

**~~2019~~ 2021 DENVER
AMENDMENTS TO THE
~~2018~~ 2021 EDITION OF THE
INTERNATIONAL ENERGY
CONSERVATION CODE
AND APPENDICES AS
PUBLISHED BY
INTERNATIONAL CODE
COUNCIL (ICC)**

**CHAPTER 1 [CE]
SCOPE AND ADMINISTRATION**

SECTION C101

SCOPE AND GENERAL REQUIREMENTS

Section C101.1 Title is replaced in its entirety as follows:

C101.1 Title. These regulations shall be known as the Energy Conservation Code of the City and County of Denver and shall be cited as such. It is referred to herein as “this code”.

Sections C102 is deleted in its entirety. The Administration of the ~~2019~~ 2021 Denver Building Code shall govern.

SECTION C103

CONSTRUCTION DOCUMENTS

~~Section C103.2 Information on construction documents, Item 12 is replaced as follows:~~

~~12. Air barrier and air sealing details, including the location of the air barrier.~~

Section C103.2.2 Energy compliance, is added as follows:

C103.2.2 Energy compliance. The Building Official is authorized to require additional documentation through written policy to ensure compliance with the *International Energy Conservation Code*.

Sections C104 through ~~C106~~C107, and ~~C108-C109~~ C109-C110 are deleted in their entirety. The Administration of the ~~2019~~ 2021 Denver Building Code shall govern.

Commented [DE1]: 2021 IECC: Added energy compliance path as number 1 and Air barrier and sealing details as number 13, should be removed as Denver amendment.

CHAPTER 2 [CE] DEFINITIONS

SECTION C202

GENERAL DEFINITIONS

The following definitions are added:

COMMERCIAL BUILDINGS: All buildings that are not included in the definition of Residential building. All R-2 Residential buildings are considered Commercial buildings and are subject to the commercial provisions of the code.

Commented [DE2]: Added from Denver's policy

ELECTRIC VEHICLE (EV). A vehicle registered for on-road use, primarily powered by an electric motor that draws current from a rechargeable storage source that is charged by being plugged into an electrical current source. Plug-in hybrid electric vehicles are electric vehicles having a second source of motive power.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). Equipment used for the purpose of transferring electric energy to a battery or other energy storage device in an *electric vehicle*. There are two different standardized levels that are currently in use at which an *electric vehicle's* battery is recharged, identified as Level 2 and Level 3.

LEVEL 2. (accelerated charging) Capable of charging at 40Amps or higher on a 208V or 240VAC, single phase branch circuit. An EVSE capable of simultaneously charging at 40Amps or higher for each of two vehicles shall be counted as two Level 2 EVSE. Level 2 connectors shall possess at a minimum an SAE J1772 EV plug. Other Level 2 EVSE connector types will not be restricted if listed or field-certified by an OSHA-approved testing lab and SAE certified.

LEVEL 3. (fast/rapid charging) Capable of fast charging on a 100A or higher 480VAC three-phase branch circuit. AC power is converted into a controlled DC voltage and current within the EVSE that will then directly charge the *electric vehicle*.

Level 3 fast charging connectors can include but are not limited to:

1. The CHAdeMO, SAE Combo CCS 'Combined Charging System' and the Tesla Supercharger connector types.
2. Wireless inductive charging systems.

ELECTRIC VEHICLE LOAD MANAGEMENT SYSTEM. These systems (also known as 'smart charging', 'power sharing', or 'load sharing') are technologies that allow multiple *electric vehicles* to charge simultaneously while not exceeding the capacity of an *electric vehicle*. The use of *Electric Vehicle Load Management Systems* requires approval by the *Building Official*.

ELECTRIC VEHICLE (EV) CAPABLE SPACE. Electric Vehicle (EV) Capable Spaces are designated parking spaces where a basic level of infrastructure is installed to accommodate future *electric vehicles*.

ELECTRIC VEHICLE (EV) READY SPACE. Electric Vehicle (EV) Ready Spaces are designated parking spaces where the EVSE infrastructure has been installed and is made ready for *electric vehicle* charging.

GROUP R. Buildings or portions of buildings that contain any of the following occupancies as established in the *International Building Code*:

1. Group R-1.

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

LEVEL 3 ALTERATION. Alterations where the work area exceeds 50 percent of the original building area or more than 10 parking spaces are substantially modified.

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

~~The definition for Wall, Above Grade, is replaced in its entirety as follows:~~

~~**WALL, ABOVE GRADE.** A wall associated with the *building thermal envelope* that is more than 15 percent above grade and is on the exterior of the building or any wall that is associated with the *building thermal envelope* that is not on the exterior of the *building*. This includes, but is not limited to, between-floor spandrels, peripheral edges of floors, roof knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts~~

Commented [DE3]: IECC 2021: Definition edited to match Denver Amendments, this should be deleted.

CHAPTER 4 [CE] COMMERCIAL ENERGY EFFICIENCY

SECTION C401

GENERAL

Section C401.2 Application and its subsections are replaced as follows:

C401.2 Application. Commercial buildings, to include Group R-2, low-rise residential buildings, shall comply with the requirements of Appendix ~~CA~~ ~~CB~~ and one of the following:

1. The requirements of compliance options a or c of Section 4.2.1.1 of ANSI/ASHRAE/IESNA 90.1 and sections C402.5, ~~C405.10~~ ~~C405.13~~, and C408, of the *International Energy Conservation Code*:
 - a. For buildings complying with ASHRAE/IESNA 90.1, Section 4.2.1.1.a, the project must comply with two of the three following requirements where the area of work is 10,000 square foot or more: the proposed envelope performance factor is equal to or less than 90 percent of the ~~proposed base~~ envelope performance factor of Section 5, the ~~new~~ interior lighting power allowance is equal to or less than 75 percent of the lighting power allowance of (equal to or more than 25 percent better than code baseline) ~~Table-Section~~ 9.5.1 or ~~Section Table~~ 9.6.1, and the HVAC minimum ~~rated~~ efficiency of the proposed design ~~is at least a minimum of~~ 10 percent greater than the ~~applicable~~ HVAC minimum efficiency requirements of Tables 6.8.1.
 - b. ASHRAE/IESNA 90.1, Section 11, Energy Cost Budget Method is not an acceptable compliance path.
 - c. For buildings complying with ASHRAE/IESNA 90.1 Appendix G, Performance Rating Method, use method C401.2.c.1 or C401.2.c.2, replace ASHRAE/IESNA 90.1, Section G1.2.1, Mandatory Provisions with section C401.2.c.3, and include the energy, in ~~kbtu~~ ~~kBtu~~/sf/yr, of the *proposed design* and *baseline building design* in the compliance documentation:

1. When using the Energy Cost approach for Appendix G, the Performance Cost Index (PCI) shall be less than or equal to the Performance Cost Index Target (PCIt) when calculated in accordance with the following:

$$PCIt = 0.85 \times [BBUEC + (BPF \times BBREC)] / BBP$$

Where:

PCI = Performance Cost Index calculated in accordance with Section G1.2.

BBUEC = Baseline Building Unregulated Energy Cost, the portion of the annual energy cost of a Baseline building design that is due to unregulated energy use.

BBREC = Baseline Building Regulated Energy Cost, the portion of the annual energy cost of a Baseline building design that is due to regulated energy use.

BPF = Building Performance Factor from the PCI column of Table 4.2.1.1. For building area types not listed in Table 4.2.1.1 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.

BBP = Baseline Building Performance.

Regulated energy cost shall be calculated by multiplying the total energy cost by the ratio of regulated energy use to total energy use for each fuel type. Unregulated energy cost shall be calculated by subtracting regulated energy cost from total energy cost.

2. When using the Energy Source approach for Appendix G, the Source Energy Index (SEI) shall be less than or equal to the Source Energy Index Target (SEIt) when calculated in accordance with the following:

$$SEIt = 0.85 \times [BBUSE + (BPF \times BBRSE)] / BBP$$

Where

SEI = Source Energy Index calculated in accordance with Section G1.2.

BBUSE = Baseline Building Unregulated Source Energy, the portion of the annual source energy of a Baseline building design that is due to unregulated energy use multiplied by the site to source conversion ratios in Table 4.2.1.2 for each fuel type.

BBRSE = Baseline Building Regulated Source Energy, the portion of the annual source energy of a Baseline building design that is due to regulated energy use multiplied by the site to source conversion ratios in Table 4.2.1.2 for each fuel type.

BPF = Building Performance Factor from the SEI column of Table 4.2.1.1. For building area types not listed in Table 4.2.1.1 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.

BBP = Baseline Building Performance.

Regulated source energy shall be calculated by multiplying the total source energy by the ratio of regulated energy use to total energy use for each fuel type. Unregulated source energy shall be calculated by subtracting regulated source energy from total source energy.

3. ASHRAE/IESNA 90.1 Appendix G, G.1.2.1 Mandatory Provisions. This performance rating method requires conformance with the following provisions:
 - a. All requirements of Sections 5.4, 6.4, 7.4, 8.4 except 8.4.2, 9.4, and 10.4, shall be met.
 - b. The interior lighting power shall not exceed the interior lighting power allowance determined using either Tables G3.7 or G3.8 and the methodology described in Sections 9.5.1 and 9.6.1.

2. The requirements of Sections C402 through C405 and C408. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.

3. ~~The requirements of Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C403.13, C404, C405, C407 and C408. The building energy cost or site EUI shall be equal to or less than 76 percent of the standard reference design building. The Total Building Performance option requires compliance with Section C407.~~

The results from a code compliant software can be utilized to show compliance. "COMcheck™" – Commercial Energy Code Compliance Software is one program currently being accepted. This program developed by the Department of Energy can be downloaded for free at www.energycodes.gov/comcheck.

