The 2015 IECC for Maine

Performance Systems Development (PSD)

June/July 2021

Logistics

• Audio Settings
• Questions
• Handouts
• Polls
• Recordings

If you can’t hear anything right now...
You may select “Phone call” in the Audio portion of the control panel. Dial the number and enter the access code.
Poll #1

How would you rate your understanding of the residential provisions of the IECC?

a. I am new to the IECC
b. I have passed a certification exam, but that’s about it
c. I have a pretty good working knowledge of the IECC, but could use a refresher
d. I have an excellent working knowledge of the IECC

Introduction
## Agenda

- Summary of code changes
- Prioritizing your attention
- Envelope air sealing
- Air leakage testing
- Insulation installation
- Mechanical ventilation
- Duct sealing and testing
- Service hot water
- Lighting
- Alternative compliance paths

## Learning Objectives

After attending this session, students will be able to...

1. Describe important changes that occurred between the 2009 and 2015 IECC Residential Provisions.
2. Identify key air barrier details necessary to meet code and obtain 5 ACH50.
3. Determine compliance with mechanical systems including duct leakage and whole-house ventilation requirements.
4. Understand when to collect and how to review blower door and duct leakage testing documentation.
Administrative Procedures

The following is a suggested outline for permits impacted by the energy code update to be effective July 1, 2021:

- Permits issued/pending prior to 7/1/21 would be completed under the IECC 2009 ed.
- Permits applications received prior to 7/1/21 would be completed under IECC 2009 ed.
- Projects under construction as of 7/1/21 would be completed under 2009 ed.
- Applications received within 30 days of 7/1/21 should be given some local discretion to chose which edition they wish to use- recognizing that some planning/contracts may have occurred when the designer/owner may not have been aware of the change. This would require some local discretion.

* Permit administration is determined at the local level: this guide provides a timeline as a guide only to aid in a reasonable transition to a code change.

Questions regarding this guidance should be directed to the State Fire Marshal’s Office
https://www.maine.gov/dps/fmo/building-codes

Structure of the 2015 EICC

- IECC – Commercial Provisions
  - Chapter 1 [CE] – Scope and Administration
  - Chapter 2 [CE] – Definitions
  - Chapter 3 [CE] – General Requirements
  - Chapter 4 [CE] – Commercial Energy Efficiency
  - Chapter 5 [CE] – Existing Buildings
  - Chapter 6 [CE] – Referenced Standards
  - Appendices
  - Index

  - Chapter 1 [RE] – Scope and Administration
  - Chapter 2 [RE] – Definitions
  - Chapter 3 [RE] – General Requirements
  - Chapter 4 [RE] – Commercial Energy Efficiency
  - Chapter 5 [RE] – Existing Buildings
  - Chapter 6 [RE] – Referenced Standards
  - Appendices
  - Index

Commercial sections begin with “C”, Residential sections begin with “R”

Existing buildings provisions taken out of Chapter 1 and put into new Chapter 5
Chapter 1 – Administration

Scope and General Requirements (R101)

2. Applies to residential buildings.
3. Regulate design of buildings to promote effective use of energy conservation.
4. Specific requirements govern over general requirements.
5. Residential buildings shall meet requirements of IECC.
**Alternative Materials, Design and Methods of Construction and Equipment (R102)**

Code does not prohibit installation any material or design or construction practice not specifically listed in this code provided such an alternative has been approved by code official.

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**Information on Construction Documents (R103.2)**

1. Insulation materials and their R-values.
2. Fenestration U-factors and solar heat gain coefficients (SHGCs).
3. Area-weighted U-factor and SHGC calculations.
4. Mechanical system design criteria.
5. Mechanical and service water heating system and equipment types, sizes and efficiencies.
6. Equipment and system controls.
7. Duct sealing, duct and pipe insulation and location.
8. Air sealing details.
Information on Construction Documents (R103.2.1)

The building’s thermal envelope shall be represented on the construction drawings.

