DENVER ENERGY CODE CORRELATION DOCUMENT

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DENVER ENERGY CODE CORRELATION DOCUMENT

COMPRISED OF

DENVER AMENDMENTS IN THE 2025 DENVER ENERGY CODE

CORRELATED TO

THE 2024 EDITION OF THE

COLORADO MODEL LOW ENERGY AND CARBON CODE

AS PUBLISHED BY THE

INTERNATIONAL CODE COUNCIL (ICC)

The content of the sections in this Code that begin with a letter or letters designations are maintained by other City or State entities.

[CRS] Colorado Revised Statute
[DOTI] Department of Transportation and Infrastructure/Wastewater Management

AMENDMENTS TO THE 2024 COLORADO MODEL LOW ENERGY AND CARBON CODE

The 2024 Colorado Model Low Energy and Carbon Code adopted in D.R.M.C. Sec. 10-16 is amended in the following particulars:

ENERGY CODE COMMERCIAL PROVISIONS

CHAPTER 1 [CE]: SCOPE AND ADMINISTRATION

THIS CHAPTER WILL BE AMENDED INTERNALLY BY DENVER STAFF OUTSIDE OF THE PUBLIC AMENDMENT PROCESS.

CHAPTER 2 [CE]: DEFINITIONS

SECTION C202 GENERAL DEFINITIONS

The following definitions are amended or added as follows:

ALL-ELECTRIC PROPERTY. A property on a single assessment parcel with an accompanying legally described area of land as shown on a site plan, that, except for *emergency power systems* and *standby power systems*:

1) Contains no permanently installed equipment or appliances that utilize combustion, plumbing for *fuel gas* or fuel oil, or fuel gas utility connection installed within the *building(s)* or *site*; or,

2) Contains at least one new stand-alone all-electric *building* where the property includes existing *fuel gas* or fuel oil infrastructure built under a code effective prior to May 1, 2023.

AUTOMOBILE PARKING SPACE. A space within a *building* or private or public parking lot, exclusive of driveways, ramps, columns, and work areas, for the parking of an automobile.

COMBUSTION EQUIPMENT. For this code, any equipment or appliance used for space heating, ventilation conditioning, space cooling, *service water heating* (including pools and spas), cooking, clothes drying, humidification, or lighting that uses *fuel gas* or *fuel oil*.

CORE AND SHELL. The phase of a new *building* or portions of a new *building* that has the outer *building* thermal envelope constructed and may contain interior lighting and heating and has not received a permanent certificate of occupancy.

DEMAND RESPONSE PROGRAM. An agreement between a *building* occupant or *building* owner and third party to install and operate *demand responsive controls* in the *building* that automatically adjust *building* operations in response to a *demand response signal* from the third party.

ELECTRIC VEHICLE CAPABLE SPACE (EV CAPABLE SPACE). A designated *automobile parking space* that has conduit and/or raceway installed to support future installation of *EVSE* and has sufficient physical space adjacent to the existing electrical equipment for future upgrades. *EV Capable Spaces* do not require a *building* to provide sufficient electrical panel or service load capacity for future EV charging.

ELECTRIC VEHICLE ENERGY MANAGEMENT SYSTEM (EVMS). An *electric vehicle energy management system* is a technology that controls *electric vehicle supply equipment (EVSE)* loads by connecting, disconnecting, increasing, or decreasing power simultaneously to multiple electric vehicles. *Electric vehicle energy management systems* are also known as 'smart charging', 'power sharing', or 'load sharing' systems.

ELECTRIC VEHICLE SUPPLY EQUIPMENT INSTALLED SPACE (EVSE INSTALLED SPACE). An *automobile parking space* that is provided with a dedicated *EVSE* connection.

ELECTRIC VEHICLE ENERGY MANAGEMENT SYSTEM (EVMS). An *electric vehicle energy management system* is a technology that controls electric vehicle supply equipment (*EVSE*) loads by connecting, disconnecting, increasing, or decreasing power simultaneously to multiple electric vehicles. *Electric vehicle energy management systems* are also known as 'smart charging', 'power sharing', or 'load sharing' systems.

ELECTRIFICATION RETROFIT FEASIBILITY REPORT. A report that analyzes the feasibility of using an electric heat pump when certain appliances are proposed to be replaced without an electric heat pump, and that also lists the following: the cost of the appliance with and without an electric heat pump; the annual energy cost of the appliance with and without an electric heat pump; and the social cost of carbon dioxide over the life of the appliance with and without an electric heat pump.

EMERGENCY EQUIPMENT REPLACEMENT. Where only one piece of heating equipment, cooling equipment, ventilation system, or service water heating equipment is failing and is replaced by another having the same heating or cooling capacity, and no other alterations are made to the central HVAC system or central water heating system.

EMERGENCY POWER SYSTEM. A source of automatic electric power of a required capacity and duration to operate required life safety, fire alarm, detection, and ventilation systems in the event of a failure of the primary power. Emergency power systems are those required for electrical loads where interruption of the primary power could result in loss of human life or serious injuries.

FUTURE ELECTRIC EQUIPMENT. Electrically-powered equipment that could be installed in the future to replace *combustion equipment* to meet a similar end use or load.

GROUP R. For this code, *buildings* or portions of *buildings* that contain any of the following occupancies as established in the *Denver Commercial Building Code*:

1. Group R-1.
2. Group R-2 .
3. Group R-4 more than three stories in height above grade plane.

PARKING FACILITY, NEW. A new *parking facility* or the area of expansion of an existing *parking facility* having an expansion area greater than 30% of the existing *parking facility*.

PARKING FACILITY. A contiguous parking area that can be accessed by a vehicle from a single entrance.

RESIDENTIAL BUILDING. For this code, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses) as well as Group R-3 and R-4 *buildings* three stories or less in height above grade plane.

STANDBY POWER SYSTEM. A source of automatic electric power of a required capacity and duration to operate required *building*, hazardous materials or ventilation systems in the event of a failure of the primary power. Standby power systems are those required for electrical loads where interruption of the primary power could create hazards or hamper rescue or fire-fighting operations.

WATER USAGE EFFECTIVENESS, SITE. The total water consumed onsite for a data center divided by its electrical energy consumption, in units of liters per kilowatt hour (L/kWh). Represented as WUE_{site} or WUE; when no subscript is present the water usage effectiveness is presumed to be at the site level.

CHAPTER 4 [CE]: COMMERCIAL ENERGY EFFICIENCY

SECTION C401 GENERAL

Section C401.2.1 International Energy Conservation Code is renamed Denver Energy Code and amended as follows:

C401.2.1 Denver Energy Code. *Commercial buildings* shall comply with one of the following:

1. Prescriptive Compliance. The Prescriptive Compliance option requires compliance with Sections C402 through C406 and C408.
2. *Simulated Building Performance*. The *Simulated Building Performance* option requires compliance with Section C407.

Exception: *Additions*, *alterations*, *repairs*, and changes of occupancy to existing *buildings* complying with Chapter 5.

SECTION C402 BUILDING ENVELOPE REQUIREMENTS

Section C402.1.2.1.6.1 Thermal resistance of cold-formed steel walls with exterior cavity insulation located between z-girts is added as follows:

C402.1.2.1.6.1 Thermal resistance of cold-formed steel walls with exterior cavity insulation located between z-girts. Where vertical or horizontal metal z-girts extend continuously through exterior insulation on steel frame walls, the exterior insulation shall be considered *cavity insulation* and the U-factor of the assembly shall be determined for compliance in accordance with Section C402.1.2.1.6. The effective R-value of exterior insulation located in the cavity between continuous z-girts shall be determined by multiplying the rated R-value of the exterior cavity insulation by one of the following correction factors:

1. 0.7 for horizontal z-girts
2. 0.6 for vertical z-girts aligned with steel studs.

Exceptions:

1. Where metal z-girts or channels are placed over top of an exterior insulation layer and are fastened through the exterior insulation without compressing the exterior insulation or are attached to intermittent clips extending through the full thickness of the exterior insulation, the exterior insulation layer shall be considered as *continuous insulation* for purposes of compliance with Section C402.1, Item 1.
2. Where a U-factor for the assembly with z-girts is determined by design using an *approved* analysis method or by testing in accordance with ASTM C1363.

Section C402.1.4 Component performance is amended by adding the following sentence to the end of the section (remainder of Section C402.1.4 is unchanged):

Roofs, walls, and floors shall meet applicable maximum U-factor requirements of Table C402.1.4(1).

Table C402.1.4(1) Minimum Insulation Requirements for Proposed Design is added as follows:

TABLE C402.1.4(1) MINIMUM INSULATION REQUIREMENTS FOR PROPOSED DESIGN[a, b, c]

Component	Assembly	Maximum U-Factor All Occupancies
Roof	Insulation entirely above deck	0.048
Roof	Metal Building	0.055
Roof	Attic and other	0.027
Wall	Mass	0.090
Wall	Metal Building	0.069
Wall	Metal Framed	0.064
Wall	Wood Framed and Other	0.064
Floors, above grade	Mass or framed	0.074

a. Up to 5% of the area of the (non-spandrel) total building thermal envelope may be excluded from the U-factor requirements of Table C402.1.4(1).
b. Spandrels/spandrel panels need not comply with the U-factor requirements of Table C402.1.4(1).
c. Buildings with data centers or computer rooms that have a design continuous load greater than 750 kW shall not be required to meet the insulation requirements of Table C402.1.4(1).

Section C402.1.5 Rooms containing fuel-burning appliances is amended as follows (Items 1, 2, and all subsections of 2 to remain):

C402.1.5 Rooms containing fuel-burning appliances. Where combustion air is supplied through openings in an *exterior wall* to a room or space containing space conditioning or service water heating fuel-burning appliances, one of the following shall apply:

Table C402.5 Building Envelope Fenestration Maximum U-factor and SHGC Requirements is amended as follows:

TABLE C402.5 BUILDING ENVELOPE FENESTRATION MAXIMUM U-FACTOR AND SHGC REQUIREMENTS

CLIMATE ZONE	**5**	
	VERTICAL FENESTRATION	
	U-FACTOR FOR VERTICAL CURTAIN WALLS, STOREFRONT, AND SITE-BUILT FENESTRATION TYPE AW PRODUCTS[a]	
Fixed fenestration	0.34	
Operable fenestration	0.45	
	U-FACTOR FOR ENTRANCE DOORS	
	0.63	
	U-FACTOR FOR ALL OTHER VERTICAL FENESTRATION	
	0.30	
	SHGC	
	Fixed	**Operable**
PF < 0.2	0.38	0.33
0.2 ≤ PF <0.5	0.46	0.40
PF ≥ 0.5	0.61	0.53
	SKYLIGHTS	
***U*-factor**	0.50	
SHGC	0.40	

NR = No Requirement, PF = Projection Factor.

a. AW Products shall mean metal windows with an AW Performance Class Rating in accordance with AAMA/WDMA/CSSA 101/I.S.2/A440.

Section C402.6.2 Air leakage compliance is amended as follows, subordinate sections remain except as amended or deleted below:C402.6.2 Air leakage compliance. *Air leakage* of the *building thermal envelope* shall be tested by an *approved* third party in accordance with Section C402.6.2.1 and shall meet verification requirements in C402.6.2.3. The measured *air leakage* shall not be greater than 0.35 cubic feet per minute per square foot (1.8 L/s x m^2) of the *building thermal envelope* area at a pressure differential of 0.3 inch water gauge (75 Pa) with the calculated *building thermal envelope* surface area being the sum of the above- and below-grade *building thermal envelope*.

Exceptions:

1. Where the measured *air leakage* rate is greater than 0.35 cfm/ft^2 (1.8 L/s × m^2) but is not greater than 0.45 cfm/ft^2 (2.3L/s × m^2), the *approved* third party shall perform a diagnostic evaluation using a smoke tracer or infrared imaging. The evaluation shall be conducted while the *building* is pressurized or depressurized along with a visual inspection of the *air barrier* in accordance with ASTM E1186. All identified leaks shall be sealed where such sealing can be made without damaging existing *building* components. A report specifying the corrective actions taken to

seal leaks shall be deemed to establish compliance with the requirements of this section where submitted to the *code official* and the *building* owner. Where the measured *air leakage* rate is greater than 0.45 cfm/ft^2 (2.3 L/s × m^2), corrective actions must be made to the *building* and an additional test completed for which the results are 0.45 cfm/ft^2 (2.3 L/s × m^2) or less.

2. 2. As an alternative, *buildings* or portions of *buildings* containing Group I and R occupancies shall be permitted to be tested by an approved third party in accordance with Section C402.6.2.2 and shall meet verification requirements in Section C402.6.2.3. The reported air leakage of the *building* thermal envelope shall not be greater than 0.27 cfm/ft^2 (1.4 L/s × m^2) of the testing unit enclosure area at a pressure differential of 0.2 inch water gauge (50 Pa).

Section C402.6.2.2 Dwelling and sleeping unit enclosure method and reporting is amended by modifying the exception to Item 3 as follows:

Exception: Corridors, stairwells, and *enclosed spaces* having a *conditioned floor area* not greater than 1,500 square feet (139 m^2) shall be permitted to comply with Section C402.6.2.3.

Section C402.6.2.3 Building thermal envelope design and construction verification criteria is amended as follows:

C402.6.2.3 Building thermal envelope design and construction verification criteria. The installation of the continuous *air barrier* shall be verified by a *registered design professional* or *approved* agency in accordance with the following:

1. A review of the *construction documents* and other supporting data shall be conducted to assess compliance with the requirements in Section C402.6.1. A verification report shall be completed by the *registered design professional* or *approved agency* and included in the submittal with the permit application.

2. Inspection of continuous *air barrier* components and assemblies shall be conducted during construction to verify compliance with the requirements of Section C402.6.2.1 or C402.6.2.2 by the *approved agency*. The *air barrier* shall be provided with access for inspection and repair.

3. A final inspection report shall be provided for inspections completed by the *registered design professional or approved agency*. The inspection report shall be provided to the *building owner* or *owner*'s authorized agent and the *code official*. The report shall identify deficiencies found during inspection and details of corrective measures taken

Sections C402.6.2.3.1 Materials and C402.6.2.3.2 Assemblies are deleted in their entirety.

SECTION C403 BUILDING MECHANICAL SYSTEMS

Section C403.1.2 Data centers is amended as follows:

C403.1.2 Data centers. *Data center systems* shall comply with Sections 6 and 8 of ASHRAE 90.4 with the following changes:

1. Replace annualized MLC values specified in Table 6.5 of ASHRAE 90.4 with the values in Table C403.1.2(1).

2. Data centers with active humidification systems that have an ITE design load exceeding 35 kW (10 tons) per/room and 20 W/ft^2 of *conditioned floor area* shall utilize only adiabatic humidification systems.

3. Data centers with air-cooled computers in racks and with an ITE design load exceeding 35 kW (10 tons) per/room and 20 W/ft^2 of *conditioned floor area* shall include air barriers such that there is no significant air path for computer discharge air to recirculate back to computer inlets without passing through a cooling system. When containment is required within existing data centers, containment shall only be required at new/relocated racks and at existing racks where the ITE design load is being increased.

   Exceptions:

   1. Expansions of existing data centers where the added ITE design load does not exceed 35 kW (10 tons) per room and 20 W/ft^2 of conditioned floor area.
   2. Computer racks with a design load less than 4 kW (1.1 tons) per /rack.

4. Evaporative cooling towers used in data centers shall use utility recycled water when a recycled water tap is available to the site.
5. Data centers shall be required to report the site level water usage effectiveness (WUE_{site}) at the request of the *code official*.

Table C403.1.2(1) Maximum Annualized Mechanical Load Component (Annualized MLC) is added as follows:

TABLE C403.1.2(1) MAXIMUM ANNUALIZED MECHANICAL LOAD COMPONENT (ANNUALIZED MLC)

(supersedes Table 6.5, ASHRAE 90.4)*

Climate Zones as Listed in ASHRAE Standard 169	**HVAC Maximum *Annualized MLC* For *Data Center ITE Design Power* > 300 *kW***	**HVAC Maximum *Annualized MLC* For *Data Center ITE Design Power* < 300 *kW***
5B	0.12	0.20

Section C403.2 System design is amended as follows, subordinate sections remain except as amended or deleted below:

C403.2 System design. Mechanical systems shall be designed to comply with Sections C403.2.1 through C403.2.4 . Where elements of a *building*'s mechanical systems are addressed in Sections C403.3 through C403.17 , such elements shall comply with the applicable provisions of those sections.

Section C403.2.3 Fault detection and diagnostics is amended as follows:

C403.2.3 Fault detection and diagnostics. New *buildings* with an HVAC system serving a gross conditioned floor area of 25,000 (2,322 m2) or larger shall include a fault detection and diagnostics (FDD) system to monitor the HVAC system's performance and automatically identify faults. The *FDD system* shall:

1. Include permanently installed sensors and devices to monitor HVAC system performance.
2. Sample HVAC system performance at least once every 15 minutes.
3. Automatically identify and report HVAC system faults.
4. Automatically notify authorized personnel of identified HVAC system faults.

5. Automatically provide prioritized recommendations for *repair* of identified faults based on analysis of data collected from the sampling of HVAC system performance.

6. Be capable of transmitting the prioritized fault repair recommendations to remotely located authorized personnel.

Exceptions:

R-1 and R-2 occupancies.

Warehouse *buildings* with heating-only systems.

Section C403.2.4 Space heating equipment is added as follows:

C403.2.4 Space heating equipment. In new *buildings*, fossil-fuel warm air furnaces and electric resistance space heating equipment shall not be permitted for space heating and ventilation conditioning.

Exceptions:

Where it has been demonstrated to the *code official* that the *building* is required by an applicable law or regulation to provide space heating with an *emergency power system* or a *standby power system*.

Make-up air systems where energy recovery ventilation is prohibited by the *Denver Mechanical Code*.

Electric resistance in buildings that comply with Section C407.

Electric resistance heat used for supplementary heat in accordance with Section C403.4.1.1.

A budget up to 5 W/ft^2 of electric resistance space heating of *conditioned floor area* in the *building,* not including supplementary heat.

Electric resistance heating elements integrated into heat pump equipment.

Fossil-fuel warm air furnaces or electric resistance space heating equipment serving heated plenums or electric resistance for freeze protection elements.

Temporary electric resistance heat for core and shell spaces prior to *Certificate of Occupancy*.

First tenant finish to a commercial *core and shell building* where the permit application for the *core and shell building* was submitted to the Agency prior to January 1st, 2024.

Section C403.4.1.1 Heat pump supplementary heat is amended as follows:

C403.4.1.1 Heat pump supplementary heat. Heat pumps having supplementary heat systems shall have controls that limit supplementary heat operation to only those times when one of the following applies:

1. The vapor compression cycle cannot provide the necessary heating energy to satisfy the *thermostat* setting.

2. The heat pump is operating in defrost mode.

3. The vapor compression cycle malfunctions.

4. The *thermostat* malfunctions.

Section C403.4.7 Heating and cooling system controls for operable openings to the outdoors is amended by adding Exception 10 as follows:

Exceptions:

10. Systems utilizing evaporative cooling do not need to reset the cooling setpoint and are allowed to operate using evaporative cooling only. Other forms of mechanical cooling are not allowed when operable openings are open.

Section C403.5 Economizers is amended as follows (Exceptions remain without modification):

C403.5 Economizers. Economizers shall comply with Sections C403.5.1 through C403.5.5.

An air or water economizer shall be provided for the following cooling systems:

1. Chilled water systems with a total cooling capacity, less cooling capacity provided with air economizers, as specified in Table C403.5(1).

2. Individual fan systems with a manufacturer published nominal cooling capacity greater than or equal to 33,000 Btu/h (9.7 kW) in *buildings* having other than a Group R occupancy.

   The total supply capacity of all fan cooling units not provided with economizers shall not exceed 20 percent of the total supply capacity of all fan cooling units serving the individual tenant space or 300,000 Btu/h (88 kW), whichever is greater (excluding systems in accordance with Exception 7).

3. Individual fan systems with cooling capacity greater than or equal to 270,000 Btu/h (79.1 kW) in *buildings* having a Group R occupancy.

   .

Section C403.5.1 Integrated economizer control is amended by adding Item 2.1 as follows (the remainder of Section C403.5.1 is unchanged):

2.1. Rooftop units with a rated capacity of at least 33,000 Btu/h (9.7 kW) but less than 75,000 Btu/h (22 kW) shall have an airside economizer with at least two stages of capacity control, with the first stage controlling the economizer and the second stage controlling mechanical cooling.

Section C403.7.4.2 Spaces other than nontransient dwelling units is amended as follows:

C403.7.4.2 Spaces other than nontransient dwelling units. Where the outside or exhaust airflow rate of a *system* serving a space other than a nontransient dwelling unit exceeds the values specified in Tables C403.7.4.2(1) and C403.7.4.2(2), the system shall include an energy recovery system. The energy recovery system shall provide an *enthalpy recovery ratio* (ERR) of not less than 60 percent at balanced airflow conditions . Where an *air economizer* is required, the energy recovery system shall include bypasses on outside and exhaust air or controls that permit operation of the economizer as required by Section C403.5. Energy recovery devices shall not exceed 1.1" w.g. sea level at design airflows and shall not exceed 0.6" w.g. sea level in 100% outside air & exhaust air economizer mode. Supply and exhaust fan static efficiency must meet 65%.

Exception: An *energy recovery ventilation system* shall not be required in any of the following conditions:

1. Where energy recovery systems are prohibited by the *International Mechanical Code*.

2. Laboratory fume hood systems that include not fewer than one of the following features:

   2.1 Variable-air-volume hood exhaust and room supply systems configured to reduce exhaust and makeup air volume to 50 percent or less of design values.

   2.2 Direct makeup (auxiliary) air supply equal to or greater than 75 percent of the exhaust rate, heated not warmer than 2°F (1.1°C) above room setpoint, cooled to not cooler than 3°F (1.7°C) below room setpoint, with no humidification added, and no simultaneous heating and cooling used for dehumidification control.

3. Systems serving spaces that are heated to less than 60°F (15.5°C) and that are not cooled.

4. Heating energy recovery where more than 60 percent of the outdoor heating energy is provided from site-recovered or site-solar energy in Climate Zones 5 through 8.

5. *Enthalpy recovery ratio* requirements at heating design condition in Climate Zones 0, 1 and 2.

6. *Enthalpy recovery ratio* requirements at cooling design condition in Climate Zone 5B; however heating enthalpy recovery ration shall be required.

7. Systems in Climate Zones 0 through 4 requiring dehumidification that employ series energy recovery land have a minimum SERR of 0.40.

8. Where the largest source of air exhausted at a single location at the building exterior is less than corresponding exhaust CFM in Tables C403.7.4.2(1) or (2) .

9. Systems expected to operate less than 20 hours per week at the outdoor air percentage covered by Table C403.7.4.2(1).

10. Systems exhausting toxic, flammable, paint or corrosive fumes or dust.

11. Commercial kitchen hoods used for collecting and removing grease vapors and smoke.

12. When the exhaust flow in tables C403.7.4.2(1) or (2) are exceeded, and exhaust to outside ratios are below 60%, an outside air bypass shall be permitted to be employed with a control method to ensure the exhaust to outside air ratio stays at or above 60%. Outside air heat wheel CFM and bypass CFM shall be clearly noted on the plans.

13. In Laboratories and Group I occupancies, where an authority having jurisdiction prohibits recirculation or leakage between exhaust and supply air, the ERR shall not be less than 50 percent at balanced airflow conditions.

Tables C403.7.4.2(1) Energy Recovery Requirements (Ventilation systems operating less than 8,000 hours per year) is amended as follows:

TABLE C403.7.4.2 (1) ENERGY RECOVERY REQUIREMENTS

(Ventilation systems operating <u>less</u> than 8,000 hours per year)

CLIMATE ZONE	PERCENT (%) OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE							
	≥ 10% and < 20%	≥ 20% and < 30%	≥ 30% and < 40%	≥ 40% and < 50%	≥ 50% and < 60%	≥ 60% and < 70%	≥ 70% and < 80%	≥ 80%
	Design Outside or Exhaust Airflow Rate (cfm)							

5B Outside	NR	NR	NR	NR	6,000	5,500	5,000	4,000
5B Exhaust	NR	NR	NR	NR	4,500	4,125	3,750	3,000

For SI: 1 CFM = 0.4719 L/s.
NR = Not required
Informative note: Requirements are based on a 10-year payback.

Table C403.7.4.2(2) Energy Recovery Requirements (Ventilation systems operating 8,000 or more hours per year) is amended as follows:

TABLE C403.7.4.2 (2) ENERGY RECOVERY REQUIREMENTS

(Ventilation systems operating 8,000 or <u>more</u> hours per year)

CLIMATE ZONE	**PERCENT (%) OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE**							
	≥ 10% and < 20%	**≥ 20% and < 30%**	**≥ 30% and < 40%**	**≥ 40% and < 50%**	**≥ 50% and < 60&**	**≥ 60% and < 70%**	**≥ 70% and < 80%**	**≥ 80%**
	Design Outside or Exhaust Airflow Rate (cfm)							
5B Outside	500	400	300	200	84	84	80	80
5B Exhaust	1,500	1,200	900	600	252	252	240	240

For SI: 1 CFM = 0.4719 L/s.

Section C403.7.10 Variable air volume, single zone variable air volume (SZVAV), dedicated outside airflow (DOAS), energy recovery ventilator (ERV) and make up air (MUA) system control is added as follows:

C403.7.10 Variable air volume, single zone variable air volume (SZVAV), dedicated outside airflow (DOAS), energy recovery ventilator (ERV) and make up air (MUA) system control. Variable air volume, SZVAV, DOAS, ERV and MAU air distribution systems, shall be provided with controls to regulate the flow of outdoor air. Such control system shall be designed to provide fault on excessive outside air, and display or report to DDC and measure and maintain the flow rate of outdoor air, at a rate of not less than that required by Section 403.3 of the *Denver Mechanical Code* over the entire range of supply air operating rates. DOAS, ERV and MAUs shall be required to measure the outside air flow on systems above 4,000 cfm.

Section C403.8 Fans and fan controls is amended as follows, subordinate sections to remain:

C403.8 Fans and fan controls. Fans in HVAC systems shall comply with Sections C403.8.1 through C403.8.6.2.

Section C403.13.2.3 High-pressure duct systems is amended by adding the following sentence at the end:

Where required by the *code official*, testing shall be conducted by an *approved* third party.

Section C403.15 Dehumidification in spaces for plant growth and maintenance is renamed Dehumidification and cooling efficiency in spaces for plant growth and maintenance and amended as follows:

C403.15 Dehumidification and cooling efficiency in spaces for plant growth and maintenance. Dehumidification equipment that serves *indoor grow* and *greenhouse spaces* shall comply with Sections C403.15.1 and C403.15.2. Space cooling equipment that serves *indoor grow* and *greenhouse spaces* shall comply with the minimum energy efficiency ratio (EER) or seasonal energy efficiency ratio (SEER) requirements of Section C403.3.2.

C403.15.1 Dehumidification. Equipment that dehumidifies indoor grow and greenhouse spaces shall be one or more of the following:

1. *Dehumidifiers* with a minimum energy factor of 1.9 l/kWh tested in accordance with the test procedure *listed* in DOE 10 CFR 430 and DOE 10 CFR 430, Subpart B, Appendix X or X1.
2. An integrated HVAC system with on-site heat recovery designed to fulfill not less than 75 percent of the annual energy for dehumidification reheat.
3. A chilled water system with on-site heat recovery designed to fulfill not less than 75 percent of the annual energy for dehumidification reheat.
4. A solid or liquid desiccant dehumidification system for system designs that require a dewpoint of not more than 50°F (10°C).

C403.15.2 Dehumidification backup. Electric or fossil fuel reheat systems shall be permitted as supplementary heat for dehumidification where the primary dehumidification system complies with C403.15.1 and is designed to fulfill not less than 60% of the facility's dehumidification needs during peak dehumidification periods.

SECTION C404 SERVICE WATER HEATING

Section C404.11 Water heating is added as follows:

C404.11 Water heating. In new *buildings*, fossil fuel and electric resistance *water heaters* shall not be permitted to provide potable hot water.

Exceptions:

1. Resistance heating elements integrated into heat pump water heating equipment.
2. Electric resistance elements used for recirculation loop temperature maintenance.
3. Electric storage water heaters with a rated water storage volume no greater than 20 gallons.
4. Instantaneous electric water heaters located within 10 feet of the point of use.
5. Hot water storage tanks without electric resistance or fossil-fuel heating elements.
6. Electric resistance equipment where not less than 100 percent of the annual service water-heating requirement is provided by an *on-site renewable energy system* not used to meet any other provision of this code.
7. Water heating systems that serve end-uses that require water temperature of 141°F (55°C) or greater.
8. Electric resistance storage water heating equipment in *buildings* where not less than 75% of the annual service water heating requirement is met by a solar thermal system.
9. *Electric resistance water heating in buildings* that comply with Section C407.
10. Water heating equipment with at least one of the following: a heat input of 200,000 Btu/hr or greater; or an operating temperature of 210 degrees F or greater; or a rated storage capacity of 120 gallons or greater.

11. *First tenant finish* to a commercial *core and shell building* where the permit application for the *core and shell building* was submitted to the Agency prior to January 1st, 2024.

Section C404.12 Water heating equipment location is added as follows:

C404.12 Water heating equipment location. In new *buildings*, *additions*, and *first tenant finish* permits, fossil fuel water heaters with an input capacity less than 200,000 Btu/h andelectric resistance storage water heaters shall be located in a space with minimum dimensions 3 feet by 3 feet by 7 feet and one of the following characteristics:

1. Minimum volume of 760 cubic feet
2. 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 10 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.

SECTION C405 ELECTRICAL POWER AND LIGHTING SYSTEMS

Section C405.1 General is replaced in its entirety as follows:

C405.1 General. This section covers lighting system controls, the maximum lighting power for interior and exterior applications, and electrical energy consumption.

Section C405.4 Horticultural lighting is amended as follows:

C405.4 Horticultural lighting. Permanently installed luminaires used for *horticultural lighting* shall have a *photosynthetic photon efficacy* of not less than 1.6 micromoles per joule (μmol/J) for luminaires, or 1.9 μmol/J for lamps. Luminaires for *horticultural lighting* in greenhouses shall be controlled by a device that automatically turns off the luminaire when sufficient daylight is available. Luminaires for *horticultural lighting* shall be controlled by a device that automatically turns off the luminaire at specific programmed times.

Section C410.5 Electric vehicle (EV) ready is renumbered as C405.14 Electric vehicle supply equipment and amended as follows:

C405.14 ***Electric vehicle supply equipment.*** *New parking facilities* shall be provided with electric vehicle charging infrastructure in accordance with Sections C405.14.1 through C405.14.4.

C405.14.1 Quantity. The number of required *EVSE installed spaces* and *EV Capable spaces*shall be determined in accordance with this section and Table C405.14.1 based on the total number of *automobile parking spaces.* The number of required *EVSE Installed Spaces* and *EV Capable Spaces*, respectively, shall be rounded to the nearest whole number, but not less than one each.

1. Where more than one *parking facility* is provided on a *building* site, the number of required *automobile parking spaces* required to have electric vehicle charging infrastructure shall be calculated separately for each *parking facility*.

2. Where one shared *parking facility* serves multiple occupancy groups, the required number of spaces shall be determined proportionally based on the floor area of each occupancy group.

3. *EVSE Installed Spaces* that exceed the minimum requirements of this section may be used to meet minimum requirements for *EV Capable Spaces*.

4. Requirements for a Group S-2 parking garage shall be determined by the occupancies served by that parking garage. Where new automobile spaces do not serve specific occupancies, the values for All Other Occupancy Groups in Table C405.14.1 shall be used.

5. The number of *EVSE Installed Spaces* for occupancy groups other than Group R-2 may be reduced by up to ten per *DCFC EVSE* provided that the *building* includes not less than one parking space equipped with a *DCFC EVSE* and not less than one *EV Capable Space*. A maximum of fifty spaces may be reduced from the total number of *EVSE Installed spaces*.

6. If the *EV Capable* raceway and/or conduit terminates adjacent to and between two parking spaces, then both parking spaces can be considered *EV Capable*.

7. If the EVSE is capable of charging multiple vehicles simultaneously and is installed adjacent to and between two parking spaces, then both parking spaces can be considered *EVSE Installed.*

Exception: *Parking facilities* serving occupancy groups other than R-2 with fewer than 10 automobile parking spaces.

Table C405.14.2 REQUIRED EV CHARGING INFRASTRUCTURE

Occupancy Served	**EVSE Installed Space**	**EV Capable**
Occupancy Groups R-1 and R-2	15%	45%
All Other Occupancy Groups	10%	20%

C405.14.2 EV capable spaces. Each *EV Capable Space* used to meet the requirements of Section C405.14.1 shall comply with the following:

1. Dedicated physical space shall be provided to accommodate all future equipment necessary for the electrical service or panel to future *EVSE.*

2. A continuous raceway or cable assembly shall be installed from a dedicated physical space and terminate within 3 feet (914 mm) of the *EV capable space* and shall be capped.

3. Installed raceway or cable assembly shall be sized and rated to supply a minimum circuit capacity of 8.3 kVA.

4. The routing of the raceway and/or conduit must be noted on the construction documents and the raceway shall be permanently and visibly marked 'EV CAPABLE' at the electrical panel and service distribution board and termination points.

C405.14.3 EVSE Installed Spaces. An installed *EVSE* can serve either a single or multiple spaces. An installed *EVSE* with multiple output connections shall be permitted to serve multiple *EVSE Installed Spaces*. Each *EVSE* serving either a single *EVSE Installed Space* or multiple *EVSE Installed Spaces*, shall comply with all the following:

1. Have a minimum circuit capacity of 8.3 kVA per space it serves.
2. Have a minimum charging rate of 6.3 kVA.
3. Be located within 3 feet (914 mm) of each *EVSE Installed Space* it serves.
4. *EVSE* capable of charging multiple vehicles simultaneously to be in accordance with C405.14.1 Item 7.

C405.14.3.1 Electric Vehicle Energy Management Systems (EVMS). *EVSE* serving multiple *EVSE Installed Spaces* and controlled by an *EVMS* providing load management shall comply with the following:

1. Have a minimum circuit capacity of 4.1 kVA per space.
2. Have a minimum charging rate capable of simultaneously charging each *EVSE Installed Space* at a minimum rate of 3.3 kVA.
3. When all of the automobile parking spaces are designated to be *EVSE Installed Spaces,* shall comply with the following:
    a. Have a minimum circuit capacity of 2.7 kVA per space.
    b. Have charging rate capable of simultaneously charging each *EVSE Installed Space* at a minimum rate of 2.1 kVA.

C405.14.3.2 New EVSE Installed on Existing Infrastructure. Where a new *EVSE* has a maximum circuit capacity of 6.65 kVA (at 208V, 1phase) or 7.68 kVA (at 240V, 1phase), the existing 40A infrastructure may be used to install the new *EVSE*. Where the maximum circuit capacity exceeds these values, new infrastructure must be installed to accommodate the new *EVSE* in accordance with Electrical Code as adopted by the State of Colorado.

C405.14.4 EVSE Installation. *EVSE* shall be installed in accordance with the Electrical Code as adopted by the State of Colorado and shall be listed and labeled in accordance with UL 2202 or UL 2594. *EVSE Installed Spaces* shall comply with accessible and universal requirements of *Denver Commercial Building Code* Section 1107.

Section C410.4 Solar ready is renumbered as C405.15 and amended as follows:

C405.15 Solar ready.

C405.15.1 General. The provisions of this section shall be applicable for new *commercial buildings* and *major renovations* and *additions*.

C405.15.2 Solar-ready zone. A *solar-ready zone* shall be located on the roof of all new *commercial buildings* five stories or less in height above grade plane that are oriented between 110 and 270 degrees of true north or have low-sloped roofs. *Solar-ready zones* shall comply with Sections C405.15.2.1 through C405.15.2.6 .

Exceptions:

1. A *building* with a permanently installed, *on-site renewable energy* system that meets the following criteria:

   1.1. The system produces the energy output equivalent to covering 60 percent of the net roof area with solar photovoltaic calculated as the horizontally projected gross roof area less that area covered by skylights, occupied roof decks, vegetative roof areas, and mandatory access or setback areas as required by the *International Fire Code*.

   1.2. The system is located on the roof or overhang of the *building* or the roof or overhang of another structure located within 250 feet (76.2 m) of the *building*, on the *building* premises, on covered parking or on another *approved* location installed with the *building* project and under the same property ownership.

   1.3. The system capacity is at a minimum the greater of 1 W per square foot of roof area and 5kW DC.

2. A *building* with a *solar-ready zone* that is shaded for more than 70 percent of daylight hours annually.

3. A *building* where a licensed design professional certifies that the incident solar radiation available to the *building* is not suitable for a *solar-ready zone*.

4. A *building* where a licensed design professional certifies that the *solar-ready zone* area required by Section C405.15.2.2 cannot be met because of extensive rooftop equipment, skylights, vegetative roof areas or other obstructions.

C405.15.2.1 Construction document requirements for a solar-ready zone. Construction documents shall indicate the *solar-ready zone*.

C405.15.2.2 Solar-ready zone area. The total *solar-ready zone* area shall be not less than 60 percent of the roof area calculated as the horizontally projected gross roof area less the area covered by skylights, occupied roof decks, vegetative roof areas, and mandatory access or setback areas as required by the *Denver Fire Code*. The *solar-ready zone* shall be a single area or smaller, separated subzone areas. Each sub-zone area shall be not less than 5 feet (1524 mm) in width in the narrowest dimension. For sloped roofs, each subzone area shall be not less than 200 square feet (18.6 m^2) and no side of any rectangular area shall be less than 11 feet (3353 mm) in length. For low-sloped or flat roofs, each subzone area shall be not less than 330 square feet (30.7 m^2), with a minimum length running generally north to south of 15 feet (4572 mm) and a minimum length running generally east to west of 22 feet (6706 mm) and no side of any rectangular area shall be less than 11 feet (3353 mm) in length.

The *solar-ready zone* shall be located on the roof or overhang of the *building* or on the roof or overhang of another structure located within 250 feet (76.2 m) of the *building*, on the *building* premises, on covered parking or on another *approved* location installed with the *building* project and under the same property ownership.

C405.15.2.3 Obstructions. *Solar-ready zones* shall be free from obstructions, including pipes, vents, ducts, HVAC equipment, skylights and roof-mounted equipment.

C405.15.2.4 Roof loads and documentation. A collateral dead load of not less than 5 pounds per square foot (5 psf) (24.41 kg/m^2) shall be included in the gravity and lateral design calculations for the *solar-ready zone*. The structural design loads for roof dead load and roof live load shall be indicated on the construction documents.

C405.15.2.5 Interconnection pathway. Construction documents shall indicate at least one potential pathway for routing of conduit and/or raceway from the *solar-ready zone* to an electrical service panel and shall be labeled as "Potential Pathway" on the construction documents.

C405.15.2.6 Electrical service reserved space. The main electrical service panel shall have a minimum bus bar rating of not less than 200 amps. The main electrical service panel shall have a reserved space to allow installation of a dual-pole circuit breaker for future solar electric and a reserved space for a dual-pole circuit breaker for an interconnection to a future electrical energy storage system. This space shall be labeled "For Future Solar Electric" and "For Future Energy Storage System", respectively. The reserved space shall be positioned at the end of the panel that is opposite from the panel supply conductor connection. The reserved spaces shall allow for compliance with the requirements of the Electrical Code as adopted by the State of Colorado Article 705.

C405.15.7 Electrical energy storage system-ready area. The floor area of the electrical energy storage system-ready area shall not be less than 2 feet (610 mm) in one dimension and 4 feet (1219 mm) in another dimension, and shall be located in accordance with Section 1207 of the *Denver Fire Code*. The location and layout diagram of the electrical energy storage system-ready area shall be indicated on the construction documents.

C405.15.8 Construction documentation certificate. A permanent certificate, indicating the *solar ready zone* shall be posted near the electrical distribution panel, water heater or other conspicuous location by the builder or registered design professional.

C405.15.3 Commercial solar panel capacity. The provisions of this section shall be applicable for new *commercial buildings* and *major renovations* and *additions*.

C405.15.3.1 Electric service reserved space. The main electrical service panel shall have a minimum bus bar rating of not less than 200 amps. The main electrical service panel shall have sufficient reserved space to allow installation of a dual-pole circuit breaker for future solar electric installation and shall be labeled "For Future Solar Electric." The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location.

Exception: A *commercial building* that must comply with the solar-ready provisions of Section C405.15.2 or that has a permanently installed *on-site renewable energy* system that provides electricity to the *building*'s electrical system.

Section C410.3 Electric ready is renumbered as C405.16 and amended as follows:

C405.16 Electric ready.

C405.16.1 General. The provisions of this section shall be applicable for all new *buildings*, *additions* and *first tenant finish* permits.

C405.16.1.1 First tenant finishes. In the case that a *first tenant finish* to a commercial *core and shell building* or unfinished space is credited towards meeting the requirements of Section C405.16

, the *code official* shall not issue a certificate of occupancy to the tenant until the requirements of Section C405.16.2 are met.

C405.16.2 Additional electrical infrastructure. *Combustion equipment* in *commercial buildings* shall meet the electrical infrastructure requirements of Section C405.16.2.1 or C405.16.2.2 .

Exceptions:

1. Interior fireplaces that do not serve as a primary source of heating.
2. Exterior fireplaces, patio heaters and fire pits.
3. *Additions* to *buildings* that do not provide new space heating equipment shall not be required to provide additional electrical infrastructure to the existing space heating equipment.
4. Emergency power systems and standby power systems.

C405.16.2.1 Commercial buildings less than 10,000 square feet and R-2, R3 and R-4 occupancies. *Commercial buildings* that have a gross floor area of less than 10,000 square feet (929 m^2), and all *Group-R*-2, R-3 and R-4 occupancies of any size, shall comply with Sections C405.16.2.1.1 through C405.16.2.1.5 .

C405.16.2.1.1 Combustion equipment. *Combustion equipment* shall be provided with all of the following:

A dedicated, appropriately phased branch circuit sized to accommodate *future electric equipment* or appliances.

1.1. Electrical infrastructure serving future electric space heating shall comply with Section C405.16.2.1.1.1 .

1.2. Electrical infrastructure serving future electrical water heating equipment shall comply with Section C405.16.2.1.1.2 .

1.3. Electrical infrastructure serving future electric cooking equipment or clothes drying equipment shall be sized to serve a comparable capacity to meet the equipment load in accordance with the *National Electrical Code*.

2. An electric receptacle or junction box that meets the requirements of Section C405.16.2.1.4 and is connected to the electrical panel through the branch circuit. Each electrical receptacle or junction box shall have reasonable access to the *combustion equipment* or dedicated physical space for *future electric equipment* with no obstructions other than the current *combustion equipment*.

   Exception: Conduit installed with a pull string to a location of a future transformer or future electrical panel with service size determined at the time of a future permit.

3. Where *combustion equipment* is used for space or water heating, dedicated physical space shall be provided for all future electric equipment, including an electric resistance backup coil for ducted systems. Physical space occupied by existing *combustion equipment* shall be permitted to count towards satisfying the physical space requirement, where *approved* by the *code official*. Physical space for service water heating equipment shall also meet the requirements of C404.12.

Exception: *Buildings* with installed air-conditioning systems shall not be required to provide additional dedicated physical space for an outdoor heat pump.

C405.16.2.1.1.1 Space heating electric infrastructure sizing. Electric infrastructure for future electric space heating equipment shall be sized to accommodate not less than one of the following:

1. An electrical capacity not less than the nameplate space heating *combustion equipment* heating capacity multiplied by the value in Table C405.16.2.1.1.1 , in accordance with Equation 4-39.

   $VA_s = Q_{com} \times P_s$ **(Equation 4-39)**

   where:

   VA_s = Required electrical capacity of the electrical infrastructure in volt-amps.

   Q_{com} = Nameplate heating capacity of the *combustion equipment* in kBtu/h.

   P_s = VA per kBtu/h from Table C405.16.2.1.1.1 in VA/kBtu/h.

2. An electrical capacity not less than the peak space heating load of the *building* areas served by the space heating *combustion equipment*, calculated in accordance with Section C403.1.1, multiplied by the value for the 99.6 percent design heating temperature in Table C405.16.2.1.1.1 , in accordance with Equation 4-40.

   $VA_s = Q_{design} \times P_s$ **(Equation 4-40)**

   where:

   VA_s = Required electrical capacity of the electrical infrastructure in volt-amps.

   Q_{design} = 99.6% design heating load of the spaces served by the *combustion equipment* in kBtu/h.

   P_s = VA per kBtu/h from Table C405.16.2.1.1.1 in VA/kBtu/h.

3. An *approved* alternate design that uses no energy source other than electricity or *on-site renewable energy*.

TABLE C405.16.2.1.1.1 ALTERNATE ELECTRIC SPACE HEATING EQUIPMENT CONVERSION FACTORS (VA/kBtu/h)

99.6% Heating Design Temperature	**P_s**
Temperature Range (°F)	**VA/kBtu/h**
>50+	N/A
>45 and ≤50	94
>40 and ≤45	100

>35 and ≤40	107
>30 and ≤35	115
>25 and ≤30	124
>20 and ≤25	135
>15 and ≤20	149
>10 and ≤15	164
>5 and ≤10	184
>0 and ≤5	210
>-5 and ≤0	243
>-10 and ≤-5	289
>-15 and ≤-10	293

N/A = Not Applicable

C405.16.2.1.1.2 Water heating electric infrastructure sizing. An individual 240-volt branch circuit with an ampacity of not less than 30 shall be provided for future electric water heating equipment with a capacity of not more than 75,000 Btu/h (22 kW). Electric infrastructure for future electric water heating equipment with a capacity of greater than 75,000 Btu/h (22 kW) shall be sized to accommodate one of the following:

An electrical capacity not less than the *combustion equipment* water heating capacity multiplied by the value in Table C405.16.2.1.1.2 plus electric capacity to serve recirculating loads as shown in Equation 4-41.

$$VA_w = (Q_{capacity} \times P_w) + [Q_{recirc} \times 293(\text{VA}/(\text{Btu/h}))] \quad \textbf{(Equation 4-41)}$$

where:

VA_w = Required electrical capacity of the electrical infrastructure in volt-amps.

$Q_{capacity}$ = Nameplate heating capacity of the *combustion equipment* in kBtu/h.

P_w = VA per kBtu/h from Table C405.16.2.1.1.2 in VA/kBtu/h.

Q_{recirc} = Capacity required for temperature maintenance by recirculation, if applicable, in Btu/h.

An alternate design that complies with this code, where *approved* by the *code official*, and uses no energy source other than electricity or *on-site renewable energy*.

TABLE C405.16.2.1.1.2 ALTERNATE ELECTRIC WATER HEATING EQUIPMENT CONVERSION FACTORS (VA/kBtu/h)

99.6% Heating Design Temperature	**P_w**

Temperature Range (°F)	VA/kBtu/h
>55 and ≤60	118
>50 and ≤55	123
>45 and ≤50	129
>40 and ≤45	136
>35 and ≤40	144
>30 and ≤35	152
>25 and ≤30	162
>20 and ≤25	173
>15 and ≤20	185
>10 and ≤15	293
>5 and ≤10	293
>0 and ≤5	293
≤0	293

C405.16.2.1.2 Electric panel space. The electrical panel shall have reserved physical space for a minimum two-pole or three-pole circuit breaker for each branch circuit provided for *future electric equipment* or appliances. The physical space in the electrical panel for each circuit breaker shall be sized with sufficient breaker capacity to meet the electrical demand of the *future electric equipment* or appliance that is sized to serve a comparable capacity to meet the heating load.

C405.16.2.1.3 Labeling. The junction box or receptacle and the dedicated circuit breaker space serving *future electric equipment* or appliances in the electrical panel shall be labeled for their intended use.

C405.16.2.1.4 Adjacency. The electrical receptacle or junction box must be provided within 3 feet (914 mm) of the *combustion equipment* or appliances or within 3 feet (914 mm) of the dedicated physical space for *future electric equipment* or appliances.

Exception: For *combustion equipment* dedicated to space or water heating, the electrical receptacle or junction box shall be located not more than 6 feet (1829 mm) from the *combustion equipment* or the dedicated physical space for *future electric equipment*.

C405.16.2.1.5 Condensate Drain. Where *combustion equipment* dedicated to space heating and water heating is installed, a location shall be provided for condensate drainage.

C405.16.2.2 Commercial buildings 10,000 square feet or greater. All *commercial buildings* that have a gross floor area of 10,000 square feet (929 m^2) or greater shall comply with Sections C405.16.2.2.1 through C405.16.2.2.5 .

Exception: *Group-R*-2, R-3, R-4 occupancies four stories or greater in height above *grade plane* shall comply with Section C405.16.2.1 .

C405.16.2.2.1 Combustion equipment. *Combustion equipment* shall be provided with all of the following:

A junction box that is located in the same physical space as the *combustion equipment* and is reasonably accessible, and that is connected to the electrical panel by continuous conduit and/or raceways.

Dedicated electrical panel space for an appropriately phased branch circuit sized to accommodate *future electric equipment* or appliances.

2.1 Electrical capacity sizing for future electric space heating equipment shall comply with Section C405.16.2.1.1.1 .

2.2 Electrical capacity sizing for future electric water heating equipment shall comply with Section C405.16.2.1.1.2 .

2.3 Electrical infrastructure serving future electric cooking equipment or clothes drying equipment shall be sized to serve a comparable capacity to meet the equipment load in accordance with the *National Electrical Code*.

3. Where *combustion equipment* is used for space and water heating, dedicated physical space shall be provided for all *future electric equipment*. Physical space occupied by existing *combustion equipment* shall be permitted to count towards satisfying the physical space requirement, where *approved* by the *code official*. Physical space for service water heating equipment shall also meet the requirements of C404.12.

C405.16.2.2.2 Electrical panel space. The electrical panel shall have reserved physical space for a minimum two-pole or three-pole circuit breaker for each branch circuit provided for *future electric equipment* or appliances. The physical space in the electrical panel for each circuit breaker shall be sized with sufficient breaker capacity to meet the electrical demand of the *future electric equipment* or appliance that is sized to serve a comparable capacity to meet the heating load.

C405.16.2.2.3 Labeling. The dedicated circuit breaker space serving *future electric equipment* or appliances in the electrical panel shall be labeled "For future electric equipment."

C405.16.2.2.4 Physical space. Dedicated physical space shall be provided for additional electric equipment, including but not limited to transformers and cabinets, necessary for electrical service to *future electric equipment* or appliances.

Section C405.16 Inverters is renumbered as C405.17.

SECTION C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS

Section C406.1 Compliance is amended as follows:

C406.1 Compliance. *Buildings* shall comply as follows:

1. *Buildings* shall comply with Section C406.1.1.
2. *First tenant finishes* greater than 1,000 square feet (93 m2) of *conditioned floor area* that do not have final lighting or final HVAC systems installed under a prior *building* permit shall comply with Section C406.1.3 .

Section C406.1.1 Additional energy credit requirements is amended as follows:

C406.1.1 Additional energy credit requirements. *Buildings* shall comply with measures from Section C406.2 to achieve not less than the number of required energy credits in Table C406.1.1. All *buildings* shall also comply with Section C406.1.2 .

Exceptions:

Portions of *buildings* devoted to manufacturing or industrial use.

Buildings with a *conditioned floor area* of 2,000 square feet (186 m^2) or less that achieve not less than 10 credits.

Table C406.1.1 Energy credit requirements is added by combining Tables C406.1.1.1(1), C406.1.1.1(2), C406.1.1.2(1) and C406.1.1.2(2) as follows:

TABLE C406.1.1 ENERGY CREDIT REQUIREMENTS

Building Occupancy Group	*All-Electric Properties*		*Buildings* with *combustion equipment* for space or water heating		All Other *Buildings*	
	2,000 to 5,000 FT^2	5,000 FT^2 or Greater	2,000 to 5,000 FT^2	5,000 FT^2 or Greater	2,000 to 5,000 FT^2	5,000 FT^2 or Greater
R-2, R-4, and I-1	XX	XX	113	146	90	113
I-2	XX	XX	54	82	43	54
R-1	XX	XX	108	141	86	108
B	XX	XX	91	138	73	91
A-2	XX	XX	90	100	72	90
M	XX	XX	78	126	62	78
E	XX	XX	84	132	67	84
S-1 and S-2	XX	XX	82	172	82	82
All Other	XX	XX	45	89	36	45

Section C406.1.1.1 All-electric properties is added as follows:

> **C406.1.1.1 All-electric properties.** The number of required energy credits in Table C406.1.1 for *All-electric properties* shall apply for *buildings* that meet the definition of *all-electric properties*.

C406.1.1.1 Buildings with combustion equipment for space or water heating is renumbered as C406.1.1.2 and amended as follows:

> **C406.1.1.2 Buildings with combustion equipment for space or water heating.** The number of required energy credits in Table C406.1.1 for *buildings* with *combustion equipment* for space and water heatingshall apply for *buildings* that use *purchased energy* that is not electricity for space heating or *service water heating*.**Exceptions:**
>
> 1. *Buildings* that use electricity as the primary fuel source for space heating and *service water heating* with *fuel gas* supplementary space heating or *service water heating* where the *fuel gas* supplementary space heating or *service water heating* has the same controls as are required for electric-resistance supplementary heating in accordance with Section C403.4.1.1.
> 2. Low-energy *buildings* complying with Section C402.1.1.

3. Portions of *buildings* in Utility and Miscellaneous Group U, Storage Group S, Factory Group F or High-Hazard Group.

Tables C406.1.1.1(1) and C406.1.1.1(2) are deleted in their entirety.

C406.1.1.2 All other buildings is renumbered as C406.1.1.3 and amended as follows:

C406.1.1.3 All other buildings. The number of required energy credits in Table C406.1.1 for All other *buildings* shall apply for *buildings* that exclusively use *purchased energy* that is electricity for space heating and *service water heating* or qualify for one or more exceptions of Section C406.1.1.2.

Tables C406.1.1.2(1) and C406.1.1.2(2) are deleted in their entirety.

Section C406.1.1.3 Limit on energy credits from renewable energy is renumbered C406.1.2 and amended as follows:

C406.1.2 Limit on energy credits from renewable energy. For *buildings* utilizing renewable energy in accordance with Section C406.2.8 (energy credit ID R01) to achieve the energy credits required in Section C406.1.1 , the number of energy credits achieved through renewable energy shall not exceed the limits in Table C406.1.1.1 .

Table C406.1.1.3 Limits on energy credits from renewable energy is renumbered as Table C406.1.2.

Section C406.1.1.4 Building core/shell and first tenant finish construction is renumbered C406.1.3 and amended as follows:

C406.1.3 Building core/shell and first tenant finish construction. Where separate permits are issued for *core and shell buildings* and *first tenant finish* construction, compliance shall be in accordance with the following requirements:

1. *Core and shell buildings* or portions of *buildings* shall comply with one of the following:

   1.1. Where the permit includes a central HVAC system or *service water heating* system , the project shall achieve not less than 50 percent of the energy credits required by Section C406.1.1 in accordance with Section C406.2.

   1.2. Where neither an HVAC system nor a *service water heating* system is included in the permit documents, the project shall achieve not less than 33 percent of the energy credits required by Section C406.1.1.

2. For *core and shell buildings* or portions of *buildings*, the energy credits achieved shall be subject to the following adjustments:

   2.2. Lighting measure credits shall be determined only for areas with final lighting installed.

   2.3. Where HVAC or *service water heating* systems are designed to serve the entire *building*, full HVAC or *service water heating* measure credits shall be achieved.

   2.4. Where HVAC or *service water heating* systems are designed to serve individual areas, the total HVAC or *service water heating* measure credits achieved shall be reduced in proportion to the floor area with final HVAC systems or final *service water heating* systems installed.

3. *First tenant finish* construction shall be deemed to comply with Section C406.1 where one of the following applies:

3.1. Where heating and cooling generation is provided by a previously installed central system that meets any of the criteria in Section C406.1.1, Item 1 or 2, the energy credits achieved in accordance with Section C406.2 under the *first tenant finish* project shall be not less than 33 percent of the credits required by Section C406.1.1.

3.2. Where heating and cooling generation is provided by an HVAC system installed in the *first tenant finish* , the energy credits achieved in accordance with Section C406.2 under the *first tenant finish* project shall be not less than 50 percent of the credits required by Section C406.1.1.

3.3. Where the entire *core and shell building* is *approved* in accordance with Section C407, Appendix SE, or Appendix PT under the 2022 Denver Energy Code or later. Application of this exception is only valid if the *first tenant finish* matches or is improved relative to the design parameters that were included within the compliance model.

Section C406.2 Additional energy efficiency credits achieved is amended by modifying Item 3 as follows, rest of Section C406.2 and subordinate sections remain except as amended or deleted below:

3. Measures installed in the project that meet the requirements in Sections C406.2.1 through C406.2.16 shall achieve the base credits listed for the measure and occupancy type in Table C406.2 or, when calculations required by Sections C406.2.1 through C406.2.16 create or modify the credits from Table C406.2, the credits achieved shall be based on the calculations. Energy credits achieved for measures shall be determined by one of the following, as applicable:

   3.1. The measure's energy credit shall be the base energy credit from Table C406.2 for the measure where no adjustment factor or calculation is included in the description of the measure in Section C406.2.

   3.2. The measure's energy credit shall be the base energy credit for the measure adjusted by a factor or equation as stated in the description of the measure in Section C406.2. Where adjustments are applied, each measure's energy credit shall be rounded up to the nearest whole number.

   3.3. The measure's energy credit shall be calculated in accordance with the measure's description in Section C406.2. Each individual measure credit shall be rounded up to the nearest whole number.

Table C406.2 Base energy credits is added by combining Tables C406.2(1) through C406.2(9) as follows:

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TABLE C406.2 BASE ENERGY CREDITS

ID	Energy Credit Measure	Section	Group R-2, R-4 & I-1	Group I-2	Group R-1	Group B	Group A-2	Group M	Group E	Groups S-1 & S-2	All Other
E01	Envelope performance	C406.2.1.1	Determined in accordance with Section C406.2.1.1								
E02	UA reduction (15%)	C406.2.1.2	10	7	5	15	5	37	32	47	20
E03	Reduced air leakage	C406.2.1.3	16	3	1	4	9	13	1	25	9
E04	Add roof insulation	C406.2.1.4	5	1	4	2	2	22	13	20	8
E05	Add wall insulation	C406.2.1.5	7	1	7	4	2	24	5	12	7
E06	Improve fenestration	C406.2.1.6	18	1	11	5	2	5	18	1	7
H01	HVAC performance	C406.2.2.1	12	x	2	15	x	25	20	x	x
H02	Heating efficiency	C406.2.2.2	5	6	2	4	11	17	11	31	11
H03	Cooling efficiency	C406.2.2.3	1	1	1	1	1	1	1	1	x
H04	Residential HVAC control	C406.2.2.4	27	x	x	x	x	x	x	x	x
H05	DOAS/fan control	C406.2.2.5	36	46	26	38	53	91	65	132	61
H06	Evaporative cooling	C406.2.2.6	2	4	3	7	1	4	2	3	2
H07	High efficiency heating credit alignment	C406.2.2.7	22	35	27	78	82	115	84	151	74
H08	Cold Climate Heat Pump Heating	C406.2.2.8	XX	XX	XX	XX	XX	XX	XX	XX	XX
W01	SHW preheat recovery	C406.2.3.1.1	111	6	36	13	40	19	14	6	31
W02	Heat pump water heater	C406.2.3.1.2	96	3	31	5	28	5	10	2	23
W03	Efficient gas water heater	C406.2.3.1.3	69	3	23	8	25	10	9	3	19

ID	Energy Credit Measure	Section	Group R-2, R-4 & I-1	Group I-2	Group R-1	Group B	Group A-2	Group M	Group E	Groups S-1 & S-2	All Other
W04	SHW pipe insulation	C406.2.3.2	8	1	4	4	3	4	5	2	4
W05	Point of use water heaters	C406.2.3.3.1	x	x	x	20	x	x	5	x	13
W06	Thermostatic balancing valves	C406.2.3.3.2	3	1	2	1	1	1	2	1	1
W07	SHW heat trace system	C406.2.3.3.3	14	2	7	5	4	5	6	2	6
W08	SHW submeters	C406.2.3.4	20	x	x	x	x	x	x	x	x
W09	SHW flow reduction	C406.2.3.5	41	x	13	x	x	x	x	x	x
W10	Shower heat recovery	C406.2.3.6	29	1	9	x	x	x	3	x	11
P01	Energy monitoring	C406.2.4	2	3	2	3	2	5	3	5	3
L01	Lighting performance	C406.2.5.1	x	x	x	x	x	x	x	x	x
L02	Lighting dimming & tuning	C406.2.5.2	1	5	1	5	2	9	5	6	4
L03	Increase occupancy sensors	C406.2.5.3	1	5	2	5	1	10	4	7	5
L04	Increase daylight area	C406.2.5.4	x	x	x	6	x	12	5	8	x
L05	Residential light control	C406.2.5.5	6	x	x	x	x	x	x	x	x
L06	Light power reduction	C406.2.5.6	1	7	1	7	2	10	7	8	5
Q01	Efficient elevator	C406.2.6.1	4	2	3	5	1	4	5	10	4
Q02	Commercial kitchen equipment	C406.2.6.2	x	x	x	x	26	x	x	x	x
Q03	Residential kitchen equipment	C406.2.6.3	16	x	11	x	x	x	x	x	x
Q04	Fault detection	C406.2.6.4	2	3	2	2	2	2	3	4	3
M01	Refrigerator doors	C406.2.7	x	x	x	x	x	2	x	x	x
R01	Renewable energy	C406.2.8	11	7	11	18	3	11	17	41	15

ID	Energy Credit Measure	Section	Group R-2, R-4 & I-1	Group I-2	Group R-1	Group B	Group A-2	Group M	Group E	Groups S-1 & S-2	All Other
G01	Lighting load management	C406.2.9	11	14	11	11	4	21	14	23	14
G02	HVAC load management	C406.2.10	22	14	x	10	14	19	31	13	18
G03	Automated shading	C406.2.11	13	2	1	5	x	10	15	x	8
G04	Electric energy storage	C406.2.12	13	15	12	17	4	11	24	31	16
G05	Cooling energy storage	C406.2.13	17	18	21	20	4	19	28	5	17
G06	SHW energy storage	C406.2.14	19	4	29	7	17	4	7	3	11
G07	Building thermal mass	C406.2.15	58	53	52	15	18	24	60	56	41
O01	Refrigerants	C406.2.16	2	2	2	2	2	2	2	2	2

a. “x” indicates credit is not available for that measure.

Tables C406.2(1) through C406.2(9) are deleted in their entirety.

Section C406.2.2.2 H02 More efficient HVAC equipment heating performance is amended by modifying Item 1 as follows (the remainder of Section C406.2.2.2 is unchanged):

Equipment installed shall be types that have their efficiency listed in tables referenced by Section C403.3.2. Electric resistance heating capacity shall be limited to 5W/ft^2 of *conditioned floor area* in the *building* served by Variable Air Volume systems and 1.35 W/ft^2 of *conditioned floor area* for all other areas of the *building* with the exception of heat pump supplemental heating .

Section C406.2.2.8 H08 Cold climate heat pump heating is added as follows:

C406.2.2.8 H08 Cold climate heat pump heating. Space heating shall be provided by air source heat pumps that comply with the following:

Packaged Terminal Heat Pumps and Single Package Vertical Heat Pumps shall have a rated COP of not less than 1.5 when operating at 5°F.

All other heat pumps shall have a rated COP of not less than 1.75 when operating at 5°F.

The total electric resistance load of the *building* shall not exceed 1.35W per square foot of conditioned floor area of the *building* for all other areas.

Section C406.2.3.1.2 W02 Heat pump water heater is amended by adding the following sentence at the beginning:

This measure is available for *alterations* and *additions,* or new *buildings* with water heating equipment that meets Section C404.11 Exception 10.

Section C406.2.3.1.3 W03 Efficient fossil fuel water heater is amended by adding the following sentence at the beginning:

This measure is available for *alterations* and *additions,* or new *buildings* with water heating equipment that meets Section C404.11 Exception 10.

Section C406.2.4 P01 Energy monitoring is amended as follows:

C406.2.4 P01 Energy monitoring. A project not required to comply with Section C405.13 shall be permitted to achieve energy credits for installing an energy monitoring system that complies with all the requirements of Sections C405.13.1 through C405.13.5.

SECTION C407 SIMULATED BUILDING PERFORMANCE

Section C407.2. Compliance based on site energy is amended as follows, subordinate sections remain except as amended or deleted below:

C407.2 Compliance based on site energy. New *buildings* shall comply with either Section C407.2.1 or C407.2.2. *Additions* or *alterations* to existing *buildings* shall comply with Section C407.2.1.

Section C407.2.1.2 Compliance Paths is amended by replacing BPF as follows:

BPF = *Building* performance factor from Table C407.2.1.3. For *building* area types not listed in Table C407.2.1.3, use "All others." Where a *building* has multiple *building* area types, the required BPF shall be equal to the area-weighted average of the *building* area types based on their gross floor area. Where a project includes an existing *building* and an *addition*, the required BPF shall be equal to the area-weighted average,

based on the gross floor area, of the existing *building* BPF determined as described in Section 4.2.1.3 of ANSI/ASHRAE/IES 90.1 and the *addition* BPF from Table C407.2.1.3.

Section C407.2.1.3 Building Performance Factors is amended as follows:

C407.2.1.3 Building performance factors. Table 4.2.1.1 Building Performance Factor (BPF), of ANSI/ASHRAE/IES 90.1 is replaced with Table C407.2.3.1.

Table C407.2.1.3 Building Performance Factor (BPF), Site Energy is added as follows:

TABLE C407.2.1.3 BUILDING PERFORMANCE FACTOR (BPF), SITE ENERGY

***Building* Area Type**	***All-Electric Properties***	***Buildings* with *combustion equipment* for space or water heating**	**All other *buildings***
Multifamily (R2, R4)	XX	XX	XX
Healthcare/hospital	XX	XX	XX
Hotel/motel	XX	XX	XX
Office	XX	XX	XX
Restaurant	XX	XX	XX
Retail	XX	XX	XX
School	XX	XX	XX
Warehouse	XX	XX	XX
All others	XX	XX	XX

Tables C407.2.1.3(1) Building Performance Factor (BPF), Site Energy and C407.2.1.3(2) Building Performance Factor, Site Energy, Buildings with Combustion Equipment for Space or Water Heating are deleted in their entirety.

Section C407.2.1.3.1 All-electric properties is added as follows:

C407.2.1.3.1 All-electric properties. The *building* performance factors in Table C407.2.1.3 for *All-electric properties* shall apply for *buildings* that meet the definition of *all-electric properties*.

C407.2.1.3.1 Buildings with combustion equipment for space or water heating is renumbered as C407.2.1.3.2 and amended as follows:

C407.2.1.3.2 Buildings with combustion equipment for space or water heating. The *building* performance factors in Table C407.2.1.3 for *Buildings* with *combustion equipment* for space and water heating shall apply for *buildings* that use *purchased energy* that is not electricity for space heating or *service water heating*.

Exceptions:

1. *Buildings* that use electricity as the primary fuel source for space heating and *service water heating* with *fuel gas* supplementary space heating or *service water heating* where the *fuel gas* supplementary space heating or *service water heating* has the same controls as are required for electric-resistance supplementary heating in accordance with Section C403.4.1.1.
2. Low-energy *buildings* complying with Section C402.1.1.

3. Portions of *buildings* in Utility and Miscellaneous Group U, Storage Group S, Factory Group F or High-Hazard Group.

C407.2.1.3.2 All other buildings is renumbered as C407.2.1.3.3 and amended as follows:

C407.2.1.3.3 All other buildings. The *building* performance factors in Table C407.2.1.3 for All other *buildings*shall apply for *buildings* that exclusively use *purchased energy* that is electricity for space heating and *service water heating* or qualify for one or more exceptions of Section C407.2.1.3.2.

C407.2.1.4 Mandatory requirements is amended as follows:

C407.2.1.4 Mandatory provisions. *Buildings* shall comply with the following:

1. The *EUI* of the *proposed design* as calculated in accordance with Appendix G of ANSI/ASHRAE/IESNA 90.1 shall be included in the documentation required by section G1.3.2.
2. Performance modeling utilized to meet the requirements of this section shall be conducted under the supervision of an individual who holds an ASHRAE Building Energy Modeling Professional Certification or *approved* equivalent certification. The name, affiliation and contact information of the modeler who supervised the performance modeling shall be included in the documentation
3. The mandatory provisions of Section G1.2.1 of Normative Appendix G of ANSI/ASHRAE/IES90.1 are replaced by Section C406.1 Compliance.

Table C407.2.1.4.1 Requirements for Simulated Building Performance is amended as follows:

TABLE C407.2.1.4.1 REQUIREMENTS FOR SIMULATED BUILDING PERFORMANCE

SECTION	TITLE
C401.3	Building thermal envelope certificate
C402.1.4	Table C402.1.4 Minimum Insulation Requirements for Proposed Design
C402.2.1.1	Joint staggered
C402.2.1.2	Skylight curbs
C402.2.6	Insulation of radiant heating system panels
C402.6	Air leakage-building thermal envelope
C403.1.1	Calculation of heating and cooling loads
C403.1.2	Data centers
C403.2	System design
C403.2.4	Space heating equipment
C403.3	Heating and cooling equipment efficiencies
C403.4.1	Thermostatic controls
C403.4.1.1	Heat pump supplementary heat
C403.4.2	Off-hour controls
C403.4.6	Demand response

C403.4.7	Heating and cooling system controls for operable openings to the outdoors
C403.5.5	Economizer fault detection and diagnostics
C403.7, except C403.7.4.1	Ventilation and exhaust systems
C403.8, except C403.8.6	Fan and fan controls
C403.9	Large-diameter ceiling fans
C403.12, except C403.12.3	Refrigeration equipment performance
C403.13	Construction of HVAC system elements
C403.14	Mechanical systems located outside of the building thermal envelope
C404 (including new section C404.10)	Service water heating
C404.11	Water heating
C404.12	Water heater equipment location
C405 (including new Sections C405.2.8 and C405.13, C404.15, C405.15)	Electrical power and lighting systems
C408	Maintenance information and system commissioning

Table C407.2.2 Fixed EUI Targets is amended as follows:

TABLE C407.2.2 FIXED EUI TARGETS

BUILDING AREA TYPE	SITE EUI PERFORMANCE TARGET ($kBtu/ft^2 \times yr$)
Multifamily	37.9
Hotel/motel	48.9
Office	42.2
Restaurant	182.8
Retail	37.4
Warehouse	6.9

C407.2.2.2.4 Weather file is added as follows:

C407.2.2.2.4 Weather file. Section G2.1 Performance Calculations of Normative Appendix G of ANSI/ASHRAE/IES 90.1 is modified to add the following sentence to the end of Item b: "The weather data shall be Denver Intl AP 725650, Denver Centennial AP 724666, or Denver Stapleton AP 724690 using TMYx for the most recent 15 years that is available on climate.onebuilding.org".

SECTION C408 MAINTENANCE INFORMATION AND SYSTEM COMMISSIONING

Section C408.2.4 Preliminary commissioning report is amended as follows:

C408.2.4 Preliminary commissioning report. A preliminary report of commissioning test procedures and results shall be completed and certified by the *registered design professional* or *approved agency* and provided to the *building owner* or owner's authorized agent and to the Agency. The report shall be organized with mechanical, service hot water, and lighting controls in C408.3 findings as required in separate sections to allow independent review. The report shall be identified as "Preliminary Commissioning Report," shall include the completed Commission Compliance Checklist, see Figure C408.2.4, below, and shall identify:

1. Itemization of deficiencies found during testing required by this section that have not been corrected at the time of report preparation.
2. Deferred tests that cannot be performed at the time of report preparation because of climatic conditions.
3. Climatic conditions required for performance of the deferred tests.
4. Results of functional performance tests.
5. Functional performance test procedures used during the commissioning process including measurable criteria for test acceptance.

Figure C408.2.4 Commissioning compliance checklist is replaced in its entirety as follows:

FIGURE C408.2.4 COMMISSIONING COMPLIANCE CHECKLIST

Project Information	Project Name:
	Project Address:
	Registered design professional or approved agency who completed commissioning:
Commissioning Plan (Section C408.2.1)	Commissioning Plan was used during construction and includes all items required by Section C408.2.1: (owner or owner representative to initial here)
Systems Adjusting and Balancing (Section C408.2.2)	Systems Adjusting and Balancing has been completed 1. Air and water flow rates have been measured and adjusted to deliver final flow rates within the tolerances provided in the product specifications.
Functional Testing (Sections C408.2.3 and C408.3.1)	HVAC Equipment Functional Testing has been executed. If applicable, deferred and/or follow-up testing is scheduled to be provided on:
	HVAC Controls Functional Testing has been executed. If applicable, deferred and/or follow-up testing is scheduled to be provided on:
	Economizers Functional Testing has been executed. If applicable, deferred and/or follow-up testing is scheduled to be provided on:
	Lighting Controls Functional Testing has been executed. If applicable, deferred and/or follow-up testing is scheduled to be provided on:
	Service Water Heating System Functional Testing has been executed. If applicable, deferred and/or follow-up testing is scheduled to be provided on:
Supporting Documents (Sections C408.2.5)	Manuals, record documents and training have been completed or are scheduled 1. System documentation has been provided to the owner or scheduled to be delivered to the owner on: 2. Record documents have been submitted to owner or scheduled to be delivered to the owner on: 3. Training has been completed or scheduled to be completed on:
Preliminary Commissioning Report (Section C408.2.4 and C408.3.2.3.1)	Preliminary Commissioning Report submitted to Owner and includes all items required by Sections C408.2.4 and C408.3.2.3.1 as amended: (owner or owner representative to initial here)
Certification	I hereby certify that the commissioning provider has provided me with evidence of mechanical, service water heating and lighting systems commissioning in accordance with the Denver Energy Code. Signature of Building Owner or Owner's Representative Date

Section C408.2.5.2 Final commissioning report is replaced in its entirety as follows:

C408.2.5.2 Final commissioning report. A report of test procedures and results identified as "Final Commissioning Report" shall be delivered to the *building* owner or owner's agent. The report shall be organized with mechanical system, service hot water, and lighting controls in C408.3 findings as required in separate sections to allow independent review. The report shall include the following:

1. Results of functional performance tests.
2. Disposition of deficiencies found during testing, including details of corrective measures used or proposed.
3. Functional performance test procedures used during the commissioning process including measurable criteria for test acceptance, provided herein for repeatability.

Exception: Deferred tests that cannot be performed at the time of report preparation due to climatic conditions.

Section C408.3 Functional testing of lighting and receptacle controls is amended by adding the following Exception:

Exception: The new installed lighting load is less than 10 kW, and the *work area* is less than 10,000 sq. ft.

Section C408.3.2.3 Report is replaced in its entirety as follows:

C408.3.2.3 Report. A preliminary commissioning report in alignment with C408.2.4 and a final commissioning report in alignment with C408.2.5.2 shall be provided.

SECTION C410 COMMERCIAL ELECTRIC READY, SOLAR READY, AND EV READY

Section C410 COMMERCIAL ELECTRIC READY, SOLAR READY, AND EV READY is deleted in its entirety. The requirements of this section are covered in Sections C405.13 Electric vehicle (EV) supply equipment, C405.14 Solar ready, and C405.15 Electric ready.

CHAPTER 5 [CE]: EXISTING BUILDING

SECTION C501 GENERAL

Section C501.2 Compliance is replaced in its amended as follows:

C501.2 Compliance. *Additions, alterations, repairs,* and changes of occupancy to, or relocation of, existing *buildings* and structures shall comply with the provisions for *alterations, repairs, additions* and changes of occupancy or relocation, respectively, in this code and the *Denver Commercial Building Code, Denver Fire Code, Denver Fuel and Gas Code, Denver Mechanical Code, Denver Plumbing Code*, and the Electrical Code as adopted by the State of Colorado .

Section C501.5 Historic buildings is replaced in its entirety as follows:

C501.5 Historic buildings. No provision of this code relating to the construction, *repair, alteration*, restoration, and movement of structures, and *change of occupancy* shall be mandatory for *historic buildings* provided that one of the following applies:

1. A report has been submitted to the *code official* and signed by a *registered design professional*, demonstrating that compliance with that provision would threaten, degrade, or destroy the contributing historic character or features, or the historic form, materials, or function of the *building*.
2. The Colorado State Historic Preservation Officer provides a letter to the *code official* with a finding that compliance would conflict with the Secretary of the Interior's Standards for Rehabilitation, outlining the specific provisions that are in conflict and how compliance would threaten, degrade, or destroy the contributing historic character or features, or the historic form, materials, or function of the *building*.
3. The Denver Landmark Preservation Commission or Lower Downtown Design Review Commission provides documentation to the *code official* with a finding that compliance with that provision would conflict with locally adopted historic preservation policies, standards, and guidelines, outlining the specific provisions that are in conflict and how compliance would threaten, degrade, or destroy the historic character or features, or the historic form, materials, or function of the *building*.

SECTION C502 ADDITIONS

Section C502.2 Change in space conditioning Exception 2 is amended as follows:

Exceptions:

2. Where the simulated *building* performance option in Section C407 is used to comply with this section, the annual site *energy* of the *proposed design* shall be not greater than 110 percent the annual site *energy* otherwise permitted by Section C407.2.1.

Section C502.3 Compliance is amended as follows, subordinate sections remain except as amended or deleted below:

C502.3 Compliance. *Additions* shall comply with Sections C502.3.1 through C502.3.8 and Sections C503.3.3 and C503.4.1.

Section C502.3.7 Additional energy efficiency credit requirements is amended as follows:

C502.3.7 Additional energy efficiency credit requirements. *Additions* shall comply with sufficient measures from Section C406.2 to achieve not less than 50 percent of the number of required efficiency credits from Table C406.1.1 based on *building* occupancy group and *climate zone*. Where a project contains multiple occupancies, credits from Table C406.1.1 for each *building* occupancy shall be weighted by the gross floor area to determine the project weighted average energy credits required. Accessory occupancies shall be included with the primary occupancy group for purposes of this section. *Alterations* to the existing *building* that are not part of the *addition*, but are permitted with an *addition*, shall be permitted to be used to achieve the required credits.

Exceptions:

1. *Buildings* in Group U (Utility and Miscellaneous), Group S (Storage), Group F (Factory), Group H (High-Hazard).
2. *Additions* less than 1,000 square feet (93 m^2) and less than 50 percent of existing floor area.
3. *Additions* that do not include the *addition* or replacement of equipment covered by Tables C403.3.2(1) through C403.3.2(16) or Section C404.2.
4. *Additions* that do not increase *conditioned space*.
5. Where the *addition* alone or the existing *building* and *addition* together are not greater than 110 percent of the annual site energy otherwise permitted by Section C407.2.1.

Section C502.3.8 Renewable energy systems is deleted in its entirety.

SECTION C503 ALTERATIONS

Section C503.1 General Exception 6 is amended as follows:

Exceptions:

6. An existing *building* undergoing alterations that complies with Section C407.2.1.

Section C503.1.1 Alteration compliance (performance option) is added as follows:

C503.1.1 Alteration compliance (performance option). Where *alterations* do not result in a change of occupancy or space conditioning per C505.1 or C502.2, the *building* shall comply with this code if the annual site energy or energy use of the *alterations* that are part of the project is less than or equal to the annual site energy or energy use of the existing *building* when modeled in accordance with Section C407.2.1, with the following changes:

1. Alterations are not subject to the mandatory requirements of C407.2 except where outlined in C503.
2. The annual site energy of the *proposed design* shall not be greater than 110 percent of the annual site energy otherwise permitted by Section C407.2.1.

Section C503.2.7 Air barrier is amended as follows:

C503.2.7 Air barrier. Altered *building thermal envelope* assemblies shall be provided with an *air barrier* in accordance with Section C402.6.1. Such *air barrier* need not be continuous with unaltered portions of the *building thermal envelope*. Testing requirements of Section C402.6.2 shall not be required Verification criteria of Section C402.6.2.3 shall be required.

Section C503.3.7 Partial electrification for space heating requirements is added as follows:

C503.3.7 Partial electrification for space heating requirements. In existing *buildings* and *additions,* new or replacement gas-fired warm-air furnaces, unitary air conditioners or condensing units serving a heated space shall meet one of the following:

1. Provide an *Electrification Retrofit Feasibility Report*.
2. The equipment shall be sized per Section C403.3.1.
3. All gas piping connected to the gas meter serving new and replacement warm-air furnaces shall be tested per Section 406 of the *Denver Fuel Gas Code*.

Exceptions:

1. This section shall not apply when equipment is replaced as an *emergency equipment replacement*.
2. This section shall not apply to gas-fired boilers used for space heating.
3. This section shall not apply to package terminal air conditioners (PTACs) or vertical terminal air conditioners (VTACs).
4. This section shall not apply to heat pumps installed as the primary heat source.

Section C503.4.2 Electrification for service water heating requirements is added as follows:

C503.4.2 Electrification for service water heating requirements. In existing *buildings* and *additions,* new or replacement gas-fired storage water heaters or instantaneous water heaters shall meet one of the following:

1. Provide an *Electrification Retrofit Feasibility Report.*
2. All gas piping connected to the gas meter serving the new and replacement gas-fired water heater shall be tested per Section 406 of the *Denver Fuel Gas Code*.

Exceptions:

1. This section shall not apply when equipment is replaced *as an emergency equipment replacement.*
2. This section shall not apply to gas-fired boilers used for water heating.

Section C503.5.1 Interior lighting and controls is amended by adding Exception 2 as follows:

Exceptions:

Compliance with Section C405.2.8 is not required for *alterations*.

New lighting systems that serve alterations shall not be required to comply with Section C408.3 where the new installed lighting load is less than 10 kW, and the *work area* is less than 10,000 sq. ft.

Section C503.5.3 Lighting systems for plant growth vegetation areas is added as follows:

C503.5.3 Lighting systems for plant growth vegetation areas. New lighting installed in new canopy areas (areas used for plant growth and plant maintenance) as part of an expansion of operations or change of use within an existing *building* shall comply with Section C405.4.

Exceptions:

1. Replacement luminaires in existing plant growth and maintenance areas.
2. New lighting in new canopy areas where the *building* ceiling height is 9 feet or less.

Section C503.6 Additional energy efficiency credit requirements for alterations is amended as follows:

C503.6 Additional energy efficiency credit requirements for alterations. *Alterations* that are *substantial improvements* shall comply with measures from Section C406.2 to earn the number of required credits specified in Table C406.1.1 based on *building* occupancy group. Where a project contains multiple occupancies, credits specified in Table C406.1.1 for each *building* occupancy shall be weighted by the gross *conditioned floor area* to determine the weighted average credits required. Accessory occupancies, other than Group F or H, shall be included with the primary occupancy group for the purposes of this section.

Exceptions:

1. *Alterations* that do not contain *conditioned space*.
2. Portions of *buildings* devoted to manufacturing or industrial use.
3. *Alterations* to *buildings* where the *building* after the *alteration* is not greater than 110 percent of the annual site energy otherwise permitted by Section C407.2.1.
4. *Alterations* that are permitted with an addition complying with Section C502.3.7.
5. *Alterations* that are *first tenant finishes* greater than 1,000 square feet (92.9 m^2) of *conditioned floor area* and comply with Section C406.1.1.4.

SECTION C505 CHANGE OF OCCUPANCY OR USE

Section C505.1 General is replaced in its entirety as follows:

C505.1 General. Spaces undergoing a change in occupancy to a higher energy-demand category (higher number) as shown in Table C505.1 shall comply with the requirements of this code's sections C402, C405.2, C405.3, and C408. Where the space undergoing a change in occupancy or use is in a *building* with a fenestration area that exceeds the limitations of Section C402.5.1, the space is exempt from Section C402.5.1 provided there is not an increase in fenestration area.

Exceptions:

1. Where it is calculated that the change in occupancy or the alterations (Section C503) will not result in an increase in demand for fossil fuel and electrical energy, the space shall comply with the requirements of this code for *alterations*.
2. Where the component performance method in Section C402.1.4 is used to comply with this section, the proposed UA shall be not greater than 110 percent of the target UA.

3. The annual site energy of the *proposed design* shall not be greater than 110 percent of the annual site energy otherwise permitted by Section C407.2.1. Change of Use are not subject to the mandatory requirements of C407.2, except where outlined in C503.

4. Where the change of occupancy is less than 5,000 square feet (465 m^2) in area. This exception shall not apply where changing from energy-demand category 1 to a higher energy-demand category.

Table C505.1 Energy-demand categories is added as follows:

TABLE C505.1 ENERGY-DEMAND CATEGORIES

ENERGY-DEMAND CATEGORY	IBC OCCUPANCIES	IRC STRUCTURES
4 (highest energy-demand)	A	
3	E, I-4	
2	B, I-1, I-2, I-3, M, R	One- and two-family dwellings and townhouses
1 (lowest energy-demand)	F, H, S, U	Accessory structures with or without living space

CHAPTER 6 [CE]: REFERENCED STANDARDS

The following referenced standards are added as follows:

ASME

Two Park Avenue
New York, NY 10016-5990

BPVC—Boiler and Pressure Vessel Code

DOE

1000 Independence Avenue SW
Washington, DC 20585

10 CFR Part 430, Subpart B - Appendix X – (2025):
Uniform Test Method for Measuring the Energy Consumption of Dehumidifiers

ENERGY CODE RESIDENTIAL PROVISIONS

CHAPTER 1 [RE]: SCOPE AND ADMINISTRATION

THIS CHAPTER WILL BE AMENDED INTERNALLY BY DENVER STAFF OUTSIDE OF THE PUBLIC AMENDMENT PROCESS

CHAPTER 2 [RE]: DEFINITIONS

SECTION R202 GENERAL DEFINITIONS

The following definitions are amended or added as follows:

ALL-ELECTRIC PROPERTY. A property on a single assessment parcel with an accompanying legally described area of land as shown on a site plan, that, except for *emergency power systems* and *standby power systems*:

1) Contains no permanently installed equipment or appliances that utilize combustion, plumbing for *fuel gas* or fuel oil, or fuel gas utility connection installed within the *building(s)* or *site*; or,

2) Contains at least one new stand-alone all-electric *building* where the property includes existing *fuel gas* or fuel oil infrastructure built under a code effective prior to May 1, 2023.

COMBUSTION EQUIPMENT. For this code, any equipment or appliance used for space heating, ventilation conditioning, space cooling, *service water heating* (including pools and spas), cooking, clothes drying, humidification, or lighting that uses *fuel gas* or *fuel oil*.

EMERGENCY POWER SYSTEM. A source of automatic electric power of a required capacity and duration to operate required life safety, fire alarm, detection and ventilation systems in the event of a failure of the primary power. Emergency power systems are required for electrical loads where interruption of the primary power could result in loss of human life or serious injuries.

FUTURE ELECTRIC EQUIPMENT. Electrically-powered equipment that could be installed in the future to replace *combustion equipment* to meet a similar end use or load.

ON-SITE PARKING SPACE. A covered area on the *lot* with minimum dimensions of 6-feet by 14-feet provided with an all-weather surface of asphalt, asphaltic concrete, concrete, crushed aggregate, or similar material and accessible by a vehicle from a *public way.*

RESIDENTIAL BUILDING. For this code, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses) as well as Group R-3 and R-4 *buildings* three stories or less in height above *grade plane*.

STANDBY POWER SYSTEM. A source of automatic electric power of a required capacity and duration to operate required *building*, hazardous materials, or ventilation systems in the event of a failure of the primary power. Standby power systems are required for electrical loads where interruption of the primary power could create hazards or hamper rescue or fire-fighting operations.

CHAPTER 3 [RE]: GENERAL REQUIREMENTS

SECTION R302 DESIGN CONDITIONS

Section R302.1 Interior design conditions is amended as follows:

R302.1 Interior design conditions. The interior design temperatures used for heating and cooling load calculations shall be a maximum of 70 °F (21 °C) for heating and minimum of 75°F (24°C) for cooling.

SECTION R303 MATERIALS, SYSTEMS AND EQUIPMENT

Section R303.2 Installation is amended as follows, subordinate sections to remain:

R303.2 Installation. Materials, systems, and equipment shall be installed in accordance with the manufacturer's instructions. Insulation shall be to minimum Grade I installation in accordance with ANSI/RESNET/ICC 301 and the *Denver Commercial Building Code* or the *Denver Residential Code*, as applicable.

CHAPTER 4 [RE]: RESIDENTIAL ENERGY EFFICIENCY

SECTION R401 SCOPE AND GENERAL REQUIREMENTS

Section R401.2 Application is amended by modifying Exception 1 as follows (Exception 2 remains without modification):

Exceptions:

1. *Additions*, *alterations*, and *repairs* to existing *buildings*, and changes of occupancy to an equal or lower energy-demand category complying with Chapter 5.

Section R401.2.1 Prescriptive Compliance Option is amended as follows:

R401.2.1 Prescriptive Compliance Option. The Prescriptive Compliance Option requires compliance with Sections R401 through R404, and R408.

Section R401.2.2 Simulated Building Performance Option is amended as follows:

R401.2.2 Simulated Building Performance Option. The *Simulated Building Performance* Option requires compliance with Section R405.

Section R401.2.3 Energy Rating Index Option is amended as follows:

R401.2.3 Energy Rating Index Option. The *Energy Rating Index* (ERI) Option requires compliance with Section R406.

Section R401.3 Certificate is amended as follows (the remainder of Section R401.3 is unchanged):

R401.3 Certificate. A permanent certificate shall be completed by the builder or other *approved* party and posted on a wall in the space where the space conditioning equipment is located, a utility room or an *approved* location inside the *building*. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory *label*, service disconnect *label* or other required labels. The certificate shall indicate the following and shall be posted for review by the time of the project's final inspection:

Section R401.4 Homeowner manual is added as follows:

R401.4 Homeowner manual. The builder or owner's agent shall provide the owner with a binder of all equipment and appliance manufacturers' installation manuals, except for manuals that are required to be affixed to the equipment, and any information required to be included on the permanent certificate in accordance with R401.3. This includes any energy assessment report and/or ERI certificate.

SECTION R402 BUILDING THERMAL ENVELOPE

Section R402.1.1 Vapor retarder is amended as follows:

R402.1.1 Vapor retarder. Wall assemblies in the *building thermal envelope* shall comply with the vapor retarder requirements of Section R702.7 of the *Denver Residential Code* or Section 1404.3 of the *Denver Commercial Building Code*, as applicable.

Table R402.1.2 Maximum Assembly U-factors and Fenestration Requirements and footnotes is amended as follows:

TABLE R402.1.2 MAXIMUM ASSEMBLY *U*-FACTORS[a] AND FENESTRATION REQUIREMENTS

CLIMATE ZONE	5
Vertical fenestration *U*-factor[d]	0.27/0.25
Skylight *U*-factor	0.45
Glazed vertical fenestration SHGC[f]	0.40
Skylight SHGC[f]	0.40
Ceiling *U*-factor	0.026
Insulation entirely above roof deck	0.032
Wood-framed wall *U*-factor	0.045
Mass wall *U*-factor[b]	0.082
Floor *U*-factor	0.026
Basement wall *U*-factor	0.050
Unheated slab *F*-factor[e]	0.51
Heated slab *F*-factor[e]	0.51

Crawl space wall *U*-factor	0.055

For SI: 1 foot = 304.8 mm.

a. Nonfenestration *U*-factors and *F*-factors shall be obtained from measurement, calculation, an *approved source*, or Appendix RF where such appendix is adopted or *approved*.
b. Mass walls shall be in accordance with Section R402.2.6. Where more than half the insulation is on the interior, the mass wall *U*-factors shall not exceed 0.065 in Climate Zone 5.
c. Reserved. .
    1. Where the proposed glazing area is greater than or equal to 15.0% of the conditioned floor area, as provided by Section R103.2, the lower U-factor shall not be exceeded. .
d. *F*-factors for slabs shall correspond to the *R*-values of Table R402.1.3 and the installation conditions of Section R402.2.10.1.
e. Glazed fenestration that is specifically used for passive solar design heat gain is exempt from SHGC requirements.

Table R402.1.3 Insulation Minimum R-values and Fenestration Requirements by Component and footnotes is amended as follows:

TABLE R402.1.3 INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	**5**
Vertical fenestration *U*-factor[g]	0.27/0.25
Skylight *U*-factor	0.45
Glazed vertical fenestration SHGC[i]	0.40
Skylight SHGC[i]	0.40
Ceiling *R*-value	49
Insulation entirely above roof deck	30ci
Wood-framed wall *R*-value[e]	30 or 20&5ci or 13&10ci or 0&20ci
Mass wall *R*-value[f]	13/17
Floor *R*-value[h]	38 or 19+10 ci or 25 ci
Basement wall *R*-value[b, e]	15ci or 19 or 13&5ci
Unheated slab *R*-value & depth[c]	10ci, 3ft
Heated slab *R*-value & depth[c]	R-10ci, 3 ft and R-10 full slab
Crawl space wall *R*-value[b, e]	15ci or 13&5ci

For SI: 1 foot = 304.8 mm.
NR = Not Required, ci = Continuous Insulation.

a. *R*-values are minimums. *U*-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed *R*-value of the insulation shall be not less than the *R*-value specified in the table.
b. “5ci or 13” means R-5 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "10ci or 13" means R-10 continuous insulation (ci) on the interior or exterior surface of the wall or R-13 cavity insulation on the interior side of the wall. "15ci or 19 or 13&5ci" means R-15 continuous insulation (ci) on the interior or exterior surface of the wall; or R-19 cavity insulation on the interior side of the wall; or R-13 cavity insulation on the interior of the wall in

addition to R-5 continuous insulation on the interior or exterior surface of the wall.

c. Slab insulation shall be installed in accordance with Section R402.2.10.1. Slab edge insulation shall be installed to separate conditioned from unconditioned spaces including adjacent garages, entries, and porches.
d. Reserved.
e. The first value is cavity insulation; the second value is continuous insulation. Therefore, as an example, "13&5" means R-13 cavity insulation plus R-5 continuous insulation.
f. Mass walls shall be in accordance with Section R402.2.6. The second R-value applies where more than half of the insulation is on the interior of the mass wall.
g. Where the proposed glazing area is greater than or equal to 15.0% of the conditioned floor area, as provided by Section R103.2, the lower U-factor shall not be exceeded. :
    1. .
h. "38 or 19+7.5ci or 20ci" means R-38 cavity insulation alone or R-19 cavity insulation with R-10 continuous insulation or R-25 continuous insulation alone.
i. Glazed fenestration that is specifically used for passive solar design heat gain is exempt from SHGC requirements.

Section R402.2.9 Basement walls is amended as follows (exceptions remain unchanged):

R402.2.9 Basement walls. *Basement walls* shall be insulated in accordance with Table R402.1.2 or Table R402.1.3 or the installed R-value shall be in accordance with the compliance path that is defined at the time of obtaining the *building* permit.

Section R402.2.9.1 Basement wall insulation installation is amended as follows:

R402.2.9.1 Basement wall insulation installation. Where *basement walls* enclosing conditioned basements are insulated, the insulation shall *comply* with the following:

1. Where exterior basement wall insulation is installed, it shall be permanently attached to the wall and extend from the sill plate downward to not less than the top of the footing or 10 feet, whichever is less.

2. Where interior basement wall insulation is installed, it shall extend from the sill plate at the top of the foundation wall downward to the finished floor or subfloor below.

Table R402.5.1.1 Air Barrier, Air Sealing, and Insulation Installation is amended as follows:

TABLE R402.5.1.1 AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION[a]

Component	AIR BARRIER, AIR SEALING CRITERIA	Insulation Installation
General requirements	A continuous air barrier shall be installed in the building thermal envelope. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	An air barrier shall be installed in any dropped ceiling or soffit to separate it from unconditioned space. Access openings, drop downstairs or knee wall doors to unconditioned attic spaces shall be sealed with gasketing materials that allow for repeated entrance over time.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier. Access hatches and doors shall be installed and insulated in accordance with Section R402.2.5. Eave baffles shall be installed in accordance with Section R402.2.4.
Above Grade Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls and interior walls that are adjacent to or abut unconditioned space shall be sealed.	Air permeable insulation installed in wall cavities shall be enclosed. Building thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.

Component	AIR BARRIER, AIR SEALING CRITERIA	Insulation Installation
	The junction of the bottom plate to the subfloor on exterior walls separating conditioned space from unconditioned space shall be air sealed. Knee walls shall be sealed.	Corners in exterior frame walls shall be insulated with material having a thermal resistance, R-value, of not less than R-3 per inch. Headers on exterior walls shall be insulated to a minimum R-5.
Knee wall	Knee walls shall have an air barrier between conditioned and unconditioned space	Insulation installed in a knee wall assembly shall be installed in accordance with Section R402.2.3. Air-permeable insulation shall be enclosed inside an air barrier assembly.
Windows, skylights and doors	The rough opening gap between framing and the frames of skylights, windows and doors, shall be sealed in accordance with fenestration manufacturer's instructions.	Insulation installed in framing around windows, skylights and doors shall be cut to fit the cavity and shall not interfere with flashing or drainage of the installed window.
Rim joists	Rim joists shall include an air barrier. The junctions of the rim board to the sill plate and the rim board and the subfloor shall be air sealed.	Rim joists shall be insulated so that the insulation maintains permanent contact with the exterior rim board.[b]
Floors separating conditioned from unconditioned space, including cantilevered floors and floors above garages	Floor framing members that are part of the building thermal envelope shall be air sealed to maintain a continuous air barrier. Air permeable floor cavity insulation shall be enclosed.	Floor insulation shall be installed in accordance with the requirements of Section R402.2.8.
Basement, crawl space and slab foundations	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder/air barrier in accordance with Section R402.2.11. Penetrations through concrete foundation walls and slabs shall be air sealed. Class 1 vapor retarders shall not be used as an air barrier or installed on the interior side of air-permeable insulation on below-grade walls and shall be installed in accordance with Section R702.7 of the *Denver Residential Code*.	Crawl space insulation, where provided instead of floor insulation, shall be installed in accordance with Section R402.2.11. Conditioned basement foundation wall insulation shall be installed in accordance with Section R402.2.9.1. Slab-on-grade floor insulation shall be installed in accordance with Section R402.2.10.
Shafts, penetrations	Duct and flue shafts to exterior or unconditioned space shall be sealed. Utility penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for	Insulation shall be fitted tightly around utilities passing through shafts and penetrations in the building thermal envelope to maintain required R-value.

Component	AIR BARRIER, AIR SEALING CRITERIA	Insulation Installation
	expansion, contraction of materials and mechanical vibration.	
Narrow cavities	Narrow cavities of 1 inch or less that are not able to be insulated shall be air sealed.	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	Insulated portions of the garage separation assembly shall be installed in accordance with Sections R303 and R402.2.8.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air sealed in accordance with Section R402.5.4.	Recessed light fixtures installed in the building thermal envelope shall be airtight and IC rated, and shall be buried in or surrounded with insulation.
Plumbing, wiring or other obstructions	All holes created by wiring, plumbing or other obstructions in the air barrier assembly shall be air sealed.	Insulation shall be installed to fill the available space and surround wiring, plumbing, or other obstructions, unless the required R-value can be met by installing insulation and air barrier systems completely to the exterior side of the obstructions.
Showers, tubs and fireplaces adjacent to the building thermal envelope	An air barrier shall separate insulation in the building thermal envelope from the shower, tub or fireplace assemblies. Tub and shower drain trap penetrations through the subfloor shall be air sealed. Fireplace doors shall have tight fitting flue dampers or doors and shall be listed in accordance with R402.5.2.	Exterior framed walls adjacent to showers, tubs and fireplaces shall be insulated.
Electrical, communication, and other equipment boxes, housings and enclosures	Boxes, housing and enclosures that penetrate the air barrier shall be caulked, taped, gasketed or otherwise sealed to the air barrier element being penetrated. All concealed openings into the box, housing or enclosure shall be sealed. The continuity of the air barrier shall be maintained around boxes, housings, and enclosures that penetrate the air barrier. Alternatively, air-sealed boxes shall be installed in accordance with Section R402.5.5.	Boxes, housing and enclosures shall be buried in or surrounded by insulation.
HVAC register boots	HVAC supply and return register boots shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	HVAC supply and return register boots located within a building thermal envelope assembly shall be buried in or surrounded by insulation.
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer.	—

Component	AIR BARRIER, AIR SEALING CRITERIA	Insulation Installation
	Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	
Common walls or double walls separating attached single-family dwellings or townhouses	An interior air barrier shall be provided. Air sealing at the intersections with building thermal envelope shall be provided. Where installed in a fire-resistance-rated wall assembly, air sealing materials shall comply with one of the following: 1. Be in accordance with an approved design for the fire-resistance-rated assembly. 2. Be supported by approved data that shows the assembly as installed complies with the required fire-resistance rating.	Insulation materials recognized in the approved common wall or double-wall design and installed in accordance with the approved design shall be permitted to be used.

a. Inspection of log walls shall be in accordance with the provisions of ICC 400.
b. Insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

Section R402.5.1.2 Air leakage testing is amended as follows:

R402.5.1.2 Air leakage testing. The *building* or each *dwelling unit* or *sleeping unit* in the *building* shall be tested for air leakage.

Testing shall be conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779, ASTM E1827 or ASTM E3158 and reported at a pressure differential of 0.2 inch water gauge (50 Pa). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after all penetrations of the *building thermal envelope* have been sealed.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other *infiltration* control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue *dampers* shall be closed, but not sealed beyond intended *infiltration* control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous *ventilation* systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Exceptions:

1. For heated, attached private garages and heated, detached private garages accessory to one- and two-family dwellings and townhouses not more than three stories above *grade plane* in height, *building thermal envelope* tightness and insulation installation shall be considered acceptable where the items in Table R402.5.1.1, applicable to the

method of construction, are field verified. Where required by the *code official*, an *approved* third party independent from the installer shall inspect both *air barrier* and insulation installation criteria. Heated, attached private garage space and heated, detached private garage space shall be thermally isolated from all other habitable, *conditioned spaces* in accordance with Sections R402.2.13 and R402.4.5, as applicable.

2. Where tested in accordance with Section R402.5.1.2.1, testing of each *dwelling unit* or *sleeping unit* is not required.

3. Group R-X occupancies built in accordance with Section 429 of the *Denver Commercial Building Code.*

Section R402.5.1.2.1 Unit Sampling is deleted in its entirety.

Section R402.5.1.3 Maximum air leakage rate is amended as follows:

R402.5.1.3 Maximum air leakage rate. Where tested in accordance with Section R402.5.1.2, the air leakage rate for *buildings, dwelling units* or *sleeping units* shall be as follows:

1. Where complying with Section R401.2.1, the *building* or the *dwelling units* or *sleeping units* in the *building* shall have an air leakage rate not greater than 3.0 air changes per hour or 0.17 cubic feet per minute per square foot [0.86 L/(s × m^2)] of the *building thermal envelope area* or the dwelling *testing unit enclosure area*.

2. Where complying with Section R401.2.2 or R401.2.3, the *building* or the *dwelling units* or *sleeping units* in the building shall have an air leakage rate not greater than 4.0 air changes per hour, or 0.22 cubic feet per minute per square foot [1.1 L/(s × m^2)] of the *building thermal envelope* area or the dwelling *testing unit enclosure area*, as applicable.

Exceptions:

1. Where *dwelling units* or *sleeping units* are attached , and are tested without simultaneously testing adjacent *dwelling units* or *sleeping units*, the air leakage rate is permitted to be not greater than 0.22 cubic feet per minute per square foot [1.1 L/(s × m^2)] of the *testing unit enclosure area*. Where adjacent dwelling units are simultaneously tested in accordance with ASTM E779, the air leakage rate is permitted to be not greater than 0.22 cubic feet per minute per square foot [1.1 L/(s × m^2)] of the *testing unit enclosure area* that separates *conditioned space* from the exterior.

2. Where *buildings* have 1,000 square feet (92.9 m^2) or less of conditioned floor area, the air leakage rate is permitted to be not greater than 0.22 cubic feet per minute per square foot [1.1 L/(s × m^2)].

SECTION R403 SYSTEMS

Section R403.1.3 Continuously burning pilot lights is added as follows:

R403.1.3 Continuously burning pilot lights. The natural gas systems and equipment listed below shall not be permitted to have continuously burning pilot lights:

1. Mechanical or natural draft furnaces, boilers, and water heaters.

2. Household cooking appliances.

Exception: Household cooking appliances without electrical supply voltage connections and in which each pilot light consumes less than 150 Btu/hr.

Section R403.3 Duct systems is renamed Duct systems and air handlers amended as follows, subordinate sections remain except as amended or deleted below:

R403.3 Duct systems and air handlers. Duct systems and air handlers shall be installed in accordance with Sections R403.3.1 through R403.3.9. The air handler shall be installed within conditioned space.

Exception: Ventilation ductwork that is not integrated with duct systems serving heating or cooling systems.

Section R403.3.3 Ductwork located outside conditioned space is amended as follows:

R403.3.3 Ductwork located outside conditioned space. Supply and return ductwork located outside *conditioned space* shall be insulated to an *R*-value of not less than R-8 and shall comply with Section R403.3.5 Ductwork buried within ceiling insulation .

Section R403.3.4 Duct systems located in conditioned space is amended by deleting item 2.2.

Section R403.3.5 Ductwork buried within ceiling insulation is replaced in its entirety as follows:

R403.5.3 Ductwork buried within ceiling insulation. Supply and return air ducts located in unconditioned attic or ceiling spaces shall comply with all the following:

1. The supply and return ducts shall have an insulation *R*-value not less than R-8.

2. The duct shall be installed on the truss bottom cord or ceiling joist closest to the ceiling finish material separating conditioned space from unconditioned space and the sum of the ceiling insulation *R*-value above the top of the duct, and against the sides of the duct, shall be greater than or equal to the proposed ceiling insulation *R*-value.

Section R403.3.5.1 Effective *R*-value of deeply buried ducts is amended as follows:

R403.3.5.1 Effective *R*-value of deeply buried ducts. Where complying using Section R405 or Section R406, sections of ductwork that are installed in accordance with Section R403.3.5 shall be considered as having an effective duct insulation *R*-value of not more than R-25.

Section R403.3.7 Duct system testing is amended as follows (Exceptions remain without modification):

R403.3.7 Duct system testing. Each *duct* system shall be tested for air leakage in accordance with ANSI/RESNET/ICC 380 or ASTM E1554. Total leakage shall be measured with a pressure differential of 0.1 inch water gauge (25 Pa) across the *duct system* and shall include the measured leakage from the supply and return *ductwork*. Where required by the *code* official, testing shall be conducted by an approved third party. A written report of the test results shall be signed by the party conducting the test and provided to the *code official*. *Duct system* leakage testing at either rough-in or post construction shall be permitted with or without the installation of registers or grilles. All portions of the *duct system*, including air handler, filter box, supply and return boots shall be tested.

Section R403.3.8 Duct system leakage is amended as follows:

R403.3.8 Duct system leakage. The total measured *duct system* leakage shall not be greater than the values in Table R403.3.8, based on the *conditioned floor area*, number of ducted returns, and location of the *duct system*. For *buildings* complying with Section R405 or R406, where duct system leakage to outside is tested

in accordance with ANSI/RESNET/ICC 380 or ASTM E1554, the leakage to outside value shall not be used for compliance with this section, but shall be permitted to be used in the calculation procedures of Section R405 and R406.

Table R403.3.8 Maximum Total Duct System Leakage and footnotes is amended as follows:

TABLE R403.3.8 MAXIMUM TOTAL DUCT SYSTEM LEAKAGE

EQUIPMENT AND DUCT CONFIGURATION	DUCT SYSTEMS SERVING MORE THAN 1,000 FT^2 OF CONDITIONED FLOOR AREA		DUCT SYSTEMS SERVING 1,000 FT^2 OR LESS OF CONDITIONED FLOOR AREA
	cfm/100 ft^2		cfm
	Number of ducted returns[a]		
	< 3	≥ 3	Any
Space conditioning equipment is not installed[b]	3	4	30
All components of the duct system are installed	4	6	40

For SI: 1 cubic foot per minute per square foot = 0.0033 LPM/m^2, 1 cubic foot per minute = 28.3 LPM.

a. A ducted return is a duct made of sheet metal or flexible duct that connects one or more return grilles to the return-side inlet of the air-handling unit. Any other method to convey air from return or transfer grilles to the air-handling unit does not constitute a ducted return for the purpose of determining maximum total duct system leakage allowance.

b. Duct system testing is permitted where space conditioning equipment is not installed, provided that the return ductwork is installed and the measured leakage from the supply and return ductwork is included.

Section R403.5 Service hot water systems is amended as follows, subordinate sections remain:

R403.5 Service hot water systems. Energy conservation measures for service hot water systems shall be in accordance with Sections R403.5.1 through R403.5.5.

Section R403.5.5 Water heating equipment location is added as follows:

R403.5.5 Water heating equipment location. Water heaters shall be located in a space with minimum dimensions 3 feet by 3 feet by 7 feet and one of the following characteristics:

1. Minimum volume of 760 cubic feet.

2. 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.

Section R403.8 Systems serving multiple dwelling units is deleted in its entirety.

Section R403.13 Gas fireplaces is amended by deleting its exception.

SECTION R404 ELECTRICAL POWER AND LIGHTING SYSTEMS

Section R409.5 Electric vehicle (EV) ready is renumbered as Section R404.4 and amended as follows:

R404.4 Electric vehicle (EV) ready.

R404.4.1 General. *Electric vehicle (EV)* charging shall be provided and installed in accordance with this section and the Electrical Code as adopted by the State of Colorado. Group R-3 and Group R-4 occupancies shall meet the criteria of Section C405.13 for electric vehicle infrastructure.

R404.4.2 Electric vehicle power transfer infrastructure for single family and townhouses. New vehicle parking spaces for one- and two-family dwellings and townhouses shall be provided with electric vehicle power transfer infrastructure in accordance with Sections R404.4.2.1 through R404.4.2.3 .

R404.4.2.1 One- and two-family dwellings and townhouses. Each dwelling unit with a dedicated attached or detached garage or other *on-site parking space* provided for the dwelling unit shall be provided with one EV ready space per dwelling unit.

R404.4.2.2 EV ready spaces. Each EV ready space shall have a branch circuit that complies with all of the following:

1. Terminates at a receptacle located within 3 feet (914 mm) of each EV ready space it serves. EV ready includes two adjacent parking spaces if the receptacle for the electrical facilities of this section are installed adjacent to and in between both parking spaces.

   Exception: A receptacle shall not be required if a hardwired EVSE is installed.

2. Has a minimum circuit capacity of 8.3 kVA (40A 208/240V).

3. The electrical panel, electrical distribution equipment directory, and all outlets or enclosures shall be marked “EV Ready” or “For future electric vehicle supply equipment.”

R404.4.2.3 Identification. Construction documents shall designate the EV ready space and indicate the locations of raceway and/or conduit and the termination points serving them. The circuits or spaces reserved in the electrical panel for EV ready spaces shall be clearly identified in the panel or subpanel directory.

Section R409.5.3 Electric vehicle power transfer infrastructure for multifamily and its subsections are deleted in their entirety.

Section R409.3 Electric ready is renumbered as Section R404.5 and amended as follows:

R404.5 Electric ready.

R404.5.1 General. The provisions of this section shall be applicable for all new *residential buildings* and major renovations and *additions*.

R404.5.2 Additional electrical infrastructure. *Combustion equipment* in *residential buildings* must meet the requirements of Sections R404.5.2.1 through R404.5.2.5 .

Exceptions:

1. Interior fireplaces that do not serve as a primary source of heating.
2. Exterior fireplaces and firepits, grills, and patio heaters.
3. Fossil fuel space heating equipment where a 208/240-volt electrical circuit with a minimum capacity of 40 amps exists for space cooling equipment.
4. Water heating equipment with an input capacity of 200,000 Btu/h or greater that serves multiple dwelling units or sleeping units.

R404.5.2.1 Combustion equipment. *Combustion equipment* shall be provided with all of the following:

1. A dedicated, appropriately phased branch circuit sized to accommodate *future electric equipment* or appliances to serve a comparable capacity to meet the heating load.

   1.1. The branch circuits serving future electric clothes drying equipment and cooking equipment shall be sized with a rating not less than 240 volts and not less than 30 amperes.
2. An electric receptacle or junction box that meets the requirements of Section R404.5.2.4 and is connected to the electrical panel through the branch circuit. Each electrical receptacle or junction box shall have reasonable access to the *combustion equipment* or dedicated physical space for *future electric equipment* with no obstructions other than the current *combustion equipment*.
3. Where *combustion equipment* is used for space or water heating, dedicated physical space shall be provided for *future electric equipment*, including an electric resistance backup coil for ducted systems, if applicable. Physical space occupied by existing *combustion equipment* shall be permitted to count toward satisfying the physical space requirement, subject to approval by the *code official*.

Exception: *Dwelling units* with installed air-conditioning systems are not required to provide additional dedicated physical space for an outdoor heat pump.

R404.5.2.2 Electrical panel space. The electrical panel shall have a reserved space for a minimum two-pole circuit breaker for each branch circuit provided for *future electric equipment* or appliances. The electrical panel shall be sized for the electrical load necessary to meet an equivalent electrical load for any *combustion equipment*. Electrical loads shall be calculated in accordance with the *National Electrical Code*.

R404.5.2.3 Labeling. The junction box or receptacle and the dedicated circuit breaker space serving *future electric equipment* or appliances in the electrical panel shall be labeled for their intended use.

R404.5.2.4 Adjacency. The electrical receptacle or junction box must be provided within 3 feet (914 mm) of the *combustion equipment* or appliances, or within 3 feet (914 mm) of the dedicated physical space for *future electric equipment* or appliances.

Exception: For *combustion equipment* dedicated to space or water heating, the electrical receptacle or junction box shall be located not more than 6 feet (1829 mm) from the *combustion equipment* or the dedicated physical space for *future electric equipment*.

R404.5.2.5 Condensate drain. Where *combustion equipment* for space heating and water heating is installed, a location shall be provided for condensate drainage.

Section R404.6 On-site renewable energy is added as follows:

R404.6 On-site renewable energy. New *dwelling units* shall comply with either Section R404.6.1 or R404.6.2.

Exception: New *dwelling units* in existing *buildings* except change of occupancy to a higher energy-demand category.

R404.6.1 Minimum renewable energy system capacity. New *dwelling units* shall be provided with an *on-site renewable energy* system(s) capable of producing annual renewable energy output of no less than 7.2 kBtu/yr (2.1 kWh/yr) per square foot of conditioned floor area of the *dwelling unit* or 0.12 ft^2 of panel per square foot of conditioned floor area of the *dwelling unit*. System specifications and system renewable calculations demonstrating that the system meets the requirements of this section shall be included in the construction documents. *Onsite renewable energy* system(s) used to comply with this section shall not be included in the calculations for Section R405 or Section R406. Areas of the roof that are in full or partial shade for more than 70% of daylight hours annually may not be used to meet this requirement.

Exception: *Dwelling units* complying with Section R401.2.1 that comply with Items 1 and 2 below that are provided with an onsite renewable energy system(s) capable of producing annual renewable energy output of no less than 1.2 kBtu/yr (0.35 kWh/yr) or 0.02 ft^2 of panel per square foot of conditioned floor area of the *dwelling unit*.

1. Measure number R408.2.2(10) or R408.2.2(11), and
2. Measure number R408.2.3(3), R408.2.3(4), R408.2.3(5)(a), R408.2.3(5)(b), or R408.2.3(6).

Section R409.4.2 Solar-ready zone for single family and townhouses is renamed and renumbered Section R404.6.2 Solar-ready zone and amended as follows:

R404.6.2 Solar-ready zone. New *residential buildings* with not less than 600 square feet (55.7 m^2) of roof area oriented between 110 degrees and 270 degrees of true north or that is a low-sloped roof shall comply with Sections R404.6.2.1 through R404.6.2.8 .

Exceptions:

1. New residential *dwelling units* with a permanently installed *on-site renewable energy* system that provides electricity to the *dwelling unit*'s electrical system.
2. A detached one- or two-family dwelling or townhouse where all areas of the roof that would otherwise meet the requirements of this section are in full or partial shade for more than 70 percent of daylight hours annually.

R404.6.2.1 Construction document requirements for solar-ready zone. Construction documents shall indicate the *solar-ready zone*.

R404.6.2.2 Solar-ready zone areas. The total *solar-ready zone* area for each detached one- or two-family dwelling or townhouse shall be not less than 300 square feet (27.9 m^2), exclusive of mandatory access or setback areas as required by the Denver Fire Code . The *solar-ready zone* shall be composed of areas not less than 5 feet (1524 mm) in width and not less than 80 square feet (7.4 m^2), exclusive of access or setback areas as required by the Denver Fire Code .

Exception: New townhouses three stories or less in height above *grade plane* and with a total floor area less than or equal to 2,000 square feet (185.8 m^2) of *conditioned space* per townhouse

unit shall have a solar-ready zone area of not less than 150 square feet (13.9 m^2).

R404.6.2.3 Obstructions. *Solar-ready zones* shall be free from obstructions, including but not limited to vents, chimneys and roof-mounted equipment.

R404.6.2.4 Shading. The *solar-ready zone* shall be set back from any existing or new permanently affixed object on the *building* or site that is located south, east or west of the *solar-ready zone* a distance not less than two times the object's height above the nearest point on the roof surface. Such objects include, but are not limited to, taller portions of the *building* itself, parapets, chimneys, antennas, signage, rooftop equipment, trees and roof plantings either existing at the time of permit application or planned for on the construction documents.

R404.6.2.5 Roof load documentation. The structural design loads of roof dead load and roof live load shall be clearly indicated on the construction documents.

R404.6.2.6 Interconnection pathway. Construction documents shall indicate at least one potential pathway for routing of conduit and/or raceway from the *solar-ready zone* to the electrical service panel and shall be labeled as "Potential Pathway" on the construction documents.

R404.6.2.7 Electrical service reserved space. The main electrical service panel shall have sufficient reserved space to allow the installation of a dual pole circuit breaker for future solar electric installation and shall be labeled "For Future Solar Electric." The reserved space shall be positioned at the opposite (load) end from the input feeder location or main circuit location.

R404.6.2.8 Construction documentation certificate. A permanent certificate indicating the solar-ready zone and other requirements of Sections R404.6.2.1 through R404.6.2.7 shall be posted near the electrical distribution panel, water heater or other conspicuous location.

SECTION R405 SIMULATED BUILDING PERFORMANCE

Table R405.2(1) Simulated Building Performance Compliance Target is amended as follows:

TABLE R405.2(1) SIMULATED BUILDING PERFORMANCE COMPLIANCE TARGET

CFA_{HS} (ft²)	*ALL-ELECTRIC PROPERTIES*	ALL OTHER DWELLING UNITS	
		With an on-site renewable energy system in accordance with Section R404.6.1 or CFA_{HS} < 1,000 sf	**Without on-site renewable energy**
< 5,000	$SE_{proposed} \leq 0.85 \times SE_{reference}$	$SE_{proposed} \leq 0.80 \times SE_{reference}$	$SE_{proposed} \leq 0.71 \times SE_{reference}$
≥ 5,000 and < 7,500	$SE_{proposed} \leq 0.75 \times SE_{reference}$	$SE_{proposed} \leq 0.70 \times SE_{reference}$	$SE_{proposed} \leq 0.61 \times SE_{reference}$
≥ 7,500	Must comply with the *Energy Rating Index* pathway in Section R401.2.3.	Must comply with the *Energy Rating Index* pathway in Section R401.2.3.	

CFA_{HS} = Conditioned floor area of the dwelling unit, in square feet, used to determine the required simulated building performance compliance target.
$SE_{proposed}$ = Site energy use of the proposed design, in kBtu/year or kBtu/ft^2/year.
$SE_{reference}$ = Site energy use of the standard reference design, in kBtu/year or kBtu/ft^2/year.

Table R405.2(2) Requirements for Simulated Building Performance is amended as follows:

TABLE R405.2(2) REQUIREMENTS FOR SIMULATED BUILDING PERFORMANCE

SECTION[a]	TITLE
General	
R401.3	Certificate
R401.4	Homeowner manual
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.1.6	Rooms containing fuel-burning appliances
R402.2.3	Attic knee wall
R402.2.4	Eave baffle
R402.2.5.1	Access hatches and door insulation installation and retention
R402.2.9.1	Basement wall insulation installation
R402.2.10	Slab-on-grade floors
R402.2.11	Crawl space walls
R402.5.1.1	Installation
R402.5.1.2	Air leakage testing
R402.5.1.3	Maximum air leakage rate
R402.5.2	Fireplaces
R402.5.3	Fenestration air leakage
R402.5.4	Recessed lighting
R402.5.5	Air-sealed electrical and communication outlet boxes
R402.6	Maximum fenestration U-factor and SHGC
Mechanical	
R403.1	Controls
R403.2	Hot water boiler temperature reset
R403.3	Duct systems
R403.4	Mechanical system piping insulation
R403.5	Service hot water systems
R403.6	Mechanical ventilation
R403.7, except Section R403.7.1	Equipment sizing and efficiency rating
R403.9	Snow melt and ice system controls
R403.10	Energy consumption of pools and spas
R403.11	Portable spas
R403.12	Residential pools and permanent residential spas
R403.13	Gas fireplaces
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R404.4	Electric vehicle (EV) ready
R404.5	Electric ready
R404.6	On-site renewable energy

a. Reference to a code section includes all the relative subsections except as indicated in the table.

SECTION R406 ENERGY RATING INDEX COMPLIANCE ALTERNATIVE

Section R406.1 Scope is amended as follows:

R406.1 Scope. This section establishes criteria for compliance using an Energy Rating Index (ERI) analysis developed per ANSI/RESNET/ICC 301. Such analysis shall be limited to *dwelling units*. Spaces other than *dwelling units* in Group R-3 or R-4 *buildings* shall comply with Sections R402 through R404.

Table R406.2 Requirements for Energy Rating Index is amended as follows:

TABLE R406.2 REQUIREMENTS FOR ENERGY RATING INDEX

SECTION[a]	TITLE
General	
R401.3	Certificate
R401.4	Homeowner manual
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.1.6	Rooms containing fuel-burning appliances
R402.2.3	Attic knee wall
R402.2.4	Eave baffle
R402.2.5.1	Access hatches and door insulation installation and retention
R402.2.9.1	Basement wall insulation installation
R402.2.10	Slab-on-grade floors
R402.2.11	Crawl space walls
R402.5.1.1	Installation
R402.5.1.2	Air leakage testing
R402.5.1.3	Maximum air leakage rate
R402.5.2	Fireplaces
R402.5.3	Fenestration air leakage
R402.5.4	Recessed lighting
R402.5.5	Air-sealed electrical and communication outlet boxes
R406.3	Building thermal envelope
Mechanical	
R403.1	Controls
R403.2	Hot water boiler temperature reset
R403.3	Duct systems
R403.4	Mechanical system piping insulation
R403.5	Service hot water systems
R403.6	Mechanical ventilation
R403.7, except Section R403.7.1	Equipment sizing and efficiency rating
R403.9	Snow melt and ice system controls
R403.10	Energy consumption of pools and spas
R403.11	Portable spas
R403.12	Residential pools and permanent residential spas
R403.13	Gas fireplaces
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls

SECTION[a]	TITLE
R404.4	Electric vehicle (EV) ready
R404.5	Electric ready
R404.6	On-site renewable energy

a. Reference to a code section includes all the relative subsections except as indicated in the table.

Table R406.5(1) Maximum Energy Rating Index, Dwelling Units less than 5,000 square feet is replaced as follows:

TABLE R406.5(1) MAXIMUM ENERGY RATING INDEX, DWELLING UNITS LESS THAN 5,000 SQUARE FEET

All-Electric Properties	**All Other Dwelling Units**	
	With an on-site renewable energy system in accordance with Section R404.6.1 or CFA_{HS} < 1,000 sf	**Without on-site renewable energy**
55	50	45

CFA_{HS} = conditioned floor area of the dwelling unit, in square feet.

Table R406.5(2) Maximum Energy Rating Index, Dwelling Units 5,000 square feet to 7,499 square feet is replaced as follows:

TABLE R406.5(2) MAXIMUM ENERGY RATING INDEX, DWELLING UNITS 5,000 SQUARE FEET TO 7,499 SQUARE FEET

All-Electric Properties	**All Other Dwelling Units**	
	With an on-site renewable energy system in accordance with Section R404.6.1	**Without on-site renewable energy**
54	49	44

CFA_{HS} = conditioned floor area of the dwelling unit, in square feet.

Section R406.5.1 Heat pump building ERI increase is deleted in its entirety

SECTION R408 ADDITIONAL EFFICIENCY PACKAGE OPTIONS

Section R408.2 Additional energy efficiency credit requirements is amended as follows, subordinate sections remain except as amended or deleted below:

R408.2 Additional energy efficiency credit requirements. *Residential buildings* shall earn the number of credits required in accordance with Table R408.2(1) and shall earn credits from not less than two measures specified in Table R408.2(2).

To earn credit as specified in Table R408.2(2), each measure selected for compliance shall comply with the applicable subsections of Section R408. Each *dwelling unit* or *sleeping unit* shall comply with the selected measure to earn credit. Interpolation of credits between measures shall not be permitted.

Exceptions:

Residential buildings shall not be required to achieve credits from two or more measures in Table R408.2(2) if sufficient credits can be achieved to meet the requirements of this section from one of the following single measures:

Achieving a 30 percent reduction in the total TC in accordance with Section R408.2.1.1.

Installation of a ground source heat pump in accordance with Section R408.2.2, Item 1.

New *all-electric properties* are not required to achieve credits from two or more measures in Table R408.2(2) and shall comply with the following:

2.1 Section R408.2.2(10) or R408.2.2(11).

2.2 Section R408.2.3(3), R408.2.3(4), R408.2.3(5)(a), R408.2.3(5)(b), or R408.2.3(6).

2.3 Measures from Sections 408.2.2 and R408.2.3 may not be used to achieve the number of credits required in Table R408.2(1).

Table R408.2(1) Energy Efficiency Credit Requirements is amended as follows:

TABLE R408.2(1) ENERGY EFFICIENCY CREDIT REQUIREMENTS

CFA_{HS}	***All-Electric Properties***	**All Other Dwelling Units**	
		With an on-site renewable energy system in accordance with Section R404.6.1 or *CFA_{HS}* < 1,000 sf	**Without on-site renewable energy**
< 5,000	3	18	31
≥ 5,000 and < 7,500	XX	XX	XX
≥ 7,500	Shall comply with the Energy Rating Index pathway in Section R401.2.3		

CFA_{HS} = conditioned floor area of the dwelling unit, in square feet, used to determine the required number of energy efficiency credits

Table R408.2(2) Credits for Additional Energy Efficiency and footnotes is amended as follows:

TABLE R408.2(2) CREDITS FOR ADDITIONAL ENERGY EFFICIENCY

MEASURE NUMBER	**MEASURE DESCRIPTION**	**CREDIT VALUE (CZ 5)**
R408.2.1.1(1)	≥ 2.5% Reduction in total TC	1
R408.2.1.1(2)	≥ 5% reduction in total TC	2
R408.2.1.1(3)	> 7.5% reduction in total TC	3
R408.2.1.1(4)	> 10% reduction in total TC	4
R408.2.1.1(5)	> 15% reduction in total TC	5
R408.2.1.1(6)	> 20% reduction in total TC	7

MEASURE NUMBER	MEASURE DESCRIPTION	CREDIT VALUE (CZ 5)
R408.2.1.1(7)	> 30% reduction in total TC	11
R408.2.1.2	U-factor and SHGC for vertical fenestration per Table R408.2.1.2	1
R408.2.2(1)[b]	Ground source heat pump	15
R408.2.2(2)[b]	High Performance Cooling (Option 1)	1
R408.2.2(3)[b]	High Performance Cooling (Option 2)	2
R408.2.2(4)[b]	High Performance Gas furnace or boiler (Option 1)	3
R408.2.2(5)[b]	High Performance Gas furnace or boiler (Option 2)	2
R408.2.2(7)[b]	High Performance Gas furnace or boiler and cooling (Option 1)	3
R408.2.2(8)[b]	High Performance Gas furnace or boiler and cooling (Option 2)	5
R408.2.2(9)[b]	High Performance Gas furnace or boiler and heat pump (Option 1)	XX
R408.2.2(10)[b]	High Performance Electric Space Heating	8
R408.2.2(11)[b]	Premium Performance Electric Space Heating	10
R408.2.2.2[b]	Evaporative cooling	5
R408.2.3(1)(a)[d]	Gas-fired storage water heaters (Option 1)	4
R408.2.3(1)(b)[d]	Gas-fired storage water heaters (Option 2 a or b)	5
R408.2.3(2)(a)[d]	Gas-fired instantaneous water heaters (Option 1)	5
R408.2.3(2)(b)[d]	Gas-fired instantaneous water heaters (Option 2)	6
R408.2.3(3)[d]	Electric water heaters (Option 1)	4
R408.2.3(4)[d]	Electric water heaters (Option 2)	4
R408.2.3(5)(a)[d]	Electric water heaters (Option 3)	5

MEASURE NUMBER	MEASURE DESCRIPTION	CREDIT VALUE (CZ 5)
R408.2.3(5)(b)[d]	Electric water heaters (Option 4)	5
R408.2.3(6)[d]	Electric water heaters (Option 5)	4
R408.2.3(7)(a)[d]	Solar hot water heating system (Option 1)	5
R408.2.3(7)(b)[d]	Solar hot water heating system (Option 2)	6
R408.2.3.1[c]	Compact hot water distribution	2
R408.2.3.2(1)[c]	Drain water heat recovery	2
R408.2.3.2(2)[c]	High performance drain water heat recovery	3
R408.2.4(1)[c]	Ductless or hydronic thermal distribution	5
R408.2.4(2)[c]	100% of duct systems in conditioned space	5
R408.2.4(4)[c]	Reduced total duct system leakage	1
R408.2.5(1)[c]	ERV or HRV installed	3
R408.2.5(2)[c]	≤ 2.0 ACH50 with ERV or HRV installed	8
R408.2.5(4)[c]	≤ 1.5 ACH50 with ERV or HRV installed	10
R408.2.5(5)[c]	≤ 1.0 ACH50 with ERV or HRV installed	12
R408.2.5.1	ERV or HRV preheating	1
R408.2.6[a]	Energy efficient appliances	1
R408.2.8[c]	Demand responsive thermostat	1
R408.2.11	Higher efficacy lighting	1
R408.2.14	Refrigerants	1

NA = Not Applicable.

a. Where the measure is selected, each dwelling unit, sleeping unit and common area where the measure is applicable must have the measure installed.
b. Where multiple heating or cooling systems are installed, credits shall be determined using a weighted average of the square footage served by each system.
c. Where the measure is selected, each dwelling unit and sleeping unit must comply with the measure.
d. Where the measure is selected, each dwelling unit shall be served by a water heater meeting the applicable requirements. Where multiple service water heating systems are installed, credits shall be determined using a weighted average of the square footage served by each system.

Section R408.2.1 Enhanced building thermal envelope options is amended as follows, subordinate

sections remain except as amended or deleted below:

R408.2.1 Enhanced building thermal envelope options. The *building thermal envelope* shall comply with one of the following:

1. Section R408.2.1.1.
2. Section R408.2.1.2.

Section R408.2.1.2 Improved fenestration is amended as follows:

R408.2.1.2 Improved fenestration. The area weighted average *U*-factor and SHGC of all vertical *fenestration* shall not exceed 0.22 and 0.40 respectively to achieve the credits in Table R408.2(2). For each increment of 0.05 that the area weighted *U*-factor is reduced below 0.22, one additional credit in addition to the credits in Table R408.2(2) shall be achieved.

Table R408.2.1.2 Improved Fenestration is deleted in its entirety.

Sections R408.2.1.3 Roof solar reflectance index and R408.2.1.4 Reduced air leakage are deleted in their entirety.

Section R408.2.2 More efficient HVAC equipment performance options is amended as follows, subordinate sections remain except as deleted below:

R408.2.2 More efficient HVAC equipment performance options. Heating and cooling *equipment* shall meet one of the following measures as applicable where heating and cooling efficiencies are represented by Annual Fuel Utilization Efficiency (AFUE), Coefficient of Performance (COP), Energy Efficiency Ratio (EER and EER2), Heating Season Performance Factor (HSPF2) and Seasonal Energy Efficiency Ratio (SEER2). Where multiple heating or cooling systems are installed serving different *zones*, credits shall be earned based on the weighted average of square footage of the *zone* served by the system.

1. Ground source heat pump: Greater than or equal to 16.1 EER and 3.1 COP ground source heat pump.
2. Cooling (Option 1): Greater than or equal to 15.2 SEER2 and 12.0 EER2 air conditioner.
3. Cooling (Option 2): Greater than or equal to 20.9 SEER2 and 16.5 EER2 air conditioner.
4. Gas furnace or boiler (Option 1): Greater than or equal to 97 percent AFUE fuel gas furnace or boiler.
5. Gas furnace or boiler (Option 2): Greater than or equal to 95 percent AFUE fuel gas furnace or boiler.
6. Reserved.
7. Gas furnace or boiler and cooling (Option 1): Greater than or equal to 95 percent AFUE fuel gas furnace or boiler and 15.2 SEER2 and 12.0 EER2 air conditioner.
8. Gas furnace or boiler and cooling (Option 2): Greater than or equal to 97 percent AFUE fuel gas furnace or boiler and 20.9 SEER2 and 16.5 EER2 air conditioner.
9. Gas furnace or boiler and heat pump (Option 1): Greater than or equal to 95 percent AFUE fuel gas furnace or boiler and 8.1 HSPF2 and 15.2 SEER 2 air source heat pump capable of meeting a capacity ratio ≥ 70 percent of heating capacity at 5°F (-15°C) versus rated heating capacity at 47°F (8.3°C).

10. High performance electric space heating: All space heating shall be provided by air source heat pumps that comply with the following:

    10.1 Capable of meeting a capacity ratio ≥ 70 percent of heating capacity at 5°F (-15°C) versus rated heating capacity at 47°F (8.3°C).

    10.2 Heat pumps shall have a rated COP of not less than 1.75 when operating at 5°F.

    10.3 Non-ducted heat pumps shall have an HSPF2 of not less than 9.

    10.4 Ducted heat pumps shall have an HSPF2 of not less than 7.7.

    10.5 The total electric resistance load for supplemental heating shall not exceed 1.35W per square foot of conditioned floor area of the *building* or 3 kW, whichever is greater.

    10.6 Gas backup shall not be permitted.

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11. Premium performance electric space heating: All space heating shall be provided by heat pumps that comply with measure 10 and shall have a minimum HSPF2 of 9.5.

Section R408.2.2.1 More efficient HVAC equipment for Climate Zone 4 is deleted in its entirety.

Section R408.2.3 Reduced energy use in service water-heating options is amended as follows, subordinate sections remain:

R408.2.3 Reduced energy use in service water-heating options. For measure numbers R408.2.3(1) through R408.2.3(8), the installed hot water system shall meet one of the Uniform Energy Factors (UEF) or Solar Uniform Energy Factors (SUEF) in Table R408.2.3. **Table R408.2.3 Service Water Heating Efficiencies is amended as follows:**

TABLE R408.2.3 SERVICE WATER HEATING EFFICIENCIES

Measure Number	Water Heater	Size and Draw Pattern	Type	Efficiency
R408.2.3(1)(a)	Gas-fired storage water heaters (Option 1)	All storage volumes, all draw patterns	Not applicable	UEF ≥ 0.82
R408.2.3(1)(b)	Gas-fired storage water heaters (Option 2a)	≤ 55 gallons, high or > 55 gallons, medium or high	Not applicable	UEF ≥ 0.86
R408.2.3(1)(b)	Gas-fired storage water heaters (Option 2b)	Rated input capacity > 75,000 Btu/h	Not applicable	UEF ≥ 0.86 or Et ≥ 94%
R408.2.3(2)(a)	Gas-fired instantaneous water heaters (Option 1)	All storage volumes, medium or high	Not applicable	UEF ≥ 0.92
R408.2.3(2)(b)	Gas-fired instantaneous water heaters (Option 2)	All storage volumes, medium or high	Not applicable	UEF ≥ 0.95

Measure Number	Water Heater	Size and Draw Pattern	Type	Efficiency
R408.2.3(3)	Electric water heaters (Option 1)	All storage volumes, low, medium, or high	Integrated HPWH	UEF ≥ 3.30
R408.2.3(4)	Electric water heaters (Option 2)	All storage volumes, low, medium, or high	Integrated HPWH, 120V/15a circuit	UEF ≥ 2.20
R408.2.3(5)(a)	Electric water heaters (Option 3)	All storage volumes, low, medium, or high	Split-system HPWH	UEF ≥ 2.20
R408.2.3(5)(b)	Electric water heaters (Option 4)	All storage volumes, low, medium, or high	Split-system HPWH	UEF ≥ 3.75
R408.2.3(6)	Electric water heaters (Option 5)	Rated input capacity > 12 kW	Not applicable	COP ≥ 3.00
R408.2.3(7)(a)	Solar water heaters (Option 1)	All storage volumes, all draw patterns	Electric backup	SUEF ≥ 3.00
R408.2.3(7)(b)	Solar water heaters (Option 2)	All storage volumes, all draw patterns	Gas backup	SUEF ≥ 1.80

For SI: 1 British thermal unit per hour = 0.2931 W.
UEF = Uniform Energy Factor, Et = Thermal Efficiency, COP = Coefficient of Performance.

Section R408.2.3.2 Drain water heat recovery is added as follows:

R408.2.3.2 Drain water heat recovery. The *building* shall be provided with drain water heat recovery units in accordance with R403.5.3 and one of the following:

1. All shower, bathtub, laundry, and sink drains shall be provided with drain water heat recovery units with Heat Recovery Efficiency of not less than 50%.
2. High performance: All shower, bathtub, laundry, and sink drains shall be provided with drain water heat recovery units with Heat Recovery Efficiency of no less than 65%.

Section R408.2.4 More efficient thermal distribution system options is amended as follows:

R408.2.4 More efficient thermal distribution system options. The thermal distribution system shall comply with one of the following:

1. The ductless thermal distribution system or hydronic thermal distribution system is located completely on the conditioned side of the *building thermal envelope*.
2. The *space conditioning equipment* is located inside *conditioned space*. In addition, 100 percent of the *ductwork* is located completely inside *conditioned space* as defined by Section R403.3.4, Items 1 and 2.
3. Reserved.
4. The total leakage of the *duct system* measured in accordance with Section R403.3.7 is one of the following:

4.1. Where the space conditioning equipment is installed at the time of testing, total leakage is

not greater than 2.0 cubic feet per minute (0.94 L/s) per 100 square feet (9.29 m^2) of conditioned floor area.

4.2. Where the space conditioning equipment is not installed at the time of testing, total leakage is not greater than 1.75 cubic feet per minute (0.83 L/s) per 100 square feet (9.29 m^2) of conditioned floor area.

Section R408.2.4.1 Testing duct leakage in all dwelling units is deleted in its entirety.

Section R408.2.5 Improved air sealing and efficient ventilation system options is amended as follows, subordinate section remains:

R408.2.5 Improved air sealing and efficient ventilation system options. The measured air leakage rate and *ventilation* system shall meet one of the following:

1. Either an Energy Recovery Ventilator (ERV) or a Heat Recovery Ventilator (HRV) installed.
2. Less than or equal to 2.0 ACH50, with an ERV or HRV installed.
3. Reserved.
4. Less than or equal to 1.5 ACH50, with either an ERV or HRV installed.
5. Less than or equal to 1.0 ACH50, with either an ERV or HRV installed.

In addition, measures requiring either an ERV or HRV shall comply with one of the following:,

HRV and ERV Sensible Recovery Efficiency (SRE) shall be not less than 75 percent at 32°F (0°C) at the lowest *listed* net airflow. ERV Latent Recovery/Moisture Transfer (LRMT) shall be not less than 50 percent at the lowest *listed* net airflow.

HRV and ERV Sensible Recovery Efficiency (SRE) shall be not less than 90 percent at 32°F (0°C) at the lowest *listed* net airflow. Three additional credits in addition to the credits in Table R408.2(2) shall be achieved.

Section R408.2.7 Renewable energy is deleted in its entirety.

Section R408.2.9 Opaque walls is deleted in its entirety.

Section R408.2.12 Dark sky exterior lighting is deleted in its entirety.

SECTION R409 RESIDENTIAL ELECTRIC READY, SOLAR READY AND EV READY

Section R409 RESIDENTIAL ELECTRIC READY, SOLAR READY AND EV READY is deleted in its entirety. The requirements of this section are covered in Sections R404.4 Electric vehicle (EV) ready, R404.5 Electric ready, and R404.6.2 Solar-ready zone.

CHAPTER 5 [RE]: EXISTING BUILDINGS

SECTION R501 GENERAL

Section R501.2 Compliance is amended as follows:

R501.2 Compliance. *Additions, alterations, repairs,* or changes of occupancy to, or relocation of, an existing *building*, *building* system, or portion thereof shall comply with Section R502, R503, R504, or R505, respectively, in this code and the provisions for *alterations, repairs, additions,* and changes of occupancy or relocation, respectively, in the Denver Residential Code, the Denver Commercial Building Code, the Denver Existing Building Code, the Denver Fire Code, the Denver Fuel Gas Code, the Denver Mechanical Code, the Denver Plumbing Code, and the Electrical Code of the City and County of Denver . Changes where unconditioned space is changed in conditioned space shall comply with Section R501.6.

Section R501.5 Historic buildings is replaced in its entirety as follows:

R501.5 Historic buildings. No provision of this code relating to the construction, *repair, alteration*, restoration, and movement of structures, and *change of occupancy* shall be mandatory for *historic buildings* provided that one of the following applies:

1. A report has been submitted to the *code official* and signed by the owner and a *registered design professional*, demonstrating that compliance with that provision would threaten, degrade, or destroy the contributing historic character or features, or the historic form, materials, or function of the *building*.
2. The Colorado State Historic Preservation Officer provides a letter to the *code official* with a finding that compliance with that provision would conflict with the Secretary of the Interior's Standards for Rehabilitation, outlining the specific provisions that are in conflict and how compliance would threaten, degrade, or destroy the contributing historic character or features, or the historic form, materials, or function of the *building*.
3. The Denver Landmark Preservation Commission or Lower Downtown Design Review Commission provides documentation to the *code official* with a finding that compliance with that provision would be in conflict with locally adopted historic preservation policies, standards, and guidelines, outlining the specific provisions that are in conflict and how compliance would threaten, degrade or destroy the historic character or features, or the historic form, materials or function of the *building*.

Section R501.6 Change in space conditioning is amended by adding Exception 2 as follows:

Exceptions:

1. Where the simulated performance option in Section R405 is used to comply with this section, the annual energy cost of the proposed design is permitted to be 110 percent of the annual energy cost otherwise allowed by Section R405.2.
2. Where complying with section R406 and when the Energy Rating Index of the *addition* and the existing *building*, and any *alterations* that are part of the project, is less than or equal to the Energy Rating Index of the existing *building*; the *addition* and any *alterations* that are part of the project shall comply with Section R406 in its entirety.

SECTION R502 ADDITIONS

Section R502.2.1 Building thermal envelope is amended by replacing Exception 1 as follows (Exception 2 remains without modification):

Exceptions:

1. New *building thermal envelope* assemblies are exempt from the requirements of Section R402.5.1.2. The *code official* may require third party inspections to be performed in accordance with R402.5.1.1.

SECTION R503 ALTERATIONS

Section R503.1.4 Lighting is amended by deleting its exception.

SECTION R505 CHANGE OF OCCUPANCY OR USE

Section R505.1 General is replaced in its entirety as follows:

R505.1 General. Any space that is converted to a residential *building* shall comply with the requirements of this chapter for *additions*, *alterations*, and *repairs*. Spaces undergoing a change in occupancy or use to a higher energy-demand category (higher number) as shown in Table R505.1 shall comply with Section R401.2.

Exceptions:

1. A change in use or occupancy from a lower-energy demand category to a residential *building* where it is calculated that it will not result in an increase in demand for fossil fuel and electrical energy.
2. Where Section R402.1.5 is used to comply with this section, the proposed *building thermal envelope* thermal conductance (TC_p) shall not be greater than 110 percent of the total *building thermal envelope* thermal conductance (TC_r) calculated in accordance with Section R402.1.5.
3. Where Section R405 is used to comply with this section, the annual site energy of the proposed design is permitted to be 110 percent of the annual site energy allowed by R405.2.

Table R505.1 Energy-Demand Categories is added as follows:

TABLE R505.1 Energy-Demand Categories

ENERGY-DEMAND CATEGORY	IBC OCCUPANCIES	IRC STRUCTURES
4 (highest energy-demand)	A	
3	E, I-4	
2	B, I-1, I-2, I-3, M, R	One- and two-family dwellings and townhouses
1 (lowest energy-demand)	F, H, S, U	Accessory structures with or without living space

CHAPTER 6 [RE]: REFERENCED STANDARDS

The following standards are added as follows:

ASME

Two Park Avenue
New York, NY 10016-5990
(800) 843-2763;

BPVC—Boiler and Pressure Vessel Code

END OF DENVER ENERGY CODE CORRELATION DOCUMENT