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Fort Collins Amendments to the 2009 International Energy Conservation Code

Bold underlined texts represents Green Code Amendments which become effective January 1, 2012

Municipal Code Sec. 5-31 Amendments and deletions to code.

The *2009 INTERNATIONAL ENERGY CONSERVATION CODE* adopted herein is hereby amended in the following respects:

Section 101.1 Title is amended to read as follows:

101.1 Title. This code shall be known as the *International Energy Conservation Code* of the City of Fort Collins and shall be cited as such. It is referred to herein as 'this code.

Section 101.4.3.1 Energy assessment, is hereby added to read as follows:

101.4.3.1 Energy assessment. Prior to any *alterations*, an *energy analysis* of the entire *building* shall be required and submitted to the Building Official.

Exceptions: Energy assessments are not required in the following cases.

1. **First-time interior finishes.**
2. **A *building* that has undergone an energy assessment within the previous three years.**
3. **Alterations with a construction valuation of less than $30,000.**

Section 103.6 Permits is added to read as follows:

103.6 Permits. Procedures related to permits, required inspections, payment of fees and obtaining required approvals shall be as set forth in Section 105, entitled 'Permits' of the adopted *International Building Code*.

Section 109 Board of Appeals is amended in its entirety to read as follows:

109.1 General. Appeals of decisions, determinations and interpretations of this code shall be made pursuant to applicable provisions as set forth in Section 113, entitled 'Board of Appeals' of the adopted *International Building Code.*

Section 110 Violations is added to read as follows:

110.1 Violations. Any person who violates a provision of this code or fails to comply with any of the requirements thereof or who erects, constructs, alters or repairs a building or structure in violation of the approved construction documents or directive of the building official, or of a permit or certificate issued under the provisions of this code, shall be guilty of a misdemeanor subject to the penalties and fines pursuant to Section 1-15 of the Code of the City, punishable by a fine of not more than $1,000.00 dollars, or by imprisonment not exceeding 180 days, or both such fine and imprisonment. Each day that a violation continues after due notice has been served shall be deemed a separate offense.

Section 110.2 Work commencing before permit issuance is hereby added to read as follows:

110.2 Work commencing before permit issuance. In addition to penalties set forth in 110.1 any person or firm who, before obtaining the necessary permit(s), commences any construction of, or work on, a building, structure, electrical, gas, mechanical or plumbing system that is not otherwise exempted from obtaining a permit, shall be subject to a processing and penalty fee in addition to the standard prescribed permit fee. Such additional fee shall be equal to the permit fee, except that such fee shall not be less than $50 nor more than $1,000 for the first such violation. A person or firm committing the same such violation repeatedly is subject to processing and penalty fees equal to double the amount of the permit fee or double the amount of the preceding violation, whichever is greater, for every same such subsequent violation committed thereafter within any 180-day period. The foregoing fees may be appealed to the City Manager pursuant to Chapter 2, Article VI of the Code of the City.

Section 202 DEFINITIONS, is hereby amended by adding the following definitions in alphabetical sequence as follows:

CONTINUOUS AIR BARRIER: The combination of interconnected materials, assemblies, and flexible sealed joints and components of the *building thermal envelope* that provides air tightness to a specified permeability.

ELECTRIC HEAT: An indoor environmental primary heat source that is electric. A ground-source electric heat pump designed by a licensed professional engineer to operate without the use of supplemental electric resistance heat shall not be considered *electric heat.*

NON-ELECTRIC HEAT: An indoor environmental primary heat source that is gas or that is a ground-source electric heat pump designed by a licensed professional engineer to operate without the use of supplemental electric resistance heat.

Section 301.4 Exterior and Interior Local Design Parameters is added to read as follows:

Exterior and Interior Local Design Parameters.

Winter Outdoor, Design Dry-bulb (°F)	= 4
Winter Indoor, Design Dry-bulb (°F)	= 72
Summer, Outdoor Design Dry-bulb (°F)	= 89
Summer, Indoor, Design Dry-bulb (°F)	= 75
Summer, Design Wet-bulb (°F)	= 62
Degree days heating	= 6368
Degree days cooling	= 479

{For SI: °C = [(°F)-32]/1.8.}"

Fort Collins is in Climate Zone 5.

