Introduction

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Housekeeping

1. All audio will remain muted.
2. This webinar is informational. There will not be a question-and-answer period.
3. Copies of this presentation will be emailed to attendees.
4. At the conclusion of this webinar, there will be a brief survey.

Today's Speakers

Matt Siska, PE, CEM

Principal at GDS Associates

Joe Rando, HERS, PHIUS

Project Consultant at GDS Associates

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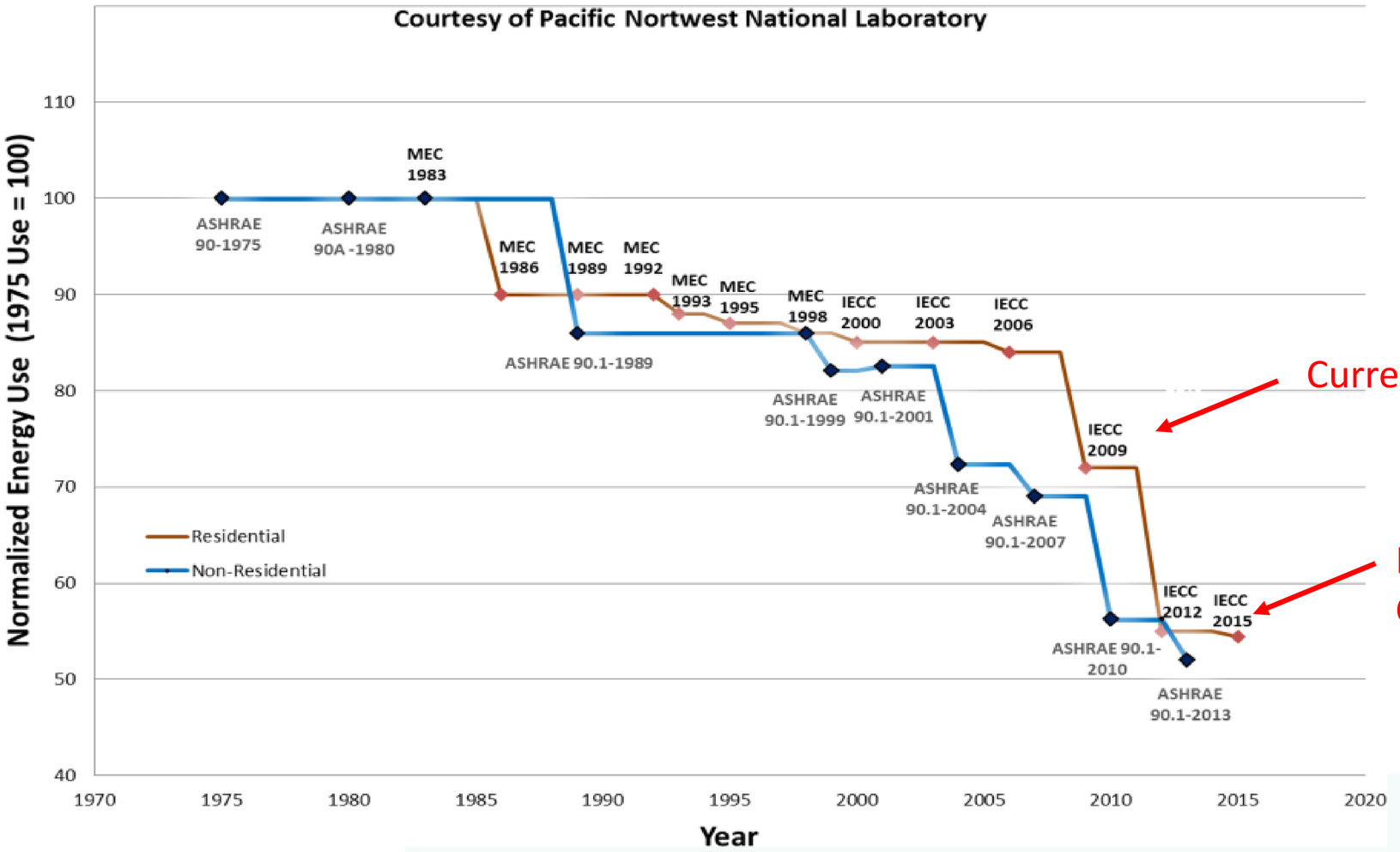
IECC 2015 Introduction - Session Outline

- What's new and what does it mean for Maine?
- General Updates and Information on IECC 2015
  - Scoping; commercial vs. residential provisions, existing buildings
  - Compliance pathways; prescriptive vs. performance
- Key Changes in the 2015 IECC relative to 2009 IECC
  - Commercial
  - Residential
- Preview Upcoming Trainings through Efficiency Maine

Improvement in Residential and Non-Residential Model Energy Codes (1975-2015)



Escalating Fuel Costs

Fuel	Units	1980	2018	% Change
Electricity	$/kWh	$0.055	$0.134	144%
Oil	$/MMBtu	$6.830	$21.050	208%

Source: Eia.gov

Current Maine Energy Code

New Maine Energy Code

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International Energy Conservation Code (IECC) Structure

2009 IECC

Chapter 1: Administration

Chapter 2: Definitions

Chapter 3: Climate Zones

Chapter 4: Residential EE

Chapter 5: Commercial EE

2015 IECC (Commercial)

Chapter 1: ***Scope*** and Administration

Chapter 2: Definitions

Chapter 3: General Requirements

Chapter 4: Commercial EE

Chapter 5: Existing Buildings

Chapter 6: Referenced Standards

2015 IECC (Residential)

Chapter 1: ***Scope*** and Administration

Chapter 2: Definitions

Chapter 3: General Requirements

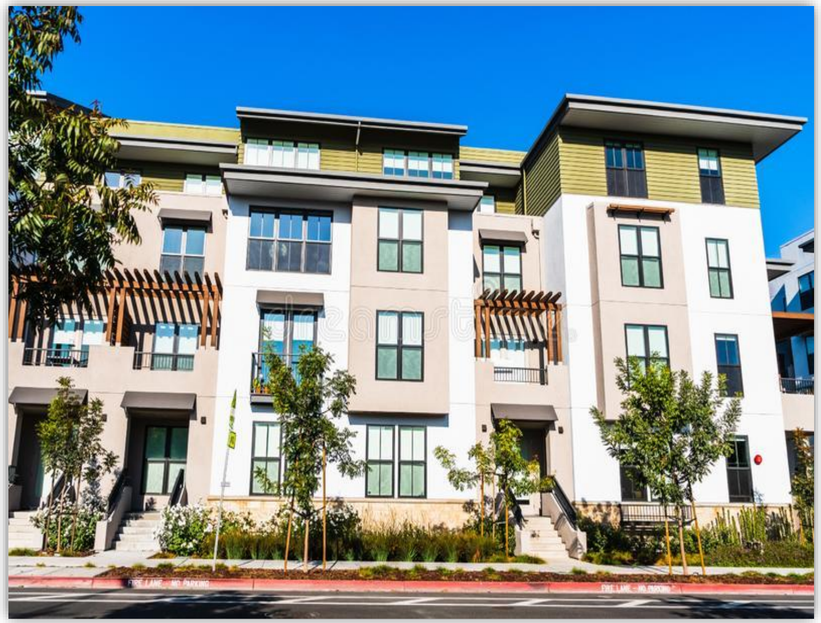
Chapter 4: Residential EE

Chapter 5: Existing Buildings

Chapter 6: Referenced Standards

Residential vs. Commercial Provisions

- ***Residential Building*** **defined (2015 IECC):** For this code, includes detached one-and-two family dwellings and multiple single-family dwellings (townhouses) as well as Group R-2, R-3, and R-4 buildings <u>three stories or less in height above grade plane</u>
  - R-1 (Hotel, Motel) must comply with commercial provisions
  - All residential buildings > 3 stories must comply with commercial provisions

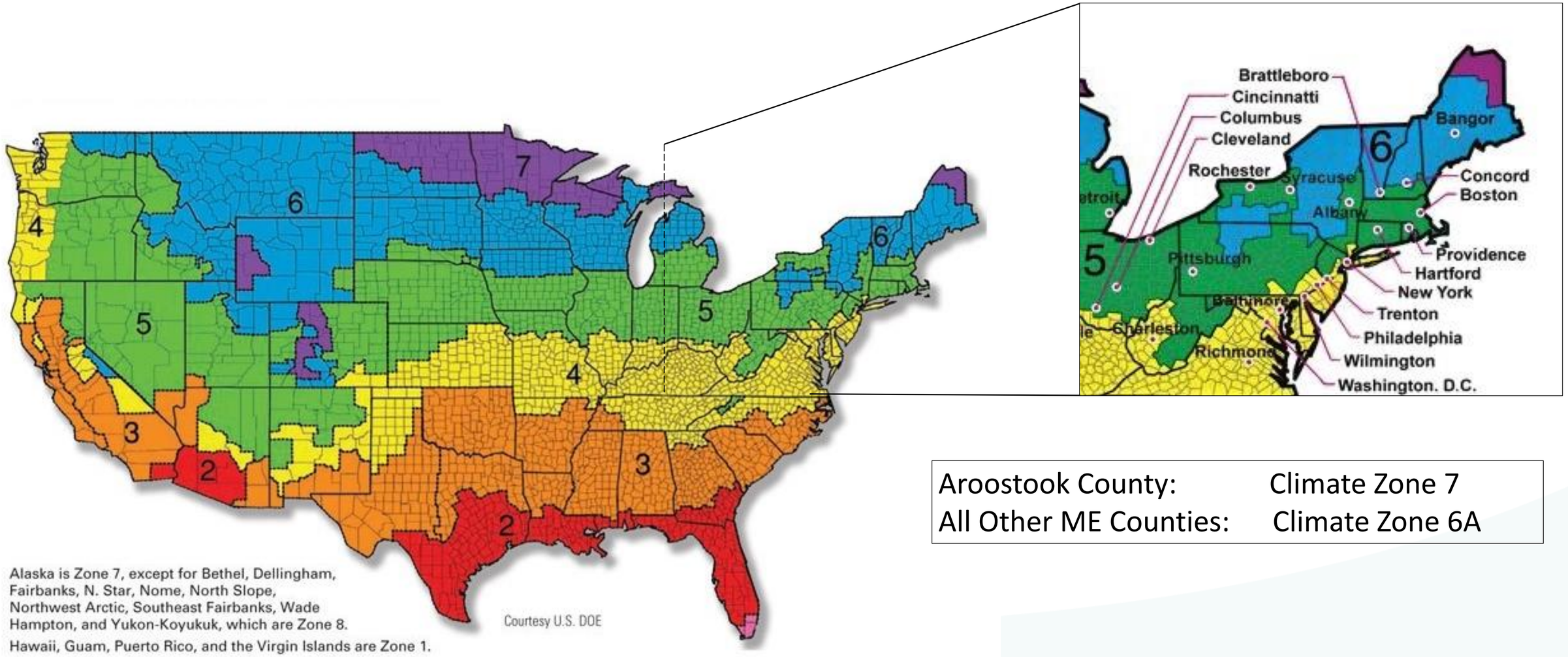


R-2, R-3 and R-4 buildings three stories or less comply with IECC residential provisions

Existing Buildings (2015)

- Additions, alterations, renovations or repairs must comply with provisions for new code. Unaltered portions are exempt
- New and replacement materials must comply except as otherwise required (i.e. repairs)
- Any non-conditioned space that is altered to become *conditioned space* must comply
- More scoping provisions in the International Existing Building Code (IEBC)

IECC Climate Zones



Aroostook County:	Climate Zone 7
All Other ME Counties:	Climate Zone 6A

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Commercial Building Requirements

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What's New in the 2015 IECC Commercial Provisions?

- More stringent requirements for building envelope components (C402)
- Increased focus on continuous air barrier detailing and construction (C402.5)
- *New* Building Entrances shall be protected with an enclosed vestibule. Exceptions
  - Non-public doors
  - Doors opening from a sleeping/dwelling unit
  - Doors opening from spaces < 3,000 ft^2
  - Entrances with a qualifying air curtain
  - Revolving doors (does not relieve requirement for adjacent swinging doors)
  - Doors used primarily to facilitate vehicular movement or material handling, and adjacent personnel doors

What's New in the 2015 IECC Commercial Provisions?

- Re-organization of mechanical system requirements (C403)
  - Increased focus on controls:

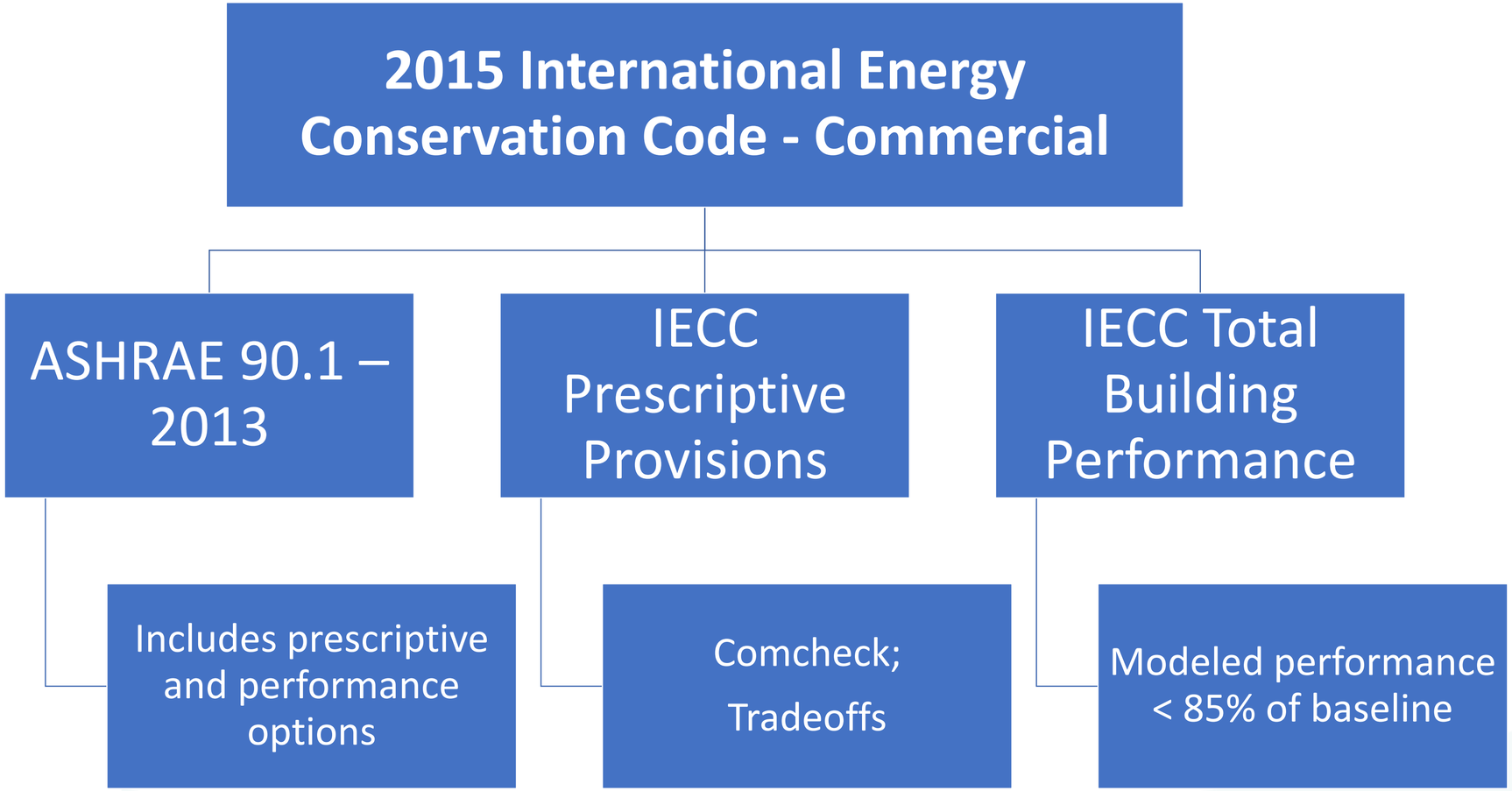
Economizers	Part load hydronic controls
OA Reset Control	VAV Reheat Control
Staged Cooling	OA Ventilation Optimization
Boiler Turndown	and more…

  - New provisions related to kitchen hood systems (C403.2.8)
  - Increased stringency of duct (C403.2.9) and pipe (C403.2.10) insulation
  - New provisions related to refrigeration systems (C403.2.15-17)

What's New in the 2015 IECC Commercial Continued…

- Substantial change in requirements for energy recovery systems based on supply rate (CFM), OA percentage, and hours of operation (C403.2.7)
- New requirements for hot water system heat traps and pools/spas (C404)
- Reduced lighting power density allowances for both interior (C405.4) and exterior (C405.5) lighting
  - Enhanced requirements for lighting controls and daylighting
- New requirement for additional package options (C406)
- New mandatory requirement for System Commissioning (C407)

Commercial Compliance Pathways



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Additional Efficiency Package Options (C406)

C406.1: *Buildings shall comply with at least one of the following:*

1) More efficient HVAC Performance by 10%
2) Reduce Lighting Power Density (LPD) by 10%
3) Include enhanced digital lighting controls
4) Include an on-site renewable energy source
5) Use of a DOAS with complex HVAC systems
6) Reduce energy use in service water heating

System Commissioning (C407)

- Requires a preliminary commissioning report, drawings and manuals, a system balancing report, a final commissioning report, and a verification of HVAC, Lighting and Electrical Systems
- Small systems (<480 MBH heating and <600 MBH cooling) and systems serving dwelling units are exempt
- Commissioning must be completed by a *registered design professional* or other *approved agency*

Residential Building Requirements

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Residential Updates

Overview of Key Changes

- Updated prescriptive requirements
- Continuous insulation
- Mandatory blower door testing (3.0 ACH50)
- Mandatory Duct Leakage testing
- Required Mechanical Ventilation

Residential Compliance Options (Paths)

Prescriptive Paths

- R402.1: Listed efficiencies
- R402.1.4-5: Total UA Alternative (“trade-off”)

Performance Path

- R405 Simulated performance alternative
- R406 Energy Rating Index

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Mandatory Requirements

R401.3 Certificate
R402.4 Air Leakage
- **R402.4.1 Thermal Envelope**
- **R402.4.1.2 Air Infiltration Testing (Blower Door Testing)**
- **R402.4.2 Fireplaces**

R402.5 Maximum fenestration U-factors for performance path
R403 Systems
- **R403.1.1 Programmable Thermostats**
- **R403.1.2 Heat pump supplementary heat**
- **R403.3.2 Duct Sealing**
- **R403.3.3 Duct Testing**
- **R403.3.5 Building cavities**

R403.4 Pipe Insulation-Mechanical
R403.5 Pipe Insulation-Service hot water (DHW)
R403.6 Mechanical Ventilation
R403.7 Equipment Sizing and Efficiency
R403.8 Multiple-Dwellings
R403.9 Snow melt and ice system controls
R403.10 Pools and Permanent Spas
R404.1 Lighting

Prescriptive Summary – IECC 2015 – Table 402.1.2

	Fenestration			Insulation				Foundation		
	Windows and Doors	Skylights	Glazing	Ceiling	Wood Framed Wall	Mass Wall	Floor	Basement Wall	Slab	Crawl Space Wall
	U-Factor	U-Factor	SHGC	R-Value	R-Value	R-Value	R-Value	R-Value	R-Value and Depth	R-Value
Zone 6	≤ 0.32	≤ 0.55	NR	49	20+5 Or 13+10	15/20	30	15/19	10 , 4ft	15/19
Zone 7	≤ 0.32	≤ 0.55	NR	49	20+5 Or 13+10	19/21	38	15/19	10 , 4ft	15/19

Changed since 2009

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Wood Framed Walls (R-Value)

Climate Zone	2015 IECC
CZ 6	**R20 + R5ci or R13 + R10ci**
CZ 7	

Reduce Thermal Bridging

Continuous Insulation

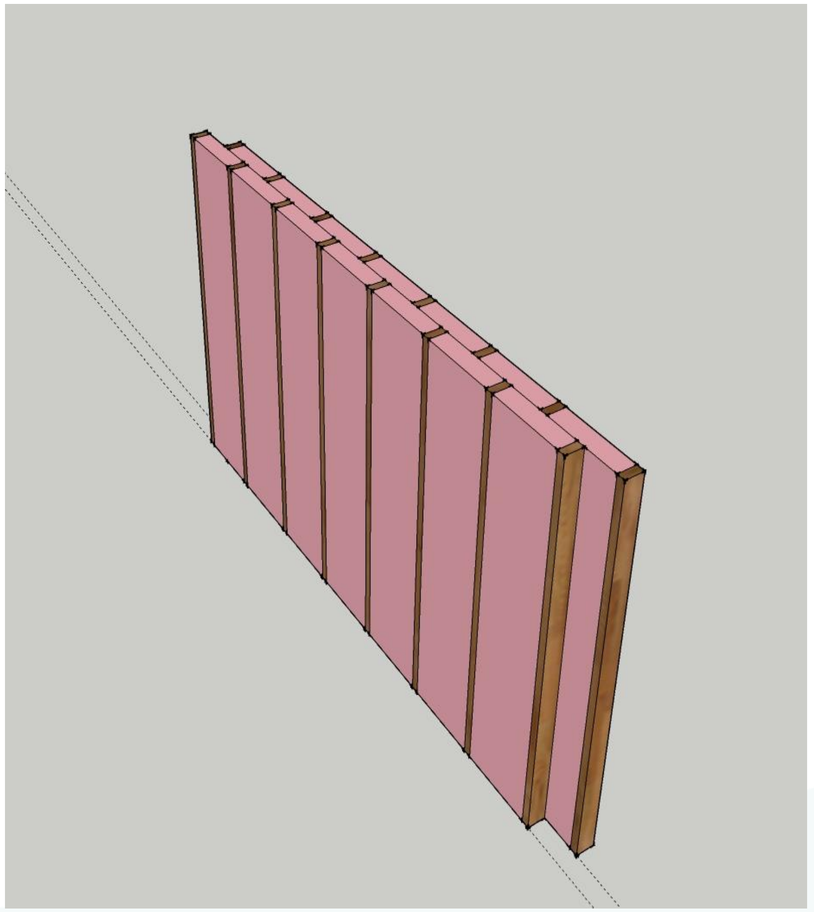
Reduce Thermal Bridging

Structural Insulated Panels (SIPS)

Reduce Thermal Bridging

Insulated Concrete Forms (ICF)

