Achieving The New 2012 Energy Code

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Achieving the 2012 Energy Code

Speakers:
**Ryan Meres**
Code Compliance Specialist
Institute for Market Transformation
ryan@imt.org

**Roger Chang**, PE, LEED AP
Principal, Director of Sustainability
Westlake, Reed, Leskosky
rchang@wrldesign.com

**Patrick A. Kunze**, PE, LEED AP
Mechanical Section Head, Senior Principal
GHT Limited
PKUNZE@ghtltd.com

Moderator:
**Keith P. Nelson**, Architect
Senior Associate
Wiss, Janney, Elstner Associates, Inc.
knelson@wje.com
Overview

- Introduction
- Scope of Energy Codes
- Commercial Codes
- Residential Codes
- Questions?
Development Next Steps

✓ Second Public comment period ended June

✓ Green TAG and Construction Codes Coordinating Board meeting to go over and make changes if necessary

✓ Codes have been finalized by the CCCB

✓ Once codes have been officially submitted to Council, they have 45 legislative days to vote on adoption
Energy and Green Code Scope

✓ The DC Energy Code applies to all projects

✓ The DC Green Code covers:
  ✓ All commercial projects (10,000 SF and larger)
  ✓ Multi-family residential 4 stories and larger (and 10,000 SF and larger)
Green Code Compliance Paths

- Green Building Act
- Green Construction Code (IgCC as amended))
- Alternate Compliance Pathways
  - ASHRAE 189.1
  - LEED
- Enterprise Green Communities
- ICC-700, NGBS
Transitory Provisions for the 2013 Codes

 Exceptions (Section 123 Building Code)

 ✓ Projects with existing valid building permits
 ✓ Projects with existing filed application
 ✓ Projects with existing design contracts
 ✓ Tenant Layout Permits for built Core and Shell
Overview of the Energy Code

- Designed to save 30% more energy
  - Increased requirements for air sealing, insulation levels, and building systems
- Code has two separate divisions
  - Commercial Buildings (ex. C101.1)
    - All non-“Residential Buildings”
  - Residential Buildings (ex. R101.1)
    - Detached one- and two- family dwellings
    - Group R2, R3, R4 < 4 stories in height
- IRC references the 2012 IECC
  - Example: “N1101.2 (R101.3)”
Thermal Enclosure Requirements (402)
### Building Envelope Requirements (C402)

Table 1: Changes in insulation and U-factors for prescriptive (Table R402.1.1) path in the 2012 IECC

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>Fenest. U-Factor</th>
<th>Skylight U-Factor</th>
<th>Glazed Fenest. SHGC</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 Wall R-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 except Marine</td>
<td>0.35</td>
<td>0.60 0.55</td>
<td>NR 0.40</td>
<td>38</td>
<td>49</td>
<td>13 20 or 13+5</td>
<td>5/10</td>
<td>10/13</td>
<td>10, 2 ft</td>
<td>10/13</td>
</tr>
<tr>
<td>5 and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Building Envelope Requirements (C402)

- Windows (SHGC, U-Value)
- Projection Factor (SHGC)
- Increased vertical fenestration (40%) and skylight (5%) with use of daylighting controls
Building Envelope Requirements (C402)

- Commercial Air leakage
  - Air barrier and thermal barrier shall be aligned and continuous
  - Joints and seams should be sealed
  - Recessed lighting fixtures (IC)
- Opaque exterior materials Req’s (choose one)
  - Materials
  - Assemblies
  - Whole Building Leakage Test
Building Mechanical Systems (403)

✓ Simple Systems – Single-Zone
✓ Complex Systems – Multi-Zone
✓ Minimum Efficiency Requirements
✓ Demand Control / Energy Recovery
✓ Other Coverage Topics
  ✓ Duct/Pipe Insulation
  ✓ Economizer
  ✓ Fan Energy
Energy Recovery

✓ Significant Changes
✓ Before: 70% OA and 5,000 cfm
✓ Current: As low as 30% OA
### Efficiency Comparison

