DENVER AMENDMENT PROPOSAL FORM
FOR CPD INTERNAL PROPOSALS TO THE 2016 DENVER BUILDING CODE AMENDMENTS AND THE 2018 INTERNATIONAL CODES

2018 CODE DEVELOPMENT CYCLE

1) Name: Robby Schwarz Date: 3/25/2019

2) Proposals should be drafted in Word with the only formatting that is needed being BOLDING, STRIKEOUT AND UNDERLINING. Please do not provide additional formatting such as tabs, columns, etc.

Please use a separate form for each proposal submitted.

Is separate graphic file provided (Yes or No):

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Code Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBC</td>
<td>International Building Code</td>
</tr>
<tr>
<td>IECC</td>
<td>International Energy Conservation Code</td>
</tr>
<tr>
<td>IEBC</td>
<td>International Existing Building Code</td>
</tr>
<tr>
<td>IFC</td>
<td>International Fire Code</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Code Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPC</td>
<td>International Plumbing Code</td>
</tr>
<tr>
<td>IRC</td>
<td>International Residential Code</td>
</tr>
<tr>
<td>IFGC</td>
<td>International Fuel Gas Code</td>
</tr>
<tr>
<td>IMC</td>
<td>International Mechanical Code</td>
</tr>
</tbody>
</table>

AMENDMENT PROPOSAL

Please provide all of the following items in your amendment proposal:

**Code Sections/Tables/Figures Proposed for Revision:**

R403.3 Ducts

**Note:** If the proposal is for a new section, indicate (new).
Proposal:

**R403.3 Ducts.** Ducts and air handlers shall be installed in accordance with Sections R403.3.1 through R403.3.7.

**R403.3.1 Insulation (Prescriptive).** Supply and return ducts located outside conditioned space in attics shall be insulated to an R-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter. Supply and return ducts in other portions of the building shall be insulated to not less than R-6 for ducts 3 inches (76 mm) in diameter and not less than R-4.2 for ducts smaller than 3 inches (76 mm) in diameter.

_Easy: Ducts or portions thereof located completely inside the building thermal envelope._

**R403.3.7 Ducts located in conditioned space.** For ductwork to be considered as inside a conditioned space, such ducts shall comply with either one of the following:

1. The duct system shall be located completely within the continuous air barrier and within the building thermal envelope.

2. **Ductwork in ventilated attic spaces.** The ducts shall be buried within ceiling insulation in accordance with Section R403.3.6 and all of the following conditions shall exist:
   2.1. The air handler is located completely within the continuous air barrier and within the building thermal envelope.
   2.2. The duct leakage, as measured either by a rough-in test of the ducts or a post-construction total system leakage test to outside the building thermal envelope in accordance with Section R403.3.4, is less than or equal to 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m²) of conditioned floor area served by the duct system.
   2.3. The ceiling insulation R-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation R-value, less the R-value of the insulation on the duct.

3. **Ductwork in floor cavities located over unconditioned space shall comply with all of the following:**
   3.1 A continuous air barrier installed between unconditioned space and the duct.
   3.2 Insulation installed in accordance with section R402.2.8.
   3.3 A minimum R-19 insulation installed in the cavity width separating the duct from unconditioned space.

4. **Ductwork located within exterior walls of the building thermal envelope shall comply with the following:**
   4.1 A continuous air barrier installed between unconditioned space and the duct.
   4.2 Minimum R-10 insulation installed in the cavity width separating the duct from the outside sheathing.
   4.3 The remainder of the cavity shall be fully insulated to the drywall side.

_Note: Show the proposal using _strikethrough_, _underline_ format. At the beginning of each section, one of the following instruction lines are also needed:_

- Revise as follows
- Add new text as follows

November 15, 2005
Ductwork insulation is dependent on its location. This proposal addresses this issue. Section R403.3.1 Insulation states, “Supply and return ducts in attics shall be insulated to an R-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter. Supply and return ducts in other portions of the building shall be insulated to not less than R-6 for ducts 3 inches (76 mm) in diameter and not less than R-4.2 for ducts smaller than 3 inches (76 mm) in diameter.” Therefore, when the duct is located in a ventilated attic and its size is greater than or equal to 3”, it is required to be insulated to an R8. This proposal’s only change is to require the few ducts that might be smaller than 3” to also be insulated to an R8. As Allison Bailes points out in his Energy Vanguard blog post titled, “The invisible problem with duct insulation” The delta T across the insulated surface can be huge when ducts are located outside the conditioned space. (https://www.energyvanguard.com/blog/invisible-problem-duct-insulation) In his example ducts located in the attic experienced a delta T of 62°. Although it would be good to raise the minimum required R-value associated with ducts located outside the conditioned envelope this proposal instead incentivizes installation techniques that drive the performance of the duct to be more like that of ducts installed completely inside.