Table 4.2.1.1 Building performance factor is added as follows:

**TABLE 4.2.1.1
BUILDING PERFORMANCE FACTOR (BPF)**

BUILDING AREA AND TYPE	PERFORMANCE RATING METHOD	
	PCI	SEI
Multifamily	0.80	0.56
Healthcare/Hospital	0.52	0.58
Hotel/Motel	0.61	0.61
Office	0.61	0.61
Restaurant	0.58	0.58
Retail	0.59	0.59
School	0.50	0.50
Warehouse	0.61	0.61
All others	0.57	0.57

Table 4.2.1.2 Source energy conversion factors is added as follows:

TABLE 4.2.1.2
SOURCE ENERGY CONVERSION FACTORS

ENERGY TYPE	CONVERSION FACTOR
Electricity (grid purchased)	2.80
Electricity (on-side renewable energy installation)	1.00
Natural gas	1.05
Fuel oil	1.01
Propane and liquid propane	1.01
Steam	1.20
Hot water	1.20
Chilled water, coal, wood, other	1.00

SECTION C402

BUILDING ENVELOPE REQUIREMENTS

Section ~~C402.1.4.2~~ ~~C402.1.4.3~~ Thermal resistance of cold-formed steel walls with exterior cavity insulation located between z-girts is added as follows:

~~C402.1.4.2~~ ~~C402.1.4.3~~ Thermal resistance of cold-formed steel walls with exterior cavity insulation located between z-girts is added 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 ~~C402.1.4.1~~ ~~C402.1.4.2~~ and Equation 4-1. The value of ER in Equation 4-1 shall include the effective R-value of any cavity insulation located between steel studs in accordance with Table ~~C402.1.4.1~~ ~~C402.1.4.2~~ plus the effective R-value of exterior insulation located in the cavity between continuous z-girts 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:

Commented [DE4]: IECC 2021: Section numbers changed throughout this section due to addition of Roof/ceiling assembly

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.

Table C402.4 is replaced as follows:

TABLE C402.4

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^{ba}			
FIXED FENESTRATION	0.38 0.36		
OPERABLE FENESTRATION	0.45		
ENTRANCE DOORS	0.77 0.63		
ALL OTHER VERTICAL FENESTRATION	0.30		
SHGC			
ORIENTATION^a	SEW Fixed	N Operable	
PF < 0.2	0.38	0.51 0.33	
0.2 ≤ PF < 0.5	0.46	0.56 0.40	
PF ≥ 0.5	0.61	0.61 0.53	
SKYLIGHTS			
U-FACTOR	0.50		
SHGC	0.40		

NR = No Requirement, PF = Projection Factor.

a: "N" indicates vertical fenestration oriented within 45 degrees of true north. "SEW" indicates orientations other than "N." For buildings in the southern hemisphere, reverse south and north. Buildings located at less than 23.5 degrees latitude shall use SEW for all orientations.

b: ^a AW Products shall mean metal windows with an AW Performance Class Rating in accordance with AAMA/WDMA/CSSA 101/1.S.2/A440.

Section C402.5 Air leakage—thermal envelope (Mandatory) is replaced as follows:

C402.5 Air leakage—thermal envelope (Mandatory). The building thermal envelope shall comply with Sections C402.5.1 through C402.5.8 ~~C402.5.11.1~~

Section C402.5.1 Air barriers and the exception is replaced as follows:

C402.5.1 Air barriers. A continuous air barrier shall be provided throughout the building thermal envelope. The continuous air barrier shall be located on the inside or outside of the building thermal envelope, located within the assemblies comprising the building thermal envelope, or any combination thereof. The air barrier shall comply with Sections C402.5.1.1, C402.5.1.2 and C402.5.1.3 ~~C402.5.1.5~~

Exception: Heated spaces between slabs and dropped ceilings utilizing greater than 3.4 Btu/sq ft, but less than 12 Btu/sq ft for space conditioning purposes may eliminate the air barrier at the plenum floor, and instead maintain air barrier continuity across the slab following C402.5.1.1. The slab must have

Commented [DE5]: Defaulting to IECC 2021. Potential proposal to add options may be drafted.

minimum R-5 insulation and the plenum floor must have minimum R-19 insulation. Flexible batt insulation shall be supported in a permanent manner by supports no greater than 24 in. on center.

Section C402.5.1.2 Air barrier compliance options is replaced as follows:

C402.5.1.2 Air barrier compliance options. A continuous *air barrier* for the opaque *building envelope* shall comply with the following:

All *buildings* or portions of *buildings* including Group I occupancies shall meet the provisions of Section C402.5.1.2.1 C402.5.1.3 or C402.5.1.2.2 C402.5.1.4, and C402.5.1.2.3 C402.5.1.5. In addition *Buildings* or portions of *buildings* of other than Group I occupancy shall meet the provisions of Section C402.5.1.2.3 C402.5.3.

Section C402.5.1.2.3 C402.5.1.5 Building thermal envelope performance verification is added replaced as follows:

Section C402.5.1.2.3 C402.5.1.5 Building thermal envelope performance verification. 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 Sections C402.5.1. A verification report shall be completed by the *registered design professional* or *approved agency* and included in the Energy Compliance Package submitted with the permit application.
2. Inspection of continuous *air barrier* components and assemblies shall be conducted during construction while the *air barrier* is still accessible for inspection and repair to verify compliance with the requirements of Sections C402.5.1.1 and C402.5.1.2. A preliminary commissioning report shall be completed by the *registered design professional* or *approved agency* and provided to the *building owner* or owner's authorized agent and the *code official*.
3. A final commissioning report shall be completed by the *registered design professional* or *approved agency* and provided to the *building owner* or owner's authorized agent and the *code official*. The report shall identify deficiencies found during the review of the construction documents and inspection and details of corrective measures used.

Exception: 10% of the air barrier may be unverified as long as the required 0.40 CFM/ft² air leakage metric has been met in accordance with C402.5.1.2.3 C402.5.3. For buildings not required to test for air leakage, full air barrier verification is required.

Section C402.5.1.3 C402.5.3 Building thermal envelope testing and subsection is added replaced as follows:

C402.5.1.3 C402.5.3 Building thermal envelope testing. The *building thermal envelope* shall be tested in accordance with ASTM E 779 or an equivalent method *approved* by the *code official*.

Exception: Testing shall not be required to include all portions of the *building thermal envelope* where the following portions of the building are tested and the measured air leakage is area weighted by the surface area of the *building thermal envelope* in each portion:

1. The entire envelope area of all stories that have any spaces directly under a roof;
2. The entire envelope area of all stories that have a *building entrance*, exposed floor, loading dock, or are below grade, and

3. Representative above-grade sections of the *building* totaling at least 25 percent of the wall area enclosing the remaining conditioned space.

~~C402.5.1.3.1 C402.5.3.1 Building thermal envelope corrective measures.~~ Where the measured air leakage rate exceeds 0.40 cfm/ft² (2.0 L/s · m²) a diagnostic evaluation using smoke tracer or infrared imaging shall be conducted while the building is pressurized along with a visual inspection of the *air barrier*. Any leaks noted shall be sealed where such sealing can be made without destruction of existing *building* components. An additional report identifying the corrective actions taken to seal leaks shall be submitted to the *code official* and the *building owner*.

Section ~~C402.5.3~~ **C402.5.5** Rooms with fuel-burning appliances is replaced in its entirety as follows (remainder of section unchanged):

~~C402.5.3~~ **C402.5.5** Rooms with fuel-burning appliances. In Climate Zones 3 through 8, 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:

SECTION C403 BUILDING MECHANICAL SYSTEMS

Section C403.5 Economizers, item #2 is replaced in its entirety as follows:

2. Individual fan systems with manufacturer published nominal cooling capacity greater than or equal to of 54,000 Btu/h (15.8 kW), in buildings having other than a Group R occupancy.

~~Section C403.6.1 Variable air volume and multiple zone systems, Item 1 is replaced as follows:~~

1. Twenty percent of the zone design peak supply for systems with *direct digital control (DDC)* and 30 percent for other systems.

Commented [DE6]: IECC 2021: Now stated as written.

Section C403.7.1.1 Variable air volume, single zone variable air volume (SZVAV), dedicated outside airflow (DOAS), energy recovery ventilator (ERV) and make up air (MUA) system control (**Mandatory**) is added as follows:

403.7.1.1 Variable air volume, single zone variable air volume (SZVAV), dedicated outside airflow (DOAS), energy recovery ventilator (ERV) and make up air (MUA) system control (Mandatory**).** 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 *International 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 C403.7.4 Energy recovery ventilation systems (**Mandatory**) is replaced as follows:

C403.7.4 Energy recovery ventilation systems (Mandatory**).** Where the outside or exhaust airflow rate of a system exceeds the values specified in modified Tables ~~C403.7.4(1)~~ **C403.7.4.2(1)** and ~~C403.7.4(2)~~ **C403.7.4.2(2)**, the system shall include an energy recovery system. The energy recovery system shall be configured to provide a change in the enthalpy of the outdoor air supply of not less than 50 percent of the difference between the outdoor air and return air enthalpies, at design conditions. Where an air economizer is required, the energy recovery system shall include bypass dampers on supply and exhaust air or controls that permit operation of the economizer as required by Section C403.5. Maximum heat exchanger pressure

drop is 0.6 in. w.g. at sea level and standard density per table C403.8.1(2), and the supply and exhaust fan static efficiency must be 65% or greater.

Section C403.7.4 Energy recovery ventilation systems (~~Mandatory~~), Exception Item #8 is replaced as follows:

8. Where the air exhausted at a single location at the building exterior is less than modified table ~~C403.7.4(1)~~ C403.7.4.2(1) or modified table ~~C403.7.4(2)~~ C403.7.4.2(2), based on the appropriate outside air column.

Tables ~~C403.7.4~~ C403.7.4.2 (1) and (2) Energy recovery requirement are replaced as follows:

TABLE ~~C403.7.4~~ C403.7.4.2 (1)
ENERGY RECOVERY REQUIREMENTS

(Ventilation systems operating less than 8,000 hours per year)

CLIMATE ZONE	PERCENT (%) OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE							
	≥10 & < 20	≥20 & < 30	≥30 & < 40	≥40 & < 50	≥50 & < 60	≥60 & < 70	≥70 & < 80	≥80
	DESIGN OUTSIDE OR EXHAUST AIRFLOW RATE (CFM)							
5B	NR	NR	NR	NR	NR	NR	7,500	5,000

For SI: 1 CFM = 0.4719 L/s.

NR = Not required

Requirements are based on a 10-year payback

TABLE ~~C403.7.4~~ C403.7.4.2 (2)
ENERGY RECOVERY REQUIREMENTS

(Ventilation systems operating 8,000 or more hours per year)

CLIMATE ZONE	PERCENT (%) OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE							
	≥10 & < 20	≥20 & < 30	≥30 & < 40	≥40 & < 50	≥50 & < 60	≥60 & < 70	≥70 & < 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 C403.8.6 Low capacity ventilation fans is added as follows:~~

~~C403.8.6 Low capacity ventilation fans. Mechanical ventilation system fans less than 1/12 horsepower in capacity shall meet the efficacy requirements of Table C403.8.6.~~

Exceptions:

1. Where ventilation fans are a component of a listed heating or cooling appliance.
2. Dryer exhaust duct power ventilators, domestic range hoods, and domestic range booster fans that operate intermittently.

