



	sealed <u>with gasketing materials that allow for repeated entrance over time.</u>	<u>Eave Baffles shall be installed in accordance with Section R402.2.3</u>
<u>Above Grade Walls</u>	<p>The junction of the foundation and sill plate shall be <u>air sealed.</u></p> <p>The junction of <del>the top plates and drywall adjacent to unconditioned space</del> <u>the top of exterior walls</u> shall be <u>gasketed or air sealed.</u></p> <p><u>The junction of the bottom plate to the subfloor on exterior walls separating conditioned space from unconditioned space shall be air sealed.</u></p> <p><del>Knee walls shall be sealed.</del></p>	<p><u>Air permeable insulation installed in wall cavities shall be enclosed.</u></p> <p><u>Exterior Building thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.</u></p> <p><del>Cavities within Corners in exterior and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch.</del></p> <p>Headers on exterior walls shall be insulated to a minimum R-5.</p>
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be <u>air sealed.</u>	<u>Insulation installed in framing around windows, skylights and doors shall be cut to fit the cavity and shall not interfere with flashing or drainage of the installed window.</u>
Rim joists	Rim joists shall include an exterior air barrier. <sup>b</sup> The junctions of the rim board to the sill plate and the rim board and the subfloor shall be air sealed.	Rim joists shall be insulated so that the insulation maintains permanent contact with the exterior rim board. <sup>b</sup>
<u>Floors, separating conditioned from unconditioned space, including cantilevered floors and floors above garages</u>	The air barrier shall be installed, and <u>air sealed to maintain its continuity at any exposed edge's of insulation the insulated floor cavity, adjacent to unconditioned space.</u>	<p><u>Air permeable insulation installed in floor cavities shall be enclosed. in a six-sided cavity.</u></p> <p>Floor framing cavity insulation shall be installed <u>in accordance with the requirements of Section R402.2.7.</u></p> <p><del>to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing or continuous in-floor framing, and shall extend from the bottom to the top of all perimeter floor framing members.</del></p>
Basement crawl space and slab foundations	<p>Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder/air barrier in accordance with Section R402.2.10.</p> <p>Penetrations through concrete foundation walls and slabs shall be air sealed.</p> <p>Class 1 vapor retarders shall not be used as an air barrier on below-grade walls and shall be installed in accordance with Section R702.7 of the <i>International Residential Code.</i></p>	<p>Crawl space insulation, where provided instead of floor insulation, shall be installed in accordance with Section R402.2.10.</p> <p>Conditioned basement foundation wall insulation shall be installed in accordance with Section R402.2.8.1.</p> <p>Slab-on-grade floor insulation shall be installed in accordance with Section R402.2.9 Slab-on-grade floors.</p>
Shafts, penetrations	Duct and flue shafts to exterior or unconditioned space shall be sealed.	Insulation shall be fitted tightly around utilities passing through shafts and

	Utility penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for expansion, contraction of materials and mechanical vibration.	penetrations in the building thermal envelope to maintain required <i>R</i> -value.
Narrow cavities	Narrow cavities of 1 inch or less that are not able to be insulated shall be air sealed.	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	Insulated portions of the garage separation assembly shall be installed in accordance with Sections R303 and R402.2.7.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air sealed in accordance with Section R402.4.5.	Recessed light fixtures installed in the building thermal envelope shall be airtight and IC rated, and shall be buried or surrounded with insulation.
Plumbing, wiring or other obstructions	All holes created by wiring, plumbing or other obstructions in the air barrier assembly shall be air sealed.	Insulation shall be installed to fill the available space and surround wiring, plumbing, or other obstructions, unless the required <i>R</i> -value can be met by installing insulation and air barrier systems completely to the exterior side of the obstructions.
Shower, tub, and fireplaces on exterior walls	<p><del>The An air barrier installed at exterior walls adjacent to showers and tubs shall be installed to separate the exterior insulated framed wall from the showers, or tubs, and fireplaces.</del></p> <p><u>Tub and shower drain trap penetrations through the subfloor shall be air sealed.</u></p> <p><u>Fireplace doors shall comply with the requirements of R402.4.2</u></p>	<p><del>Exterior framed walls adjacent to showers, and tubs, and fireplace shall be insulated and when insulated with air permeable insulation shall be enclosed by an air barrier assembly.</del></p>
Electrical /phone box on exterior walls, communication, and other equipment boxes, housings, and enclosures	<p><del>The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.</del></p> <p><u>Boxes, housings, and enclosures that penetrate the <i>air barrier</i> shall be caulked, taped, gasketed, or otherwise sealed to the <i>air barrier</i> element being penetrated.</u></p> <p><u>All concealed openings into the box, housing, or enclosure shall be sealed.</u></p> <p><u>The continuity of the air barrier shall be maintained around boxes, housings, and enclosures that penetrate the <i>air barrier</i></u></p> <p><u>Alternatively, air-sealed boxes shall be installed in accordance with R402.4.6</u></p>	<p><u>Boxes, housing, and enclosure shall be buried in or surrounded by insulation</u></p>