Reduce Thermal Bridging



Double Stud Wall

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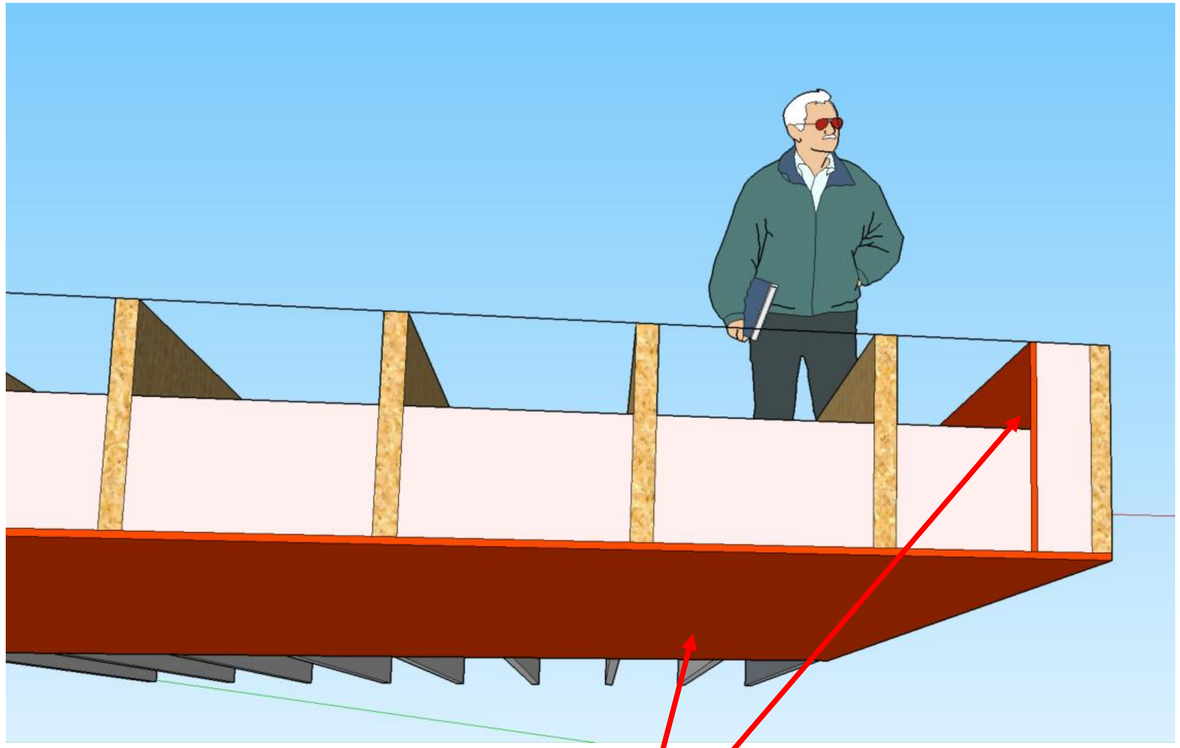
Floor Exception (2015 IECC)



Continuous Air-Barrier

Exception:

- Floor insulation permitted to be on topside of continuous air barrier installed on the bottom side of floor framing
- Perimeter band joists must be insulated to Above Grade Wall requirements

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Air Infiltration Testing: Blower Door Test

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Air Infiltration Testing: Blower Door Test (Mandatory)

Test Method	IECC 2015
Blower Door	**3 ACH_{50}**

Test Method	IECC 2009
Blower Door	**7 ACH_{50}**

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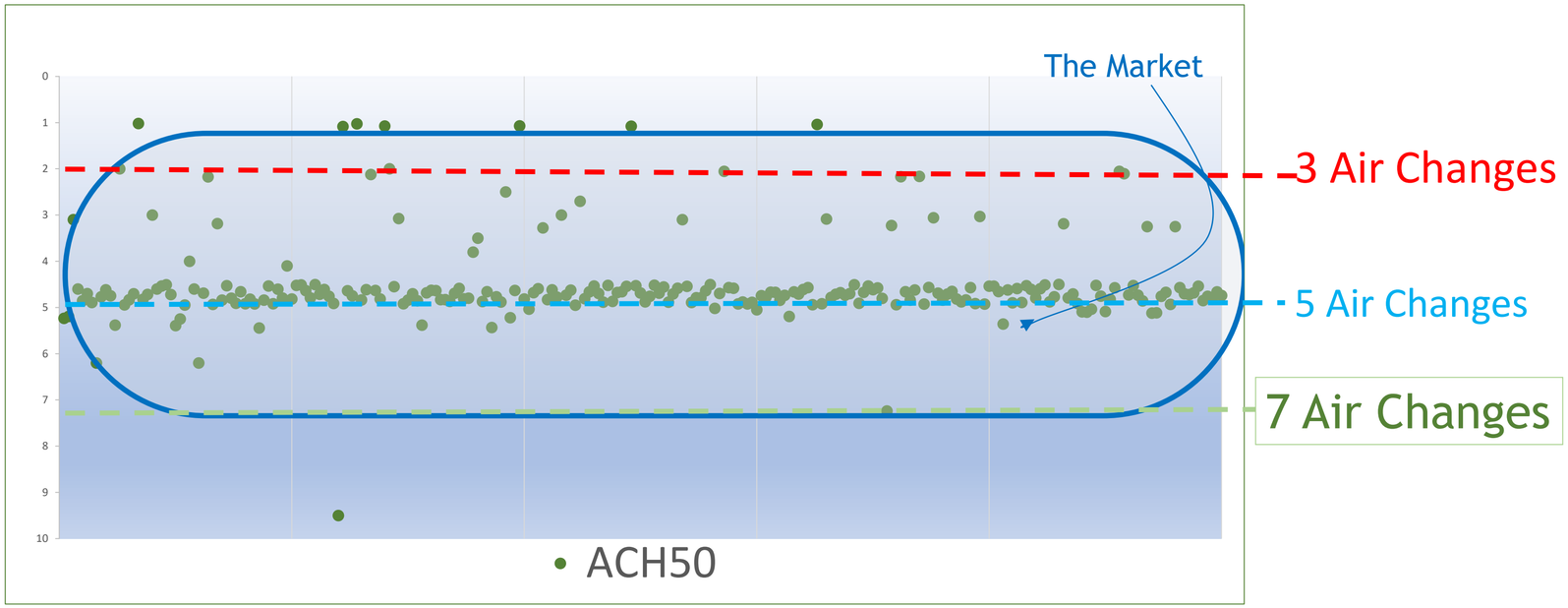
What Does it Mean?



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Air Infiltration Testing

Measured in Cubic Feet per Minute
at a pressure differential of 50 Pascals (CFM_{50})

Converted to Air Changes per Hour
at a pressure differential of 50 Pascal (ACH_{50})

