



SECTION	5B
C406.2.1: 5% heating efficiency improvement	NA
C406.2.2: 5% cooling efficiency improvement	2
C406.2.3: 10% heating efficiency improvement	1
C406.2.4: 10% cooling efficiency improvement	5
C406.3: Reduced lighting power	8
C406.4: Enhanced digital lighting controls	2
C406.5: On-site renewable energy	9
C406.6: Dedicated outdoor air	3 6
C406.7.2: Recovered or renewable water heating	NA
C406.7.3: Efficient fossil fuel water heater	NA
C406.7.4: Heat pump water heater	NA
C406.8: Enhanced envelope performance	7
C406.9: Reduced air infiltration	4
<u>C406.10 Cold-climate heat pump</u>	<u>8</u>

*Note: There would be a similar additional row to the energy efficient credit tables for other occupancies, with an additional credit C406.10 for qualifying systems for occupancies R and I (10 points), E (6 points), M (6 points), and 5 points for other occupancies.*

**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.

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

**Purpose:** this proposal introduces a new energy efficiency credit to section C406 of the Denver amendments to the IECC. The credit would provide efficiency points for projects that exclusively utilize cold-climate heat pump technology to contribute towards the city and state's decarbonization goals. The cold-climate heat pumps limit the use of electric resistance heating to very cold outdoor air temperatures. While the technology does not eliminate electric resistance heating completely, it does improve performance in Denver's winter climate conditions, while promoting Denver's electrification goals. This measure moves the city towards electrification goals.

Qualifying equipment must meet performance specification similar to the Northeast Energy Efficiency Partnership's air-source cold-climate heat pump program. The specification requires participating manufacturers to test and publish capacity and energy performance at 5F outdoor conditions.

Heat pumps tend to lose some of their rated efficiency and capacity at low outdoor air temperatures. The cold-climate heat pumps listed in the NEEP database have approximately 40% lower capacity at 5F than the capacity at the rated condition of 47F. The following additional criteria are recommended:

1. The tested coefficient of performance (COP) at 5F is at least 2.0.
2. All cold-climate heat pumps are sized to meet 80% of the heating demand at 5F without supplemental heat.

A related proposal adjusts the energy efficiency credits in the Denver Building Code (IECC), to (1) require additional efficiency to get credit points and (2) establish a higher efficiency tier for additional credit points. The credit points for packaged equipment should be based on both full-load and part-load efficiency metrics, where present.

**Reason:** Equipment with this performance is available for many smaller split and packaged heat pumps, but projects do not always specify the high-performance equipment. Conventional heat pumps can occasionally be configured in multifamily buildings to use supplemental electric resistance heat even at mild outdoor temperatures, to rapidly "boost" the temperature to setpoint.

Providing incentives for cold-climate heat pumps is important because it allows for electricity-based space heating. Conventional heat pumps begin to lose their performance and capacity at milder outdoor air temperatures and use supplemental resistance heat more frequently, which can result in high winter energy use. Credits for CCHPs will move the industry away from using gas for space heating.

Revising the efficiency credit in the IECC to align with high-performance and best-in-class equipment will provide additional flexibility, while incentivizing high performance equipment. In commercial buildings, equipment runs most often at part-load, and equipment with high part-load performance will save additional energy. The current credit points are limited to equipment that is only slightly more efficient than federal minimums.

**Substantiation:** Identify high-performance equipment meeting the proposed Standard for all applicable equipment categories.

### NEEP, Cold Climate Air-Source Heat Pump Specification (Version 3.0)

As facilitated by Northeast Energy Efficiency Partnerships (NEEP) EFFECTIVE JANUARY 1, 2019

The following specification defines a set of performance requirements and reporting requirements to meet the voluntary "Cold-climate Air-Source Heat Pump Specification" (ccASHP Specification). The specification was designed to identify air-source heat pumps that are best suited to heat efficiently in cold climates (IECC climate zone 4 and higher). The specification is intended as a model equipment specification to be used broadly by energy efficiency program administrators in cold climates as a minimum requirement for program qualification. It also is intended for engineers, contractors, and other practitioners who need assurance that the equipment they select will have the required heating capacity at design temperature without unnecessary oversizing, and will serve the load efficiently throughout the ambient temperature range. Stakeholders should be aware that simply meeting the performance requirements does not necessarily mean a product is appropriate for all cold climate applications. Consumers, contractors, and designers should review building loads, equipment capacities at design temperatures, and other important factors before selecting equipment.

#### Scope

- Air-to-air, split system heat pumps
- Indoor and outdoor units must be part of an AHRI matched system, defined by federal regulation 10CFR §430.2 as a central air conditioning heat pump

- Compressor must be variable capacity (three or more distinct operating speeds, or continuously variable)
- Non-ducted ASHP systems1 • Single-zone ASHP systems with non-ducted indoor units (i.e. wall, ceiling, floor, etc.) • Multi-zone systems rated with non-ducted indoor units
- Ducted ASHP systems2 • Centrally ducted • Single-zone systems with compact-ducted indoor unit • Multi-zone systems rated with all ducted or mixed (ducted and non-ducted) indoor units • Does NOT include ground-source, water-source, or air-to-water heat pump systems

**Performance Requirements**

- For Non-Ducted systems: HSPF >10
- For Ducted systems: HSPF >9 • COP @5°F >1.75 (at maximum capacity operation)
- SEER > 15
- Lab testing results OR engineering data for each system must be reported through the attached “Cold Climate Air-Source Heat Pump Performance Information Tables”. Incomplete tables will not be considered.

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

2020 Northeast Energy Efficiency Alliance, Cold Climate Ductless Heat Pump Specification and Recommendations, <https://akheatsmart.org/wp-content/uploads/2020/11/NEEA-Cold-Climate-DHP-Spec-and-Recommendations.pdf>, September 2020.

**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.

None.

**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