Commented [DE7]: IECC 2021 added section C403.8.5

Policy 4a states provide schedules with notes indicated equipment efficiencies comply, otherwise this policy is already covered by IECC 2021.

Table C403.8.6 is added as follows:

**TABLE C403.8.6
MECHANICAL VENTILATION SYSTEM FAN EFFICACY**

FAN LOCATION	AIR FLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)	AIR FLOW RATE MAXIMUM (CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
In-line fan	Any	3.8 cfm/watt	Any
Bathroom, utility room	10	2.8 cfm/watt	<90
Bathroom, utility room	90	3.5 cfm/watt	Any

Section ~~C403.13~~ **C403.15** Dehumidification and cooling efficiency for plant growth and maintenance (~~Mandatory~~) and subsections are added as follows:

C403.13 C403.15 Dehumidification and cooling efficiency for plant growth and maintenance (~~Mandatory~~). Indoor agricultural operations must follow the requirements for dehumidification and cooling from sections C403.13.1 and C403.13.2. Space cooling equipment for indoor plant grow operations shall meet the minimum energy efficiency ratio (EER) or seasonal energy efficiency ratio (SEER) specified in C403.3.2.

C403.13.1 C403.15.1 Dehumidification. All indoor plant grow operations that require dehumidification shall utilize one of the following dehumidification options:

1. Free-standing dehumidification units with a minimum energy factor of 1.9 l/kWh. The test method for minimum energy factor shall be as specified in 10 CFR Part 430, Subpart B - Appendix X.
2. Chilled water system with heat recovery from the condenser coil to achieve dehumidification reheat.
3. Integrated HVAC system with heat recovery from the condenser coil (hot gas reheat) to achieve dehumidification reheat.

C403.13.2 C403.15.2 Dehumidification backup. Electric or fossil fuel reheat systems may be employed as supplementary heat for dehumidification when the primary dehumidification system in C403.13.1 is designed to fulfill at least 60% of the facility's dehumidification needs during peak dehumidification periods.

SECTION C404

SERVICE WATER HEATING (MANDATORY)

Section C404.2.1 High input service water heating systems is replaced as follows:

~~C404.2.1 High input service water heating systems. Gas-fired water-heating equipment installed in new buildings shall be in compliance with this section. Where a singular piece of water heating equipment serves the entire building and the input rating of the equipment is 1,000,000 Btu/h (293 kW) or greater, such equipment shall have a thermal efficiency, Et, of not less than 92 percent. Where multiple pieces of water heating equipment serve the building and the combined input rating of the water heating equipment~~

Commented [DE8]: IECC 2021 includes the same requirements
Policy 4b states provide schedules with notes indicated equipment efficiencies comply, otherwise this policy is already covered by IECC 2021

is 1,000,000 Btu/h (293 kW) or greater, the combined input capacity-weighted average thermal efficiency, E_t , shall be not less than 90 percent.

Exceptions:

- ~~1. Where not less than 25 percent of the annual service water heating requirement is provided by onsite renewable energy or site-recovered energy, the minimum thermal efficiency requirements of this section shall not apply.~~
- ~~2. The input rating of water heaters installed in individual dwelling units shall not be required to be included in the total input rating of service water heating equipment for a building.~~
- ~~3. The input rating of water heaters with an input rating of not greater than 100,000 Btu/h (29.3 kW) shall not be required to be included in the total input rating of service water heating equipment for a building.~~

**SECTION C405
ELECTRICAL POWER AND LIGHTING SYSTEMS**

Section C405.1 General is replaced as follows:

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

C405.1.1 Lighting for dwelling units and sleeping units. No less than ~~90%-100%~~ of the permanently installed luminaires in *dwelling units* and *sleeping units* shall be provided with lamps or light sources with an efficacy of not less than 65 lm/W.

~~**C405.1.2 Lighting for refrigerated applications.** Lighting installed in walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with the lighting requirements of Section C403.10.1 or C403.10.2.~~

Section ~~C405.2.6~~ C405.2.7 Exterior lighting controls, Exception 1 is replaced as follows:

1. Lighting for covered vehicle entrances and exits from buildings where required for eye adaption.

~~Section C405.2.7~~ C405.2.8 Parking Garage Lighting Control is added replaced as follows:

~~**C405.2.7**~~ **C405.2.8 Parking Garage Lighting Control.** Lighting for parking garages shall comply with the following:

Exception: Where the total interior lighting power density watts per square foot does not exceed 0.08.

- ~~1. Parking garage lighting shall have automatic time switch shutoff in accordance with Section C405.2.2.1.~~
- ~~2. Lighting power of each luminaire shall be automatically reduced by not less than 60% when there is no activity detected within a lighting zone for 20 minutes. Lighting zones for this requirement shall be no larger than 3600 sq. ft.~~
- ~~3. Where lighting for eye adaptation is provided at covered vehicle entrances and exits from buildings and parking structures, such lighting shall be separately controlled by a device that automatically reduces lighting power by at least 50% from sunset to sunrise.~~

Commented [DE9]: Added to 2021 IECC.

4. ~~The power to luminaires within 20 ft. of perimeter wall openings or fenestration shall automatically reduce in response to daylight by at least 50%.~~

Exceptions:

1. ~~Where the opening or fenestration to wall ratio is less than 40% as viewed from the interior and encompassing the vertical distance from the driving surface to the lowest structural element.~~
2. ~~Where the distance from the opening or fenestration to any exterior daylight blocking obstruction is less than one half the height from the bottom of the opening or fenestration to the top of the obstruction.~~
3. ~~Where openings are obstructed by permanent screens or architectural elements restricting daylight entering the interior space.~~

Section C405.3.2 Interior Lighting Power Allowance

Table C405.3.2(1) Interior lighting power allowances – building area method: Table remains unchanged. Footnotes A, B and C have been deleted.

Section ~~C405.3.3~~ C405.4 Lighting for plant growth and maintenance is ~~added~~ replaced as follows:

~~C405.3.3~~ C405.4 Lighting for plant growth and maintenance. All non-LED lighting using replaceable lamps must be installed with electronic ballasts. All luminaires shall be listed by an OSHA Nationally Recognized Testing Labs (NRTL) or field certified by an OSHA NRTL to an appropriate standard. In addition, not less than ~~80~~ 95 percent of the total Watts of lighting for canopy areas (areas used for plant growth and plant maintenance) must be provided by lighting having a photosynthetic photon efficacy of not less than 1.6 $\mu\text{mol}/\text{J}$ (luminaires), or 1.9 $\mu\text{mol}/\text{J}$ (lamps). Indoor agriculture facilities have three options to demonstrate that lighting meets these efficacy requirements:

1. LED luminaires listed in the Design Lights Consortium's Horticultural Qualified Products List (QPL), <https://www.designlights.org/horticultural-lighting/search/>, will be considered to comply with this section.
2. Double-ended high-pressure sodium (HPS) lamps with efficacies of 1.9 $\mu\text{mol}/\text{J}$ or greater, used with any reflector and ballast combination, satisfy the requirements of this section. ~~Compliance with this efficacy requirement must be demonstrated by a third-party test report providing the lamps' photosynthetic photon efficacy (measured in $\mu\text{mol}/\text{J}$), generated by a facility accredited to the ANSI/IES LM-51 standard.~~
3. For lamps or luminaires not included in 1) or 2) above, compliance with the efficacy requirements of this section must be demonstrated by either providing manufacturer's documentation indicating the luminaire or lamp efficacy or by submitting for review a third-party test report providing the lamps' or luminaires' photosynthetic photon efficacy (measured in $\mu\text{mol}/\text{J}$), generated by a facility accredited to the ANSI/ASABE S642, ANSI/IES LM-79, or ANSI/IES LM-51 standards.

Section ~~C405.10~~ C405.13. *Electric Vehicle (EV) charging for new construction and Level 3 Alterations* and subsections are added as follows:

~~C405.10~~ C405.13. *Electric Vehicle (EV) charging for new construction and Level 3 Alterations.* Electric vehicle charging shall be provided and installed in accordance with this section and the *National Electrical Code (NFPA 70)*. When parking spaces are added or modified without an increase in building floor area or a *level 3 alteration*, only the new parking spaces are subject to this requirement.

~~C405.10.1~~ ~~C405.13.1~~. **Group R occupancies.** Group-R occupancies with three or more dwelling units and/or sleeping units shall be provided with *electric vehicle* charging in accordance with Table ~~C405.10.1~~ ~~C405.13.1~~. Calculations for the number of spaces shall be rounded up to the nearest whole number.

The minimum required quantity of EV parking spaces shall be calculated based upon the total provided new and existing parking spaces for the building. A minimum of 70% of the required EV parking spaces shall be amongst the 50% of parking spaces located closest to the intended occupant entrance to the building served.

Table ~~C405.10.1~~ ~~C405.13.1~~ EV spaces in Group R occupancies is added as follows:

TABLE ~~C405.10.1~~ ~~C405.13.1~~
EV SPACES IN GROUP R OCCUPANCIES

	NUMBER OF LEVEL 2 EV READY SPACES	NUMBER OF LEVEL 2 EV CAPABLE SPACES	NUMBER OF LEVEL 2 EVSE INSTALLED SPACES
1 Space	1	None	None
2 to 9 spaces	1	20% of spaces	None
10 or more spaces	15% of spaces	Remainder of spaces	5% of spaces

~~C405.10.2~~ ~~C405.13.2~~ **Group A, B, E, I, M and S-2 occupancies.** Group A, B, E, I, M and open or enclosed parking garages under S-2 occupancy shall be provided with electric vehicle charging in accordance with Table ~~C405.10.2~~ ~~C405.13.2~~. Calculations for the number of spaces shall be rounded up to the nearest whole number.

The minimum required quantity of EV parking spaces shall be calculated based upon the total provided new and existing parking spaces for the building. A minimum of 70% of the required EV parking spaces shall be amongst the 50% of parking spaces located closest to the intended occupant entrance to the building served.