$$ACH_{50} = \frac{CFM_{50}\ X\ 60}{Volume}$$

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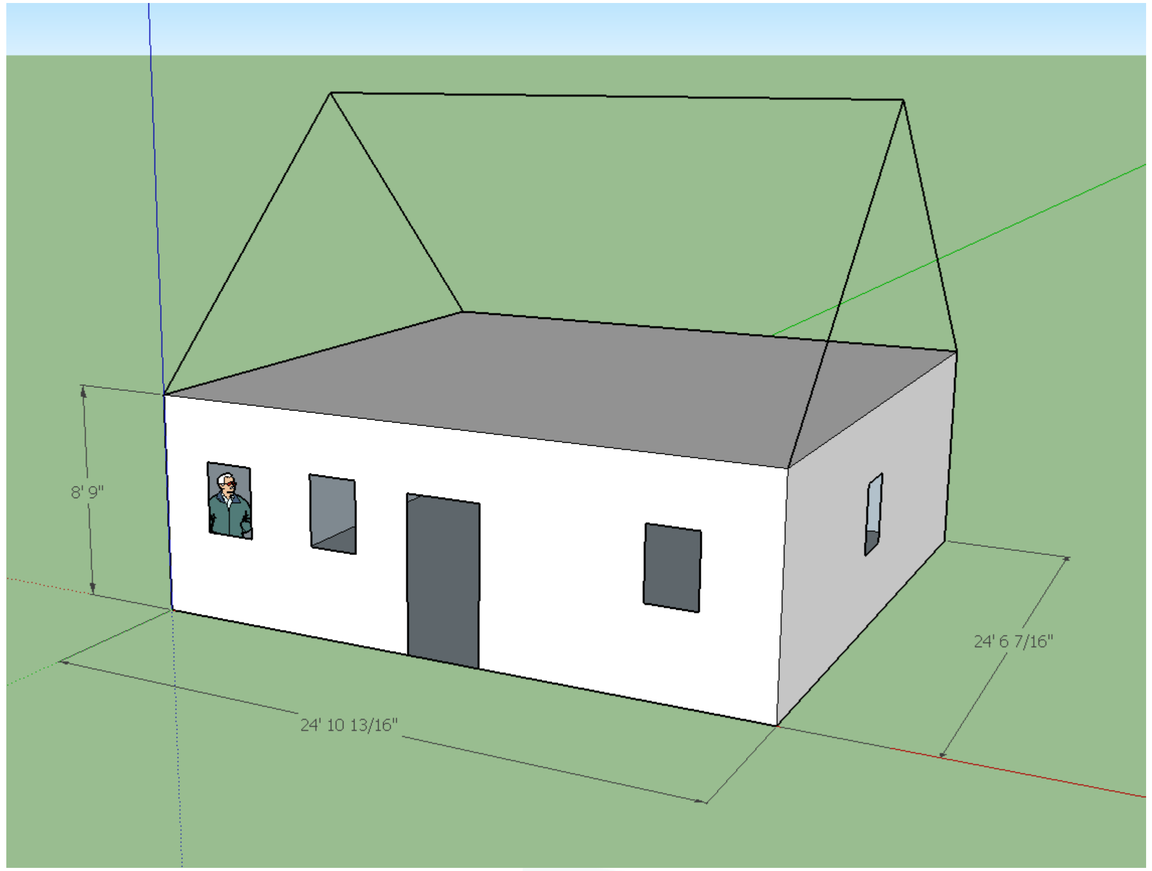
Air Infiltration Testing – Volume Calculation



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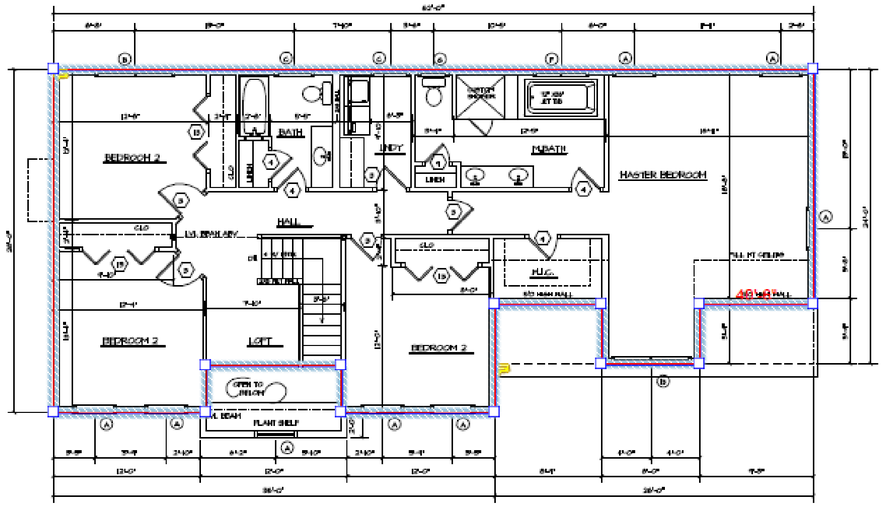
Air Infiltration Testing



Area: 1,500 SqFt

Volume: 12,000 cubic ft

$$ACH_{50} = \frac{1{,}200\ X\ 60}{12{,}000} = 6\ ACH_{50}$$

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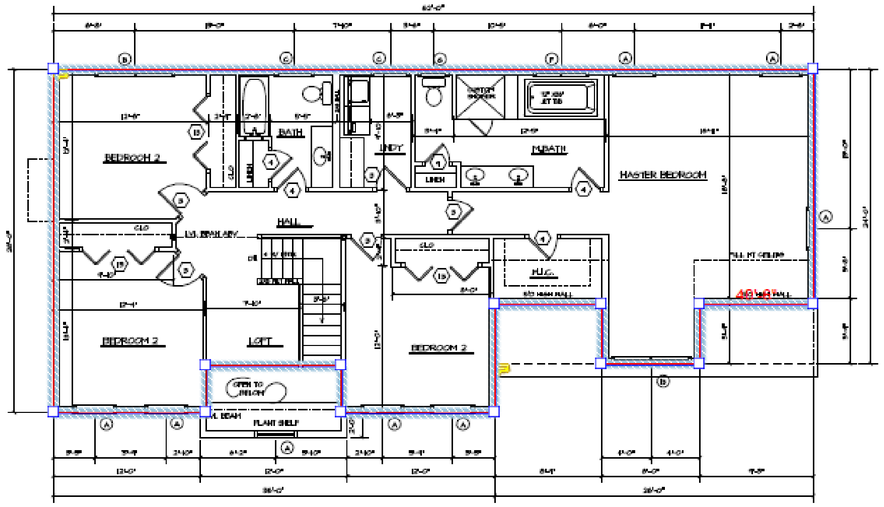
Air Infiltration Testing



Area: 3,000 SqFt

Volume: 24,000 cubic ft

$$ACH_{50} = \frac{1{,}200\ X\ 60}{24{,}000} = 3\ ACH_{50}$$

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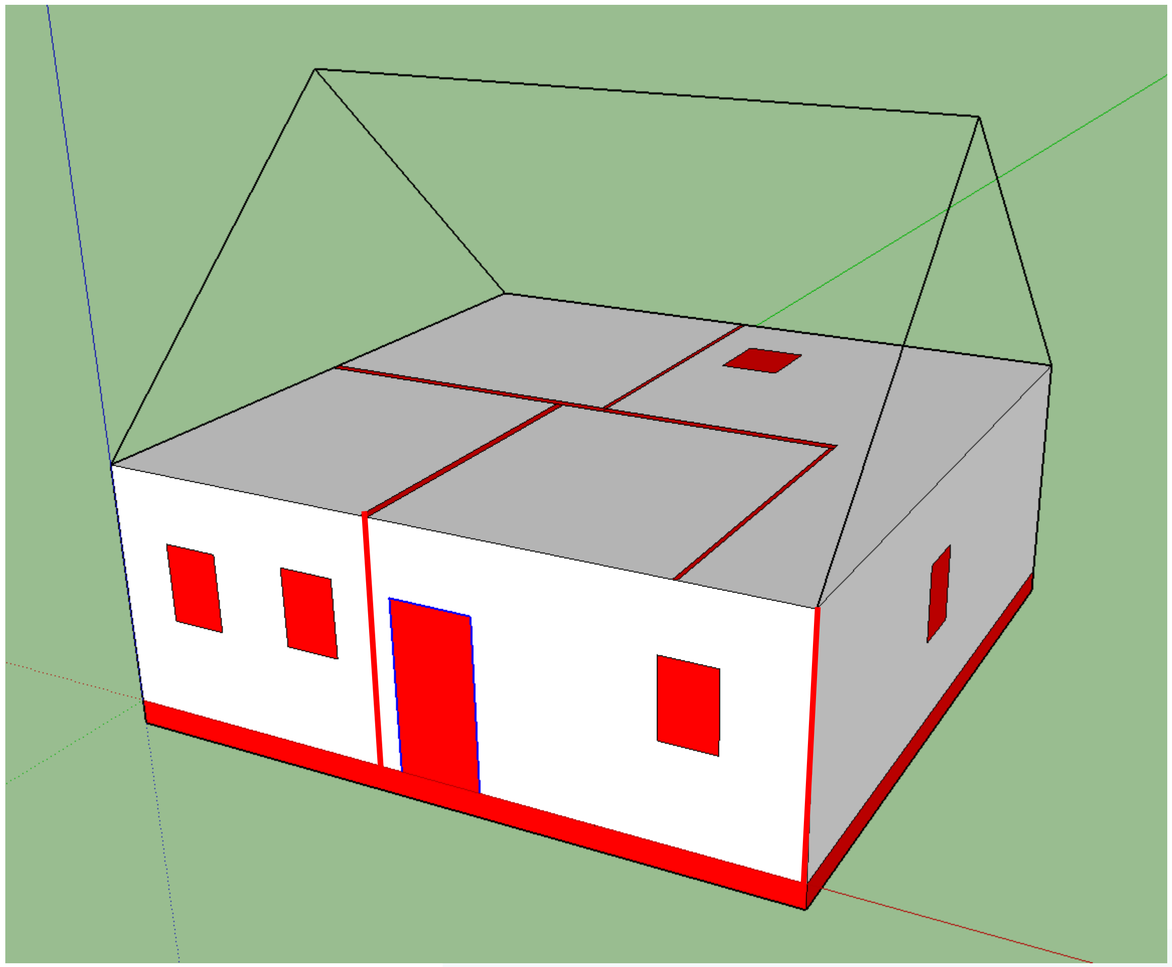
Where is the Air Leaking?



