



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 **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
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

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.

R404.4

Add new section as follows:

R404.4 Additional Electric Infrastructure. Fossil fuel appliances and equipment shall be installed in accordance with this section and Section R403.5.4.

Exceptions:

1. Fossil fuel space heating equipment where a 208/240-volt electrical circuit with a minimum capacity of 40 amps exists for space cooling equipment.
2. Water heating equipment with an input capacity greater than 300,000 Btu/h that serves multiple dwelling units or sleeping units.

R404.4.1 Electric Infrastructure. Fossil fuel appliances and equipment shall be provided with a junction box or receptacle located within 12” of the gas appliance, equipment or end-use that is connected to an electrical panel by continuous raceways or conductors that meets 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. The panel shall have reserved physical space for a dual-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”

Modify section as follows:

R403.5 Service hot water systems. Energy conservation measures for service hot water systems shall be in accordance with Sections R403.5.1 through ~~R403.5.3~~ R403.5.4.

Add new section as follows:

R403.5.4 Water heating equipment location. Where required by Section R404.4, water heaters shall be located in a space with the following characteristics:

1. Minimum dimensions of 3 feet by 3 feet by 7 feet high
2. 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 water heaters with a rated storage volume of less than 20 gallons.
2. The space and ventilation requirements may be reduced to conform with the manufacturer’s recommendations for a specific heat pump hot water heater that meets the requirements of Section R403.5. The specific heat pump water heater shall be identified on the construction documents and the certificate required by Section R401.3.

Revise table as follows:

**TABLE R406.2
REQUIREMENTS FOR ENERGY RATING INDEX**

SECTION ^a	TITLE
Mechanical	
<u>R403.5.4</u>	<u>Water heating equipment location</u>
Electrical Power and Lighting Systems	
<u>R404.4</u>	<u>Additional Electrical Infrastructure</u>

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 R404 to require that certain gas end-uses in residential 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 one of the largest 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 proposal is limited to gas equipment that serves individual dwelling units. Larger equipment that serves multiple dwelling units is exempt from the requirements as the implications of electrification of large loads are different.

Electric Infrastructure:

R404.4.1 is focused on raceways and ensuring there is physical space for adding future electric equipment:

- The installation of conductors or continuous raceways allow the addition of branch circuits from panels to end uses without the need to open existing finished surfaces or installing unsightly surface raceways or conduit. The provisions allow for an attic to be used as a link for non-continuous conduit, which would lower compliance costs in many cases.
- 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 building capacity. Such a requirement could result in building capacity upgrades, 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 equipment location:

R403.5.4 is focused on ensuring that water heater locations are physically capable of incorporating a future HPWH. It 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.

R406

The proposal also includes a modification to the mandatory table in R406 to ensure that projects using the ERI method will also comply with this requirement.

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)

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 a dedicated branch circuit ranges from \$114 to \$300 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 homes for electrification retrofits can be highly variable and substantial. The cost of adding a 240V circuit can range from \$400-1700 according to homeguide.com. A small investment during new construction will save homeowners substantial future costs. Given the market and regulatory trends for electrification in Denver, it is not a question of whether Denver homes will need electrification retrofits but when. Failing to adopt this proposal will be saddling future homeowners with substantially higher costs.

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.