Required Inspections (R104.2.1 through R104.2.5)

- **Footing/foundation**: Insulation R-value, location, thickness, depth of burial and protection
- **Framing/rough-in**: Insulation type, R-value, correct location, proper installation, fenestration U-factors & SHGCs, air leakage controls
- **Plumbing rough-in**: Pipe insulation and protection, controls, heat traps
- **Mechanical rough-in**: HVAC equipment type and size, controls, pipe insulation, dampers
- **Final**: Verification of all required building systems, equipment controls, proper operation and high efficacy lighting fixtures and lamps.
Fees (R107) and Stop Work Order (R108)

1. These two sections are not being adopted in Maine.
Conditioned Space Definitions (R202)

- An area, room or space enclosed within the building thermal envelope that is:
  - Directly heated or cooled
  - Indirectly heated or cooled

- Indirect heating/cooling includes spaces that:
  - Communicate through openings with other conditioned spaces
  - Are separated from conditioned spaces by uninsulated building assemblies
  - Contain uninsulated ducts, piping or other sources of heating or cooling

Definitions (R202)

- **Air Barrier:** Materials Assembled and joined together to provide a barrier to air leakage through the building envelope. An air barrier may be a single material or a combination of materials.

- **Continuous insulation:** Insulating material that is continuous across all structural members without thermal bridges other than Fastners and service openings. It is installed on the interior or exterior, or is integral to any opaque surface, of the building envelope.

- **Dwelling Unit:** A single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation

- **Residential Building:** For this code, includes detached one – and two-family dwellings and multiple singles-family dwellings (townhouses) as well as Group R-2, R-3, and R-4 buildings three stories or less in height above grade plane.
Chapter 3 – General Requirements

Maine Climate Zone (R301)
Poll #2

Please tell us what is your profession or trade?

a. Code Enforcement
b. Construction/Builder
c. Architect/Designer
d. Equipment specifier
e. Other:___________

Chapter 4 – Residential
Energy Efficiency [RE]
2009 to 2015 IECC – Summary of Changes – Insulation and Fenestration

<table>
<thead>
<tr>
<th>Climate Zone 6</th>
<th>2009 IECC</th>
<th>2015 IECC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows</td>
<td>U-0.35</td>
<td>U-0.32</td>
</tr>
<tr>
<td>Skylights</td>
<td>U-0.60</td>
<td>U-0.55</td>
</tr>
<tr>
<td>Ceilings</td>
<td>R-38</td>
<td>R-49</td>
</tr>
<tr>
<td>Wood-frame walls</td>
<td>R-20 or 13+5</td>
<td>R-20+5 or 13+10</td>
</tr>
<tr>
<td>Mass walls</td>
<td>R-15/19</td>
<td>R-15/20</td>
</tr>
<tr>
<td>Floors</td>
<td>R-30</td>
<td>R-30</td>
</tr>
<tr>
<td>Basement walls</td>
<td>R-15/19</td>
<td>R-15/19</td>
</tr>
<tr>
<td>Crawlspace walls</td>
<td>R-10/13</td>
<td>R-15/19</td>
</tr>
<tr>
<td>Slab-on-grade</td>
<td>R-10, 4 ft</td>
<td>R-10, 4 ft</td>
</tr>
</tbody>
</table>
### Climate Zone 7

<table>
<thead>
<tr>
<th></th>
<th>2009 IECC</th>
<th>2015 IECC</th>
</tr>
</thead>
<tbody>
<tr>
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<td><strong>Slab-on-grade</strong></td>
<td>R-10, 4 ft</td>
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</tr>
</tbody>
</table>

**Air Sealing Requirements in the Code  R(402)**

- **Air Barrier and Insulation Installation Criteria**
- **Blower door test**

2009 IECC  
“Or”

2015 IECC  
“And”
Building Thermal Envelope – Installation

**Section R402.4.1.1:** The components of the building thermal envelope shall be installed in accordance with manufacturer’s instructions and the criteria listed in *Table 402.4.1.1*.

