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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



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Introduction



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Agenda

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



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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.



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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



efficiency MAINE

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

- IECC Residential Provisions
- 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



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Chapter 1 – Administration



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Scope and General Requirements (R101)

- 1. Code shall be known as International Energy Code.
- 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.



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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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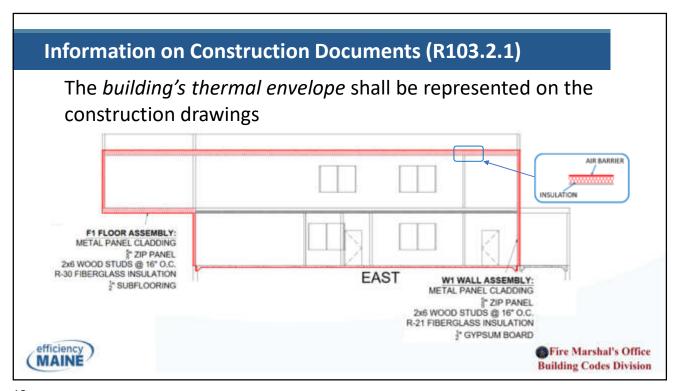
Information on Construction Documents (R103.2)

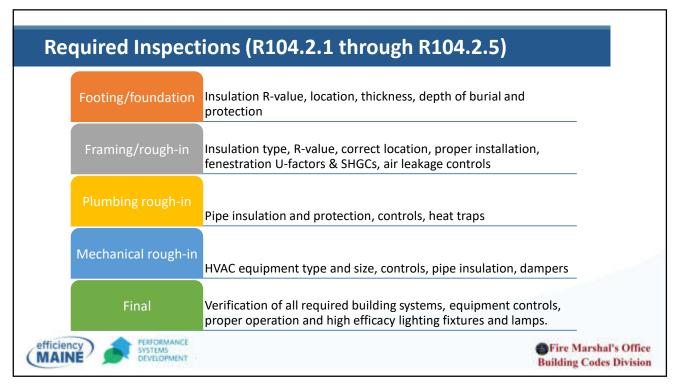
- 1. Insulation materials and their R-values.
- 2. Fenestration U-factors and solar heat gain coefficients (SHGCs).
- 3. Area-weighted U-factor and SHGC calculations.
- 4. Mechanical system design criteria.
- 5. Mechanical and service water heating system and equipment types, sizes and efficiencies.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



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Fees (R107) and Stop Work Order (R108)

1. These two sections are not being adopted in Maine.



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Chapter 2 – Definitions



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Conditioned Space

Definitions (R202)

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

or

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



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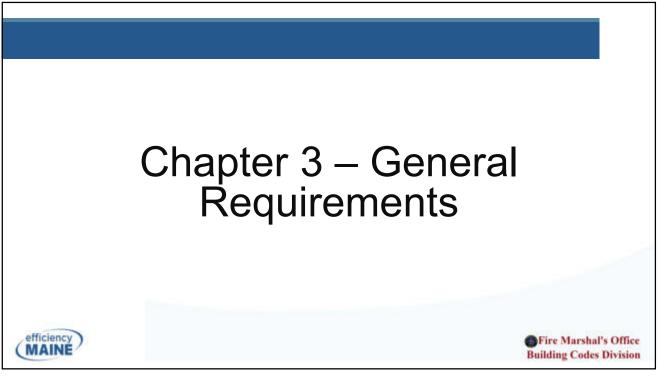
Definitions (R202)

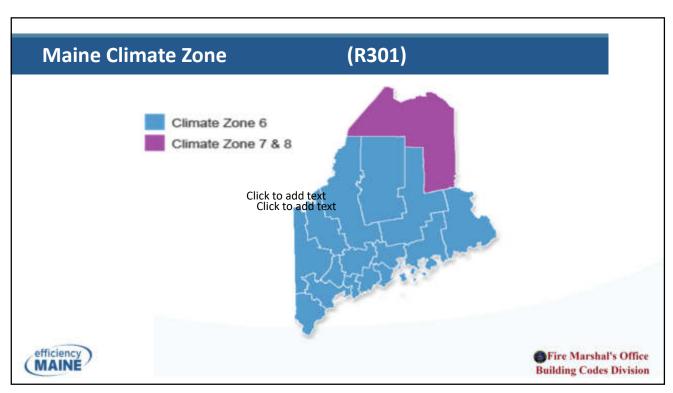
- Air Barrier: Materials Assembled and joined together to provide a barrier to air leakage through the building envelope. An air barrier may be a single material or a combination of materials.
- **Continuous insulation:** Insulating material that is continuous across all structural members without thermal 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 envelop.
- 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.