- Any Penetration in the Thermal Envelope
  - Plumbing
  - Electrical
  - HVAC
- Rim/Band Joists
- Around Windows/Doors
- Wall-Ceiling Intersections
- Door to Basement Stairwell

Duct Leakage Testing – Heating and Cooling Ducts

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Duct Leakage Testing

Leakage Limits measured in CFM per 100 ft^2 of conditioned floor area (% of floor area)

Applicability	Rough-In Duct Leakage Limit		Post Construction Duct Leakage Limit
2015 IRC	3% (w/o air handler)	4% (with air-handler)	4%

<u>Exemption from Testing</u>: If all ductwork is entirely within the building's thermal envelope

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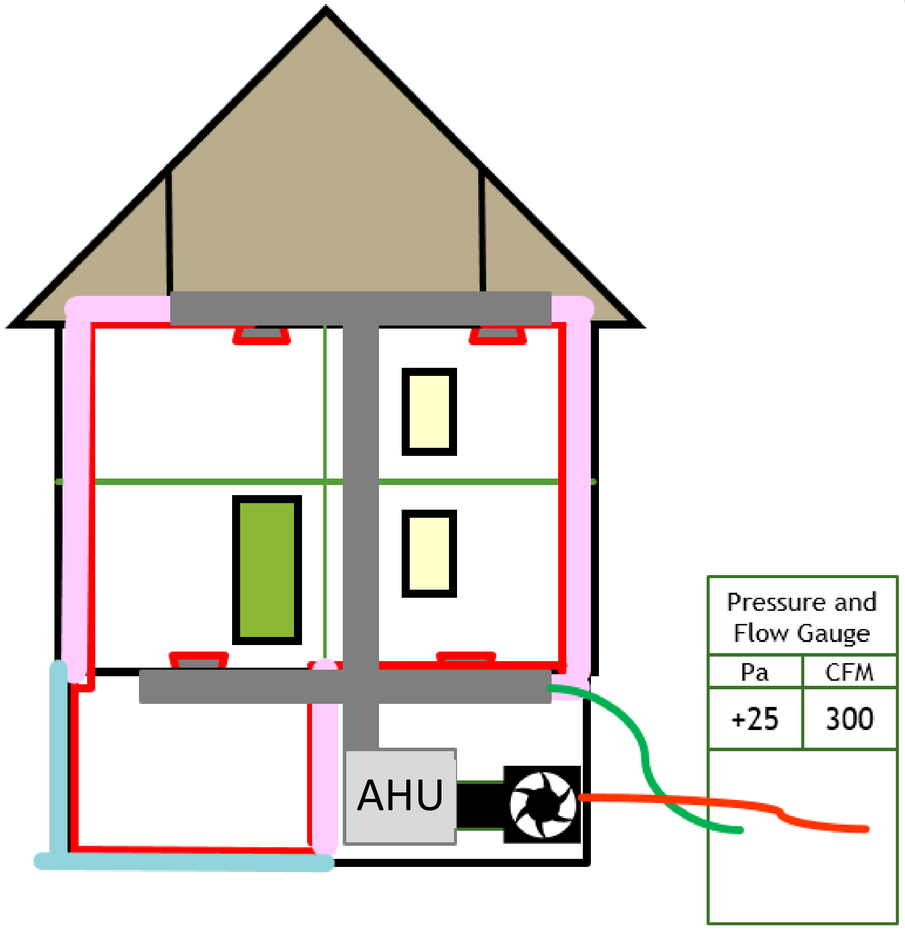
Duct Leakage Testing

Total Duct Leakage (Rough-In or Post Construction)

