Introduction
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
• What’s new and what does it mean for Maine?
• General Updates and Information on IECC 2015
  o Scoping; commercial vs. residential provisions, existing buildings
  o Compliance pathways; prescriptive vs. performance
• Key Changes in the 2015 IECC relative to 2009 IECC
  o Commercial
  o Residential
• Preview Upcoming Trainings through Efficiency Maine
Improvement in Residential and Non-Residential Model Energy Codes (1975-2015)

Escalating Fuel Costs

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Units</th>
<th>1980</th>
<th>2018</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>$/kWh</td>
<td>$0.055</td>
<td>$0.134</td>
<td>144%</td>
</tr>
<tr>
<td>Oil</td>
<td>$/MMBtu</td>
<td>$6.830</td>
<td>$21.050</td>
<td>208%</td>
</tr>
</tbody>
</table>

Source: Eia.gov

Current Maine Energy Code

New Maine Energy Code

Fire Marshal's Office
Building Codes Division
<table>
<thead>
<tr>
<th>Code</th>
<th>Chapter 1</th>
<th>Chapter 2</th>
<th>Chapter 3</th>
<th>Chapter 4</th>
<th>Chapter 5</th>
<th>Chapter 6</th>
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<tbody>
<tr>
<td>2009 IECC</td>
<td>Administration</td>
<td>Definitions</td>
<td>Climate Zones</td>
<td>Residential EE</td>
<td>Commercial EE</td>
<td></td>
</tr>
<tr>
<td>2015 IECC (Commercial)</td>
<td><strong>Scope</strong> and Administration</td>
<td>Definitions</td>
<td>General Requirements</td>
<td>Commercial EE</td>
<td>Existing Buildings</td>
<td>Referenced Standards</td>
</tr>
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<td>Residential EE</td>
<td>Existing Buildings</td>
<td>Referenced Standards</td>
</tr>
</tbody>
</table>
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 **three stories or less** in height above grade plane
  - 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
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.

Aroostook County: Climate Zone 7
All Other ME Counties: Climate Zone 6A
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 ft²
  - 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
    - OA Reset Control
    - Staged Cooling
    - Boiler Turndown
    - Part load hydronic controls
    - VAV Reheat Control
    - OA Ventilation Optimization
    - 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

2015 International Energy Conservation Code - Commercial

ASHRAE 90.1 – 2013
Includes prescriptive and performance options

IECC Prescriptive Provisions
Comcheck; Tradeoffs

IECC Total Building Performance
Modeled performance < 85% of baseline
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
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
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
<table>
<thead>
<tr>
<th>Zone 6</th>
<th>Fenestration</th>
<th>Insulation</th>
<th>Foundation</th>
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<tbody>
<tr>
<td></td>
<td>Windows and Doors</td>
<td>Skylights</td>
<td>Glazing</td>
</tr>
<tr>
<td></td>
<td>U-Factor</td>
<td>U-Factor</td>
<td>SHGC</td>
</tr>
<tr>
<td>Zone 6</td>
<td>≤ 0.32</td>
<td>≤ 0.55</td>
<td>NR</td>
</tr>
<tr>
<td>Zone 7</td>
<td>≤ 0.32</td>
<td>≤ 0.55</td>
<td>NR</td>
</tr>
</tbody>
</table>

*Changed since 2009*
<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>2015 IECC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CZ 6</td>
<td>R20 + R5ci or R13 + R10ci</td>
</tr>
<tr>
<td>CZ 7</td>
<td></td>
</tr>
</tbody>
</table>
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
Floor Exception (2015 IECC)

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
Air Infiltration Testing: Blower Door Test

[Image of a blower door with a red fabric around it, showing the setup for testing air infiltration]

[Image of a digital gauge displaying pressure and flow readings]

[Image of another digital gauge showing additional readings]
### Air Infiltration Testing: Blower Door Test (Mandatory)

<table>
<thead>
<tr>
<th>Test Method</th>
<th>IECC 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blower Door</td>
<td>3 $\text{ACH}_{50}$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Method</th>
<th>IECC 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blower Door</td>
<td>7 $\text{ACH}_{50}$</td>
</tr>
</tbody>
</table>
What Does it Mean?