By defining the three possible locations where ductwork can be installed and how to address the insulated assembly so the duct can be considered to be inside conditioned space this proposal increases the energy performance of homes. The three possible locations for duct installation are, one, completely inside the continuous air barrier assemblies, two, completely outside the continuous air barrier assemblies, or three within the continuous air barrier and building thermal envelope assemblies. In the last code cycle, the addition of section R403.3.6 Ducts buried within ceiling insulation addressed the insulation installation issue for ducts located outside of the continuous air barrier assemblies. This code cycle, the hope is that ducts located within the continuous air barrier and building thermal envelope assemblies will be addressed.

The last detail to point out is an energy code compliance issue when using section R405 Simulated Performance Alternative and section R406 Energy Rating Index compliance paths. These pathways include duct location in the software modeling. It has not been clear until the 2018 IECC how to model buried ductwork and the hope now is that the additional language in this proposal will clarify how to model duct work that is installed within the continuous air barrier and building thermal envelope assemblies. If it is installed per this code change proposal is can be considered to be within conditioned space.

Note: The following items are required to be included:

**Purpose**: The proponent shall clearly state the purpose of the proposed amendment to physical, environmental and customary characteristics that are specific to the City and County of Denver (e.g., clarify the Code; revise outdated material; substitute new or revised material for physical, environmental and customary characteristics; add new requirements to the Code; delete current requirements, etc.)

**Reasons**: The proponent shall justify changing the current Code provisions, stating why the proposal is necessary to reflect physical, environmental and customary characteristics that are specific to the City and County of Denver. Proposals that add or delete requirements shall be supported by a logical explanation which clearly shows why the current does not reflect physical, environmental and customary characteristics that are specific to the City and County of Denver and explains how such proposals will improve the Code.

**Substantiation**: The proponent shall substantiate the proposed amendment based on technical information and substantiation. Substantiation provided which is reviewed and determined as not germane to the technical issues addressed in the proposed amendment shall be identified as such.

**Bibliography** (as needed): The proponent shall submit a bibliography when substantiating material is associated with the amendment proposal. The proponent shall make the substantiating materials available for review.
**Referenced Standards:**

- See city of Fort Collins Building Guide: “Approved ductwork location details”

List any new referenced standards that are proposed to be referenced in the code.

<table>
<thead>
<tr>
<th>Impact: Cost Statement:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will not increase the cost of construction</td>
</tr>
<tr>
<td>This proposal provides new installation guidance and a definition of when a duct is considered to be inside conditioned space that will increase the energy efficiency of a house with better insulated ducts when installed within the continuous air barrier and building thermal envelope assemblies. Ductwork must be insulated and installed per manufacturer instruction. Also, insulation currently must fully surround obstructions like ductwork that is installed in a cavity. So, no additional cost should be expected with the approval of this proposal.</td>
</tr>
</tbody>
</table>

**Note:** The proponent shall indicate one of the following regarding the impact of the amendment proposal:

- The effect of the amendment proposal on the cost of construction; Increase, Reduce, No Effect:
- The effect of the amendment proposal on the cost of design; Increase, Reduce, No Effect:
- Is the amendment proposal more- or less-restrictive than the I-Codes; More, Less, Same:

<table>
<thead>
<tr>
<th>Departmental Impact:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Click or tap here to enter text.</td>
</tr>
</tbody>
</table>

**Note:** Indicate one of the following regarding the impact of the amendment proposal:

- The effect of the amendment proposal on the cost of review; Increase, Reduce, No Effect:
- The effect of the amendment proposal on the cost of enforcement/inspection; Increase, Reduce, No Effect: