City of Boulder Energy Codes:

*Commercial Energy Conservation Code Training*

April 2017
OUTLINE

- Background and Context
- General Code Updates (apply to residential and commercial)
- Commercial Code Updates
- Implementation Tools and Website
- Questions
BACKGROUND AND CONTEXT
THE IMPORTANCE OF NET ZERO ENERGY CODES

CITY OF BOULDER CLIMATE AND ENERGY GOALS

~ 1 million metric tons CO$_2$e
~ 10% savings by 2050
COMPARISON TO OTHER ENERGY CODES

- Boston "Stretch"
- Seattle
- IECC 2015
- California T24-2016
- ASHRAE 90.1-2016
- San Francisco
- 2017 COBECC
Santa Monica, CA requires net zero for all new homes.
Code is effective: Monday May 8, 2017

- Exception: Any building with site review approval, or that has filed a complete site review application (that is later approved).
Adopt a stand-alone energy code

OVERARCHING ENERGY CODE CHANGES

- Residential
  - New Construction
    - < 500 SF: Mandatory + Prescriptive
    - ≥500 SF: Mandatory + ERI Requirement
  - Additions
    - < 1,000 SF: Mandatory + Prescriptive
    - ≥ 1,000 SF: Mandatory + ERI Requirement
  - Alteration/Repair
    - < 26% of AV: Mandatory + Energy Advisor
    - 26 – 50% of AV: Mandatory + Energy Assessment
    - > 50% of AV: Triggers New Construction Requirements

- Commercial
  - New Construction & Additions
    - < $500,000: Mandatory + Prescriptive
    - ≥ $500,000: Mandatory + 30% better than ASHRAE 90.1-2010 baseline
  - Alteration/Repair
    - < 26% of AV: Mandatory + Scope must comply with Prescriptive Requirements
    - 26 – 50% of AV: Mandatory + equivalent or better than ASHRAE 90.1-2010 Baseline
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AV = Actual Values as Assessed by Boulder County’s Tax Assessor
OVERARCHING ENERGY CODE CHANGES

Commercial

New Construction & Additions

- < $500,000
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Alteration/Repair

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  - Triggers New Construction Requirements

AV = Actual Values as Assessed by Boulder County’s Tax Assessor
Regulate multifamily units (MFUs) under the commercial energy code

VS

Residential: detached one- and two-family dwellings and multiple single family dwellings (townhouses and duplexes) with a separate means of egress and their accessory structures, as well as Group R-3 and R-4 buildings three stories or less in height above grade plane.
**DEFINITION**: The total square footage of all levels as measured from the inside finished surface of the walls, but excluding courts, unconditioned garages, and uninhabitable crawl spaces and attics.

How is floor area measured?
Square footage and construction value triggers for additions and alterations are based on all permits filed within 24 months.
Solar PV Ready per COBECC C406 for New Construction.

- 40% of roof area designated for PV (no obstructions or shading)
- Locate and provide space for future required electrical equipment (inverter and meter)
- Install conduit from roof to future electrical equipment location.
- Main electrical panel shall have space for future solar.
- Structural roof load included.

OVERARCHING ENERGY CODE CHANGES
Electric Vehicle Charging Stations – NEC 210.52/53

Offices, Industrial Buildings, and Multifamily Units *

- Applies to New Construction
- Require EV (120 V and 240 V outlets) for 10% of parking spaces
- Require *one* Level 2 dual port charging stations (min: 2 spaces)

* Exception if less than 25 parking spaces
* Lodging facilities required to install Level 2, dual port stations for 1% of parking spots
* 50% of spaces with charging shall be designated with signage
Applies to New Construction

Require at least one dedicated 120 V and 240 V outlet for each new dwelling unit.
### Plumbing Fixtures – IPC Table 604

<table>
<thead>
<tr>
<th>Plumbing Fixture</th>
<th>Maximum Flowrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lavatory, private</td>
<td>1.5 gpm at 60 psi</td>
</tr>
<tr>
<td>Lavatory, public (metering)</td>
<td>0.25 gallon per metering cycle</td>
</tr>
<tr>
<td>Lavatory, public (no metering)</td>
<td>0.5 gpm at 60 psi</td>
</tr>
<tr>
<td>Shower head</td>
<td>2.0 gpm at 80 psi</td>
</tr>
<tr>
<td>Sink Faucet</td>
<td>1.5 gpm at 60 psi</td>
</tr>
<tr>
<td>Urinal</td>
<td>1.0 gallon per flushing cycle</td>
</tr>
<tr>
<td>Water Closet</td>
<td>1.28 gallons per flushing cycle</td>
</tr>
</tbody>
</table>

**OVERARCHING ENERGY CODE CHANGES**
COMMERCIAL ENERGY CODE UPDATES

1) Revisions to the Prescriptive Path
2) Changes to how Alteration/Repair projects comply with COBECC
3) Envelope Mandatory Changes
4) HVAC Mandatory Changes
5) Electric Power & Lighting Mandatory Changes
6) Core and Shell Energy Efficiency and Energy Modeling
How has the Prescriptive Path changed?