- Entire Duct System Pressurized @ +25 Pa

- Fan flow measures TOTAL LEAKAGE in CFM@25Pa



2000 ft^2 home

4 CFM / 100 ft^2 = **80** CFM_{25}

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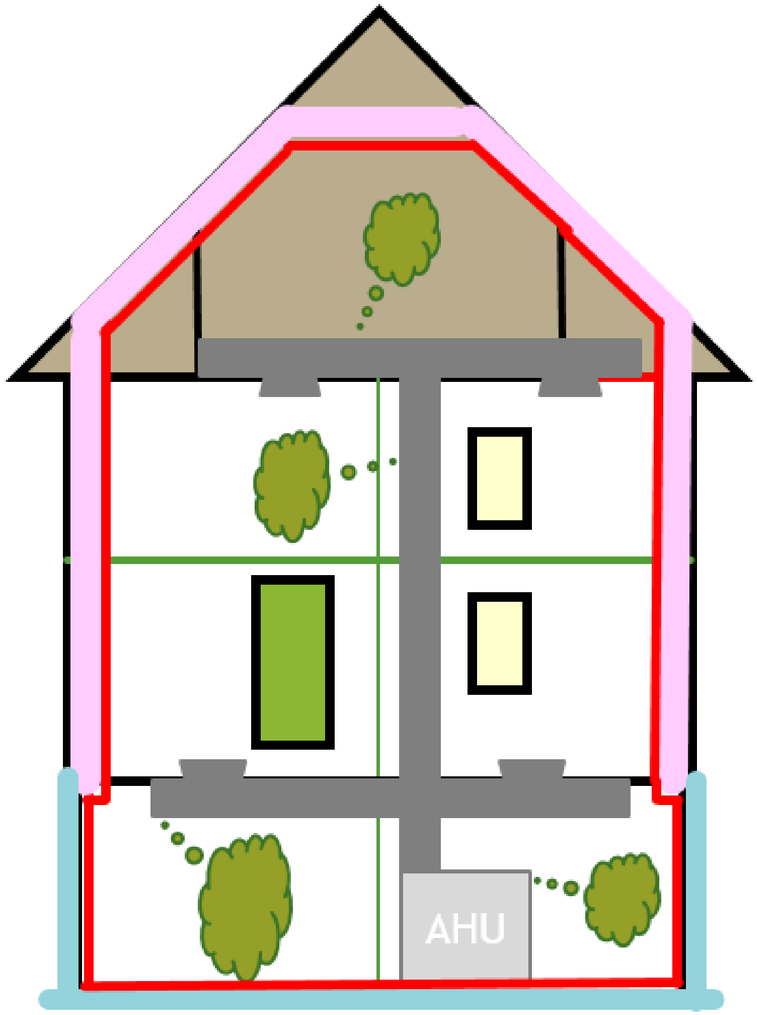
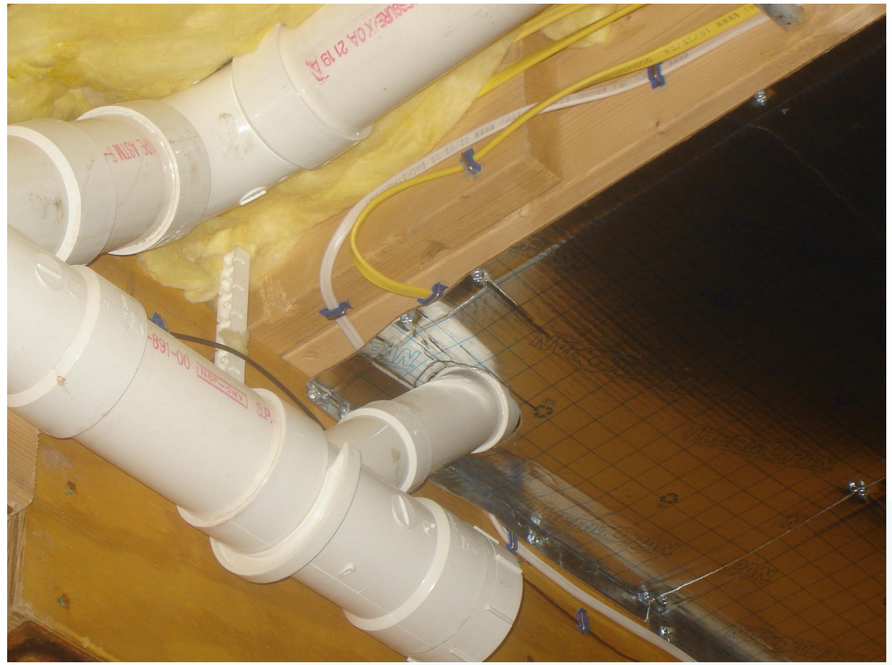
Duct Leakage Testing

Exemption: ALL Ducts and AHU's are within the thermal envelope



Ducts (IECC 403.3.5)

- Building cavities shall NOT be used as ducts or plenums
- NEITHER SUPPLIES OR RETURNS



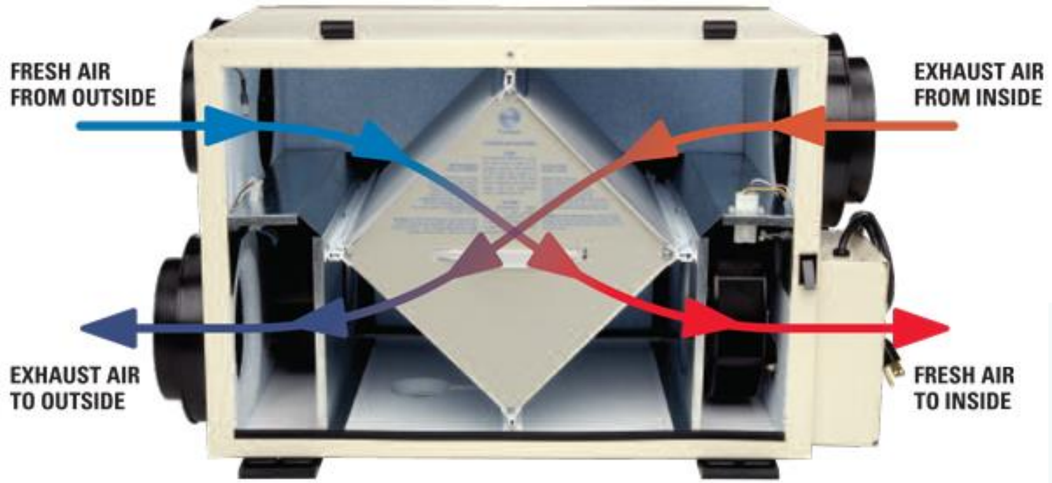
Third Party Testing

- ***AHJ***, may require third-party testing
- ***AHJ***, may ***approve*** the third-party

AHJ = Authority Having Jurisdiction = Code Enforcement Officer

R403.6 Whole House Mechanical Ventilation (IECC 2015)

- Mandatory Whole House Mechanical Ventilation
  - Can be Supply Air Only
  - Can be Exhaust Only
  - Can Be a Balanced System (ERV/HRV)



SOURCE: deltabreez.com

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2015 IECC
Whole-House Mechanical Ventilation System Airflow Rate Requirements

Dwelling Unit Floor Area (Square Feet)	Number of Bedrooms				
	0- 1	2-3	4-5	6-7	>7
	Airflow in CFM				
< 1,500	30	45	60	75	90
1,501 – 3,000	45	60	75	90	105
3,001 – 4,500	60	75	90	105	120
4,501 – 6,000	75	90	105	120	135
6,001 – 7,500	90	105	120	135	150
> 7,500	105	120	135	150	165

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Section R404: Lighting Systems

- Minimum % of lamps in permanently installed lighting fixtures must be high-efficacy lamps; or

Minimum % High Efficacy Lighting	**2015 IECC**
	75%

Prescriptive Path: Total UA Alternative

Generated by REScheck-Web Software

Compliance Certificate

Project Sample

Energy Code:	2015 IECC
Location:	Concord, New Hampshire
Construction Type:	Single-family
Project Type:	New Construction
Orientation:	Bldg. faces 0 deg. from North
Conditioned Floor Area:	2,000 ft2
Glazing Area	8%
Climate Zone:	6 (7554 HDD)
Permit Date:	
Permit Number:	

Construction Site: Owner/Agent: Designer/Contractor:

Compliance: Passes using performance alternative

Compliance: **1.2% Better Than Code**

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	U-Factor	UA
Wall: Wood Frame, 16in. o.c. Orientation: Front	506	21.0	5.0	0.043	19
Window: Vinyl Frame, 2 Pane w/ Low-E SHGC: 0.30 Orientation: Front	54			0.290	16
Door: Solid Orientation: Front	19			0.200	4
Wall: Wood Frame, 16in. o.c. Orientation: Right side	506	21.0	5.0	0.043	21
Window: Vinyl Frame, 2 Pane w/ Low-E SHGC: 0.30 Orientation: Right side	25			0.290	7
Wall: Wood Frame, 16in. o.c. Orientation: Left side	506	21.0	0.0	0.057	26
Window: Vinyl Frame, 2 Pane w/ Low-E SHGC: 0.30 Orientation: Left side	39			0.290	11
Door: Solid Orientation: Left side	19			0.200	4
Wall: Wood Frame, 16in. o.c. Orientation: Back	506	21.0	5.0	0.043	19
Window: Vinyl Frame, 2 Pane w/ Low-E SHGC: 0.30 Orientation: Back	54			0.290	16
Floor: All-Wood Joist/Truss Over Uncond. Space	1,000	30.0	0.0	0.033	33

Project Title: Sample
Data filename:

Report date: 02/21/17
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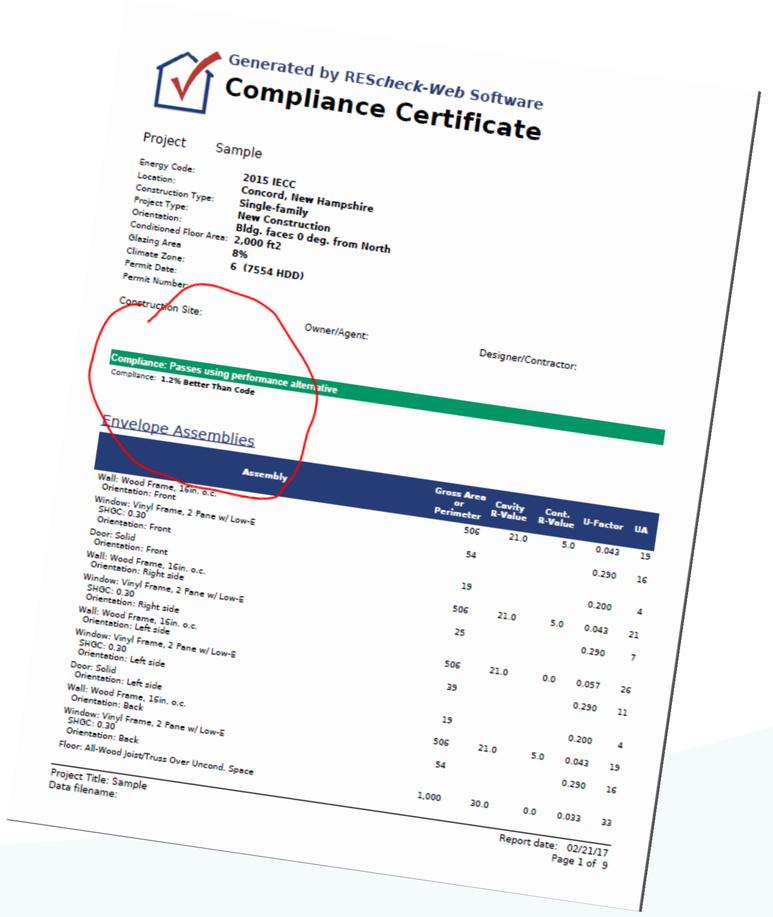
Performance Path: Simulated Performance Alternative (Section 405)

- Simulated energy performance
- Energy cost for Proposed < Energy Cost of Reference Home
- RES/Check Report
- Compliance Report at Permit
- Compliance Report at C of O



Generated by REScheck-Web Software

Compliance Certificate

Project Sample

Energy Code: 2015 IECC
Location: Concord, New Hampshire
Construction Type: Single-family
Project Type: New Construction
Orientation: Bldg. faces 0 deg. from North
Conditioned Floor Area: 2,000 ft2
Glazing Area 8%
Climate Zone: 6 (7554 HDD)
Permit Date:
Permit Number:

Construction Site:

Owner/Agent:

Designer/Contractor:

Compliance: Passes using performance alternative

Compliance: **1.2% Better Than Code**

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	U-Factor	UA
Wall: Wood Frame, 16in. o.c. Orientation: Front	506	21.0	5.0	0.043	15
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Window: Vinyl Frame, 2 Pane w/ Low-E SHGC: 0.30 Orientation: Left side	39			0.290	11
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Wall: Wood Frame, 16in. o.c. Orientation: Back	506	21.0	5.0	0.043	19
Window: Vinyl Frame, 2 Pane w/ Low-E SHGC: 0.30 Orientation: Back	54			0.290	16
Floor: All-Wood Joist/Truss Over Uncond. Space	1,000	30.0	0.0	0.033	33

Project Title: Sample
Data filename:

Report date: 02/21/17
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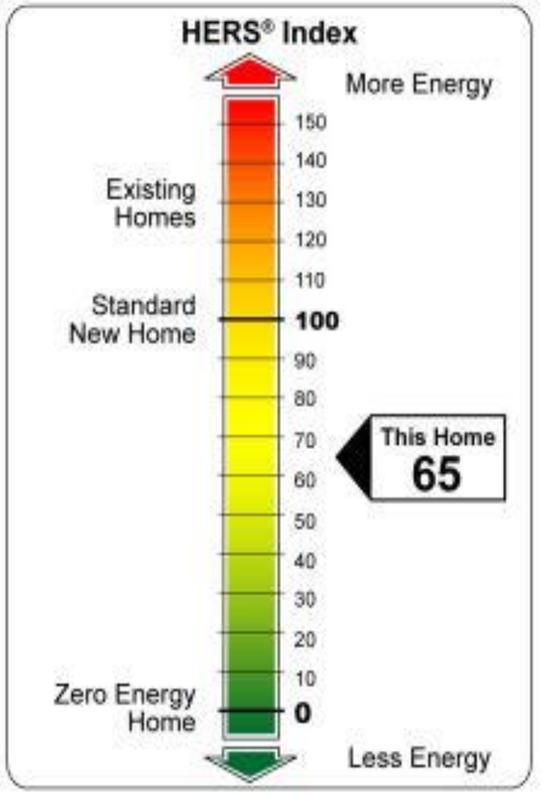
Performance Path: Energy Rating Index Alternative (Section R406)

- Establishes an energy rating compliance alternative
- Voluntary Performance Compliance Path
- Uses ERI or “Energy Rating Index”
  - Reference Home=2006 IECC
- Similar to HERS Rating

Home Energy Rating (HERS)

- 100 = Reference Home (IECC 2006)
- 55 = a home that uses only 55% of the energy of a standard home
- Rating performed by independent 3rd-party



2015 IECC

Energy Rating Index Targets

Climate Zone	Energy Rating Index
1	52
2	52
3	51
4	54
5	55
6*	**54**
7*	**53**
8	53

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What's Next?

https://www.efficiencymaine.com/iecc-training/

For additional MUBEC training, please go to:
https://www.maine.gov/dps/fmo/building-codes/calendar

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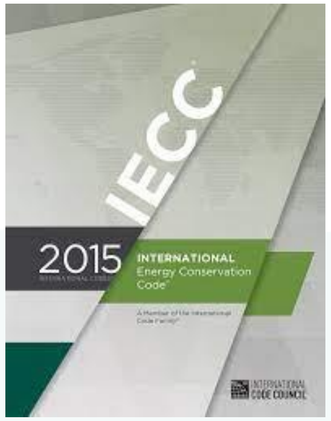
Additional IECC 2015 Training

In the coming months

- Deep dives into ***residential*** code section covering:
  - Building Thermal Envelope
  - Systems (Mechanical)
  - Electrical Power & Lighting Systems
  - Simulated Performance Alternative
  - Energy Rating Index Compliance



- Deep dives into ***commercial*** code section covering:
  - Building Envelope Requirements
  - Building Mechanical Systems
  - Service Water Heating
  - Electrical Power & Lighting Systems
  - Additional Efficiency Package Options
  - Total Building Performance
  - System Commissioning

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Additional Building Code Training and Best Practices

Code Training Topics	Commercial	Residential
Definition additions and changes		
Administration & Enforcement		
Prescriptive Pathway		
Performance Pathway		
Existing Building Provisions		
Energy Rating Index compliance alternative		
System Commissioning		
ASHRAE 90.1 2013significant changes from 2007		
ASHRAE 62.1 2016 significant changes from 2007		
ASHRAE 62.2 2016 significant changes from 2007		
ComCheck		
ResCheck		

Best Practices	Commercial	Residential
Thermal Envelope		
Blower Door/Duct Testing		
Mechanical Ventilation		
Ventilation Test & Balancing		
Service Hot Water		
Combustion Appliance Zone Testing		
Permitting Overview (State of Maine Requirements)		
Inspections (Code Compliance)		

COMcheck•Web™

REScheck•Web™

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For additional information and resources please visit:
https://www.efficiencymaine.com/iecc-training/

Thank you for attending!

For additional MUBEC training or Code Official information, please go to:
https://www.maine.gov/dps/fmo/building-codes

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