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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:



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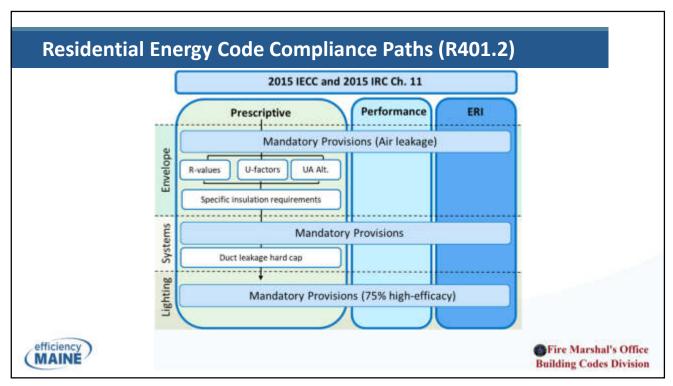
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Chapter 4 – Residential Energy Efficiency [RE]



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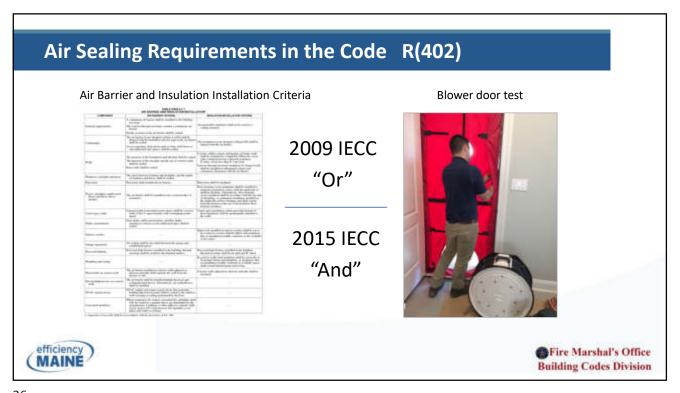
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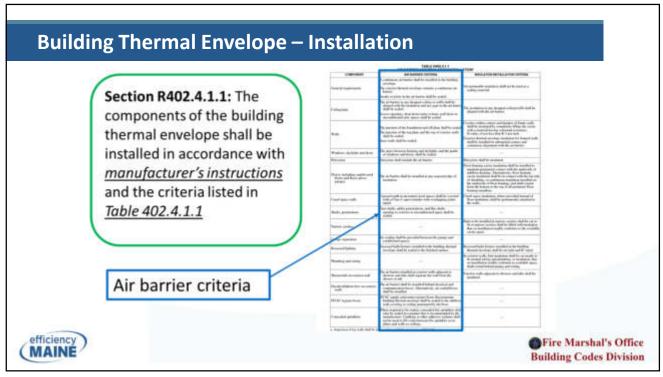
2009	to 2015 IECC – Sum	mary of Changes – In	sulation and Fenestration	n			
	Climate Zone 6						
		2009 IECC	2015 IECC				
	Windows	U-0.35	U-0.32				
	Skylights	U-0.60	U-0.55				
	Ceilings	R-38	R-49				
	Wood-frame walls	R-20 or 13+5	R-20+5 or 13+10				
	Mass walls	R-15/19	R-15/ 20				
	Floors	R-30	R-30				
	Basement walls	R-15/19	R-15/19				
	Crawlspace walls	R-10/13	R-15/19				
efficienc MAINE	Slab-on-grade	R-10, 4 ft	R-10, 4 ft	Marshal's Office			

