains any permanent residential occupancy, such as houses, apartments, condos, or dorms (hotel and temporary housing units are not included here)?
  - If you checked “YES”, please complete the Residential Compliance Form.

- Is the building 4 stories or less above grade and does it contain any permanent residential occupancy and any other occupancy which occupies more than 15% of the total building area?
  - If you checked “YES”, please complete the Commercial Compliance Form as well as the Residential Compliance Form.
Tools Prior to Submittal

- Use of a checklist for required documents needed for permit submittal

<table>
<thead>
<tr>
<th>APPLICANT’S INITIALS</th>
<th>VILLAGE VERIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Two set of drawings
2. Site plan detail sheet
3. Foundation detail sheet
4. Floor plans
5. Wall construction detail sheet
6. Floor construction detail sheet
7. Roof/ceiling construction detail sheet
8. Chimney/fireplace & chase detail sheet
9. Mechanical detail sheet
10. Plumbing detail sheet
11. Electrical detail sheet
12. Drainage Certificate Agreement
13. Site Development Permit/Erosion Control
14. Contractor Listing
15. Open Space Disclaimer or Open Space Checklist & Receipts
16. Energy Code Compliance

Signature of Applicant ____________________________ Date ____________________________

Accepted: Village of New Lenox ____________________________ Date ____________________________
Tools Prior to Submittal

- Might want a detailed description of what is required for the “Energy Code Compliance”

1. Two set of drawings
2. Site plan detail sheet
3. Foundation detail sheet
4. Floor plans
5. Wall construction detail sheet
6. Floor construction detail sheet
7. Roof/ceiling construction detail sheet
8. Chimney/fireplace & chase detail sheet
9. Mechanical detail sheet
10. Plumbing detail sheet
11. Electrical detail sheet
12. Drainage Certificate Agreement
13. Site Development Permit/Erosion Control
14. Contractor Listing
15. Open Space Disclaimer or
   Open Space Checklist & Receipts
16. **Energy Code Compliance**
Tools Prior to Submittal

Compliance forms

- Chicago, IL - Residential Compliance Form
- Fort Collins, CO - Residential Energy Code Compliance Form
- Jefferson County, CO - Residential Energy Code Submittal Requirements
Tools Prior to Submittal – Chicago, IL

A. Rescheck

RECOMMENDED METHOD

- REScheck
  - Report, Check List, Certificate, Project Details, Permit Date
  - 403: Systems

- *Article 4
  - (403 is in addition to Rescheck)

Print and attach REScheck compliance certificate (required)

OR

B. Prescriptive Method

- Article 4
  - 401: General
  - 402.4: Air Leakage
  - 402.5: Moisture Control
  - 402.6: Fenestration U-factor/SHGC
  - 403: Systems
    - 402.1: Building Thermal Envelope
    - 402.2: Insulation Requirements
    - 402.3: Fenestration

OR

C. Performance Method

- Article 4
  - 401: General
  - 402.4: Air Leakage
  - 402.5: Moisture Control
  - 402.6: Fenestration U-factor/SHGC
  - 403: Systems
  - 404: Simulated Performance Alternative
Tools Prior to Submittal – Chicago, IL

A. Rescheck

RECOMMENDED METHOD

REScheck

Report, Check List, Certificate, Project Details, Permit Date

403: Systems *Article 4
(403 is in addition to Rescheck)

Print and attach REScheck compliance certificate. (required)
Tools Prior to Submittal – Chicago, IL

B. Prescriptive Method

- Article 4
- 401: General
- 402.4: Air Leakage
- 402.5: Moisture Control
- 402.6: Fenestration U-factor/SHGC
- 403: Systems
- 402.1: Building Thermal Envelope
- 402.2: Insulation Requirements
- 402.3: Fenestration

OR

C. Performance Method

- Article 4
- 401: General
- 402.4: Air Leakage
- 402.5: Moisture Control
- 402.6: Fenestration U-factor/SHGC
- 403: Systems
- 404: Simulated Performance Alternative
Tools Prior to Submittal – Fort Collins, CO

2010 FORT COLLINS RESIDENTIAL ENERGY CODE COMPLIANCE FORM

<table>
<thead>
<tr>
<th>Permit Number</th>
<th>Address</th>
</tr>
</thead>
</table>

DIRECTIONS: Place a check next to Prescriptive, UA, or Site indicating the path chosen. Next, circle the method within that path you intend to follow. If choosing prescriptive or UA, the applicant must also choose between an Air sealing checklist or Blower Door Test.

