



# 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 \_\_\_ 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	<b>DGC</b>	Denver Green Code

## AMENDMENT PROPOSAL

Please provide all the following items in your amendment proposal.

**Code Sections/Tables/Figures Proposed for Revision:**

**701.4.8.1**

For reference:

**C405.12 Energy monitoring.** New buildings with a gross *conditioned floor area* of 25,000 square feet (2322 m2) or larger shall be equipped to measure, monitor, record and report energy consumption data in compliance with **Sections C405.12.1** through **C405.12.5**.

**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 \_\_\_ Delete/Substitute \_\_\_ Deletion

*The changes include a revision to the Energy Star section of the DGC, and additional requirements for end use monitoring.*

**701.4.7.3.2 (7.4.7.3.2) ENERGY STAR Requirements for Equipment Covered by Federal Appliance Efficiency Regulations.** All *building projects* shall comply with the equivalent criteria required to achieve the ENERGY STAR label if installed prior to the issuance of the certificate of occupancy. Building projects shall include a statement of intent to install products only meeting the specifications in 701.4.7.3.2a through 701.4.7.3.2.f below for any equipment not installed prior to the issuance of the certificate of occupancy. For those products listed below that are also contained in Normative Appendix B, the installed equipment shall comply by meeting or exceeding both the requirements in this section and in Normative Appendix B.

a. Appliances:

1. Clothes washers: ENERGY STAR MOST EFFICIENT Program Requirements for Clothes Washers [see also the water efficiency requirements in Section 601.3.2.2 (6.3.2.2)].
2. Clothes dryers: ENERGY STAR MOST EFFICIENT Program Requirements for Clothes Dryers
2. Dehumidifiers: ENERGY STAR Program Requirements for Dehumidifiers.

3. Dishwashers: ENERGY STAR **MOST EFFICIENT** Program Requirements Product Specifications for *Residential Dishwashers* [see also the water efficiency requirements in Section 601.3.2.2 (6.3.2.2)].
  4. Refrigerators and freezers: ENERGY STAR **MOST EFFICIENT** Program Requirements for Refrigerators and Freezers.
  5. Room air conditioners: ENERGY STAR Program Requirements and Criteria for Room Air Conditioners.
- b. Heating and Cooling:
1. *Residential* air-source heat pumps: ENERGY STAR Program Requirements for ASHPs and Central Air Conditioners [see also the energy efficiency requirements in Section 701.4.1 (7.4.1)].
  2. *Residential* boilers: ENERGY STAR Program Requirements for Boilers [see also the energy efficiency requirements in Section 701.4.1 (7.4.1)].
  3. *Residential* central air conditioners: ENERGY STAR Program Requirements for ASHPs and Central Air Conditioners [see also the energy efficiency requirements in Section 701.4.1 (7.4.1)].
  4. *Residential* ceiling fans: ENERGY STAR Program Requirements for *Residential* Ceiling Fans.
  5. Dehumidifiers: ENERGY STAR Program Requirements for Dehumidifiers.
  6. *Residential* warm air furnaces: ENERGY STAR Program Requirements for Furnaces.
  7. *Residential* geothermal heat pumps: ENERGY STAR Program Requirements for Geothermal Heat Pumps.
- c. Water Heaters: ENERGY STAR Program Requirements for *Residential* Water Heaters.
- d. Lighting:
1. Lamps: ENERGY STAR Program Requirements for Lamps (Light Bulbs).
  2. Luminaires: ENERGY STAR Program Requirements for Luminaires.
  3. *Residential* light fixtures: ENERGY STAR Program Requirements for *Residential* Light Fixtures.
- e. Commercial Food Service:
1. Commercial refrigerators and freezers: ENERGY STAR Program Requirements for Commercial Refrigerators and Freezers.
  2. Commercial ice machines: ENERGY STAR Program Requirements for Commercial Ice Machines.
- f. Other Products:
1. Battery charging systems: ENERGY STAR Program Requirements for Products with Battery Charger Systems (BCSs).
  2. External power adapters: ENERGY STAR Program Requirements for Single-Voltage AC-DC and AC-AC Power Supplies.
  3. Vending machines: ENERGY STAR Program Requirements for Refrigerated Beverage Vending Machines.

**Exception 1.** Projects shall be exempt from specifying Energy Star Most Efficient appliances as required above if it can be shown that ADA requirements result in no qualifying products. Projects shall use EnergyStar appliances where the exception to EnergyStar Most Efficient is claimed.

**701.4.8 The following requirements shall supersede Section C405.12 of the Denver Supplement to the IECC:**

**701.4.8.1 Energy monitoring.** New buildings with a gross conditioned floor area of 10,000 square feet (929 m<sup>2</sup>) or larger shall be equipped to measure, monitor, record and report energy consumption data in compliance with Sections C405.12.1 through C405.12.5.

**Exception:** R-2 occupancies and individual tenant spaces are not required to comply with this section provided that each space has its own utility services and meters .

**701.4.8.1.1 ~~C405.12.1~~ Electrical energy metering.** For all electrical energy supplied to the building and its associated site, including but not limited to site lighting, parking, recreational facilities and other areas that serve the building and its occupants, meters or other measurement devices shall be provided to collect energy consumption data for each end-use category required by **IECC C405.12.2**.

**701.4.8.1.2 ~~C405.12.2~~ End-use metering categories.** Meters or other approved measurement devices shall be provided to collect energy use data for each end-use category indicated in **IECC Table C405.12.2**. Where multiple meters are used to measure any end-use category, the data acquisition system shall total all of the energy used by that category. Not more than 5

percent of the measured load for each of the end-use categories indicated in **IECC Table C405.12.2** shall be permitted to be from a load that is not within that category.