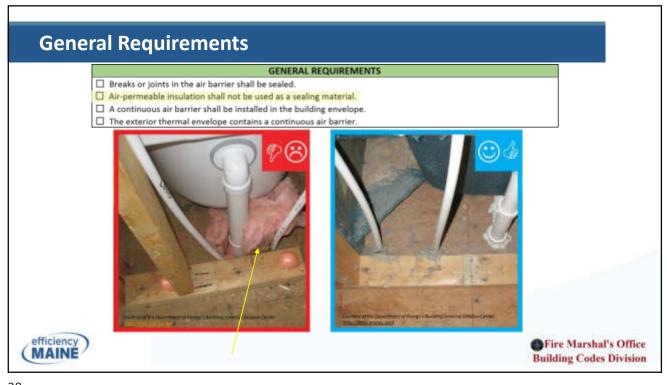
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	Climate Zone	e 7	
	2009 IECC	2015 IECC	
Windows	U-0.35	U-0.32	
Skylights	U-0.60	U-0.55	
Ceilings	R-49	R-49	
Wood-frame walls	R-21	R-20+5 or 13+10	
Mass walls	R-19/21	R-19/21	
Floors	R-38	R-38	
Basement walls	R-15/19	R-15/19	
Crawlspace walls	R-10/13	R-15/19	
Slab-on-grade	R-10, 4 ft	R-10, 4 ft	arshal's Ot

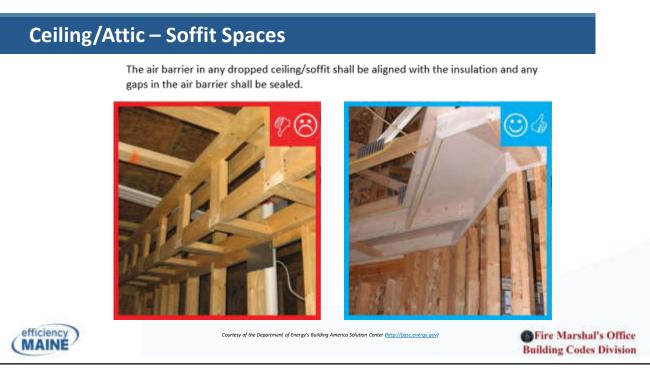


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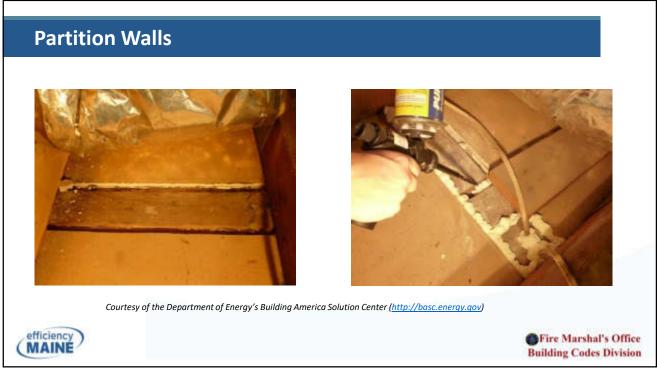


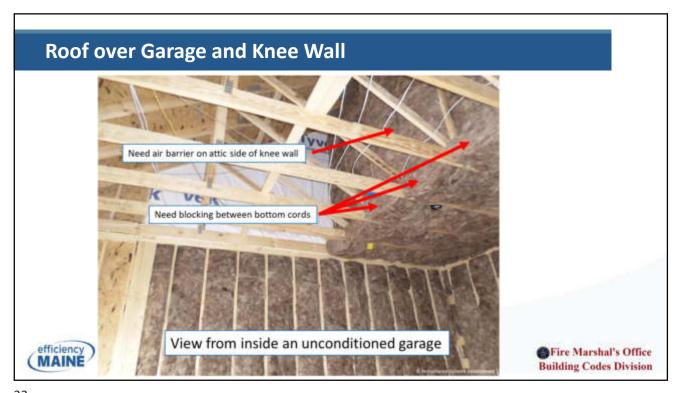
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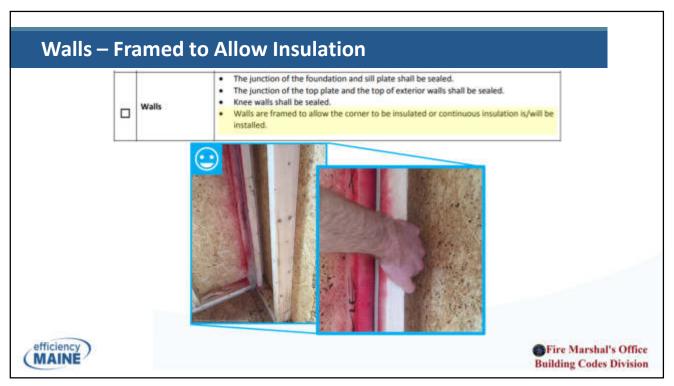