Exception: The number of *electric vehicle supply equipment* installed spaces for Groups A, B, E, I, M, and S-2 Occupancies may be reduced by up to five provided that the *building* includes not less than one parking space equipped with an *electric vehicle Level 3 EVSE* and not less than one *Level 2* charging *electric vehicle ready space*. A maximum of five spaces may be reduced from the total number of installed spaces.

Table ~~C405.10.2~~ ~~C405.13.2~~ EV spaces in Group A, B, E, I, M and S-2 occupancies is added as follows:

TABLE ~~C405.10.2~~ ~~C405.13.2~~
EV SPACES IN GROUP A, B, E, I, M and S-2 OCCUPANCIES

	NUMBER OF LEVEL 2 EV READY SPACES	NUMBER OF LEVEL 2 EV CAPABLE SPACES	NUMBER OF LEVEL 2 EVSE INSTALLED SPACES
1 Space	1	None	None
2 to 9 spaces	1	1	None

10 or more spaces	10% of spaces	10% of spaces	5% of spaces
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~~C405.10.2.1~~ ~~C405.13.2.1~~ **Group R occupancy Parking Garages.** Group S-2 parking garages utilized as vehicle parking specifically for Group R occupancies shall be provided with electric vehicle charging in accordance with Table ~~C405.10.1~~ C405.13.1.

~~C405.10.3~~ ~~C405.13.3~~. **Accessible parking.** Where new *EVSE installed spaces* and/or new *EV ready spaces* and new accessible parking are both provided, parking facilities shall be designed so that at least one accessible parking space shall be an *EV ready space* or *EVSE installed space*. The accessible parking space shall be included in the total EV parking spaces as required in Tables ~~C405.10.1~~ C405.13.1 and ~~C405.10.2~~ C405.13.2.

~~C405.10.4~~ ~~C405.13.4~~ **Level 2 Electric Vehicle Supply Equipment (EVSE) Requirements.**

1. Each *Level 2 EVSE* can have one or multiple connectors. It is permissible to serve multiple parking spaces with one *Level 2 EVSE* so long as the connectors can adequately reach each individual designated parking space.
2. *Level 2 EVSE* can be equipped with cellular, wired, or wireless communications.

~~C405.10.5~~ ~~C405.13.5~~ **EV Space Infrastructure Requirements.**

~~C405.10.5.1~~ ~~C405.13.5.1~~ **EV Ready Spaces**

1. Installation of infrastructure conduit.
 - a. The conduit shall be sized and installed per the National Electrical Code and shall be no less than 1" in size.
 - b. Conduits must be continuous from the future or existing panelboard or switchboard location(s) and end at a location allowing convenient, future installation of and access to the future *EVSE*.
2. Installation of conductors.
 - a. Conductors shall be installed of sufficient size to accommodate a minimum 40Amp branch circuit to each parking space where required in Tables ~~C405.10.1~~ C405.13.1 and ~~C405.10.2~~ C405.13.2 as applicable.
 - b. Conductors shall terminate in either
 - i. a minimum 40Amp NEMA receptacle or SAE J1772 EV plug.
 - ii. a junction or outlet box that is capped off, with the conduit sealed and the cap labeled as 'EV Ready for Future Use'.
 - iii. an *EVSE* installed within the parking space.
3. Electrical service and distribution capacity.
 - a. Electrical loads for the EV Ready parking spaces shall be included in the utility service calculations when determining the required ampacity rating for the service equipment.
 - b. The electrical loads shall be based on the quantity of *EV Ready Spaces* and *EVSE Installed Spaces* as required in Tables ~~C405.10.1~~ C405.13.1 and ~~C405.10.2~~ C405.13.2 as applicable.
4. Panelboard space.
 - a. There shall be adequate reserved circuit breaker space in an electrical panelboard or reserved space within an electrical switchboard to meet the requirements of Tables ~~C405.10.1~~ C405.13.1 and ~~C405.10.2~~ C405.13.2 as applicable.
 - b. This is in addition to the quantity of required *EVSE Installed Spaces* circuit

breakers or fused switches to meet the requirements of Tables ~~C405.10.1~~ ~~C405.13.1~~ and ~~C405.10.2~~ ~~C405.13.2~~ as applicable.

~~C405.10.5.2~~ ~~C405.13.5.2~~ EV Capable Spaces.

1. Installation of infrastructure conduit.
 - a. The conduit shall be sized and installed per the National Electrical Code and shall be no less than 1” in size.
 - b. Conduits must be continuous from the future or existing panelboard or switchboard location(s) and end at a location allowing convenient, future installation of, and access to, the future EVSE.
 - c. The *EV Capable Space* infrastructure conduit shall include installation of a pull rope or line for future conductor installation, with the conduit sealed and labeled as ‘EV Capable for Future Use’.
 - d. At the termination where each conduit ends at a future *EVSE* location, the conduit shall be sealed at a junction or outlet box that is capped off, with the conduit sealed and the cap labeled as “EV Capable for Future Use”.
2. Electrical distribution equipment room.
 - a. The electrical equipment room shall provide dedicated space for the future installation of the electrical distribution equipment required to serve the *EVSE*. Such equipment may include service switchgear, distribution panelboards, and transformers.
 - b. The future space shall be identified on all construction documents submitted for review and shall demonstrate compliance with the requirements of the National Electrical Code.
The space shall not be used for any other permanent purposes so as not to restrict future installation of electrical equipment.

SECTION C406

ADDITIONAL EFFICIENCY PACKAGE OPTIONS

~~Section 406.1 Requirements is replaced as follows:~~

~~**C406.1 Requirements.** Building shall comply with two or more of the following:~~

~~Items 1 through 8 ~~11~~ remain unchanged.~~

~~Section C406.1.1 Tenant spaces is replaced in its entirety as follows:~~

~~**C406.1.1 Tenant space.** Tenant spaces where the area of work is 10,000 square feet or more shall comply with two or more of the following Sections C406.2, C406.3, C406.4, C406.6 or C406.7. Alternatively, tenant spaces shall be considered in compliance with Section C406.5 where the entire building is in compliance with C406.5. A second Additional Efficiency Package Option will be required to meet C406.1.1.~~

~~Section C406.1.2 Documentation is added as follows~~

~~**C406.1.2 Documentation.** Drawings, calculations, and documents which graphically indicate, label, and/or specify building assemblies, equipment, luminaires, and enhanced lighting controls in compliance with the additional efficiency options shall be included in permit plans set.~~

~~Section C406.3 Reduced lighting power is replaced as follows~~

Commented [DE10]: IECC 2021: Conflict- This section is now credit based, removed this amendment and will be replaced with a new proposal.

Commented [DE11]: Added per Denver policy.

~~C406.3 Reduced lighting power.~~ The total connected interior lighting power calculated in accordance with Section C405.3.1 shall be less than 70 percent of the total lighting power allowance calculated (more than 30 percent better than code) in accordance with Section C405.3.2.

SECTION C407

TOTAL BUILDING PERFORMANCE

Section C407.2 Mandatory requirements is replaced as follows:

~~C407.2 Mandatory requirements. Compliance based on total building performance requires that a proposed design meet all of the following: Compliance with this section requires compliance with Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404 and C405. Minimum mandatory requirements shall be modeled in the Standard Reference Design and mandatory requirements shall be modeled as designed in the Proposed Design.~~

- ~~1. The requirements of the sections indicated within Table C407.2.~~
- ~~2. The building energy cost or site EUI shall be equal to or less than 76 percent of the standard reference design building. Energy prices shall be taken from a source approved by the code official, such as the Department of Energy, Energy Information Administration's State Energy Data System Prices and Expenditures reports. Code officials shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the proposed design associated with on-site renewable energy shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the standard reference design and the proposed design.~~

Section ~~C407.4.1~~ C407.3.1 Compliance report item #2 is replaced as follows:

- ~~2. An inspection checklist documenting the building component characteristics of the proposed design as specified in Table ~~C407.5.1(1)~~ C407.4.1(1). The inspection checklist shall show the estimated annual energy cost and site Energy Use Intensity in kBtu/sf/yr for both the standard reference design and the proposed design.~~

SECTION C408

SYSTEM COMMISSIONING

Section C408.2 Mechanical systems and service water heating systems commissioning, and completion requirements is modified by adding Exception 3 as follows:

Exceptions:

1. Systems in existing buildings where the area of work is less than 10,000 square feet.

Section C408.2.4 Preliminary commissioning report is replaced in its entirety 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 project mechanical and plumbing inspector. The report shall be organized with mechanical, lighting controls, and service hot water findings 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

Commented [DE12]: IECC 2021 now has a table of required sections rather than mandatory items marked throughout the code.

Commented [DE13]: Moved from C401.2

Commented [DE14]: Originally in C407.3 of IECC 2018, moved to include in amendment of C407.2

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 require 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 is replaced as follows:

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 <ul style="list-style-type: none"> Air and water flow rates have been measured and adjusted to deliver final flow rates within the tolerances provided in the produce 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 C408.1.3.2)	Manuals, record documents and training have been completed or are scheduled <ul style="list-style-type: none"> System documentation has been provided to the owner or scheduled to be delivered to the owner on: __ Record documents have been submitted to owner or scheduled to be delivered to the owner on: __ 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 2018 IECC as amended.
	Signature of Building Owner or Owner’s Representative _____ Date _____

FIGURE 408.2.4

COMMISSIONING COMPLIANCE CHECKLIST

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, lighting controls, and service hot water system findings 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 controls is amended by adding the following Exception:

Exception:

New lighting systems are exempt from the functional testing requirements in Section C408.3.1 in buildings where the new installed lighting load is less than 20 kW and the area of work is less than 10,000 square feet.

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

C408.3.2.3 Reports. The commissioning reports shall be provided as follows:

C408.3.2.3.1 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 project electrical inspector. The report shall be organized with mechanical, lighting controls, and service hot water findings 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. Results of functional performance tests.
3. Functional performance test procedures used during the commissioning process including measurable criteria for test acceptance.

C408.3.2.3.2 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, lighting controls, and service hot water system findings 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.

CHAPTER 5 [CE] EXISTING BUILDING

SECTION C501 GENERAL

Section ~~C501.4~~ C501.2 Compliance is replaced in its entirety as follows:

~~C501.4~~ C501.2 **Compliance.** *Alterations, repairs, additions* and changes of occupancy to, or relocation of, existing buildings and structures shall comply with the provisions for *alternations, repairs, additions* and changes of occupancy or relocation, respectively, in this code and the *International Building Code, International Fire Code, International Fuel and Gas Code, International Mechanical Code, International Plumbing Code* and NFPA 70.