• Which projects can follow the Prescriptive Path
• The requirements themselves

### Assessed Value
Actual value according to Boulder County tax assessor’s database (reappraisal possible) [http://maps.boco.solutions/propertysearch/](http://maps.boco.solutions/propertysearch/)

### Construction Valuation
Total value of work covered by permits in the past 24 months (B.R.C. 4-20-4(d))
(1) REVISIONS TO THE PRESCRIPTIVE PATH

- **Residential**
  - New Construction
    - < 500 SF: Mandatory + Prescriptive
    - ≥500 SF: Mandatory + ERI Requirement
  - Additions
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- **Commercial**
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AV = Actual Values as Assessed by Boulder County’s Tax Assessor
2017 COBECC Prescriptive Tables have been made more stringent compared to IECC 2012:

- Envelope: U-factors Tables C402.2.1 & C402.2.
- Fenestration: U-factor Tables C402.3
- Cooling Equipment: Min efficiency Tables in C403
- Heating Equipment: Min boiler efficiency Table C403.2.3(5)
- Service Hot Water Heating: Min efficiency Table C404.2
- Lighting: Lighting Power Allowances: Table C405.5.2(1)
(2) REQUIREMENTS FOR ALTERATIONS

- **Residential**
  - **New Construction**
    - < 500 SF: Mandatory + Prescriptive
    - ≥500 SF: Mandatory + ERI Requirement
  - **Additions**
    - < 1,000 SF: Mandatory + Prescriptive
    - ≥ 1,000 SF: Mandatory + ERI Requirement
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*AV = Actual Values as Assessed by Boulder County’s Tax Assessor*
### (2) REQUIREMENTS FOR ALTERATIONS

<table>
<thead>
<tr>
<th>Construction valuation is &lt;26% of assessed value</th>
<th>Construction valuation is 26-50% of assessed value</th>
<th>Construction valuation is &gt;50% of assessed value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All mandatory and prescriptive energy and building code requirements (for scope of alteration)</td>
<td>Shall have annual energy operating costs for the proposed design that are ≤ the standard reference design of ASHRAE 90.1-2010</td>
<td>Triggers new construction requirements (30% better than ASHRAE 90.1-2010)</td>
</tr>
</tbody>
</table>
Air Leakage Testing – Test requirements have not changed
  • < 0.4cfm/ft^2 at 0.3”wg

“Testing and inspection shall be conducted by a third party registered design professional. A written report of the test results shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after completion of all penetrations of the building thermal envelope.”
For Multifamily Buildings a sampling of at least 20% of dwelling units shall be tested for air infiltration.

Test Requirements (C402.2)

- < 0.25cfm/ft² at 0.2”wg (50 Pascals)
- Testing shall be conducted by third party
- Test results submitted to the Code Official
(4) HVAC MANDATORY REQUIREMENTS

Design Temperatures for Load Calculations

• Revised design temperatures for load calcs:
  • Heating: 70°F maximum (previously 72°F)
  • Cooling: 75°F minimum (unchanged)
(4) HVAC MANDATORY REQUIREMENTS

Mechanical System Shutoff

• Any conditioned space with operable windows, roof openings, overhead doors, sliding doors or folding accordion style wall systems that open to the outdoors shall be equipped with interlock controls.
• Controls shall disable or reset the temperature setpoints.
(5) LIGHTING MANDATORY REQUIREMENTS

Reduced Lighting Power Allowances for EXTERIOR Lighting

Sampling from Table C405.6.2
- Parking: 0.03-0.08w/sf
- Stairways: 0.6-0.7w/sf
- Tunnels: 0.12-0.21w/sf
- Entry Canopies: 0.2-0.4w/sf
Reduced Lighting Power Allowances for INTERIOR Lighting - C405.5.2(1)