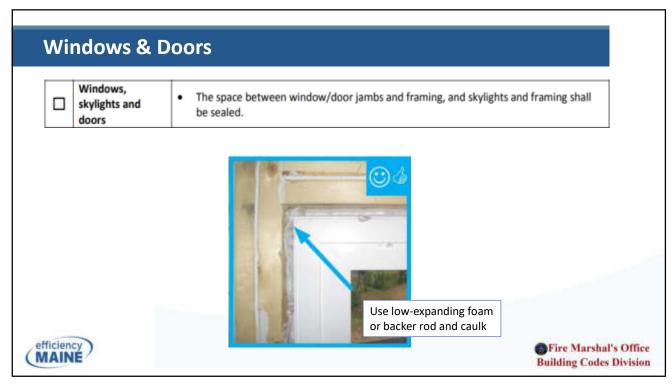
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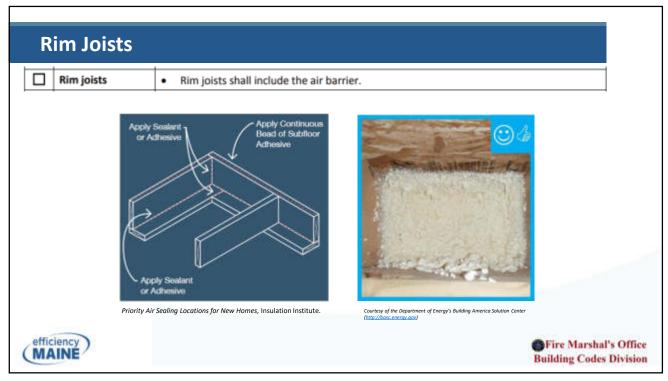


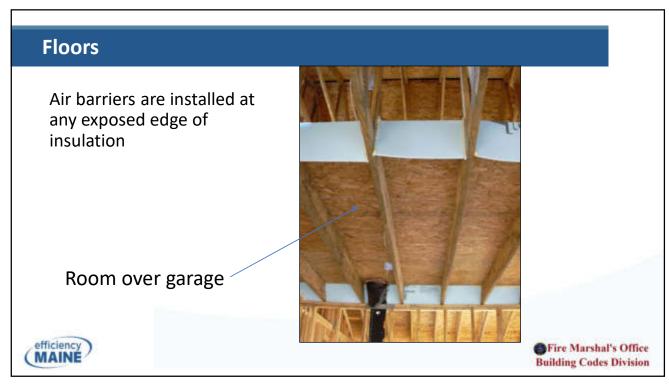
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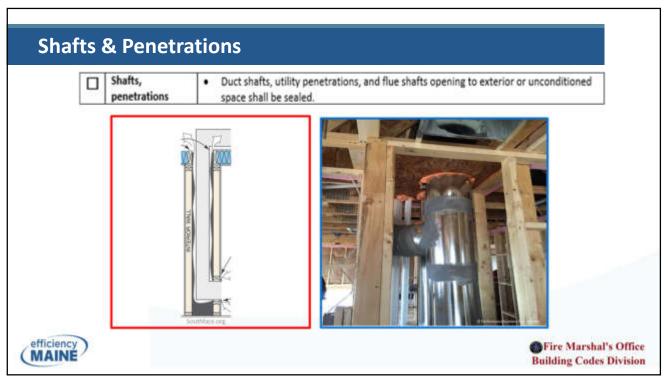