(A) PRESCRIPTIVE compliance for house, 2009 IRC, section N1102.1.1, climate zone 5.

<table>
<thead>
<tr>
<th>BUILDING ENVELOPE</th>
<th>INSULATION R-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood frame wall insult value</td>
<td>R-20 or 13+5s</td>
</tr>
<tr>
<td>Metal frame wall insult value</td>
<td>R-13+90c or R-19+8</td>
</tr>
<tr>
<td>Crawlspace wall</td>
<td>R-13 or R-10+1d</td>
</tr>
<tr>
<td>Roof insulation attic</td>
<td>R-38</td>
</tr>
<tr>
<td>Roof rafter insulation</td>
<td>R-30</td>
</tr>
<tr>
<td>Walls below grade</td>
<td>R-13 or R-10+1d</td>
</tr>
<tr>
<td>Wood floor over un-cond</td>
<td>R-30</td>
</tr>
<tr>
<td>Slab on grade floor, unheated</td>
<td>R-10, 74&quot; DEEP</td>
</tr>
<tr>
<td>Windows</td>
<td>U-35</td>
</tr>
</tbody>
</table>

Circle one:  Air Sealing Checklist  Blower Door Test

(B) TOTAL UA ALTERNATIVE (ResCheck), 2009 IRC, SECTION N1102.1.3

Submit a passing UA calculation (i.e., ResCheck) using 2009 IXCC. The report must be submitted at time of application and include: Address of residence; name of individual completing the rating form, name & version of software tool (i.e., ResCheck). Air Sealing Checklist or Blower Door Test is required.

Circle one:  Air Sealing Checklist  Blower Door Test

(C) SIMULATED PERFORMANCE ALTERNATIVE, 2009 IECC, SECTION 405

Current accredited programs: E-star of Colorado or Enerlogics.

InSAS accredited energy rating system. Must submit InSAS index of 860 minimum. Preliminary rating must be submitted at time of application and must include: Address of residence; Name of individual completing the rating/compliance form, Name & version of software tool. Final rating requires a Blower Door test.

SIGN:  DATE:  
CONTRACTOR:  PHONE:
Tools Prior to Submittal – Fort Collins, CO

Option (A) - Prescriptive

- Simple - specific to the exact climate zone
- Could include the U-Factor values as an option
Tools Prior to Submittal – Fort Collins, CO

Option (B) – UA Alternative

(B) TOTAL UA ALTERNATIVE (ResCheck), 2009 IRC, SECTION N1102.1.3
Submit a passing UA calculation (i.e., ResCheck) using 2009 IRC/IECC. The rating must be submitted at time of application and must include address of residence; name of individual completing the rating form; name & version of software tool (i.e., ResCheck). Air Sealing Checklist or Blower Door Test is required.

Circle one: Air Sealing Checklist Blower Door Test

Option (C) –

(C) SIMULATED PERFORMANCE ALTERNATIVE, 2009 IECC, SECTION 405
Current accredited programs: E-star of Colorado or Energylogic
HERS accredited energy rating system. Must submit HERS index of 100 maximum. A preliminary rating must be submitted at time of application and must include Address of residence; Name of individual completing the rating/compliance form; Name & version of software tool. Final rating requires a blower door test.
Residential Energy Code Submittal Requirements

The Jefferson County Division of Building Safety has adopted the 2009 International Codes effective January 1, 2010. Included as part of this adoption are the International Residential Code (IRC), and the International Energy Conservation Code (IECC). The IECC contains specific design and submittal requirements. The submittal requirements for residential energy compliance are outlined below as determined by the Division.

Energy code submittals shall be required for all residential projects in accordance with the applicable provisions of the 2009 IRC and 2009 IECC. There are four design path options available to the designer:

- **Option #1:** Prescriptive path as outlined in IRC Chapter 11
- **Option #2:** Total UA Alternative path (trade-off) as outlined in IRC section N1102.1.3 & IECC 401.1.4
- **Option #3:** Simulated Performance Alternative (Performance) path as outlined in IECC section 405
- **Option #4:** A Professional Design

**Note:** All four options have similar requirements for submittal documents to meet the code requirements including:

- Building envelope information
- A Manual J equipment design in accordance with the IRC section M1401.3
- A Manual D duct design in accordance with the IRC section M1601.1
Tools Prior to Submittal – Jefferson County, CO

Option #1 Prescriptive Path

The Prescriptive Path requirements for the building envelope are found in 2009 IRC. Unincorporated Jefferson County is located in Climate Zone 5 & Table N1102.1. All prescriptive information shall be taken from the various Climate Zone 5 requirements.

The Prescriptive Building Envelope submittal shall include, at the minimum, the following information on the submitted plans:

- **Address of the building** (this is a site specific submittal)
- **Define/ Delineate your Building Thermal Envelope** (this information shall be shown on the plans rather than a separate document)
- Insulation materials; R values denoted for each individual area (walls, roof, over garage, etc.)
- Crawl space insulation for structural floors and other crawl space insulation whether the foundation wall or the structural floor system is to be insulated and whether the insulation requirements of section N1102.2.9)
- Fenestration U factors 402.3
- **Duct sealing and insulation**. 403.2
- **Manual J**, specific to the site
- **Manual D duct design**, specific to the building
- **Lighting equipment** 404.1
- **Specific insulation** 402.2
Tools Prior to Submittal

All projects should include:

• Air sealing details to limit air infiltration
• Air barrier and insulation notes (air barriers at all installed insulation)
• Duct sealing notes, note that no stud cavity shall be used as a supply duct, and possibly duct insulation notes
• Mechanical equipment details (type, efficiency, venting, location, etc.)
• Statement requiring a energy certificate to be installed on or near the electrical panel
Tools Prior to Submittal

Prescriptive Pathway
• Mandatory notes
• Insulation schedule
• Wall Sections specifying insulation
• High-efficacy lighting

Efficiency Schedule

<table>
<thead>
<tr>
<th>Energy Details - Climate Zone 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009 IECC Compliance - Prescriptive</td>
</tr>
<tr>
<td>Basement Walls 2x4 with R-13 cav. (FB)</td>
</tr>
<tr>
<td>Above Grade Walls 2x6 with R-20 cav (BC)</td>
</tr>
<tr>
<td>Floor Over Garage 11.875&quot; TJ with R-43 cav (BC)</td>
</tr>
<tr>
<td>Ceiling - Attic R-50 (BC)</td>
</tr>
<tr>
<td>Windows All U-Factors equal or below 0.30</td>
</tr>
<tr>
<td>Lighting 75% or more to be CFL</td>
</tr>
</tbody>
</table>

FB - Fiberglass Batt (R-3.7/inch)
BC - Blown Cellulose (R-3.66/inch)
Tools Prior to Submittal

U-Factor Pathway
- Mandatory notes
- Insulation schedule
- Wall Sections specifying insulation
- High-efficacy lighting

<table>
<thead>
<tr>
<th>Efficiency Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy Details - Climate Zone 4</strong></td>
</tr>
<tr>
<td><strong>2009 IECC Compliance - Prescriptive/U-Factor</strong></td>
</tr>
<tr>
<td>Basement Walls</td>
</tr>
<tr>
<td>Above Grade Walls</td>
</tr>
<tr>
<td>Floor Over Garage</td>
</tr>
<tr>
<td>Ceiling - Attic</td>
</tr>
<tr>
<td>Windows</td>
</tr>
<tr>
<td>Lighting</td>
</tr>
</tbody>
</table>

FB - Fiberglass Batt (R-3.7/inch)
BC - Blown Cellulose (R-3.66/inch)
PI - Polyisocyanurate Rigid Foam (R-6.25/inch)
Tools Prior to Submittal

UA Alternative Pathway

- REScheck Compliance Certificate
- Wall Sections specifying insulation
- Detail specifying high-efficacy lighting
Tools Prior to Submittal

Simulated Performance Pathway
- Compliance Certificate
- Wall Sections specifying insulation
Tools Prior to Submittal

Could use REScheck as a template also

- Automatically calculates the U-Factor of an assembly
- Focus on R-Value or U-Factor of assemblies
Topic 3 Objectives

- Review examples of tools to enhance compliance with the code prior to submittal
- Review the plans review process
- Review the inspections required
Plans Review

Phoenix, AZ has an 10 page review and on the last page is a requirement for the home to meet the energy code – it could be more helpful

