



DENVER AMENDMENT PROPOSAL FORM FOR PROPOSALS TO THE 2019 DENVER BUILDING CODE AMENDMENTS AND THE 2021 INTERNATIONAL CODES

DENVER
THE MILE HIGH CITY

2021 CODE DEVELOPMENT CYCLE

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2) One proposal per this document is to be provided with clear and concise information.

Is a separate graphic file provided ("X" to answer): ___ Yes or _x__ No

3) Highlight the code and acronym that applies to the proposal

<u>Acronym</u>	<u>Code Name</u>	<u>Acronym</u>	<u>Code Name</u>
DBC-AP	Denver Building Code–Administrative Provisions	IPC	International Plumbing Code
IBC	International Building Code	IRC	International Residential Code
IECC	International Energy Conservation Code	IFGC	International Fuel Gas Code
IEBC	International Existing Building Code	IMC	International Mechanical Code
IFC	International Fire Code	DGC	Denver Green Code

Please provide all the following items in your amendment proposal.

Code Sections/Tables/Figures Proposed for Revision:

Instructions: If the proposal is for a new section, indicate (new), otherwise enter applicable code section.

Tables N1102.1.2/R402.1.2 and N1102.1.3/R402.1.3

Proposal:

Instructions: Show the proposal using strikeout, underline format.

Place an "X" next to the choice that best defines your proposal: X Revision X New Text X Delete/Substitute Deletion

Revise as Follows:

CLIMATE ZONE	FENESTRATION U-FACTOR ^f	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC ^{d, e}	CEILING U-FACTOR	WOOD FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
5 and Marine 4	0.30 <u>0.27/0.25^g</u>	0.55 <u>0.45</u>	NR	0.024	0.045	0.082	0.033 <u>0.026</u>	0.050	0.055

**TABLE N1102.1.2 / R402.1.2
MAXIMUM ASSEMBLY U-FACTORS^a AND FENESTRATION REQUIREMENTS**

For SI: 1 foot = 304.8 mm.

- a. Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source.
- b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.17 in Climate Zones 0 and 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.
- c. In Warm Humid locations as defined by Figure R301.1 and Table R301.1, the basement wall *U*-factor shall not exceed 0.360.
- d. The SHGC column applies to all glazed fenestration.
Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.
- e. There are no SHGC requirements in the Marine Zone.
- f. A maximum *U* factor of 0.32 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:
 - 1. Above 4,000 feet in elevation above sea level, or
 - 2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.
- g. Where the proposed glazing area is more than 15.0% of the conditioned floor area, as provided by Section R103.2 the second *U*-value shall be required.

**TABLE N11102.1.3 / R402.1.3
INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION UFACTOR ^{b, i, j}	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, c}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE ^g	MASS WALL R-VALUE ^h	FLOOR R-VALUE	BASEMENT WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^{e, f} WALL R-VALUE
5 and Marine 4	0.30ⁱ <u>0.27 / 0.25^j</u>	0.55 <u>0.45</u>	0.40	60	30 or 20 & 5ci ^h or 13 & 10ci ^h or 0 & 20ci ^h	13/17	30 <u>38</u>	15ci or 19 or 13 & 5ci	10ci, 4 ft	15ci or 19 or 13 & 5ci

For SI 1 foot = 304.8mm

NR = Not Required

ci = continuous insulation.

- a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.
- b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration except for that specifically used for passive solar design heat gain which is exempt.
Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.
- c. "5ci or 13" means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13 + 5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in addition to R-5 continuous insulation on the interior or exterior surface of the wall.
- d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation *R*-value for slabs, as indicated in the table. Slab edge insulation shall be installed to separate conditioned from unconditioned spaces including adjacent garages, entries, and porches. The slab-edge insulation for heated slabs shall not be required to extend below the slab.
- e. There are no SHGC requirements in the Marine Zone.
- f. Basement wall insulation is not required in Warm Humid locations as defined by Figure R301.1 and Table R301.1.
- g. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, "20 & 5" "13 + 5" means R-20 cavity insulation plus R-5 continuous insulation.
- h. Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies where more than half of the insulation is on the interior of the mass wall.
- i. A maximum *U* factor of 0.32 shall apply in Climate Zones 3 through 8 to vertical fenestration products installed in buildings located either:
 - 1. Above 4,000 feet in elevation, or

- ~~2. In windborne debris regions where protection of openings is required by Section R301.2.1.2 of the *International Residential Code*.~~
- j. Where the proposed glazing area is more than 15.0% of the conditioned floor area, as provided by Section R103.2, the second U-value shall be required.

Add as Follows:

Add #10 below to Section N1101.5/R103.2 Information on construction documents.

10. Glazing area as a percentage of conditioned floor area and wall area.

Supporting Information (Required):

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.

- Purpose: What does your proposal achieve?
- Reason: Why is your proposal necessary?
- Substantiation: Why is your proposal valid? (i.e. technical justification)

Based on energy modeling and in order to create parity and calibration between the prescriptive and performance compliance paths and in order to ensure movement toward the 2030 goals, changes were made in the R and U-value tables.

The U value changes for windows are based off of the Total Building Performance reference home table R405.4.2(1) Section “Vertical Fenestration other than opaque doors” where it states that:

Total area =

(a) The proposed glazing area, where the proposed glazing area is less than 15 percent of the conditioned floor area.

(b) 15 percent of the conditioned floor area, where the proposed glazing area is 15 percent or more of the conditioned floor area.

This section makes compliance with the IECC more difficult when the window to floor ratio is above 15%. Changes in the R and U-value table equalize compliance within the compliance paths to begin the journey to the climate action goal of zero energy new homes.

The SHGC has been lowered because of its impact on the Manual J headload calculation which has been driving up equipment sizing in order to have capacity to meet the load. This reduction can help lead to more right sized equipment which in turn leads to better efficiency and performance. An exception has been placed in footnote b for windows designed specifically for passive solar heat gain.

Slab edge insulation R-value is addressed in the Table and Under Slab insulation is addressed in footnotes. The under slab insulation R-value has been increased to that required in the table for slab edge insulation R10. These installation criteria have been strengthened here to ensure the total boundary of the slab is insulated in places where it traditionally has not been such as below the slab. In addition, the footnote now speaks to slab edge insulation installation between the conditioned space of the house and the non-conditioned such as the garage to better ensure full coverage of the slab edge that when not insulated cause excessive heat loss and comfort issues.

#10 of section R103.2 information on construction documents was added to help plan review and field inspection understand what the window to floor ratio for the project is without having to calculate it themselves.

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

9 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 ___ No Impact

Cost of design: Increase ___ Decrease ___ No Impact

Restrictiveness: Increase ___ Decrease ___ No Impact

Departmental Impact (City use only):

This amendment proposal increases/decreases/is neutral to the cost of plans review.

This amendment increases/decreases/is neutral to the cost of inspections.