Air barrier criteria

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General Requirements

<table>
<thead>
<tr>
<th>GENERAL REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Breaks or joints in the air barrier shall be sealed.</td>
</tr>
<tr>
<td>☐ Air-permeable insulation shall not be used as a sealing material.</td>
</tr>
<tr>
<td>☐ A continuous air barrier shall be installed in the building envelope.</td>
</tr>
<tr>
<td>☐ The exterior thermal envelope contains a continuous air barrier.</td>
</tr>
</tbody>
</table>
Ceiling/Attic – Soffit Spaces

The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed.

Party Walls
Partition Walls

Courtesy of the Department of Energy’s Building America Solution Center (http://basc.energy.gov)

Roof over Garage and Knee Wall

Need air barrier on attic side of knee wall
Need blocking between bottom cords

View from inside an unconditioned garage
Walls – Framed to Allow Insulation

- The junction of the foundation and sill plate shall be sealed.
- The junction of the top plate and the top of exterior walls shall be sealed.
- Knee walls shall be sealed.
- Walls are framed to allow the corner to be insulated or continuous insulation is/will be installed.

Use low-expanding foam or backer rod and caulk
Rim Joists

- Rim joists shall include the air barrier.

Air barriers are installed at any exposed edge of insulation.

Room over garage
Garage Separation

Shower/Tub on Exterior Wall
Shafts & Penetrations

- Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.

HVAC Register Boots

- HVAC register boots that penetrate building thermal envelope shall be sealed to the subfloor or drywall.
**Recessed Lighting**

- Recessed light fixtures installed in the building thermal envelope shall be sealed to the drywall.

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**Attic Access Hatch**
Poll #3

Which of the following is NOT an air barrier installation requirement of the IECC?

a. Air barriers separate tubs/showers from exterior walls
b. Continuous insulation is installed on all exterior walls
c. Insulation in a soffit is aligned with an air barrier
d. Attic hatches are sealed

Envelope Air Leakage Testing
Air Leakage Testing

(R402.4) Air Leakage

- Typical home: 5-10 ACH50
- Canadian R-2000 Program: 1.5 ACH50
- Passive House Standard: 0.6 ACH50
- Perera & Perkins coin “build tight, ventilate right”
- 2009 IECC: 7 ACH50 (testing optional)
- 2012 IECC: 3 ACH50
- 2015 IECC: 3 ACH50
- 2018 IECC: 3 ACH50

Blower Door Testing and the Code – Preparing the House

R402.4.1.2 Testing.
The building or dwelling unit shall be tested and verified as having an air leakage rate not exceeding five air changes per hour in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8. Testing shall be conducted in accordance with ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, if installed at the time of the test, shall be open.
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.
5. Heating and cooling systems, if installed at the time of the test, shall be turned off.
6. Supply and return registers, if installed at the time of the test, shall be fully open.

https://codes.iccsafe.org/content/IECC2015/chapter-4-re-residential-energy-efficiency
Air Leakage (Blower Door) Testing

- Fan and Rings
- Door and Frame
- Digital Manometer

Calibrated Blower Door Test

- Outgoing air
- Inward leaking air
- Outward leaking air

Efficiency Maine Trust
Air Leakage (Blower Door) Testing

Video demonstration

Air Barrier and Insulation Installation Checklist (Overview)

- Checklist for code official inspectors or third-party energy inspectors

**Note:** R402.4.1.1. Where required by the code official, an *approved third party* shall inspect all components and verify compliance
Poll #4

What are the two pieces of information you need to know to determine if a home passes the blower door test at 3 ACH50?

a. Blower door result in CFM50 and volume of conditioned space
b. Equivalent leakage area and volume of conditioned space
c. Blower door test result in CFM50 and envelope surface area
d. Tracer gas test result and conditioned floor area
Insulation Installation

Section R402.4.1.1: The components of the building thermal envelope shall be installed in accordance with manufacturer's instructions and the criteria listed in Table 402.4.1.1.

