



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.

C406.12

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

Add the following sections and renumber the following equations:

Add definitions as follows:

ALL-ELECTRIC PROPERTY. *A property that contains no permanently installed equipment or appliances that utilize combustion, or plumbing for fuel gas or fuel oil, installed within the building(s) or site.*

COMBUSTION. *In the context of this code, refers to the rapid oxidation of fuel accompanied by the production of heat or heat and light.*

Modify the section as follows:

TABLE C406.1
Additional Energy Efficiency Credits for Denver

Sub-section / Occupancy:	Group B	Group R and I	Group E	Group M	Other _a Occupancies
C406.2.1: 5% Heating Eff Imprv.	NA	1	2	2	2
C406.2.2: 5% Cooling Eff Imprv.	2	1	1	2	2

C406.2.3: 10 % Heating Eff Imprv.	1	2	4	4	3
C406.2.4: 10 % Cooling Eff Imprv.	5	1	2	3	3
C406.3: Reduced Light Power	8	2	9	14	8
C406.4: Enh. Digital Light Ctrl	2	NA	2	3	3
C406.5.1: On-site Renewable Egy.	9	7	6	7	7
C406.6: Dedicated OA Sys (DOAS)	3	5	NA	3	4
C406.7.2: Recovered/Renew SWH_b	NA	14	1	NA	14
C406.7.3: Eff fossil fuel SWH_b	NA	9	3	NA	9
C406.7.4: Heat Pump SWH_b	NA	5	1	NA	5
C406.8: Enhanced Envelope Perf	7	5	3	5	5
C406.9: Reduced Air Infiltration	4	5	NA	2	4
C406.10 Energy Monitoring	3	1	3	4	3
C406.11 Fault Detection	1	1	1	1	1
C406.12.1 Electric Space Heating	21	30	30	35	NA
C406.12.2 Electric Water Heating	21	30	23	6	NA

- a. Other occupancy groups include all Groups except for Groups B, R, I, E, and M
b. For occupancy groups listed in C406.7.1 and schools with showers or full-service kitchens

Modify the section as follows:

C406.7 Reduced energy use in service water heating. Buildings shall comply with Section C406.7.1 and Section C406.7.2, or C406.7.3 ~~or C406.7.4.~~

~~**C406.7.4 Heat pump water heater.** Where electric resistance water heaters are allowed, all service hot water system heating requirements shall be met using heat pump technology with a combined input capacity weighted average EF of 3.0. Airsource heat pump water heaters shall not draw conditioned air from within the building, except exhaust air that would otherwise be exhausted to the exterior.~~

Add the following section:

C406.12 Building electrification. Buildings shall comply with C406.12.1 or C406.12.2. All-electric properties shall not be eligible for credits from this section.

C406.12.1 Electric Space Heating. The building shall be provided with electrically operated equipment for all space heating. No less than 75% of space heating loads shall be served by equipment with a COP greater than 1.0.

C406.12.2 Electric Water Heating. The building shall be provided with electrically operated equipment for all service water heating. No less than 75% of water heating loads shall be served by equipment with a COP greater than 1.0.

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 creates two additional credit options for C406 based on partial electrification to create greater flexibility in Section C406 and to reward the benefit of building electrification.

Reason: Why is your proposal necessary?

“Denver’s Net Zero Energy (NZE) New Buildings & Homes Implementation Plan” includes four foundations to achieve Denver’s climate goals: efficiency, electrification, grid flexibility and renewable energy. With XCEL’s mandated carbon reduction goals for the electrical

grid serving Denver (80% reduction by 2030, zero carbon by 2050), electrification provides an opportunity to make substantial carbon reductions over the lifespan of a building. Considering this, adding credit options for electrification to Section C406 both enables C406 to better support meeting Denver's climate goals while also providing greater flexibility for projects. The addition of more efficiency credit options is especially important in light of Denver's goals for increased adoption of efficiency and renewable energy in the Denver Energy Code.

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

This proposal adds credit options for both space heating electrification and water heating electrification. The requirements for these credit options include a provision ensuring that the electric equipment is mostly heat-pump technology. Since the credit calculations are based on an average COP of 1.25 (see below), this ensures that projects generally adopt heat pump technology and that the actual carbon performance of the equipment should be better than the assumptions in the calculations.

The value of the options varies by building type, reflecting the different proportion of total energy in different building types represented by these two loads. The credits were calculated by calculating the carbon emission savings that would result over the lifecycle of a building (assumed to be 50 years and an average CO of 1.25 to represent the impact of low-temperature heat pump operation and resistance heating equipment), calculating the efficiency improvement that would be required from a standard mixed fuel-building to generate the same carbon emissions savings, and assigning the credit value that amount of efficiency gains. The calculations were based on the EUI target for each building type identified in "Denver's Net Zero Energy (NZE) New Buildings & Homes Implementation Plan." (If the Denver Energy Code does not meet the EUI targets set in the plan, the value of electrification would actually be even higher, so these numbers are conservative.) The gas/electric breakdown was based on the building prototypes developed by Pacific Northwest National Lab (PNNL) to assess the energy impact of advancements in the national model energy code (the ASHRAE 90.1-2013 models were used). The breakdown of gas loads for space heating and water heating was based on analysis of the Denver building stock conducted by the City of Denver (this is why some of the building types have NA for the credit value, the end-use breakdown for these building types were not available). The 50-year carbon savings from electrification were calculated along with the efficiency savings that would be necessary to generate an equivalent carbon emissions savings. These efficiency savings were then converted at the percentage savings-to-credits ratio used in the 2021 IECC (1 credit per .25% savings).

The proposal also eliminates Section C406.7.4. This section is similar to this proposal since it provides credit for utilizing heat pump water heaters for SWH. However, its applicability is narrower than the option provided in this proposal and the credit values. The credit values of Section C406.7.4 are also based on efficiency alone, while the credit values for this proposal also capture the decarbonization value of electrification.

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 reduce the cost of construction by giving projects another option for obtaining additional efficiency credits. In many cases, all-electric buildings are less costly to construct than mixed-fuel buildings.

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