



# 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

1) **Name:** Courtney Anderson **Date:** 10/12/2021  
**Email:** [Courtney.Anderson@denvergov.org](mailto:Courtney.Anderson@denvergov.org) **Representing (organization or self):**  
**City Staff Proposal (check box):**

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 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
<b>IECC</b>	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

## AMENDMENT PROPOSAL

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.

**IECC: C405.14**

**DGC:**

**Proposal:**

**Instructions:** Show the proposal using ~~strikeout~~, underline format.

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

**IECC:**

*Add the following sections and renumber the following equations:*

*Add new definition as follows:*

**COMMERCIAL COOKING APPLIANCES.** Appliances used in a commercial food service establishment for heating or cooking food. For the purpose of this definition, a commercial food service establishment is where food is prepared for sale or is prepared on a scale that is by volume and frequency not representative of domestic household cooking.

*Add new section as follows:*

**C405.14 Additional Electric Infrastructure.** The following fossil fuel appliances and equipment or connections serving new *buildings* shall be installed in accordance with this section and Section C404.10.

1. Water heating equipment with an input capacity less than 300,000 Btu/h
2. Warm air furnaces serving spaces without space cooling.
3. Fireplaces, ranges and stoves not defined as *commercial cooking appliances*.
4. *Commercial cooking appliances*

5. Fossil Fuel appliances and equipment serving *dwelling units* or *sleeping units*

**C405.14.1 Electric Infrastructure.** Fossil fuel appliances and equipment listed in Section C405.14 shall be provided with a junction box or receptacle located within 12” of the fossil fuel appliance or equipment that is connected to an electrical panel by continuous raceways or conductors that meet the following requirements:

1. The junction box, raceway, and bus bar in the electric panel and conductors serving the electric panel shall be sized to accommodate electric water heating equipment sized to serve the same load as the fossil fuel appliance or equipment.
1. The panel shall have reserved physical space for a three-pole circuit breaker.
2. The junction box and electrical panel directory entry for the dedicated circuit breaker space shall have labels stating “For future electric equipment”

**C404.10 Water heating equipment location.** Where required by Section C405.14, water heaters shall be located in a space with the following characteristics:

3. Minimum dimensions of 3 feet by 3 feet by 7 feet high
1. Minimum volume of 760 cubic feet, or the equivalent of one 16-inch by 24-inch grill to a heated space and one 8-inch duct of no more than 10 feet in length for cool exhaust air.

**Exceptions:**

1. Electric storage water heaters with a rated storage volume of less than 20 gallons.
2. Instantaneous water heaters located within 6 feet of the point of use.
3. The space and ventilation requirements shall be permitted to be reduced to conform with the manufacturer’s recommendations for a specific heat pump hot water heater that meets the requirements of Section C404. The specific heat pump water heater shall be identified on the construction documents.

**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?

This proposal adds a new section to C405 to require that certain gas end-uses in commercial buildings be provided with a minimum level of electric infrastructure and other building provisions in order to enable easier and less costly electrification of those loads in the future.

**Reason:** Why is your proposal necessary?

Meeting Denver’s climate goals will require a transition from combustion equipment to high-performance electric equipment running on low/no-carbon electricity. However, Denver is not quite ready to make a wholesale transition to all-electric buildings now, so it will be important to ensure that buildings built in the short-term can be easily and cost-effectively retrofit for all-electric operation in the future. One of the biggest expenses of electrification retrofits – and therefore barriers to electrification retrofits - is running electrical infrastructure through a completed and enclosed building. This significant future cost can be greatly reduced through making simple, low-cost modifications to buildings during construction that enable easier electrification in the future.

**Substantiation:** Why is your proposal valid? (i.e. technical justification)

The requirements are focused on two issues: enabling future electrical infrastructure installation and ensuring that gas water heaters can be replaced with high-performance heat pump water heaters (HPWHs) in the future.

The requirements are limited to only a sub-set of (generally smaller) gas equipment that have a clear electrification retrofit path now.

**Electric Infrastructure:**

C405.14.1 is focused on conduit and ensuring there is physical space for adding future electric equipment:

- Continuous raceways (or conductors, that is wires) allow the wiring for branch circuits to be easily run from panels to end uses without the need to open existing finished surfaces or installing unsightly surface conduit.
- Reserving physical space in the panel ensures that panels won't have to be replaced. Replacing a panel can be particularly costly if there is not enough physical space for a larger panel.
- Installing a panel with an upsized bus bar is a minimal cost upgrade that also ensures that the panel won't have to be replaced with the addition of additional loads, even if the panel breaker does have to be replaced.

The code section does not include requirements for reserved capacity. This is for two reasons. The first is that service and onsite transformer sizing is not very granular. Some buildings will require additional service capacity for additional loads and some will not, all depending on how closely other building loads match the standard service/transformer sizes serving the building. The second is that such a requirement could result in oversized building capacity, which could incur both higher up-front costs and higher monthly connection costs. This is a tradeoff since capacity upgrades are the other primary driver of electrification retrofit costs. However, advancements in electric equipment are allowing for reductions in required capacity for electric equipment. Additionally, the market is beginning to see the availability of load management equipment that is specifically intended to enable the addition of new electric equipment without upgrading building electric infrastructure capacity.

**Requirements for water heating:**

C404.10 is focused on ensuring that water heater locations are physically capable of incorporating a future HPWH. Section C405.14 includes a size threshold for all of the requirements, so C405.14 only applies to smaller, unitary water heaters and not larger boilers. C404.10 provides a series of requirements that ensure that the building can accommodate a HPWH in the future. Requirement 1 ensures that the water heater location is physically large enough to accommodate HPWHs that are frequently wider and/or taller than code-minimum gas water heaters. HPWHs require access to air as a source of heat for the heat pump. Requirement 2 ensures that a future HPWH has access to sufficient air volume to effectively and efficiently operate. The water heater either needs to be in a space large enough itself, or sufficiently vented/ducted to a space that is large enough. These requirements are based on the requirements adopted in several CA jurisdictions electrification reach codes.

**Commercial Cooking:** The proposal leverages the definition of commercial cooking appliances from the IMC to differentiate between small residential-scale cooking equipment that might be found in dwelling units or kitchenettes from more substantial equipment used in commercial kitchens.

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

None

**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.

None

**Referenced Standards:**

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

None

**Impact:**

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

## Cost:

The proposal will increase the cost of construction. Research by NBI and partners conducted for the NY state market indicates that the cost of adding dedicated branch circuits for the kinds of loads ranges from \$114 to \$1100 for labor and materials depending on the capacity of the circuit and (more importantly) the location of the circuit termination relative to the panel. The proposed Denver requirements (raceways) involves less material investment, so should be even cheaper.

The cost of retrofitting buildings for electrification retrofits can be highly variable and substantial. A small investment during new construction will save building owners substantial future costs. Given the market and regulatory trends for electrification in Denver, it is not a question of whether Denver buildings will need electrification retrofits but when. Failing to adopt this proposal will be saddling future building owners with substantially higher costs.

Cost of construction:	<input checked="" type="checkbox"/> Increase	<input type="checkbox"/> Decrease	<input type="checkbox"/> No Impact
Cost of design:	<input type="checkbox"/> Increase	<input type="checkbox"/> Decrease	<input type="checkbox"/> No Impact
Restrictiveness:	<input checked="" type="checkbox"/> Increase	<input type="checkbox"/> Decrease	<input type="checkbox"/> 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.