HVAC Register boots	All HVAC supply and return register boots that penetrate the <del>building thermal envelope</del> shall be sealed to the subfloor, wall covering, or ceiling penetrated by the boot.	HVAC supply and return register boots located in the <del>buildings thermal envelope</del> shall be buried in or surrounded by insulation.
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	
Common walls	<p><u>Air sealing materials recognized in a listed, fire-resistance rated common wall design and installed in accordance with the listing, or</u></p> <p><u>Air sealing materials recognized in an approved design, shall be used.</u></p> <p><u>Common walls separating townhouse &amp; duplex units shall be considered an exterior wall for the purposes of air barrier and air sealing application of this Table (R402.4.1.1).</u></p>	<p><u>Insulation materials recognized in the listed common wall design and installed in accordance with the listing, or</u></p> <p><u>Insulation materials recognized in the approved design, shall be used.</u></p>

**Supporting Information**

All proposals must include a written explanation and justification as to how they address physical, environmental, and/or customary characteristics that are specific to the City and County of Denver. The following questions must be answered for a proposal to be considered.

**Ceiling and attic**

Component column:

- The 2012 IECC Air barrier and Insulation table was the last table that specifically referenced the void space behind fireplaces that are located on exterior walls. Just like behind tubs and shower pans a supplemental air barrier is needed on the interior side to enclose the insulation as the drywall plane has been moved to the front of the fireplace.

Air barrier criteria section:

- This first revision continues to require the installation of a supplemental air barrier in areas where drywall, tile backer, or other air impermeable material will not be installed as the finished surface is not in alignment with the insulation installed in the building's thermal envelope. The only addition, other than clarification, is the addition of the area behind framed fireplaces boxes on exterior walls.
- Air sealing the tub and shower drain trap penetration eliminates a significant leakage source especially when located in floor systems over unconditioned spaces. This air leakage often creates condensation on the back side of tubs and shower pans which leads to mold and other building durability issues.
- Fireplace door air sealing is outlined in the prescriptive section R402.4.2 and clearly describes that this component shall be air sealed. The instruction should not be limited to fireplaces that are installed using the prescriptive compliance options. Therefore, there is need to ensure that the installation criteria is used when assessing R405 and R406 compliance. The addition of this language does that.

Insulation Installation Criteria:

- Manufactures of air permeable insulation have begun to recognize that their installation literature must incorporate language and pictures showing that air permeable insulation must be enclosed inside of air barrier assemblies. The current language offered no guidance of this fact and therefore was amended.

Cost Statement:

- The proposed language does not increase the cost of construction, but rather offers guidance and clarity of existing requirements.

### Above Grade Wall

#### Component:

- To ensure a precise understanding this language has been changed to focus on above grade walls. Foundation and other walls are addressed separately.

#### Air barrier and air sealing criteria section:

- Clarification of the language requiring top drywall to be sealed to the top plate is needed. In the field there is confusion regarding what exterior means. Did it mean four exterior walls, or did it mean top plates that are adjacent to unconditioned space. The gained clarity of this air sealing activity addresses one of the largest air leakage sources on the high side of the home.
- The junction of the bottom plate to the subfloor on exterior walls had not been addressed yet is again one of the largest sources of air leakage in homes and therefore was added to the table.
- There is a proposal to address Knee walls separately as they are a unique beast.

#### Insulation Installation Criteria:

- Air permeable insulation must be enclosed in an air barrier in order to trap the pockets of air that are required to resist the flow of energy. This new language expresses that so it can be executed properly in the field.
- Corners and headers are significantly different assemblies. Headers, in particulate may not have a true cavity to insulate and may be better suited to insulate with foam board. This proposal breaks the two assemblies into separately addressed assemblies.
- Adding the defined term Building Thermal Envelop ensures clarity

Cost Statement: The proposed language does not increase the cost of construction but rather offers guidance and clarity of existing requirements.

### Windows

#### Air barrier and air sealing criteria section:

- A simple adjective creates better clarity

#### Insulation installation criteria section:

- Often the framing around windows creates spaces that are odd sizes and shapes. I think of a recent house that I inspected that had several octangle widows fit into a square opening. The cavities that were created would not be defined as narrow cavities section of this table but would be addressed by the proposed language.
- Insulation installation must not be pushed to far into the cavity as it may interfere with drainage and flashing of the window.

#### Cost Statement:

- The proposed language does not increase the cost of construction but rather offers clarity of requirements.

### FLOORS

#### Component:

- It needs to be clear that the floor cavities that are being addressed by this table are only floor that separate conditioned from unconditioned space. It is surprising how not all understand this.

#### Air barrier and air sealing criteria section:

- Floor cavities are wall cavities laid down, therefore, air permeable insulation installed inside the cavity also needs to be enclosed by the air barrier assembly. As the IECC allows alternative insulation techniques for insulating floors as seen in the exceptions detailed in Section R402.2.8 it become more important to ensure that the rim joist of the insulated floor not only get insulated but is air tight because the insulation no longer must be installed adjacent to the subfloor decking. The proposed language change brings this to light for builders and trades that are executing the code requirements.

#### Insulation Installation Criteria:

- The insulation installation criteria outlined in the prescriptive section R402.2.8 clearly describes how insulation in floor systems must be installed. There is no need to further explain it in this table.