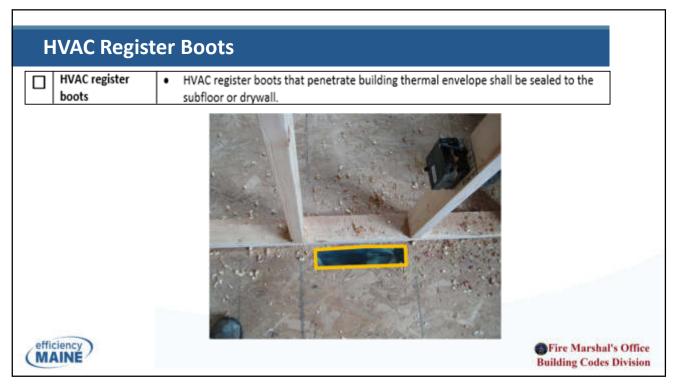
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Poll #3

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



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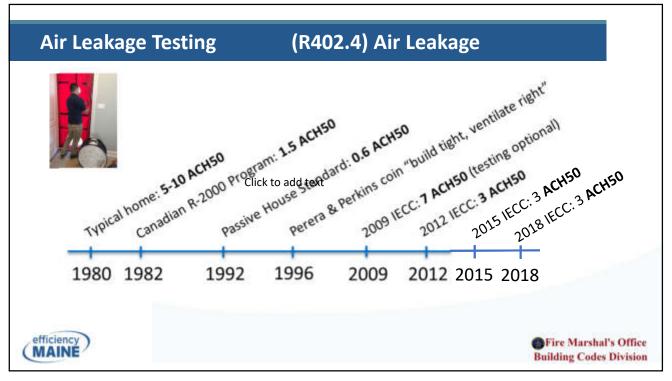
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Envelope Air Leakage Testing



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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:

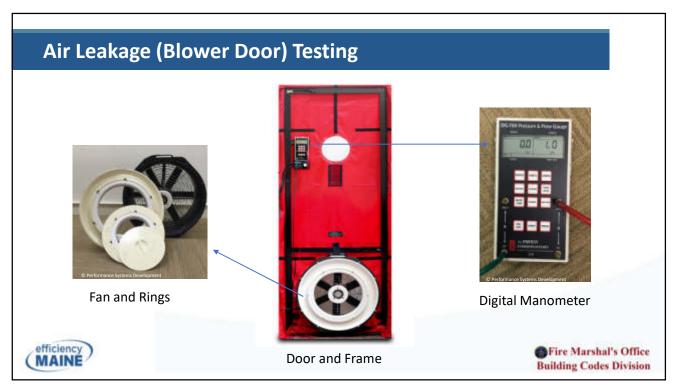
- Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
- Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration 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.
- Supply and return registers, if installed at the time of the test, shall be fully open.

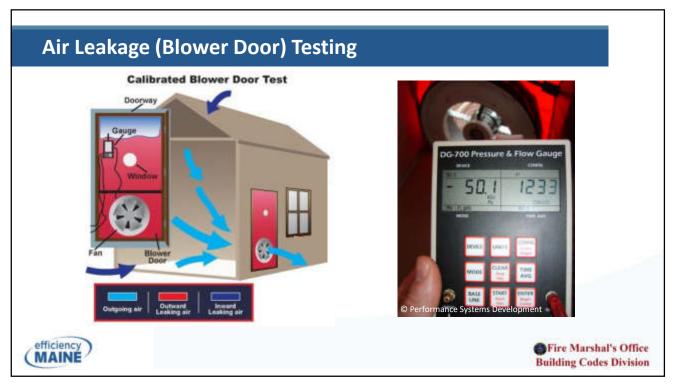
https://codes.iccsafe.org/content/IECC2015/chapter-4-re-residential-energy-efficiency



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Air Leakage (Blower Door) Testing Video demonstration





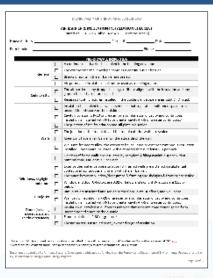
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Air Barrier and Insulation Installation Checklist (Overview)

 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





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RESIDEN	TIAL DUCT & ENVELOPE 1	ESTING (DET) FORM	И	
House Address:		Permit #:	Date:	_
Permit holder:		Phone:		_
Blower door test (Mandatory) Test Result:				
Ten How at 53 -aso	als = UI M50 ACH30 = CFM50 × 60 / Volume =		e= ft*	
esting company:		Phone	:	
ester Name (print):	Signature:		Date:	

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



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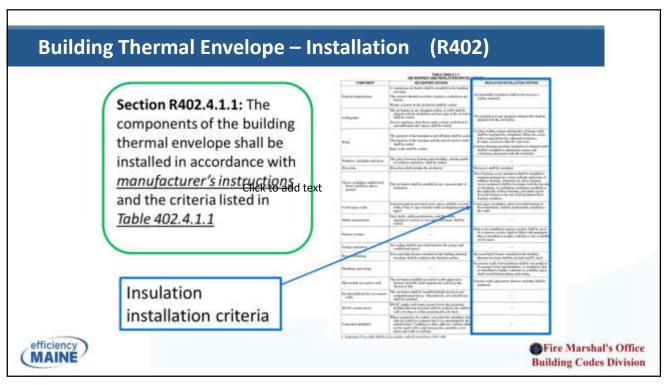
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Insulation Installation

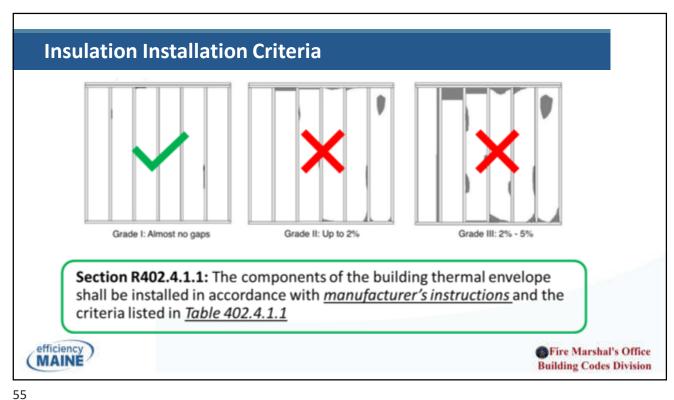


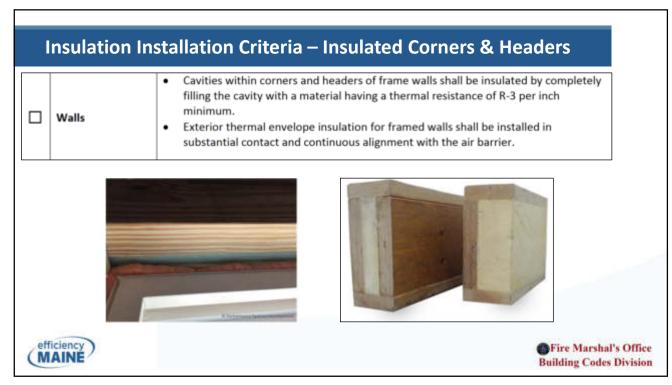
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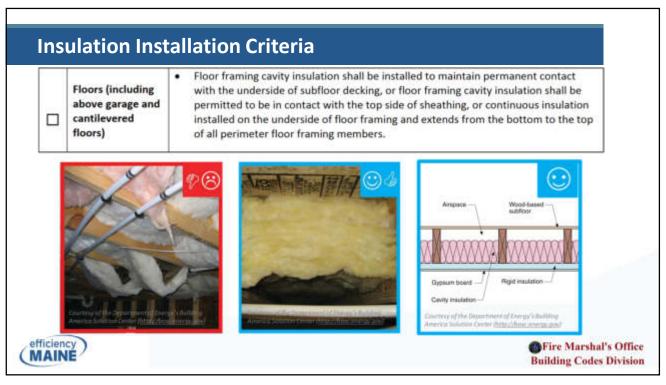






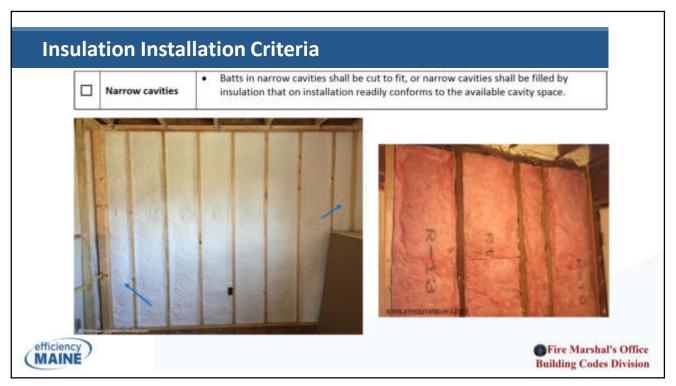
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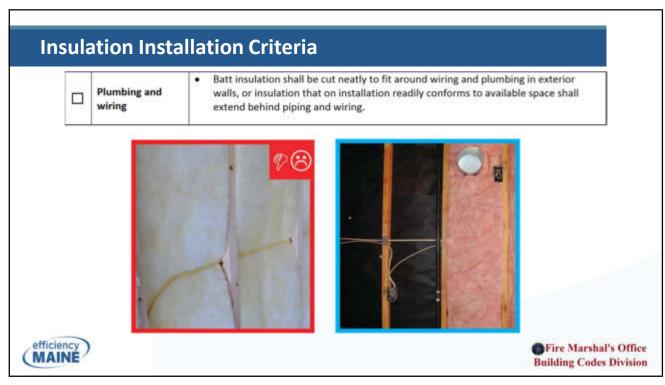
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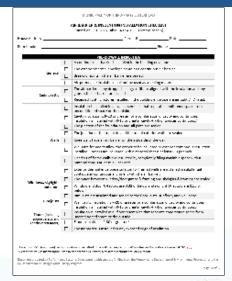


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Air Barrier and Insulation Installation Checklist (Reminder)

 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





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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



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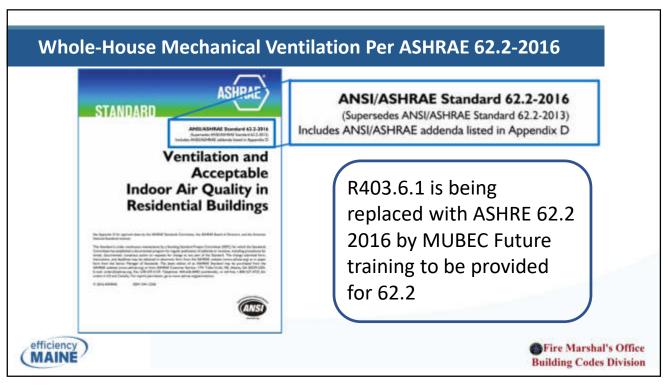
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Whole-House Mechanical Ventilation



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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*.



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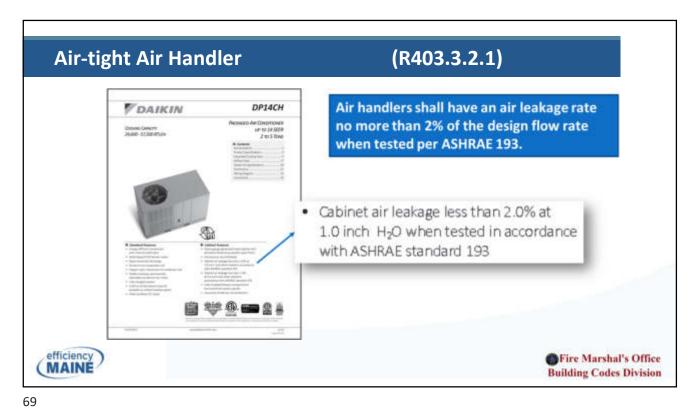
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Duct Leakage



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Duct Insulation – Prescriptive (R403.3.1)

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



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Duct Testing

R403.3.3 Duct Testing (Mandatory)

(Applies to all projects)

- Ducts shall be pressure tested to determine air leakage during rough-in OR post-construction.
- A <u>written report</u> of the results of the test shall be <u>signed</u> by the party conducting the test and <u>provided to</u> the building official.

