2021 International Energy Conservation Code (IECC) Significant Changes

The 2021 International Energy Conservation Code and amendments have been adopted by The City of Fort Collins on April 15th, 2022.

Purpose: Following is a summary overview of the significant changes from the 2018 IECC to the 2021 IECC and local amendments.

2021 International Energy Conservation Code (IECC)

COMMERCIAL

***C103.2 Information on Construction Documents:** Added energy compliance path and the location of the air barrier to list of details that must be on the plans.

C202 General definitions: Added definitions for All-Electric Building, Electric Heat, and Mixed-Fuel Building.

***C301.1 General:** Revised Climate Zones in Figure C301.1 and Table C301.1 to update the climate zones to correspond with the release of ASHRAE Standard 169-2013".

***C303.1.2 Insulation Mark Installation:** Revised language to require an insulation certificate on site if the R value label for insulation is not visible.

***Chapter 4 items listed as (Mandatory):** the word mandatory was removed throughout the entire chapter. Mandatory always meant that that specific item could not be traded off if someone used a trade-off path of compliance. Instead of saying “mandatory”, a table of “required” items has been placed in the Performance Path Section of C407 to list those items that cannot be traded off in that pathway. Otherwise, all items not listed as (Performance) are required if using the prescriptive approach.

C401.1.1 Building Electrification: Added that all newly constructed *buildings* shall be constructed as an *all-electric building* or a *mixed-fuel building* that is pre-wired for future electric space heating, water heating, cooking and clothes drying equipment.

***C401.2.1 International Energy Conservation Code:** One of the changes to these sections simply clarifies

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that there is a prescriptive path, a performance path, and then a separate Section 401.2.2 for the option of ASHRAE 90.1. The Sections tell you which code sections to comply with in each instance. Exempts out existing buildings that comply with Chapter C5. (no technical changes, only cleanup of layout)

***C401.2.1 #1 Prescriptive Compliance:** Allows dwelling and sleeping units in R-2 buildings over 3 stories with systems that do not serve multiple units are to not be required to comply with the commercial chapter of the IECC as long as they comply with R406 Energy Rating Index path of the residential chapter.

***C401.3 Thermal Envelope Certificate:** Adding new section to require a permanent certificate to commercial buildings that will record basic information related to the building thermal envelope like the certificate required in residential buildings.

***C402.1.1 Low Energy Buildings and Greenhouses:** Adding the term "greenhouse" to the title of the section and removing it as an exception so that they now must comply with the code.

***C402.1.1.1 Greenhouses:** Adding new section for conditioned greenhouses. Adding skylight and vertical fenestration U factor table to section. Provides exception for low energy use or unconditioned greenhouses.

***C402.1.2 Equipment buildings:** Increasing sq ft of exempt buildings from 500 to 1200 sq ft. and clarifying that it is for electric equipment.

Table C402.1.3 Insulation R-value Table: (appropriate matching changes made to U/C/F factor table)
Climate Zone 5: Changing R value of attic insulation from R38 to R49 (all other occupancies), Changing R value of Mass wall insulation from R11.4ci to R13ci and R13.3ci to R13ci, Changing R value of wall insulation in metal buildings from R13 + R13ci to R13 + R15ci (group R); Changing R value of insulation in metal framed buildings from R13 + R7.5ci to R13 + R10ci; Changing R value of insulation in wood framed walls from R13 + R3.8ci or R20 to R15 + R7.5ci or R20 + R5ci; Changing R value of insulation for below grade walls from R7.5 to R10ci (Group R); Changing R value of insulation for mass floors from R10 to R14.6; Changing R value of insulation for mass floors from R12.5 to R16.7 (group R); Added floor insulation – steel joist to R30+7.5ci, Changing slab edge insulation for unheated slabs from R10 to R15 and from R10 to R20 (Group R).

***Table C402.1.3 Footnote g**: Revised wording to add "full under" slab.

***Table C402.1.4 Insulation U factor Table**: Deleted multiple f factors for heated slabs and changed to one F factor to make it easier to use COM*check*.

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***Table C402.4 U factor & SHGC fenestration table**: lowered most of the U factor and SHGC values for fixed and operable windows and entrance doors in climate zones 1-8. values. Also changed SHGC values to be dependent on whether the fenestration is fixed or operable instead of by orientation.

C402.5.1.5 Building Envelope Performance Verification requires an air barrier and air sealing inspection report be provided to the building owner or owner's agent at the time of framing and insulation inspection. This makes sure the contracted air tightness test firm has input on details that ensure the building meets the required air tightness requirement.

C402.5.2 Dwelling and sleeping unit enclosure testing changed to require buildings that have fewer than eight units, each unit shall be tested. For buildings with eight or more units, 20% of the units shall be tested including one of each unit type and approximately an equal number on each floor.

C402.5.6 Doors and access openings to shafts, chutes, stairways and elevator lobbies requires that doors and access openings on vertical walls from conditioned space to unconditioned attic space shall be insulated to a minimum of R-7.