**Exceptions:**

1. HVAC and water heating equipment serving only an individual dwelling unit shall not require end-use metering.
2. End-use metering shall not be required for fire pumps, stairwell pressurization fans or any system that operates only during testing or emergency.
3. End-use metering shall not be required for an individual tenant space having a floor area not greater than 2,500 square feet (232 m<sup>2</sup>) where a dedicated source meter complying with **IECC C405.12.3** is provided.

**701.4.8.1.3 Disaggregation of end uses.**

Plug loads, including appliances rated less than 25 kVA shall be monitored as follows:

- (a) For buildings with plug loads exceeding 25 kVA in an area less than 5,000 sf shall be separately monitored
- (b) For buildings with service greater than 250 kVA, plug load measurements shall be separated (disaggregated) by floor, type, or area

**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 addresses energy use of unregulated plug loads and other unregulated energy use. Currently, regulations on plug loads are limited to controls and energy monitoring. Denver's commercial building code will not be able to reach long-term goals without addressing plug loads and other unregulated loads. To achieve continued reduction in total building energy use, energy end uses of installed appliances and other unregulated loads must be addressed.

**Reason:** Unregulated loads can constitute as much as 30% to 50% of the total energy use of commercial buildings. As buildings become increasingly stringent through efficiency measures, the fraction of loads that are unregulated increases each code cycle. Unregulated loads include not only plug loads, but also process loads of computer servers and commercial refrigeration, and building-specific equipment such as elevators and air compressors.

This proposal presents the following changes to the Denver Green Code:

- 1) Lower the threshold for energy monitoring requirements from 25,000 sf to 10,000 sf.
- 2) Require disaggregation of loads by end use for larger buildings
- 3) Require Energy Star Most Efficient for the types of appliances where equipment with this designation is available and where current market penetration for Energy Star equipment is significant.
- 4) Require demand responsive control for controlled receptacles. This submeasure aligns with Denver's goals of promoting grid-interactive, resilient buildings.

The following issues are not directly addressed in this proposal but should be evaluated in the next code cycle for inclusion in the DGC and/or Denver Supplements to the IECC.

- 1) Establish power allowances for commercial refrigeration for full-scale supermarkets by floor area and function. Current regulations have focused on component efficacy but do not specify power or energy consumption allowances for refrigeration.
- 2) Establish power allowances for big box retail with commercial refrigeration by refrigeration floor area.
- 3) Develop aggressive requirements for computer rooms and data centers.
- 4) Establish requirements for elevators. One possible requirement for the Denver Green Code is to require regenerative drives for traction elevators, which can save 40% over non-regenerative elevators. (Sachs 2015).

*There is also a companion proposal to this proposal, "26b Solar Contribution to EUI Targets", that addresses the challenges in meeting a performance energy target that requires a 23% reduction in unregulated loads while not being permitted to claim unregulated load energy reductions relative to the baseline.*

**Substantiation:** The lower threshold for energy monitoring is achievable with readily available technology. While there is some additional cost, there is a substantial benefit: a large portion of smaller buildings do not have dedicated facilities staff onsite to monitor energy use. Most attention is placed on when there are comfort complaints; even offline equipment may not be detected.

Disaggregation for energy monitoring by end use will provide facility managers and building owners with more actionable information about how they and their tenants are using energy.

Energy Star Most Efficient (ESME) is a designation for the highest efficiency tier available for residential and commercial appliances. EnergyStar publishes reports of the market penetration rates of rated equipment and appliances. The appliances categories included in this proposal are equipment that have low but significant market penetration for EMSE equipment.

EnergyStar residential washer and dryer appliances have a high market penetration rate. For example, clothes washers have a market penetration of 50% and clothes dryers have a market penetration of 38%. (Energy Star 2019). While Energy Star specification is still a good requirement, the high adoption rates indicate that savings attributed to code will be reduced by natural market adoption, and that higher efficiency levels beyond Energy Star are possible for some appliances. One high-performance code recommendation is to require “Energy Star Most Efficient” products for appliances with this tier as an advanced specification. Residential washers and dryers qualifying as ENERGY STAR MOST EFFICIENT are available from several of the largest laundry equipment manufacturers, including Samsung, LG, Whirlpool, Bosch, Miele, Beko, and Bloomberg.

Controlled receptacle requirements are already in place that disable controlled outlets when a workstation or area is unoccupied. This submeasure extends these requirements to provide automatic demand response capability when a signal is received from a utility or authority that a critical peak period has been reached. As with controlled receptacles, the loads would be connected so that critical equipment would remain online. The 2022 Title 24 Building Energy Efficiency Standards have included a requirement for demand-controlled receptacles.

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

2022 Title 24 Building Efficiency Standards, California Energy Commission.

Energy Star 2018. Cost & Savings Estimates, Energy Star Certified Homes, Version 3, December 2018.

<https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Version%203%20Cost%20%20Savings%20Summary.pdf>

City of Santa Clara 2020. Appliance Energy Use Chart. Accessed April 2021.

<https://www.siliconvalleypower.com/residents/save-energy/appliance-energy-use-chart>

Energy Star 2019. ENERGY STAR® Unit Shipment and Market Penetration Report Calendar Year 2018 Summary,

[https://www.energystar.gov/ia/partners/downloads/unit\\_shipment\\_data/2018/2018%20Unit%20Shipment%20Data%20Summary%20Report%20.pdf?ff4f-7d06](https://www.energystar.gov/ia/partners/downloads/unit_shipment_data/2018/2018%20Unit%20Shipment%20Data%20Summary%20Report%20.pdf?ff4f-7d06)

Sachs, Harvey, H. Misuriello, S. Kwatra 2015, Advancing Elevator Energy Efficiency, Report A1501. American Council for an Energy Efficiency Economy, January 2015.

**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