<table>
<thead>
<tr>
<th></th>
<th>ASHRAE 90.1-2010</th>
<th>ASHRAE 90.1-2007</th>
<th>ASHRAE 90.1-2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan, Constant Volume</td>
<td>0.0011 HP/ cfm</td>
<td>0.0011</td>
<td>0.0011</td>
</tr>
<tr>
<td>Fan, VAV</td>
<td>0.0015 HP/ cfm</td>
<td>0.0015</td>
<td>0.0015</td>
</tr>
<tr>
<td>AC, Air Cooled, &gt;= 760 MBH</td>
<td>9.5 EER</td>
<td>9.5 EER</td>
<td>9.0 EER</td>
</tr>
<tr>
<td>Water-Cooled Centrifugal, &lt;150 tons</td>
<td>0.634 kw/ton</td>
<td>0.7 kw/ton</td>
<td>0.7 kw/ton</td>
</tr>
<tr>
<td>Boilers, Gas-Fired, &lt;300 MBH</td>
<td>80% AFUE</td>
<td>80% AFUE</td>
<td>80% AFUE</td>
</tr>
<tr>
<td>Duct Insulation, Combined Cooling/Heating, Exterior</td>
<td>R-6</td>
<td>R-6</td>
<td>R-6</td>
</tr>
<tr>
<td>Pipe Insulation, 141-200F, 1.5 to 4”</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>SHW, Gas Storage, &gt;75 MBH</td>
<td>80% Et</td>
<td>80% Et</td>
<td>80% Et</td>
</tr>
</tbody>
</table>

Most of the increases in stringency are related to lighting, controls and building envelope.
Service Water Heating (404)

- Coverage
  - Restrooms, showers, laundries, kitchens, pools and spas, defrosting of sidewalks and driveways, car washes, beauty salons, and other commercial enterprises.
- Minimum efficiency for equipment – no significant changes from previous edition.
- Fixture efficiency covered in Green/Plumbing Code
Lighting Systems (405)

- 40% of Commercial Building Energy Consumption
- Impact on HVAC Load
- Lighting Power Density
  - Reductions across the board
- Controls
  - Additional emphasis – daylit spaces

<table>
<thead>
<tr>
<th></th>
<th>ASHRAE 90.1-2010</th>
<th>ASHRAE 90.1-2007</th>
<th>ASHRAE 90.1-2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting, Office</td>
<td>0.9</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lighting, Multifamily</td>
<td>0.6</td>
<td>0.7</td>
<td>0.7</td>
</tr>
</tbody>
</table>
Lighting Systems (405)

Alternating Luminaires

Dimming

Alternating Lamps
Additional Efficiency (406)

- 1 – Additional HVAC Equipment Efficiency
- 2 – Additional Lighting Power Density Reductions
- 3 – On-Site Renewable Energy
  - 0.5 W/sf (conditioned)
  - 3% of mechanical, SHW, lighting
Total Building Performance (407)

☑ Greatest design flexibility
☑ Requires whole-building energy analysis
☑ Similar language to 90.1-2010 energy cost budget
☑ ComCheck is not an energy modeling tool
☑ Proposed versus Standard Reference Building
☑ 85%!
Compliance—Three Options

**Prescriptive**
- Insulation & Fenestration Only R402.1.1
- Follow R402.1.2 when computing R-values.

**U-Factor & "UA" Alternatives**
- U-factor R402.1.3
- Total Building UA R402.1.4
- REScheck

**Simulated Performance (software)**
- Simulated Performance Alternative R405

Energy Model
**Significant changes for Low-Rise Residential**
(one- and two-family, multi-family 3 stories or less)