- 3 Air Changes
- 5 Air Changes
- 7 Air Changes

ACH50

The Market
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$_{50}$)

\[ ACH_{50} = \frac{CFM_{50} \times 60}{Volume} \]
Air Infiltration Testing

Area: 1,500 SqFt

Volume: 12,000 cubic ft

\[ ACH_{50} = \frac{1,200 \times 60}{12,000} = 6 \, ACH_{50} \]
Area: 3,000 SqFt

Volume: 24,000 cubic ft

\[ ACH_{50} = \frac{1,200 \times 60}{24,000} = 3 \ ACH_{50} \]
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
**Duct Leakage Testing**

*Leakage* Limits measured in CFM per 100 ft² of conditioned floor area (% of floor area)

<table>
<thead>
<tr>
<th>Applicability</th>
<th>Rough-In Duct Leakage Limit</th>
<th>Post Construction Duct Leakage Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015 IRC</td>
<td>3% (w/o air handler)</td>
<td>4% (with air-handler)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4%</td>
</tr>
</tbody>
</table>

**Exemption from Testing:** If all ductwork is entirely within the building’s thermal envelope
**Total Duct Leakage**
*(Rough-In or Post Construction)*

- Entire Duct System Pressurized @ +25 Pa
- Fan flow measures TOTAL LEAKAGE in CFM@25Pa

2000 ft² home

4 CFM / 100 ft² = 80 CFM₂₅
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 testing

**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)
## 2015 IECC
Whole-House Mechanical Ventilation System Airflow Rate Requirements

<table>
<thead>
<tr>
<th>Dwelling Unit Floor Area (Square Feet)</th>
<th>Number of Bedrooms</th>
<th>Airflow in CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-1</td>
<td>2-3</td>
</tr>
<tr>
<td>&lt; 1,500</td>
<td>30</td>
<td>45</td>
</tr>
<tr>
<td>1,501 – 3,000</td>
<td>45</td>
<td>60</td>
</tr>
<tr>
<td>3,001 – 4,500</td>
<td>60</td>
<td>75</td>
</tr>
<tr>
<td>4,501 – 6,000</td>
<td>75</td>
<td>90</td>
</tr>
<tr>
<td>6,001 – 7,500</td>
<td>90</td>
<td>105</td>
</tr>
<tr>
<td>&gt; 7,500</td>
<td>105</td>
<td>120</td>
</tr>
</tbody>
</table>
• Minimum % of lamps in permanently installed lighting fixtures must be high-efficacy lamps; or

<table>
<thead>
<tr>
<th>Minimum % High Efficacy Lighting</th>
<th>2015 IECC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>75%</td>
</tr>
</tbody>
</table>
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
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
## Energy Rating Index Targets

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>Energy Rating Index</th>
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<tbody>
<tr>
<td>1</td>
<td>52</td>
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<tr>
<td>2</td>
<td>52</td>
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<tr>
<td>3</td>
<td>51</td>
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<tr>
<td>4</td>
<td>54</td>
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<tr>
<td>5</td>
<td>55</td>
</tr>
<tr>
<td>6*</td>
<td>54</td>
</tr>
<tr>
<td>7*</td>
<td>53</td>
</tr>
<tr>
<td>8</td>
<td>53</td>
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</tbody>
</table>
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
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
## Additional Building Code Training and Best Practices

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<th>Code Training Topics</th>
<th>Commercial</th>
<th>Residential</th>
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<tbody>
<tr>
<td>Definition additions and changes</td>
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<tr>
<td>Administration &amp; Enforcement</td>
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<tr>
<td>Prescriptive Pathway</td>
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<tr>
<td>Performance Pathway</td>
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<td></td>
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<tr>
<td>Existing Building Provisions</td>
<td></td>
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<tr>
<td>Energy Rating Index compliance alternative</td>
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<tr>
<td>System Commissioning</td>
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<tr>
<td>ASHRAE 90.1 2013 significant changes from 2007</td>
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<td>ASHRAE 62.1 2016 significant changes from 2007</td>
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<td>ASHRAE 62.2 2016 significant changes from 2007</td>
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<tr>
<td>ComCheck</td>
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<tr>
<td>ResCheck</td>
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<table>
<thead>
<tr>
<th>Best Practices</th>
<th>Commercial</th>
<th>Residential</th>
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<tbody>
<tr>
<td>Thermal Envelope</td>
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<tr>
<td>Blower Door/Duct Testing</td>
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<tr>
<td>Mechanical Ventilation</td>
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<td>Ventilation Test &amp; Balancing</td>
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<td>Service Hot Water</td>
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<tr>
<td>Combustion Appliance Zone Testing</td>
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<tr>
<td>Permitting Overview (State of Maine Requirements)</td>
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<td></td>
</tr>
<tr>
<td>Inspections (Code Compliance)</td>
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</table>
Thank you for attending!

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

For additional MUBEC training or Code Official information, please go to:
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