Open offices:
• 1.00 w/sf (current LPD)
• 0.93 w/sf (new COBECC LPD)

<table>
<thead>
<tr>
<th>COMMON SPACE-BY-SPACE TYPES</th>
<th>LPD (w/ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrium – First 40 feet in height</td>
<td>0.03 per ft. ht.</td>
</tr>
<tr>
<td>Atrium – Above 40 feet in height</td>
<td>0.02 per ft. ht.</td>
</tr>
<tr>
<td>Audience/seating area – permanent</td>
<td>0.9</td>
</tr>
<tr>
<td>For auditorium</td>
<td>2.43</td>
</tr>
<tr>
<td>For performing arts theater</td>
<td>1.14</td>
</tr>
<tr>
<td>For motion picture theater</td>
<td>1.05</td>
</tr>
<tr>
<td>Classroom/lecture/training</td>
<td>1.11</td>
</tr>
<tr>
<td>Conference/meeting/multipurpose</td>
<td>0.56</td>
</tr>
<tr>
<td>Corridor/transition</td>
<td></td>
</tr>
<tr>
<td>Dining area</td>
<td></td>
</tr>
<tr>
<td>Bar/lounge/leisure dining</td>
<td>0.963</td>
</tr>
<tr>
<td>Family dining area</td>
<td>0.801</td>
</tr>
<tr>
<td>Dressing/fitting room performing arts theater</td>
<td>0.61</td>
</tr>
<tr>
<td>Electrical/mechanical</td>
<td>0.42</td>
</tr>
<tr>
<td>Food preparation</td>
<td>1.20</td>
</tr>
<tr>
<td>Laboratory for classrooms</td>
<td>1.3</td>
</tr>
<tr>
<td>Laboratory for medical/industrial research</td>
<td>1.7</td>
</tr>
<tr>
<td>Lobby</td>
<td>0.9</td>
</tr>
<tr>
<td>Lobby for performing arts theater</td>
<td>2.0</td>
</tr>
<tr>
<td>Lobby for motion picture theater</td>
<td>0.56</td>
</tr>
<tr>
<td>Locker room</td>
<td>0.75</td>
</tr>
<tr>
<td>Lounge recreation</td>
<td>0.62</td>
</tr>
<tr>
<td>Office – enclosed</td>
<td>1.05</td>
</tr>
<tr>
<td>Office – open plan</td>
<td>0.93</td>
</tr>
<tr>
<td>Restroom</td>
<td>0.98</td>
</tr>
<tr>
<td>Sales area</td>
<td>1.37</td>
</tr>
<tr>
<td>Stairway</td>
<td>0.69</td>
</tr>
<tr>
<td>Storage</td>
<td>0.63</td>
</tr>
</tbody>
</table>
(6) CORE AND SHELL ENERGY EFFICIENCY

Core & Shell projects may take credit for energy efficiency that is part of future tenant finish plans.

- Tenant build-out drawings must be submitted.
- Code official will issue a temporary certificate of occupancy until the final tenant drawings are submitted.
IMPLEMENTATION TOOLS

Commercial Amendment Summary

Four page document highlighting detailed changes to the commercial code.

In 2017, the City of Boulder introduced an updated version of its adopted energy code. This code, known as the 2017 City of Boulder Energy Conservation Code (COBECC), has simplified the compliance approaches and access to information. This resource provides a high-level overview of what areas of the 2012 IECC have been significantly amended to create the 2017 City of Boulder Energy Conservation Code. This resource is not a substitute for the code language itself.