**ENERGY CODE COMPLIANCE:**

1) IRC Chapter 11 or
2) IECC (Prescriptive or Performance).
   a) Prescriptive IECC 401, 402, and 403
   b) Performance based IECC 404
Plans Review

Checklist:
- Defined pathway of compliance
- Mandatory notes included on the plans
  - Duct, air sealing, and air barrier notes
- Compliance is accurate/no inconsistencies
  - REScheck/REM/Manual J/S documents or insulation schedule matches the plan documents
- Fiberglass batts used in 2x6 to meet Climate Zone 5 Requirements
  - Standard batts compressed to fit a 2x6 cavity are rated at R-18 – requires UA Alternative or Simulated Performance Alternative to meet code if using fiberglass batts
- Any unique locations on the plans that might not be clear
  - Unfinished mechanical rooms (still need to be either insulated out of or into the house depending on combustion air)
  - Varying depth of cavity (but schedule states a consistent insulation)
  - Staircase to basement does not allow for 2x4 stud depth at an exterior foundation wall
  - Slab on grade insulation not shown
  - Stud cavity depth does not allow for standard insulation that would meet code
Topic 3 Objectives

- Review examples of tools to enhance compliance with the code prior to submittal
- Review the plans review process
- Review the inspections required
Inspections

Inspection checklists

- REScheck inspection checklist
- REM/Design inspection checklist
- Georgia Residential Energy Code Inspection checklist
- Department of Energy 2009 IECC checklist:
Inspections

Required Inspections:

**Insulation:**
- Insulation (to be covered) is sufficient and installed correctly
- Air sealing completed
- Installed insulation to have air barrier (thermal bypass)
- Possible duct testing verification

**Final**
- Remaining insulation is inspected
- Ducts are fully located in conditioned space or insulated
- Verify an accurate final certificate is posted near electrical panel
- Possible duct testing verification
- Possible whole house air infiltration testing or checklist verification
Inspections

Thermal Bypass - “Exterior thermal envelope insulation for framed walls is not installed in substantial contact and continuous alignment with building envelope air barrier.”
Inspections

Common air barrier/insulation mistakes

Inspections

No rigid air barrier is installed behind fireplace.

http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_v2_v3_training_resources
Inspections

Insulation is misaligned with floor above.

http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_v2_v3_training_resources
Inspections

Insulation has misalignment, compression, and gaps.

http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_v2_v3_training_resources
Inspections

Compression and misalignment because insulation is not split around wires.

http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_v2_v3_training_resources
Inspections

Improperly installed insulation and no rigid backing.

http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_v2_v3_training_resources
Inspections

Hole has not been air sealed.

http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_v2_v3_training_resources
Inspections

**401.3 Certificate.** A permanent certificate shall be posted on or in the electrical distribution panel... shall be completed by the builder or registered design professional...shall list the predominant R-values of insulation installed in or on ceiling/roof, walls, foundation (slab, basement wall, crawlspace wall and/or floor) and ducts outside conditioned spaces; U-factors for fenestration and the solar heat gain coefficient (SHGC) of fenestration...shall list the types and efficiencies of heating, cooling and service water heating equipment.
## Inspections

### 2009 IECC Energy Efficiency Certificate

<table>
<thead>
<tr>
<th>Insulation Rating</th>
<th>R-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling / Roof</td>
<td>30.00</td>
</tr>
<tr>
<td>Wall</td>
<td>33.00</td>
</tr>
<tr>
<td>Floor / Foundation</td>
<td>10.00</td>
</tr>
<tr>
<td>Ductwork (unconditioned spaces):</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Glass &amp; Door Rating</th>
<th>U-Factor</th>
<th>SHGC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>Door</td>
<td>0.31</td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Heating &amp; Cooling Equipment</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating System:</td>
<td></td>
</tr>
<tr>
<td>Cooling System:</td>
<td></td>
</tr>
<tr>
<td>Water Heater:</td>
<td></td>
</tr>
</tbody>
</table>

Name: ___________________________   Date: __________

Comments:
Inspections

**APPENDIX D**

**SAMPLE COMPLIANCE CERTIFICATE**

*Georgia Residential Energy Code Compliance Certificate*

**Envelope Summary:**
- List the R-Value for the following components:
  - Flat ceiling/roof:
  - Exterior wall:
  - Attic kneewall:
  - Basement stud wall:
  - Crawlspace stud wall:
  - Foundation slab:
  - Cantilevered Floor:

**Mechanical Summary:**
- Water Heater Energy Factor: _____
- Fuel type: □ Gas □ Electric □ Other
- Number of Heating and Cooling Systems:
- Heating System Type (choose one):
  - □ Gas AFUE □ Air-Source Heat Pump: HSPF
  - □ Other: Efficiency:
- Cooling System Type (Standard DX, Heat Pump, Geothermal, etc.):
- Cooling System Efficiency: □ SEER □ EER □ Other
- Heating/Cooling Load Calculations Performed by: □ Phone:
- Total Heating Load (Based on ACCA Han. J or other approved methodology): ________ Btu/h
- Total Cooling Load (Based on ACCA Han. J or other approved methodology): ________ Btu/h
- Cooling Sensible Load: ________ Btu/h
- Cooling Latent Load: ________ Btu/h
- Total Air Handler CFM (Based on design calculations): ________ CFM
- Duct Tightness Test Conducted by: ________ Phone:
- CFM<sub>50</sub> per 100 ft<sup>2</sup> of conditioned floor area = CFM<sub>50</sub> x 100 / Conditioned floor area served
- If all ducts are not located within conditioned space, builder must verify that either the postconstruction duct leakage to outdoors (PCD) is ≤ 6 cfm/100 ft<sup>2</sup>, the post construction duct leakage (PCT) is ≤ 12 cfm/100 ft<sup>2</sup>, or the rough-in test (RIT) with air handler installed is ≤ 6 cfm/100 ft<sup>2</sup>. State which method was used to conduct the duct tightness test.

<table>
<thead>
<tr>
<th>System</th>
<th>Method (DB, MBDS, AMBD)</th>
<th>Test (PCO, PCT, RIT)</th>
<th>CFM&lt;sub&gt;50&lt;/sub&gt;</th>
<th>Area served (ft&lt;sup&gt;2&lt;/sup&gt;)</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: This permanent certificate shall be posted on or in the electrical distribution panel. Certificate shall be completed by the builder or registered design professional. Where there is more than one value for each component, certificate shall list the value covering the largest area.*
405.4.3. Additional documentation. The code official shall be permitted to require the following when approved by the code official. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include, but are not limited to, variable insulation materials and their R-values; fenestration U-factors and SHGC; area-weighted U-factor and SHGC; system design criteria; mechanical system and equipment types, sizes and descriptions; equipment and systems horsepower (hp) and controls; ducted and non-ducted system location; lighting fixture and control narrative; and air sealing:

1. Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documents are permitted to be submitted

2. Verification of compliance software tools. Documentation verifying that the methods and accuracy of the compliance software tools conform to the provisions of this section shall be provided to the code official.

3. Documentation of the actual values for types and efficiencies of heating, service water heating equipment.
Overall Summary

- Topic 1 Awareness of the 2009 IECC
- Topic 2 Highlights of the residential 2009 IECC
- Topic 3 Tools to enhance compliance

- Questions?
Next Steps

Adoption of the 2009 IECC

• How are current practices different?
• Obstacles to implementing the code?
• Solutions?
• 2012 IECC
Next Steps

2012 IECC is already published (major changes)

• Prescriptive Items:
  – Increased insulation and fenestration requirements
  – Hot water pipe insulation and length requirements

• Mandatory Items:
  – Air infiltration test/verification
  – Mechanical ventilation
  – 75% high-efficacy lighting
  – Duct leakage is more stringent for systems outside of conditioned space
### 2012 IECC Insulation and Fenestration Requirements

#### TABLE 402.1.1

**INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT**

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>FENESTRATION U-FACTOR</th>
<th>SKYLIGHT U-FACTOR</th>
<th>GLAZED FENESTRATION SHGC, e</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>4 except Marine</td>
<td>0.35</td>
<td>0.66</td>
<td>NR</td>
<td>0.40</td>
<td>49</td>
<td>20 or 13+5h</td>
<td>8/13</td>
<td>19</td>
<td>10/13</td>
<td>10/13</td>
</tr>
<tr>
<td>5 and Marine 4</td>
<td>0.35</td>
<td>0.60</td>
<td>NR</td>
<td>0.38</td>
<td>49</td>
<td>20 or 13+5h</td>
<td>13/17</td>
<td>30g</td>
<td>10/13</td>
<td>10/13</td>
</tr>
</tbody>
</table>
Thank You

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