Insulation installation criteria
**Insulation Installation Criteria**

Grade I: Almost no gaps

Grade II: Up to 2%

Grade III: 2% - 5%

**Section R402.4.1.1:** The components of the building thermal envelope shall be installed in accordance with manufacturer’s instructions and the criteria listed in Table 402.4.1.1

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**Insulation Installation Criteria – Insulated Corners & Headers**

<table>
<thead>
<tr>
<th>Walls</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance of R-3 per inch minimum.</td>
</tr>
<tr>
<td>• Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.</td>
</tr>
</tbody>
</table>
Insulation Installation Criteria – Insulated Corners & Headers

Insulation Installation Criteria

- Rim joists shall be insulated.

Images courtesy of Building America Solution Centre, bauamericasolutioncentre.org
Insulation Installation Criteria

- Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking, or floor framing cavity insulation shall be permitted to be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extends from the bottom to the top of all perimeter floor framing members.

- Where provided instead of floor insulation, insulation shall be permanently attached to the crawlspace walls.
Insulation Installation Criteria

- **Narrow cavities**: Batts in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.

Insulation Installation Criteria

- **Plumbing and wiring**: Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls, or insulation that on installation readily conforms to available space shall extend behind piping and wiring.
### Air Barrier and Insulation Installation Checklist (Reminder)

- Checklist for code official inspectors or third-party energy inspectors

**Note:** R402.4.1.1. Where required by the code official, an *approved third party* shall inspect all components and verify compliance

### Poll #5

Officials may have a builder hire an approved 3rd party to inspect the components of the Air Barrier and Insulation Installation.

- a. True
- b. False
Whole-House Mechanical Ventilation Per ASHRAE 62.2-2016

R403.6.1 is being replaced with ASHRE 62.2 2016 by MUBEC Future training to be provided for 62.2
Rooms Containing Fuel-Burning Appliance (R402.4.4)

SECTION DELETED IN ITS ENTIRETY

R402.4.4 Rooms Containing Fuel-Burning Appliances

In Climate Zones 3 through 8, where open combustion air ducts provide combustion air to open combustion fuel burning appliances, the appliances and combustion air opening shall be located outside the building thermal envelope or enclosed in a room, isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table R402.1.2, where the walls, floors and ceilings shall meet not less than the basement wall R-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section R403. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of R-8.

Exceptions: Direct vent appliances with both intake and exhaust pipes installed continuous to the outside. Fireplaces and stoves complying with Section R402.4.2 and Section R1006 of the International Residential Code.
Air-tight Air Handler (R403.3.2.1)

Air handlers shall have an air leakage rate no more than 2% of the design flow rate when tested per ASHRAE 193.

- Cabinet air leakage less than 2.0% at 1.0 inch H2O when tested in accordance with ASHRAE standard 193

Duct Insulation – Prescriptive (R403.3.1)

- Attic ducts
  - Based on duct diameter
    - ≥3” R-8
    - <3” R-6
- Other spaces
  - ≥3” R-6
  - <3” R-4.2
- Applies to supply and return
- Exception: Ducts or portions thereof completely inside the thermal envelope
Poll #6

All ducts must be insulated – True or False?

a. True
b. False
## Service Hot Water Pipe Insulation (R403.5)

<table>
<thead>
<tr>
<th>Service Hot Water Pipe Insulation of R-3 required for</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Piping ¾ inch nominal diameter and larger</td>
</tr>
<tr>
<td>2) Piping serving more than one dwelling unit</td>
</tr>
<tr>
<td>3) Piping located outside conditioned space</td>
</tr>
<tr>
<td>4) Piping from water heater to distribution manifold</td>
</tr>
<tr>
<td>5) Piping located under a floor slab</td>
</tr>
<tr>
<td>6) Buried in piping</td>
</tr>
<tr>
<td>7) Supply and Return piping in recirculation systems other than demand recirc.</td>
</tr>
</tbody>
</table>

Note: Pipe insulation is required if *any* of the above conditions apply.
Lighting

Electric Power and Lighting  (R404.1)

75% of lamps in permanent fixtures are high-efficacy

Or

75% of fixtures contain only high-efficacy lamps
Compliance Certificate

Certificate (R401.3)

A permanent certificate shall be completed by the builder or registered design professional and posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building.

Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels.
Simulated Performance Alternative

Simulated Performance Alternative (R405)

- Whole-home energy simulation
- Typical software programs: REM/Rate, REM/Design, and Ekotrope
- 2015 IECC Performance Report required to obtain a CO

Energy Cost ≤

Proposed home ≤ Reference home
Energy Rating Index Compliance Alternative (R406)

- ERI is a generic term patterned after the HERS Index
- The lower the number, the better
- Data from plans or field rating is compared against a ‘reference home’
- A third-party energy professional performs inspections and testing

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>Maximum ERI</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>54</td>
</tr>
<tr>
<td>7</td>
<td>53</td>
</tr>
</tbody>
</table>
Chapter 5 [RE]
Existing Buildings
### Existing Buildings Section (R501)

- **Additions** – Treat like new construction
- **Alterations** – Significant exceptions
- **Repairs** – Exempt
- **Changes of occupancy or use** – Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code.

### Alterations (R503)

**Exceptions**
- Existing ceiling, wall or floor cavities exposed during construction, provided they are filled with insulation.
- Storm windows installed over existing fenestrations
- Construction where the existing roof, wall or floor cavity is not exposed.
- Roof recover
- Roofs without insulation in the cavity and where the sheathing or insulation or insulation exposed during the roofing shall be insulated either above or below the sheathing.
- Surface applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided the code does not require the glazing or fenestration assembly to be replaced.
Alterations (R503) Continued

Exceptions
- Where ducts from an existing heating and cooling system are extended, duct systems with less than 40 linear feet (12.19 m in unconditioned spaces shall not be required to be tested in accordance with Section R403.3.3
- Alterations that replace less than 50% of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.
- Where the simulated performance option in section R405 is used to comply with this section, the annual energy cost otherwise allowed by Section R405.3.

Change of Occupancy (R505)

Exceptions
- Where the simulated performance option in section R405 is used to comply with this section, the annual energy cost otherwise allowed by Section R405.3.
Appendix RA: Combustion Zone Testing

Combustion Safety Testing

• Testing done on combustion appliances drawing combustion air from inside the building or dwelling unit.
• Worst case testing conditions, turn all appliances exhausting to outside and close all interior/exterior doors and windows.
• Test for spillage, draft, and carbon monoxide.
• If spillage exists, appliance draft test fails, or CO is above limits, equipment must be fixed immediately.
• Contact authorized service personnel.
• Do no work that could reduce air infiltration until work is complete.
• Repeat testing after any air sealing or insulation work is completed.

Solar-Ready Provisions – Section RB102

Solar-ready Zone. A section or sections of the roof or building overhang designated and reserved for the future installation of a solar photovoltaic or solar thermal system.

- Applies only to new detached one- and two-family dwellings, and townhouses with ≥600 sqft of roof area oriented between 110° and 270° of true north
- 300 sqft reserved roof space, free from obstructions
- Roof load documentation
- Space in electrical panel
- Exceptions: existing renewables, shading
Summary

• Better insulation R-values and fenestration U-factors
• Blower door test (every home)
• Whole-house mechanical ventilation (every home)
• Duct leakage test or all ducts outside the thermal envelope
• Tighter building shell of 3ACH50
• Greater light efficacy
• Prescriptive, simulated, and rating paths
• Solar provisions
Conclusion

THANK YOU

QUESTIONS?