C403.12.3.1 Protection of piping insulation added a provision that paint products and similar applications that require maintenance shall not be permitted.

C405.2.5 Specific application controls now includes an exception for buildings undergoing an occupancy change to R-1 and that have eight or less sleeping units.

C405.2.7.3 Lighting Setback removed language that only applied to luminaires that are only greater than 78 watts and a height of 24 feet or less so the reduction of total wattage by 50% where activity has not been detected for 15 min or more applies to all lighting.

C405.2.8 Parking garage lighting control: New section requires occupant sensor control or automatic time-switch shutoff, light reduction by not less than 50% when no activity detected within 15 minutes, lighting zones of no more than 3,600 sq ft, lighting used for eye adaptation at covered vehicle entrances and exits must be controlled separately by controls that automatically reduce lighting by 50% from sunset to sunrise, power to luminaires within 30 feet of the perimeter wall openings must automatically reduce in response to daylight by 50%.

***Table C405.3.2(1) Interior lighting power allowances building area method**: Revised all LPD watts per sq ft to be more in line with what is in space-by-space method. most wattage allowances were

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Decreased, while a few were increased.

Table C405.3.2(2) Interior lighting power allowances space by space method: Revised Lighting Power Density (LPD) to increase stringency/reduce wattage in most space types.

C405.4 Lighting for plant growth and maintenance: New section requiring that at least 95% of the permanently installed luminaires used for plan growth and maintenance have specific higher efficiency lighting as defined in accordance with ANSI/ASABE S640.

C405.12 (and subsections) Energy Monitoring: Added new mandatory requirement to measure / monitor / record / report energy consumption in new buildings with greater than or equal to 600 amp electric service. Added exceptions for R-2 occupancies and individual tenant spaces that have their own utility services and meters and have less than 5000 square feet of conditioned floor area.

***C406 Additional Efficiency Package Options**: Completely redid this entire section of the code to make it into a point-based system, requiring new buildings to achieve a total of 10 credits from the various tables.

C408.2 Mechanical systems and service water-heating systems commissioning and completion requirements: lowered the required building gross from the previously amended 25,000 square feet to 15,000 sq feet or less.

C409 Integrated Design Assistance: A new compliance path was added to include a submittal option for those participating in The City of Fort Collins Integrated Design Assistance Program. Typical submittals fall under the ASHRAE 90.1 Appendix G Performance Rating Method.

APPENDIX CB SOLAR READY ZONE – COMMERCIAL: Appendix adopted in its entirety. All buildings must comply with the appendix. This applies to roof areas that are five stories or less and that orient between 110 degrees and 270 degrees of true north.

EXISTING BUILDINGS

C501.2 Compliance: An exception to C402.2.4 Slab-on-grade floors was added to exempt insulation requirements for existing building projects where it would require demolition of existing permanent building construction components.

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RESIDENTIAL

***R103.2 Information on Construction Documents:** Requires that the construction documents now specify somewhere which path of compliance was chosen for the project. (i.e. Prescriptive, Total UA Alternative, Total Building Performance, ERI).

***Chapter 4 items listed as (Mandatory)**: The word mandatory was removed throughout the entire chapter. Mandatory always meant that that specific item could not be traded off if someone used a trade-off path of compliance. Instead of saying "mandatory", a table of "required" items has been placed in the Simulated Performance Approach and the Energy Rating Index Approach to list those items that cannot be traded off in those pathways. Otherwise, all items are required if using the prescriptive approach.

R401.2.5 Additional Energy Efficiency: New Section is added to bring in a requirement to pick a path of compliance and then also pick an additional efficiency package on top of that to meet the efficiency requirements of the building. There are several options to choose from. This is like the additional efficiency package options of C406 for commercial (prior to 2021 edition which is now points based for commercial). See Section R408 below for the full requirements.

Table R402.1.3 Insulation Minimum R-Values and Fenestration Requirements: Fenestration U-factor lowered from 0.30 to 0.28 or 0.25 for wall elevations where glazing area is more than 30% of the wall area. SHGC changed from NA to maximum SHGC of 0.35. Ceiling insulation changed from R49 to R60. Wall insulation PRESCRIPTIVE options are now R30, or R20+5ci (ci=continuous insulation), or R13+10ci, or R0+20ci, or R23+3ci. Adds an additional option for basement walls so that there is a cavity plus continuous option. Slab insulation requirements are revised to increase depth of insulation from 2 to 4 feet or to top of footing. Floor insulation increased from R30 to R38. An option was added for cavity plus continuous insulation (R13+5ci) for basements and crawlspaces.

R402.2.4 Access Hatches and Doors: revised the vertical door section to entries from conditioned to unconditioned spaces that are not required to be a swinging door and shall be less than or equal to U-0.10 or have an average insulation *R*-value of R-10 or greater.

Table R402.4.1.1 Air Barrier, Air Sealing and Insulation Installation: Includes several additions and clarifications, one of which is Walls – The junction of the top plate and the top of walls that are adjacent to an unconditioned space (ie: attic) shall be sealed.