### Electrical Box etc.

#### Component column:

- Although technically speaking, low voltage, speaker, computer wire boxes, or fan housings are a form of electrical box many builders and trade partners only view true 20- or 15-amp power outlet or switch gang boxes as electrical boxes. By simply broadening the definition to Electrical, communication, and other equipment boxes, housings, and enclosures-we can ensure that any such box that is installed in an exterior wall or ceiling is insulated, and air sealed properly. This is the approach that just passed at the 2024 IECC hearings

#### Air barrier and air sealing criteria section:

- In this section the two requirements have been broken apart for greater clarity. First the box/housing must be sealed to the surface that it penetrates, they must be airtight, and an air barrier continuity must be maintained. An alternative is offered by directing builders to R402.4.6

Insulation Installation Criteria:

- Currently there is no guidance in this table regarding insulating installation. This added language rectifies this.

Cost Statement:

- The proposed language does not increase the cost of construction because the requirement was existing it just was not clear. This proposal offers clarity.

#### HVAC Boots

Air barrier and air sealing criteria section:

- The change to this section of language in the table slightly broadens the scope of sealing, to not only include air sealing between inside and outside, but to include sealing of all supply and return boots to the surface they penetrate. This helps to gain more control and predictability of air flow in and out of interstitial spaces as well as improves the performance of the HVAC system. This concept was first introduced by the EnergyStar program.

Insulation Installation Criteria:

- The supply and return duct boot installation and the insulation installation must be coordinated so that the insulation is not damaged or compressed resulting in the reduction of required R-value. Often little thought of the impact of poorly insulated duct boots is given.

Cost Statement:

- The proposed language does not increase the cost of construction, but rather offers guidance and clarity of existing requirements.

#### Common Walls

Air Sealing Criteria:

- Common walls used to be addressed by this table. Now that there are listed air sealing products that can be used in the assembly it is time to add them back to the table
- Common walls separating townhouse & duplex units have extreme air leakage. The BXUV guides has been updated to allow air sealing and this should be reflected in the IECC and specifically in Table R402.4.1.1. Below is an example of the new language that has been added to the following Shaft Liner assemblies: U336, U347, U366, U373, U375

8. **Caulk/Sealant** — (Optional, Not Shown, Intended for use as an air barrier - Not intended to be used as fireblocking) — ASTM C834, Type OP, Grade 0° C or -18° C Latex Sealant at the Shaftliner and C-Track (Item 1) and H-Stud (Item 2) framing locations.

8A. **Caulking and Sealants\*** — (Optional - Intended for use as an air barrier - Not intended to be used as fireblocking) - A bead of sealant applied around the partition perimeter in the 3/4 in. air space between wood framing (Item 4) and shaftliner panels (Item 3) to create an air barrier.

**DUPONT DE NEMOURS, INC.** — Great Stuff Gaps & Cracks, Great Stuff Pro Gaps & Cracks, Great Stuff Pro Window & Door

- Common walls separating townhouse & duplex units need to be treated like any other exterior wall that has a drop ceiling, tub, or other air barrier issue associated with this table within it. The 1" to 3/4" gap between the framed portion of the assembly and the gypsum area separation portion of many common wall assemblies, allows significant air flow between conditioned and unconditioned spaces which the requirements of Table R402.4.1.1 are designed to mitigate. If these issues are not addressed with common wall construction, it is even more difficult to achieve the air leakage requirements of the IECC.

Insulation Criteria:

- Insulation in area separations walls have traditionally been ignored as they are assumed to be an adiabatic wall with no heat loss or gain. In reality, a significant amount of air moves behind the interior drywall in these assemblies and therefore insulation installation makes a significant difference in their energy performance. The listed assemblies call out insulation installation which this section points to.

#### Cost

- Construction is expected to be impacted by this proposal because air sealing has not been allowed in most jurisdiction because of interpretations (right or wrong) of how area separation walls must be built. It is unclear how these assemblies used in town house and duplex construction, are complying with the air leakage requirements of the code. In the Colorado market most jurisdictions are allowing some level of air sealing and we are seeing compliance with air leakage requirements. So, in Colorado, and other similar markets, cost of construction will remain the same, and in other markets construction cost will go up, but air leakage compliance will also increase.

**Bibliography and Access to Materials** (as needed when substantiating material is associated with the amendment proposal):

**Other Regulations Proposed to be Affected**

**\*For proposals to delete content from the 2019 Denver Green Code in conjunction with adding it to other mandatory Denver codes and/or regulations, only.**

Please identify which other mandatory codes or regulations are suggested to be updated (if any) to accept relocated content.

**Referenced Standards**

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

**Impact**

How will this proposal impact cost and restrictiveness of code? ("X" answer for each item below)

Cost of construction:    \_\_\_ Increase    \_\_\_ Decrease    x\_\_\_ No Impact

Cost of design:        \_\_\_ Increase    \_\_\_ Decrease    \_x\_ No Impact

Restrictiveness:       \_\_\_ Increase    \_\_\_ Decrease    \_x\_ No Impact