Section ~~C501.6~~ C501.5 Historic buildings is replaced in its entirety as follows:

~~C501.6~~ 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 State Historic Preservation Office having jurisdiction provides a letter to the *code official* with a finding that compliance would be in 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 local historic preservation authority having jurisdiction 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 C502 ADDITIONS

Section C502.1 General is amended by replacing the last two sentences as follows:

Additions shall comply with Sections C402, C403, C404, C405, C406 (if using the prescriptive path), and C502.2 or C502.3.

Additions complying with Section 4.2.1.2 of ANSI/ASHRAE/IESNA 90.1 and Sections C405.10, C502.3.3.1, C502.3.4.1, C502.3.6.3, and C502.3.6.4 of DBCA need not comply with Sections C402, C403, C404, C405, and C406. Tenant spaces where the area of work is 10,000 square foot or more shall comply with two of the three requirements in Section C401.2.1.a if using the prescriptive path.

Section ~~C502.2.3.1~~ C502.3.3.1 Mechanical systems acceptance testing is added as follows:

~~C502.2.3.1~~ ~~C502.3.3.1~~ **Mechanical systems acceptance testing.** New mechanical systems that serve *additions* shall comply with Sections C408.2.2, C408.2.3 and C408.2.5.

Exceptions: The following systems are exempt:

1. Mechanical systems and service water heater systems in buildings where the total mechanical equipment capacity is less than 480,000 Btu/h (140.7 kW) cooling capacity and 600,000 Btu/h (175.8 kW) combined service water-heating and space-heating capacity.
2. Systems included in Section C403.5 that serve individual *dwelling units* and *sleeping units*.
3. Systems in existing buildings where the area of work is less than 10,000 sq. ft.

Section ~~C502.2.4.1~~ ~~C502.3.4.1~~ **Service hot water systems acceptance testing is added as follows:**

~~C502.2.4.1~~ ~~C502.3.4.1~~ **Service hot water systems acceptance testing.** New service hot water systems that serve *additions* shall comply with Sections C408.2.3 and C408.2.5.

Exceptions: The following systems are exempt:

1. Service water heater systems in buildings where the total mechanical equipment capacity is less than 600,000 Btu/h (175.8 kW) combined service water-heating and space-heating capacity.
2. Systems included in Section C403.5 that serve individual dwelling units and sleeping units.
3. Systems in existing buildings where the area of work is less than 10,000 sq. ft.

Section ~~C502.2.6.3~~ ~~C502.3.6.3~~ **Lighting acceptance testing is added as follows:**

~~C502.2.6.3~~ ~~C502.3.6.3~~ **Lighting acceptance testing.** New lighting systems that serve *additions* shall comply with Section C408.3.

Exception: New installed lighting load less than 20 kW and the area of work is less than 10,000 sq. ft.

Section ~~C502.2.6.4~~ ~~C502.3.6.4~~ **Lighting Systems for Plant Growth Vegetation Areas is added as follows:**

~~C502.2.6.4~~ ~~C502.3.6.4~~ **Lighting Systems for Plant Growth Vegetation Areas.** New lighting installed in new canopy areas (areas used for plant growth and plant maintenance) within a new addition shall comply with Section C405.3.3.

Section ~~C502.3~~ ~~C502.4~~ **Performance Option and subsections is added as follows:**

~~C502.3~~ ~~C502.4~~ **Performance Option.** Additions shall comply with the Section ~~C502.3.1~~ ~~or~~ ~~C502.3.2~~ ~~C502.4.1~~ ~~or~~ ~~C502.4.2~~, as applicable.

~~C502.3.1~~ ~~C502.4.1~~ **Addition compliance (Performance Option).** Where a building includes *additions*, the building shall comply if the annual energy cost or energy use of the *additions* is less than or equal to 85% of the annual energy cost of the baseline *additions* when modeled in accordance with Section C407.

~~C502.3.2~~ ~~C502.4.2~~ **Alteration plus addition compliance (Performance Option).** Where a building includes both *alterations* and *additions*, and *alterations* do not result in a change of occupancy or space conditioning per C505.1 ~~or~~ ~~C503.2~~ ~~or~~ ~~C502.2~~, the total building shall comply if the annual energy cost or energy use of the total building is less than or equal to 85% of the annual energy cost of the total baseline *building* when modeled in accordance with Section C407 and C503.1.1.

SECTION C503 ALTERATIONS

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 ~~C503.2~~ **C502.2**, the building shall comply with this code if the annual energy cost or energy use of the *alterations* that are part of the project is less than or equal to the annual energy cost of the existing *building* when modeled in accordance with Section C407, with the following changes:

1. Systems and building components that are not part of the alteration should be modeled identically in both baseline and proposed models.
2. Unaltered spaces may be excluded from the models if the energy use of the space is not impacted by the scope of the alterations.
3. When existing conditions are unknown for the spaces and systems the alterations affect, C407 should be used to determine baseline.
4. When existing conditions are known for the spaces and systems the alterations affect, they should be modeled as such in the baseline.
5. When existing conditions are unknown and unaltered, C407 should be used to determine baseline and proposed conditions.
6. When the alterations include envelope improvements, the baseline building should represent existing conditions prior to the alterations.
7. Alterations are not subject to the mandatory requirements of C407.2 except where outlined in C503.

Section ~~C503.3.1~~ **C503.2.1** is amended by adding an exception:

Exception. Where increasing the thickness of above deck insulation would result in existing exterior wall openings becoming less compliant with the *International Building Code*, increased insulation to the maximum extent feasible shall be considered in compliance with Section C402.1.4.

Section ~~C503.4.2~~ **C503.3.2** Mechanical systems acceptance testing is added as follows:

~~C503.4.2~~ **C503.3.2 Mechanical systems acceptance testing.** New mechanical systems that serve *alterations* shall comply with Sections C408.2.2, C408.2.3 and C408.2.5.

Exceptions: The following systems are exempt:

1. Mechanical systems and service water heater systems in buildings where the total mechanical equipment capacity is less than 480,000 Btu/h (140.7 kW) cooling capacity and 600,000 Btu/h (175.8 kW) combined service water-heating and space-heating capacity.
2. Systems included in Section C403.5 that serve individual *dwelling units* and *sleeping units*.
3. Systems in existing buildings where the area of work is less than 10,000 sq. ft.

Section ~~C503.5.1~~ **C503.4.1** Service hot water systems acceptance testing is added as follows:

~~C503.5.1~~ **C503.4.1 Service hot water systems acceptance testing.** New service hot water systems that serve *alterations* shall comply with Sections C408.2.3 and C408.2.5.

Exceptions: The following systems are exempt:

1. Service water heater systems in buildings where the total mechanical equipment capacity is less than 600,000 Btu/h (175.8 kW) combined service water-heating and space-heating capacity.
2. Systems included in Section C403.5 that serve individual dwelling units and sleeping units.
3. Systems in existing buildings where the area of work is less than 10,000 sq. ft.

Section ~~C503.6.1~~ C503.5.1 Lighting acceptance testing is added as follows:

~~C503.6.1~~ C503.5.1 Lighting acceptance testing. New lighting systems that serve *alterations* shall comply with Section C408.3.

Exception: New installed lighting load is less than 20 kW, and the area of work is less than 10,000 sq. ft.

Section ~~C503.6.2~~ C503.5.2 Lighting Systems for Plant Growth Vegetation Areas is added as follows:

~~C503.6.2~~ C503.5.2 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 C405.3.3.

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 C505

CHANGE OF OCCUPANCY OR USE

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 for new construction. Where the space undergoing a change in occupancy or use is in a building with a fenestration area that exceeds the limitations of Section C402.4.1, the space is exempt from Section C402.4.1 provided that 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 alternative in Section C402.1.5 is used to comply with this section, the proposed UA shall be not greater than 110 percent of the target UA.
3. Where the total building performance option in Section C407 is used to comply with this section, the annual energy cost or site EUI of the proposed design shall be not greater than 110 percent of the annual energy cost or site EUI otherwise permitted by Section ~~C407.3~~ C407.2.

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

**TABLE C505.1
ENERGY-DEMAND CATEGORIES**

4 (highest energy-demand)	A, B small assembly space
3	B gym, E, I-4, M
2	B (except as listed above), I-1, I-2, I-3, R
1	F, H, S

**CHAPTER 6 [CE]
REFERENCED STANDARDS**

The following referenced standard is added as follows:

10 CFR Part 430, Subpart B - Appendix X – (2018): Uniform Test

Method for Measuring the Energy Consumption of Dehumidifiers

Appendix CA Solar-ready zone—commercial is adopted with the following amendments:

APPENDIX ~~CA-CB~~
SOLAR-READY ZONE—COMMERCIAL

SECTION ~~CA103 CB103~~
SOLAR-READY ZONE

Section ~~CA103.6 CB103.6~~ Interconnection pathway is **added replaced** as follows:

~~CA103.6 CB103.6~~ Interconnection pathway. The building shall be provided with conduit or piping from the solar-ready zone to the electrical service panel ~~and electrical energy storage system area~~ or service hot water system.

Commented [DE15]: Added in IECC 2021

~~Section CA103.7 CB103.8~~ Electrical service reserved space is **added as follows:**

~~CA103.7 CB103.8~~ Electrical service reserved space. The main electrical service panel shall have a reserved space to allow for installation of a two pole/three pole circuit breaker or disconnect switch for future solar electric and a two pole/three pole circuit breaker or disconnect switch for future electrical energy storage system installation. These spaces shall be labeled “For Future Solar Electric.” and “For Future Energy Storage” respectively. The reserved spaces shall be positioned at the end of the panel that is opposite from the panel supply conductor connection.

Commented [DE16]: In IECC 2021 – now CB103.8.

**CHAPTER 1 [RE]
SCOPE AND ADMINISTRATION**

PART 1 – SCOPE AND APPLICATION

SECTION R101

SCOPE AND GENERAL REQUIREMENTS

Section R101.1 Title is replaced in its entirety as follows:

R101.1 Title. These regulations shall be known as the Energy Conservation Code of the City and County of Denver and shall be cited as such. It is referred to herein as “this code”.