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R402.4.1.2 Testing: Added an option to comply with air tightness testing (blower door) by either meeting an air leakage rate of 3 ACH50 *or* by meeting an air leakage rate of 0.16 CFM/50 per square foot of dwelling unit enclosure area. Multifamily dwelling units are still required to be tested and meet an air leakage rate that does not exceed 0.30 CFM/50 per square foot of dwelling unit enclosure area.

R402.5 Maximum Fenestration U-Factor and SHGC: change from a maximum area weighted U-value of 0.48 to 0.32 for vertical fenestration and an SHGC of 0.35.

R403.3.6 Duct Leakage: A requirement is added (by removing the exception) to mandate all ducts be tested, including those inside the thermal envelope. City of Fort Collins amended testing of all duct systems total leakage be less than or equal to 4.0 cubic feet per minute per 100 square feet of conditioned floor area.

R403.4.1 Protection of piping insulation: Added a provision that paint products and similar applications that require maintenance shall not be permitted.

***R403.5 Service hot water systems**: A Water heating equipment section is added that lists allowed water heater types, as well as a table (Minimum uniform energy factor for storage gas water heaters).

***R404.1 Lighting equipment**: Changed from not less than 90 percent to All permanently installed lighting fixtures must be high efficacy.

***R404.1.1 Exterior lighting**: New section for exterior lighting of R2, R3 and R4 buildings that requires them to meet commercial exterior lighting provisions.

***R404.2 Interior lighting controls**: New section is brought in that will require either a dimmer, occupant sensor or other control that is built into the fixture to be installed in all lighting. But provides an exception for lighting controls in bathrooms, hallways, exterior lighting fixtures, lighting designed for safety or security. Also, a section that specifies exterior lighting controls must be automatic if over 30 watts of lighting is installed.

R404.4 Occupant sensor controls: New section added that requires multifamily *buildings*, *occupant sensor controls* shall be provided to automatically reduce connected lighting power by not less than 50 percent during periods when no occupants are present in common corridors and common enclosed stairwells. Exceptions exist for control of battery back-up, emergency lighting and exit signage.

R404.5 Electric readiness: New section added that requires buildings be constructed with electric

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appliances (heat pumps space and water heating, electric cooking equipment and clothes dryers) *or* be pre-wired to support these types of systems. Electrical requirements are included within this section. An exception exists to provide conduit with pull string sized to accommodate future electrical appliances.

R404.5.6 Space heating for electrification: New requirement that space heating equipment shall be constructed with a ground-source electric heat pump or an electric cold climate heat pump specifically designed to heat at the Winter Outdoor, Design Dry-Bulb temp defined in Section 301.5 of this code or pre-wired to support the aforementioned electric heat pump system. Electric resistance strip heat shall only serve as defrost, emergency back-up heat or supplemental heat at outdoor temperatures less than or equal to 15^{o}F.

TABLE R405.4.2(1) Service water heating (**Plumbing Compactness**): Applicable to all residential compliance paths is the requirement that hot water distribution systems meet the following compactness requirements: One story buildings – All hot water sources and hot water fixtures shall bewithin a rectangle that has a square foot area no more than 60% of the total conditioned floor area of the home/dwelling. Two story buildings shall be no more than 30% of the total conditioned floor area. Stacked Multifamily apartment style units shall be no more that 70% of the total conditioned floor area. Exceptions apply.

***R408 Additional Efficiency Package Options**: New section added requiring choosing one additional energy efficiency measure on top of those within the chosen compliance path (ie: Prescriptive, Total UA Alt, Total Building Performance, ERI). It is mandatory, no matter which path you choose so it cannot be traded off. This is like the old C406 in the 2012-2018 code for commercial. Options include a 5% better Total UA (commonly verified by REScheck), high efficient HVAC equipment, more efficient water heating, more efficient duct system or improved air sealing and ventilation system combo.

EXISTING BUILDINGS

R501.2 Compliance: An exception to R402.2.9 Slab-on-grade floors was added to exempt insulation requirements for existing building projects where it would require demolition of existing permanent building construction components.

R502.4 Compliance: A new section was added requiring that additions shall be deemed to comply where the existing building plus the addition does not use more energy that the existing building. Exceptions exist for unaltered portions of the building if the existing building was constructed to the 2009 International Energy Conservation Code or later, or if the addition is less than 30% of the conditioned floor area of the existing building, or if the building has undergone documented efficiency upgrades to

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the envelope/shell within the last 10 years. Reporting details to show compliance exist within code section **R502.4 Compliance.**

APPENDIX RB SOLAR-READY PROVISIONS –DETACHED ONE AND TWO-FAMILY DWELLINGS AND TOWNHOUSES: Appendix adopted in its entirety. New detached one- and two-family dwellings and townhouses with not less than 600 sq ft of roof area oriented between 110 degrees and 270 degrees of true north must comply with the appendix.

*****Language borrowed from the Colorado Energy Office Building Energy Codes / Energy Code Adoption Toolkit site. https://energyoffice.colorado.gov/climate-energy/energy-policy/building-energy-codes/energy-code-adoption-toolkit