EXCEPTION:

Air handler and **all** ducts are located entirely within the building thermal envelope

R403.3.4 Duct Leakage (Prescriptive)

(Prescriptive path only, including REScheck)

- · Total duct leakage shall not exceed:
 - Rough-in test
 - With air handler: 4 cfm per 100 ft2
 - Without air handler: 3 cfm per 100 ft2
- · Post-construction test
 - o 4 cfm per 100 ft2 conditioned floor area

Prescriptive leakage limits do not apply when using:

- · Simulated Performance Alternative
- Energy Rating Index Alternative



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Poll #6

All ducts must be insulated – True or False?

- a. True
- b. False



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Service Hot Water



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Service Hot Water Pipe Insulation (R403.5) IECC 2015 Hot Water Pipe Insulation of R-3 required for 1) Piping % inch nominal diameter and larger 2) Piping serving more than one dwelling unit 3) Piping located outside conditioned space 4) Piping from water heater to distribution manifold 5) Piping located under a floor slab 6) Buried in piping 7) Supply and Return piping in recirculation systems other than demand recirc. Note: Pipe insulation is required if any of the above conditions apply

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Lighting



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Electric Power and Lighting (R404.1)

75% of lamps in permanent fixtures are high-efficacy
Or

75% of fixtures contain only high-efficacy lamps





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Compliance Certificate



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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.



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Simulated Performance Alternative



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Simulated Performance Alternative (R405) Energy Cost ≤ Proposed home Reference home • Whole-home energy simulation • Typical software programs: REM/Rate, REM/Design, and Ekotrope • 2015 IECC Performance Report required to obtain a CO Fire Marshal's Office Building Codes Division

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Energy Rating Index Compliance Alternative



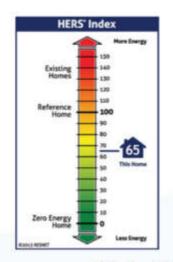
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Energy Rating Index Compliance Alternative (R406)

- 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

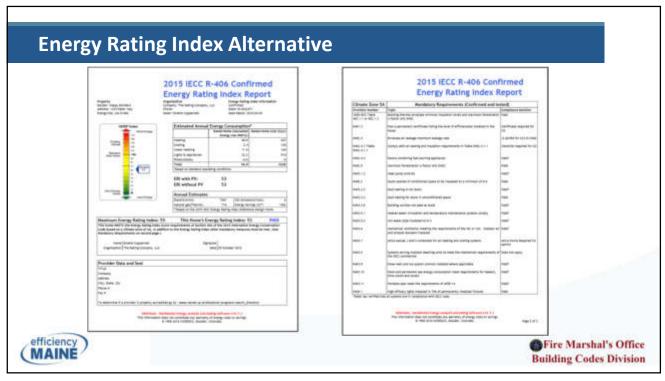
Climate Zone	Maximum ERI
6	54
7	53



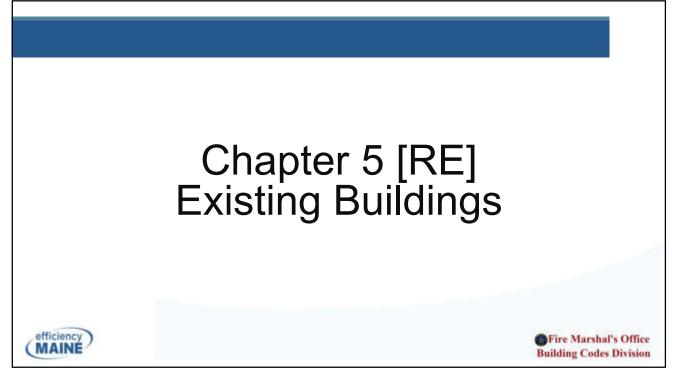
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Existing Buildings Section (R501)

- 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.



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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.



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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.



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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.



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Appendix RA: Combustion Zone Testing



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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 wok is completed.



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Appendix RB: Solar-Ready Provisions



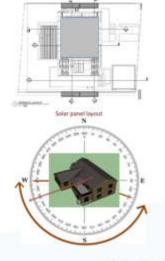
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Solar-Ready Provisions – Section RB102

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 twofamily 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



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Summary



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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



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