Section R103.2.2 Energy compliance, is added as follows:

R103.2.2 Energy compliance. The Building Official is authorized to require additional documentation through written policy to ensure compliance with the *International Energy Conservation Code*.

Sections ~~R103~~ R103.3 through R104, R106, and R108 through R109 are deleted in their entirety. The Administration of the 2019 Denver Building Code shall govern.

Commented [ro17]: Section R103 in its entirety should not be deleted. Section R103.2 information on construction documents It outlines what should be on Construction document which helps ensure better performing homes. It also assists at plan review. The following sections should be included R103.1, R103.2 the remaining sections outlines the process of code approval for permitting and could be left out as it is probably address elsewhere.

Commented [ro18]: Section R105 Inspections begins the process of outlining inspection for the IECC and how they differ from other code inspections. It would be good to consider keeping or amending this section rather than deleting it in its entirety.

CHAPTER 2 [RE] DEFINITIONS

SECTION R202

GENERAL DEFINITIONS

The following definitions are added:

~~**DWELLING UNIT ENCLOSURE AREA.** The sum of the area of the ceiling, floors, and walls separating a dwelling unit's conditioned space from the exterior or from adjacent conditioned or unconditioned spaces. Wall height shall be measured from the finished floor of the dwelling unit to the underside of the floor above.~~

Commented [ro19]: Dwelling unit enclosure area definition has been added to the 2021 IECC

ELECTRIC VEHICLE (EV). A vehicle registered for on-road use, primarily powered by an electric motor that draws current from a rechargeable storage source that is charged by being plugged into an electrical current source. Plug-in hybrid electric vehicles are electric vehicles having a second source of motive power.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE). Equipment used for the purpose of transferring electric energy to a battery or other energy storage device in an *electric vehicle*. There are two different standardized levels that are currently in use at which an *electric vehicle's* battery is recharged, identified as Level 1 and Level 2.

LEVEL 1. (slow charging) Capable of charging at 20Amps maximum on a 120VAC, single phase branch circuit. Approved Level 1 connectors include the standard 120V grounded outlets (NEMA 5-15, 5-20) and SAE J1772 EV plug.

LEVEL 2. (accelerated charging) Capable of charging at 40Amps or higher on a 208V or 240VAC, single phase branch circuit. An EVSE capable of simultaneously charging at 40Amps or higher for each of two vehicles shall be counted as two Level 2 EVSE.

Level 2 connectors shall possess an SAE J1772 EV plug. Other Level 2 EVSE connector types will not be restricted if listed or field-certified by an OSHA-approved testing lab and SAE certified.

ELECTRIC VEHICLE LOAD MANAGEMENT SYSTEM. These systems (also known as 'smart charging', 'power sharing', or 'load sharing') are technologies that allow multiple *electric vehicles* to charge simultaneously while not exceeding the capacity of an *electric vehicle*.

ELECTRIC VEHICLE (EV) CAPABLE SPACE. Electric Vehicle Capable Spaces are designated parking spaces where a basic level of infrastructure is installed to accommodate future *electric vehicles*.

ELECTRIC VEHICLE (EV) READY SPACE. Electric Vehicle Ready Spaces are designated parking spaces where the *EVSE* infrastructure has been installed and is made ready for *electric vehicle* charging.

ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE) INSTALLED SPACE. A parking space installed with Level 1 or Level 2 *Electric Vehicle Supply Equipment*.

GROUP R. Buildings or portions of buildings that contain any of the following occupancies as established in the *International Building Code*:

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

LEVEL 3 ALTERATION. Alterations where the work area exceeds 50 percent of the original building area or more than 10 parking spaces are substantially modified.

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

TOWNHOUSE. A single-family *dwelling unit* constructed in a group of three or more attached units in which each unit extends from foundation to roof and has a *yard* or public way on the full length of one of the four principal sides and has a *yard* or public way on at least 50% of the length of another principal side.

~~The definition of HIGH-EFFICACY LAMPS is replaced as follows:~~

~~**HIGH-EFFICACY LAMPS AND LIGHT SOURCES.** Compact fluorescent lamps, light-emitting diode (LED) sources, T-8 or smaller diameter linear fluorescent lamps, or other lamps or light sources with an efficacy of not less than 65 lumens per watt.~~

Commented [ro20]: High- Efficacy light sources is defined in the 2021 IECC.

CHAPTER 3 [RE] GENERAL REQUIREMENTS

SECTION R303

MATERIALS, SYSTEMS AND EQUIPMENT

Section R303.2 Installation is replaced as follows:

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 RESNET/ICC 301 and the *International Building Code* or the *International Residential Code*, as applicable.

CHAPTER 4 [RE] RESIDENTIAL ENERGY EFFICIENCY

SECTION R401 SCOPE AND GENERAL REQUIREMENTS

~~Section R401.2 Compliance is replaced as follows:~~

~~**R401.2 Compliance.** Projects shall comply with one of the following:~~

- ~~1.—Sections R401 through R404. Construction of new residential building using this option shall also comply with Section R407.~~
- ~~2.—Section R405 and the provisions of Sections R401 through R404 indicated as “Mandatory.”~~
- ~~3.—The energy rating index (ERI) approach in Section R406.~~

~~The results from a code compliant software program can be utilized to show compliance. REScheck™—Residential Energy Code Compliance Software—is one program currently being accepted. This program developed by the Department of Energy can be downloaded for free at <http://www.energycodes.gov/rescheck>. REMRate, Ekotrope and EnergyGuage are example of other softwares that are accepted that are not free.~~

Section R401.3 Certificate (Mandatory) is replaced and subsections are added as follows:

R401.3 Documentation (Mandatory). The documents in Section R401.3.1 and R401.3.2 shall be required.

~~**R401.3.1 Certificate.** A permanent certificate shall be completed by the builder or other approved party and posted on a wall in the space where the furnace 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 predominant R-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, basement walls, crawl space walls and floors and ducts outside conditioned spaces; U factors of fenestration and the solar heat gain coefficient (SHGC) of fenestration, and the results from any required duct system and building envelope air leakage testing performed on the building. Where there is more than one value for each component, the certificate shall indicate the value covering the largest area. The certificate shall indicate the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces and electric base board heaters.~~

R401.3.1.2 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 R401.3.1. This includes any energy assessment report and/or ERI certificate.

Commented [ro21]: The Structure of the 2021 IECC has been changed and R401.2 is now Application. "Residential buildings shall comply with Section R401.2.5 and either Sections R401.2.1, R401.2.2, R401.2.3 or R401.2.4." It makes sense to stick with the new structure.

Commented [ro22]: 6/6/2021 all of R401.2 will be different and a proposal will have to be created to go to the committee

Commented [ro23]: All of R401.3.1 Certificate is in the 2021 IECC

Commented [ro24]: New numbering added

**SECTION R402
BUILDING THERMAL ENVELOPE**

Section R402.2.3 Eave baffle title is amended as follows:

R402.2.3 Eave baffle (Mandatory)

Remainder of section is unchanged.

Section R402.2.8 Floors is replaced as follows:

R402.2.8 Floors. Floor cavity insulation shall comply with one of the following:

1. ~~Insulation shall be installed to maintain permanent contact with the underside of the subfloor decking in accordance with manufacturer instructions to maintain designed loft or readily fill the available cavity space.~~
2. ~~Floor framing cavity insulation shall be permitted to be in contact with the topside of sheathing separating the cavity and the unconditioned space below. Insulation shall extend from the bottom to the top of all perimeter floor framing members and the framing members shall be air sealed.~~
3. ~~A combination of cavity insulation and continuous insulation shall be installed so that the cavity insulation is in contact with the topside of the continuous insulation that is installed on the underside of the floor framing separating the cavity and the unconditioned space below. The combined R-value of the cavity insulation and continuous insulation shall equal the required R-value for floors. Insulation shall extend from the bottom to the top of all perimeter floor framing members and the framing members shall be air sealed.~~

Section R402.4.1.2 Testing is replaced in its entirety as follows:

R402.4.1.2 Testing The building or dwelling unit shall be tested and verified as having an air leakage rate not exceeding three air changes per hour or 0.16 cfm per square foot (0.8 L/s/m²) of dwelling unit enclosure area in climate zone 5. Testing shall be conducted in accordance with ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved agency. 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 after all penetrations of the building thermal envelope ~~are in place have been sealed.~~

Exception: When testing individual dwelling units, an air leakage rate not exceeding four air changes per hour or 0.22 cfm per square foot (1.1 L/s/m²) of the dwelling unit enclosure area, tested in accordance with RESNET/ICC 380, ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals) shall be permitted for:

1. Attached one- and two-family dwelling units and townhouses.
2. Buildings or dwelling units that are 1000 square feet or smaller.
3. Rx occupancies built in accordance with International Building Code Section 429 by the City and County of Denver.

Mechanical ventilation shall be provided in accordance with Section M1505 of the International Residential Code or Section 403.3.2 of the International Mechanical Code, as applicable, or with other approved means of ventilation.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the

Commented [ro25]: The word Mandatory has been removed from the 2021 IECC. For the prescriptive section all requirements, as they are now called, are in essence mandatory. Requirement tables have been added to Sections R405 & R406 that bring the prescriptive requirements to those sections as "Mandatory" items. Also the Eave Baffle section as been updated in the 2021 IECC.

Commented [ro26]: This section on Floor insulation installation has been added to the 2021 IECC.

Commented [ro27]: This Air Leakage Testing section of the IECC has changed a lot in the 2021 IECC. The Denver Amendment is still valid but additional amending of the IECC will be needed when we get the that point in the process. We will need to pull the appropriate numbers from this amendment for the new amendment.

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, if installed at the time of the test, shall be open.
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.
5. Heating and cooling systems, if installed at the time of the test, shall be turned off.
6. Supply and return registers, if installed at the time of the test, shall be fully open.

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. Fan-type central furnaces.
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.