### Compliance Path Requirements

<table>
<thead>
<tr>
<th>Code Application</th>
<th>COBECC Section</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amended Definitions Section</td>
<td>C202</td>
<td>Definitions section has been amended to include: <strong>Construction Valuation</strong>: &quot;The total value of work covered by the permit, to be determined consistent with the standards of Subsection 4-20-4(d), B.R.C. 1981. The higher of the two valuations considered under Subsection 4-20-4(d), B.R.C. 1981, shall be the total value of work.&quot; <strong>Floor Area</strong>: The total square footage of all levels as measured from the inside finished surface of the walls, but excluding courts, unconditioned garages, and uninhabitable crawl spaces and attics. <strong>Residential Building</strong>: For this code, includes detached one- and two-family dwellings and multiple single family dwellings (townhouses and duplexes) with a separate means of egress and their accessory structures, as well as Group R-3 and R-4 buildings three stories or less in height above grade plane. <strong>Solar Ready</strong>: A number of new definitions were added for the new solar ready requirements in C406.</td>
</tr>
<tr>
<td>Actual Value of Existing Building</td>
<td>Table C401.2.2</td>
<td>Actual value as assessed by Boulder County’s Tax Assessor.</td>
</tr>
<tr>
<td>Compliance for Mixed Occupancy Buildings</td>
<td>C101.4.6</td>
<td>Where a building includes both residential and commercial occupancies, the building shall meet the requirements of this code for commercial buildings.</td>
</tr>
<tr>
<td>New Buildings and Additions</td>
<td>C401.2.1</td>
<td>Section amended to read &quot;New buildings and additions with a construction valuation of $500,000 or more shall have annual energy operating costs for the proposed design that are at least 50 percent less than the standard reference design of Appendix G of ASHRAE/IESNA Standard 90.1-2010 Energy Standard for Buildings Except for Low-Rise Residential Buildings.&quot; Compliance is demonstrated through performance modeling conducted by a registered design professional and must also comply with all mandatory requirements in Chapter 4. New buildings and additions with a construction valuation less than $500,000 shall comply with requirements in COBECC sections C402, C403, C404, C405, C406, and C407.</td>
</tr>
</tbody>
</table>
IMPLEMENTATION TOOLS

- Commercial Mandatory Checklist

Checklist shall be completed and included on an “Energy Conservation Code” sheet within the plans being submitted for permit application.
IMPLEMENTATION TOOLS

Commercial Prescriptive Checklist

Checklist shall be completed and included on an “Energy Conservation Code” sheet within the plans being submitted for permit application.
IMPLEMENTATION TOOLS

Commercial Performance Checklist & Report

Checklist included on plans being submitted for permit application.

Energy Modeling Report submitted with results as part of permit application.
1) Permit Application (not new, but permits have been revised)
2) Mandatory, Prescriptive, and/or Performance Checklist (pasted into plans)
3) Energy Modeling Report Template (submit with permit)
4) Energy Modeling Output Reports from modeling software (submit with permit)
5) Solar Ready Requirements (indicate on plans)
6) Electric Vehicle Requirements (indicate on plans)
Energy Code FAQs

NOTE: This document is updated often, please check back regularly to ensure you are referencing the most recent version. Check the date in the footer below.

Questions for Residential AND Commercial Projects

1. Q. Has the city adopted a new energy code?
   A. On March 7, 2017 the City of Boulder adopted the 2017 City of Boulder Energy Conservation Code (COBECC) which prescribes minimum energy efficiency and conservation standards for new buildings and for additions and alterations to existing buildings. Code requirements are effective 60 days after council adoption, the effective date is May 8, 2017. Projects submitting building permit applications on or after May 8, 2017 are subject to the 2017 COBECC.

2. Q. Which projects are “grandfathered” under the codes prior to this recent 2017 update?
   A. Any project which has filed a complete site review application (which is later approved) at the time of the code adoption, will be subject to the codes that were in place at the time the application was filed. If the site review application is denied and a new submittal is required, that project will be subject to the codes in place at the time the new application is filed.

3. Q. Will accessory structures (i.e. offices in a detached garage) be subject to the commercial or the residential energy code requirements?
   A. As part of the recent updates, staff amended the definition for a Residential Building to include accessory structures. With this proposed change, all accessory structures/units would be under the residential energy and building codes. In the proposed energy code, Residential Building is defined as: “For this code, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses and duplexes) with a separate means of egress and their accessory structures, as well as Group R-3 and R-4 buildings three stories or less in height above grade plane.”

4. Do mixed-use buildings now fall under the commercial code and are ERI’s no longer required for individual units? If my project is a building of all condo units with a garage underneath for example is that a commercial building?
   A. All mixed-use projects will now be required to follow the commercial requirements within the 2017 City of Boulder Energy Conservation Code (COBECC). Refer to the question above for the definition of a Residential Building. The condo unit you describe would not be considered a residential building per this definition, and would therefore need to comply with the commercial provisions of the COBECC.

5. Do the “Solar Ready” requirements apply only to new buildings? Do they apply to additions? Remodels?
   A. The new “Solar Ready” requirements only apply to new buildings and additions and alterations that trigger New Construction requirements.

6. For projects with multiple buildings that are of various uses, will different codes be required for each building?
   A. For multi-building projects with both commercial and residential buildings, so long as buildings are permitted separately, the residential building(s), assuming they comply with the answered on March 15, 2017
DISCUSSION AND Q & A