**Table 402.1.1 Insulation and Fenestration Requirements:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Current D.C. Code</th>
<th>2012 IECC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skylights</td>
<td>U-0.60</td>
<td>U-0.55</td>
</tr>
<tr>
<td>Glazed Fenestration</td>
<td>SHGC-N/R</td>
<td>SHGC-0.40</td>
</tr>
<tr>
<td>Wood frame wall</td>
<td>R-18</td>
<td>R-20 or R-13+5</td>
</tr>
<tr>
<td>Mass wall</td>
<td>R-5/10</td>
<td>R-8/13</td>
</tr>
</tbody>
</table>

No changes to requirements for: ceiling, floor, slab or window U-factor.
## Current D.C. Code vs. 2012 IECC (w/DC Amendments)

### Additional Changes:

<table>
<thead>
<tr>
<th>Section/Component</th>
<th>Current D.C. Code</th>
<th>2012 IECC</th>
</tr>
</thead>
<tbody>
<tr>
<td>402.4 Air Leakage (envelope)</td>
<td>7 $\text{ACH}_{50}$ + visual inspection option</td>
<td>5 $\text{ACH}_{50}$, no visual inspection option</td>
</tr>
<tr>
<td>403.2 Ducts</td>
<td>8 CFM/100ft$^2$ floor area @ post construction 6 CFM @ rough-in</td>
<td>8 CFM/100 ft$^2$ floor area total leakage @ post const. or rough-in*</td>
</tr>
<tr>
<td>403.4 Hot water piping insul.</td>
<td>R-2</td>
<td>R-3</td>
</tr>
<tr>
<td>403.5 Mechanical ventilation</td>
<td>NR</td>
<td>Natural and mechanical per IRC and IMC</td>
</tr>
<tr>
<td>404 Lighting Systems</td>
<td>50% high efficacy</td>
<td>75% high efficacy</td>
</tr>
</tbody>
</table>

*Sampling allowed for multifamily
The evolution of residential energy codes…

How energy codes make homes more efficient

1983 House (MILC)

Ducts:
- Insulation: R-4
- Air Leakage testing: Not required

Envelope:
- Air Leakage testing: Not required

Thermostat:
- Adjustable

Lighting:
- No requirement

DOORS:
- U-value: .6

INSULATION:
- U-value indicates thermal resistance. The higher the R-value, the more effective the insulation.
- R-11: Walls
- R-19: Ceiling
- R-6: Floor
- R-19

WINDOWS:
- U-value measures the rate of heat loss through a material. The lower the U-value, the more effective the thermal retention.
- U-value: 1.1
- Solar Heat Gain Coefficient: SHGC: .25

DOORS:
- U-value: .39

Both houses:
- Location: Atlanta, Georgia
- 2,640 square feet
- 28-foot frontage, two stories with 6’ ceilings and 1’ basement stories, basement with furnace, attic with ducts

2012 House (IECC)

Ducts:
- Insulation: R-4
- Air Leakage testing: Mandatory

Envelope:
- Air Leakage testing: Mandatory

Lighting:
- 70% of lamps must be high efficiency

Thermostat:
- Programmable

Household energy use is lower than it was in the ‘80s, even as we buy up PlayStations and iPhones. Why? Thank stronger energy codes.

Building energy codes set minimum legal standards for the energy efficiency of new homes. That’s good for the environment because it lowers carbon emissions, and also good for America’s bank accounts. Houses built to stronger codes are up to 40% more efficient and can save a family hundreds of dollars a year on energy costs. The two hypothetical properties depicted below—a 1983 house and a 2012 house—show the evolution of an average home and a side-by-side comparison of how energy codes make a surprising difference in home energy efficiency.

Over the past three decades, the share of electricity used by appliances and electronics in U.S. homes has nearly doubled, from 17 percent to 31 percent. Moreover, energy use per household fell 31 percent. As the U.S. population and use of personal electronics grows, codes will need to stay stringent to keep energy use in check.


IMT estimates that the residents of the 2012 house will pay almost $400 less in energy costs (in 2010 dollars) than the residents of the 1983 house, thanks to stronger energy codes and appliance standards.

Free download at: http://www.imt.org/codes/how-energy-codes-make-homes-more-efficient