3. Pool heaters.
4. Spa heaters.
5. Fireplaces.

Section R403.3.1 Insulation (Prescriptive) is replaced as follows:

~~**R403.3.1 Insulation (Prescriptive).** Supply and return ducts located outside conditioned space shall be insulated to an R-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter.~~

Section 403.3.5.3 Duct testing (Mandatory) is replaced as follow:

~~**R403.3.5.3 Duct testing (Mandatory).** The duct work in a building or dwelling unit shall be pressure tested in accordance with ANSI/RESNET/ICC 380 or ASTM E1554 for air leakage. The maximum total leakage rate for duct in any building or dwelling unit under any compliance path shall not exceed 6.0 cubic feet per minute (169.9 L/min) per 100 square feet (9.29 m²) of conditioned floor area served, (6cfm/100sqft), when the air handler is installed at the time of the test. When the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3.0 cubic feet per minute (85 L/min) per 100 square feet (9.29 m²) of conditioned floor area; (3 cfm/100 sq ft). Registers shall be taped or otherwise sealed during the test. Testing shall be conducted at the rough-in stage or post-construction by one of the following methods:~~

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.

Commented [ro28]: This amendment has is incorporated in the 2021 IECC new section R403.3.1 Ducts located outside conditioned space.

Commented [ro29]: This Duct Leakage Testing section of the IECC has changed a lot in the 2021 IECC. The Denver Amendment is still valid but additional amending of the IECC will be needed when we get the that point in the process. We will need to pull what is appropriate from this amendment for the new amendment.

2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Alternatively, a duct leakage test to outside conditioned space with a pressure differential of 0.1 inch w.g. (25 Pa) with reference to the outside across the entire system including the manufacturers' air handler may be performed. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. A duct air-leakage test shall not be required for ducts serving ventilation systems that are not integrated with ducts serving heating or cooling systems.
2. If the HVAC duct system is serving less than or equal to 1,200 square feet of conditioned floor area, the allowable duct leakage shall be 7.2 cubic feet per minute or less.

A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.

Section R403.3.4 R403.3.6 Duct leakage (Prescriptive) is amended by adding item 3 and an exception

3. Where all ducts and air handlers are located entirely within the building thermal envelope, total leakage shall be less than or equal to 6.0 cubic feet per minute (169.9 L/min) per 100 square feet (9.29 m) of conditioned floor area.

Exception: If the HVAC duct system is serving less than or equal to 1,200 square feet of conditioned floor area, the allowable duct leakage shall be 7.2 cubic feet per minute or less.

Section R403.3.7 Ducts located in conditioned space is replaced as follows:

Commented [ro30]: This has been added to the 2021 IECC

~~R403.3.7 Ducts located in conditioned space. For ductwork to be considered as inside conditioned space it shall comply with one of the following:~~

- ~~1. The duct system shall be located completely within the continuous air barrier and within the building thermal envelope.~~
- ~~2. Ductwork in ventilated attic spaces shall be buried within ceiling insulation in accordance with Section R403.3.6 and all of the following conditions shall exist:
 - ~~2.1. The air handler is located completely within the continuous air barrier and within the building thermal envelope.~~
 - ~~2.2. The duct leakage, as measured either by a rough-in test of the ducts or a post-construction total system leakage test to outside the building thermal envelope in accordance with Section R403.3.4, is less than or equal to 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m²) of conditioned floor area served by the duct system.~~
 - ~~2.3. The ceiling insulation R-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation R-value, less the R-value of the insulation on the duct.~~~~
- ~~3. Ductwork in floor cavities located over unconditioned space shall comply with all of the following:
 - ~~3.1. A continuous air barrier installed between unconditioned space and the duct.~~
 - ~~3.2. Insulation installed in accordance with section R402.2.8.~~
 - ~~3.3. A minimum R-19 insulation installed in the cavity width separating the duct from unconditioned space.~~~~
- ~~4. Ductwork located within exterior walls of the building thermal envelope shall comply with the~~

following:

- 4.1. A continuous air barrier installed between unconditioned space and the duct.
- 4.2. Minimum R-10 insulation installed in the cavity width separating the duct from the outside sheathing.
- 4.3. The remainder of the cavity shall be fully insulated to the drywall side.

Table R403.6.2.1 is replaced as follows:

Table R403.6.2.1
MECHANICAL VENTILATION SYSTEM FAN EFFICACY^a

FAN LOCATION	AIR FLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)	AIR FLOW RATE MAXIMUM (CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	3.8 cfm/watt	Any
Bathroom, utility room	10	2.8 cfm/watt	<90
Bathroom, utility room	90	3.5 cfm/watt	Any

a. When tested in accordance with HVI Standard 916

Commented [ro31]: Range hoods, inline fans, bath fans, etc. are dealt with as other fans in the 2021 IECC

Section R403.10.1 Heaters is replaced as follows:

R403.10.1 Heaters. The electric power to heaters shall be controlled by a readily accessible on-off switch that is an integral part of the heater mounted on the exterior of the heater, or external to and within 3 feet (914 mm) of the heater. Operation of such switch shall not change the setting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater.

Commented [ro32]: This amended language is in the 2021 IECC plus a new meaningful addition. "Gas-fired heaters shall not be equipped with continuously burning ignition pilots."

SECTION R404 ELECTRICAL POWER AND LIGHTING SYSTEMS

Section R404.1 Lighting equipment (Mandatory) is replaced as follows:

R404.1 Lighting equipment (Mandatory). Not less than 90 percent of the permanently installed luminaires shall be, or contain, only high efficacy light sources.

Commented [ro33]: Now 100% must be high efficacy lighting

Section R404.1.2 Building grounds lighting efficacy is added as follows:

R404.1.2 Building grounds lighting efficacy. Connected exterior lighting for Group R-3 and R-4 buildings shall comply with Section C405.4 of the *International Energy Conservation Code* Commercial Provisions.

Commented [ro34]: This section is now in the 2021 IECC

Exceptions:

1. Solar-powered lamps not connected to any electrical service.
2. Luminaires controlled by a motion sensor.

Section R404.4.2. Group R Occupancy *Electric Vehicle (EV)* charging requirements for new construction

and level 3 alterations and subsections are added as follows:

R404.4.2. Group R Occupancy Electric Vehicle (EV) charging spaces for new construction and level 3 alterations (Mandatory). Electric vehicle charging shall be provided and installed in accordance with this section and the *National Electrical Code (NFPA 70)*. When parking spaces are added or modified without an increase in building floor area or a *level 3 alteration*, only the new parking spaces are subject to this requirement.

R404.4.1 2.2 Group-R occupancies. Group-R occupancies (~~All R-3 buildings and R-4 buildings three stories and less~~) with three or more dwelling units and/or sleeping units shall be provided with electric vehicle charging in accordance with Table ~~R404.4.1 2.2~~. Calculations for the number of parking spaces shall be rounded up to the nearest whole number.

The minimum required quantity of EV parking spaces shall be calculated based upon the total provided new and existing parking spaces for the building. A minimum of 70% of the required EV parking spaces shall be amongst the 50% of parking spaces located closest to the intended occupant entrance to the building served.

R404.4.2 2.3 Accessible parking. Where new accessible parking space(s) are provided, parking facilities shall be designed so that at least one accessible parking space shall be an *EV ready space* or *EVSE installed space*. The accessible parking space shall be included in the total EV parking spaces as required in Table ~~R404.4.1 2.2~~.

Commented [ro35]: Policy Number IRCN1104.2 does not limit EV Charging stations to R3 & R4 occupancy and not for 3 or more dwelling units.

TABLE R404.4.1 2.2
EV SPACES IN GROUP R OCCUPANCIES

	NUMBER OF LEVEL 2 EV READY SPACES	NUMBER OF LEVEL 2 EV CAPABLE SPACES	NUMBER OF LEVEL 2 EVSE INSTALLED SPACES
1 Space	1	None	None
2 to 9 spaces	1	20% of spaces	None
10 or more spaces	15% of spaces	Remainder of spaces	5% of spaces

R404.4.3 R404.2.4 Electric Vehicle Supply Equipment (EVSE) Requirements.

R404.4.3.1 R404.2.4.1 Level 2 charging.

1. Each *Level 2 EVSE* can have one or multiple connectors. It is permissible to serve multiple parking spaces with one *Level 2 EVSE* so long as the connectors can adequately reach each individual designated parking space.
2. *Level 2 EVSE* can be equipped with cellular, wired, or wireless communications.

R404.4.4 R404.2.5 EV Space Infrastructure Requirements.

R404.4.4.1 R404.2.5.1 EV Ready Spaces

1. Installation of infrastructure conduit.

- a. The conduit shall be sized and installed per the National Electrical Code and shall be no less than 1” in size.
 - b. Conduits must be continuous from the future or existing panelboard or switchboard location(s) and end at a location allowing convenient, future installation of and access to the future *EVSE*.
2. Installation of conductors.
- a. Conductors shall be installed of sufficient size to accommodate a minimum 40Amp branch circuit to each parking space where required in Table R404.2.2.
 - b. Conductors shall terminate in either
 - i. a minimum 40Amp NEMA receptacle or SAE J1772 EV plug.
 - ii. a junction or outlet box that is capped off, with the conduit sealed and the cap labeled as ‘EV Ready for Future Use’.
 - iii. an *EVSE* installed within the parking space.
3. Electrical service and distribution capacity.
- a. Electrical loads for the EV Ready parking spaces shall be included in the utility service calculations when determining the required ampacity rating for the service equipment.
 - b. The electrical loads shall be based on the quantity of *EV Ready Spaces* and *EVSE Installed Spaces* as required in Table R404.2.2.
4. Panelboard space.
- a. There shall be adequate reserved circuit breaker space in an electrical panelboard or reserved space within an electrical switchboard to meet the requirements of Table R404.2.2.
 - b. This is in addition to the quantity of required *EVSE Installed Spaces* circuit breakers or fused switches to meet the requirements of Table R404.2.2.

R404.4.4.2 ~~R404.2.5.2~~ EV Capable Spaces.

1. Installation of infrastructure conduit.
- a. The conduit shall be sized and installed per the National Electrical Code and shall be no less than 1” in size.
 - b. Conduits must be continuous from the future or existing panelboard or switchboard location(s) and end at a location allowing convenient, future installation of, and access to, the future *EVSE*.
 - c. The *EV Capable Space* infrastructure conduit shall include installation of a pull rope or line for future conductor installation, with the conduit sealed and labeled as ‘EV Capable for Future Use’.
 - d. At the termination where each conduit ends at a future *EVSE* location, the conduit shall be sealed at a junction or outlet box that is capped off, with the conduit sealed and the cap labeled as “EV Capable for Future Use”.
2. Electrical distribution equipment room.
- a. The electrical equipment room shall provide dedicated space for the future installation of the electrical distribution equipment required to serve the *EVSE*. Such equipment may include service switchgear, distribution panelboards, and transformers.
 - b. The future space shall be identified on all construction documents submitted for review and shall demonstrate compliance with the requirements of the National Electrical Code.
3. The space shall not be used for any other permanent purposes so as not to restrict future installation of electrical equipment.

Section R404.5 ~~R404.3~~ One- and Two-Family Dwellings and Townhouses *Electric Vehicle (EV)* charging requirements and subsections are added as follows:

R404.5 R404.3 One- and Two-Family Dwellings and Townhouses Electric vehicle (EV) charging requirements (Mandatory). *Electric vehicle* charging shall be provided and installed in accordance with this section and the National Electrical Code (NFPA 70).

Exception: The number of *electric vehicle ready spaces* per lot shall not be required to exceed one *electric vehicle ready space* per dwelling unit on that lot.

R404.5.1 R404.3.1 (N1104.5.1 N1104.2.1) Electric vehicle (EV) ready spaces for new dwelling units. Each new dwelling unit with *on-site parking spaces* shall be provided with a minimum of one *electric vehicle ready space*.

R404.5.2 R404.3.2 (N1105.2 N1104.2.2) Electric vehicle (EV) ready spaces for new garages and carports. Each new garage and/or carport with *on-site parking spaces* shall be provided with a minimum of one *electric vehicle ready space*.

R404.5.3 R404.3.3 (N1105.3 N1104.2.3) Electric vehicle (EV) ready spaces for new on-site parking spaces. Each new *on-site parking space* shall be provided with a minimum one *electric vehicle ready space*.

R404.5.4 R404.3.4 (N1104.5.4 N1104.2.4) Minimum EV Ready Space infrastructure shall require the following:

1. Installation of conductors.
 - a. Conductors shall be installed of sufficient size to accommodate a 120VAC 20Amp branch circuit to each parking space where required.
 - b. Conductors shall terminate in either
 - i. a 20Amp NEMA receptacle or SAE J1772 EV plug.
 - ii. a junction or outlet box that is capped off and the cap labeled as 'EV Ready for Future Use'.
 - iii. an EVSE installed within the parking space.
2. The circuit breakers and/or circuit breaker spaces reserved for the *electric vehicle ready spaces* shall be clearly identified on the panelboard. The branch circuit shall be identified as 'EV Ready' on the panelboard schedule, and the termination location shall be marked as 'EV Ready'

R404.5.5 R404.3.5 (N1104.5.5 N1104.2.5) Construction Documents. Construction documents shall graphically indicate and label all *EV ready spaces* and associated termination locations. For all IRC Townhouses and one- and two-family dwellings with an electrical utility service exceeding 200Amps, a panelboard schedule shall be provided indicating the EV Ready circuit breaker space(s) and the circuit designation(s).

SECTION R406

ENERGY RATING INDEX COMPLIANCE ALTERNATIVE

Section R406.2 Mandatory requirements is replaced as follows (exception remains unchanged):

Commented [ro36]: A table of requirements that bring over "mandatory" requirements from the prescriptive section has been added. the word mandatory has been removed and replaced with just the word requirement. Some amendments will be made for this new table.

R406.2 Mandatory requirements. Compliance with this section requires that the provisions identified in Sections R401 through R404 indicated as “Mandatory” and Section R403.5.3 be met. The *building thermal envelope* shall be greater than or equal to levels of efficiency and Solar Heat Gain Coefficients in Table 402.1.2 or 402.1.4 of the 2015 *International Energy Conservation Code*.

Table R406.4 Maximum energy rating index is replaced as follows, footnote a is deleted:

**TABLE R406.4
MAXIMUM ENERGY RATING INDEX**

CLIMATE ZONE	ENERGY RATING INDEX
5	56

Commented [ro37]: The 2021 maximum ERI score for CZ 5 is 55 which is more efficient, has been added in the 2021 IECC.

Section **R408 R407** is added as follows:

**SECTION R408 R407
ADDITIONAL EFFICIENCY PACKAGE OPTIONS**

Commented [ro38]: Everything other than Improved air leakage has been added into the 2021 IECC.

R407.1 Requirements (Prescriptive). Construction of new *residential buildings* shall comply with at least one of the following Sections:

1. ~~Enhanced envelope performance in accordance with Section R407.1.1.~~
2. ~~More efficient HVAC performance in accordance with Section R407.1.2.~~
3. ~~High efficiency in service water heating in accordance with Section R407.1.3.~~
4. ~~More efficient thermal distribution system in accordance with Section R407.1.4.~~
5. ~~Improved air leakage in accordance with Section R407.1.5.~~
6. ~~Lighting efficiency in accordance with Section R407.1.6.~~

R407.1.1 Enhanced building thermal envelope performance. The total *building thermal envelope* UA shall be less than or equal to 95 percent of the total UA as calculated per R402.1.5

R407.1.2 More efficient HVAC equipment performance. Heating and cooling equipment for each heating and cooling system shall meet or exceed at least one of the following efficiencies:

1. ~~Greater than or equal to 95 AFUE natural gas furnace and 15 SEER air conditioner.~~
2. ~~Greater than or equal to 10 HSPF/15 SEER air source heat pump.~~
3. ~~Greater than or equal to 3.5 COP ground source heat pump.~~

R407.1.3 High efficiency in service water heating. Water heating equipment shall meet or exceed one of the following efficiencies:

1. ~~Greater than or equal to .82 UEF fossil fuel service water heating system.~~
2. ~~Greater than or equal to 2.0 UEF electric service water heating system.~~
3. ~~Greater than or equal to 0.4 Solar Fraction solar water heating system.~~

R407.1.4 More efficient thermal distribution system. The thermal distribution system shall meet or exceed at least one of the following:

1. ~~100 percent of ducts and air handlers shall be located entirely within the *building thermal envelope*.~~
2. ~~100 percent of ductless thermal distribution system or hydronic thermal distribution system shall be located completely inside the *building thermal envelope*.~~
3. ~~100 percent of duct thermal distribution system shall be located in *conditioned space* as defined by R403.3.7.~~

R408.2.6 ~~R407.1.5~~ Improved air leakage. The measured air leakage rate shall be less than or equal to 2.0 air changes per hour as tested in accordance with the requirements of Section R402.4.1.2.

R407.1.6 Lighting efficiency. ~~Install 100% high efficacy lighting with a minimum 75 lumens/watt in 100% of spaces. Installed luminaires must be capable of meeting the recommended light levels for each given space type, per the IESNA Lighting Handbook.~~

CHAPTER 5 [RE] EXISTING BUILDINGS

SECTION R501 GENERAL

Section R501.4 Compliance is modified by deleting the reference to the International Property Maintenance Code

Section R501.6 Historic buildings is replaced in its entirety as follows:

R501.6 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 State Historic Preservation Office having jurisdiction provides a letter to the *code official* with a finding that compliance with that provision would be in 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 local historic preservation authority having jurisdiction 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 R502 ADDITIONS

Section R502.1 General is replaced as follows:

R502.1 General. *Additions* to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portion of the existing building or building system to comply with this code. *Additions* shall not create an unsafe or hazardous condition or overload existing building systems. An *addition* shall be deemed to comply with this code where the addition alone complies using section R502.1.1, where the existing building and *addition* comply with this code as a single building, or where the building with the addition does not use more energy than the existing building. *Additions* shall be in accordance with Sections ~~R502.1.1~~**R502.3**, ~~R502.1.2~~ or R502.1.3.

Section ~~R502.1.1~~ **R502.3.1 Building envelope is amended by adding Exception #2 as follows:**

2. Where unconditioned space is changed to conditioned space, the air leakage rate of the *addition* shall comply where the air leakage rate, as determined in Section R402.4.1.2, of the existing building, the addition, and any alterations that are part of the project, is less than or equal to the air leakage rate of the existing building.

Section Existing plus addition compliance (Energy Rating Index Alternative) is added as follows:

R502.1.3 Existing plus addition compliance (Energy Rating Index Alternative). Where *unconditioned space* is changed to *conditioned space*, the addition shall comply where the energy rating index score 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* when modeled in accordance with Section R406. The addition and any alterations that are part of the project shall comply with Section R406 in its entirety.

**CHAPTER 6 [RE]
REFERENCED STANDARDS**

The following standard is added as follows:

IESNA

Illuminating Engineering Society
120 Wall Street, 17th Floor
New York, NY 10005-4001

IESNA Lighting Handbook – 10th edition (2011)

Appendix ~~RA~~ ~~RB~~ Solar-ready provisions—detached one- and two-family dwellings and townhouses is adopted with the following amendments:

APPENDIX ~~RA~~ ~~RB~~
SOLAR-READY PROVISIONS—DETACHED ONE- AND TWO-FAMILY DWELLINGS AND TOWNHOUSES

SECTION ~~RA103~~ ~~RB103~~
SOLAR-READY ZONE

Section ~~RA103.1~~ ~~RB103.1~~ General is replaced in its entirety as follows:

- ~~RA103.1~~ ~~RB103.1~~ **General.** New detached one- and two-family *dwellings*, and *townhouses* with not less than 600 square feet (55.74 m²) of roof area oriented between 110 degrees and 270 degrees of true north shall comply with Sections RA103.2 through RA103.10.

Exceptions:

- ~~1. New residential *buildings* with a permanently installed on-site renewable energy system.~~
- ~~2. A *building* where all areas of the roof that would otherwise meet the requirements of Section RA103 are in full or partial shade for more than 70 percent of daylight hours annually.~~

Section RA103.9 Shading is added as follows:

RA103.9 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 zone a distance not less than 2 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, roof-mounted equipment, trees, and roof plantings.

Section RA103.10 Capped Roof Penetration Sleeve is added as follows:

RA103.10 Capped Roof Penetration Sleeve. A capped roof penetration sleeve shall be provided adjacent to a solar-ready zone located on a roof slope of not greater than 1 unit vertical in 12 units horizontal (8-percent slope). The capped roof penetration sleeve shall be sized to accommodate the future photovoltaic system conduit but shall have an inside diameter of not less than 1 1/4 inches (32 mm).

Commented [ro39]: The 2021 IECC says RB103.2 through RB103.8 and the amendment takes it through RB103.10. The exceptions are already in the 2021 IECC.

Commented [ro40]: Now in the 2021 IECC

Commented [ro41]: Now in the 2021 IECC