Section 401.2 Compliance is hereby amended in its entirety to read as follows:

401.2 Compliance. Compliance shall be demonstrated by conforming with mandatory Sections 401, 402.2.12 , 402.4, 402.5, 403.1, 403.2.2, 403.2.3, and 403.3 through 403.9.

Section 402, TABLE 402.1.1 Insulation and Fenestration Requirements by Component is hereby amended in its entirety to read as follows:

TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT

HEATING SYSTEM TYPE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U-FACTOR*	GLAZED FENESTRATION SHGC	CEILING *R-VALUE*	WOOD FRAME WALL *R*-VALUE	MASS WALL *R*-VALUE[g]	FLOOR *R*-VALUE[e]	BASEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL[c] SPACE WALL *R*-VALUE
Non-electric heat	**0.35**	**0.60**	**NR**	**38**	**20 or 13+5[f]**	**13/17**	**30**	**10/13**	**10, 2 ft**	**10/13**
Electric heat	**0.30**	**0.60**	**NR**	**49**	**20+5 [f]**	**15/19**	**30**	**15/19**	**10,4 ft**	**15/19**

For SI: 1 foot = 304.8mm

a. ***R*-values are minimums. *U*-factors SHGC are maximums. R-19 batts compressed into a nominal 2x6 framing cavity such that the *R*-value is reduced by R-1 or more shall be marked with the compressed batt *R*-value in addition to the full thickness *R*-value.**

b. **The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.**

c. **"15/19" means R-15 continuous insulation on the interior or exterior of the foundation wall or R-19 cavity insulation at the interior of the foundation wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the foundation wall plus R-5 continuous insulation on the interior or exterior of the foundation wall. "10/13" means R-10 continuous insulation on the interior or exterior of the foundation wall or R-13 cavity insulation at the interior of the foundation wall.**

d. **R-5 shall be added to the required slab edge *R*-values for heated slabs.**

e. **Or insulation sufficient to fill the framing cavity, R-19 minimum.**

f. **"13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of the exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.**

The second *R*-value applies when more than half the insulation is on the interior of the mass wall.

Section 402 TABLE 402.1.3 Equivalent U-Factors is hereby amended in its entirety to read as follows:

TABLE 402.1.3
EQUIVALENT *U*-FACTORS[a]

HEATING SYSTEM TYPE	FENESTRATION *U*-FACTOR	SKYLIGHT *U-FACTOR*	CEILING *R-VALUE*	FRAME WALL *U*-FACTOR	MASS WALL *U*-FACTOR[b]	FLOOR *U*-FACTOR	BASEMENT WALL *U*-FACTOR	CRAWL SPACE WALL *U*-FACTOR
Non-electric heat	**0.35**	**0.60**	**0.030**	**0.057**	**0.082**	**0.033**	**0.059**	**0.065**
Electric heat	**0.30**	**0.60**	**0.026**	**0.043**	**0.060**	**0.033**	**0.050**	**0.055**

a. Non-fenestration *U*-factors shall be obtained from measurement, calculation or an *approved* source. When more than half the insulation is on the interior, the mass wall *U*-factor shall be the same as the frame wall *U*-factor.

Section 402.2.12 Specific insulation requirements is hereby added to read as follows:

402.2.12 Specific insulation requirements. All insulation shall be installed to meet Residential Energy Services Network (RESNET) Grade I standard.

Exceptions: RESNET Grade II is acceptable for:

1. **cavity insulation in exterior walls that include continuous rigid insulating sheathing and/or insulated siding with a minimum R-value of 5; and**
2. **rim joists**

Section 402.4.2 Air sealing and insulation is hereby amended to read in its entirety as follows:

402.4.2 Air sealing verification. *Building thermal envelope* air tightness shall be demonstrated to comply with either Section N1102.4.2.1 (new construction) or Section N1102.4.2.2 (existing *buildings*):

402.4.2.1 Performing testing. In new construction, air sealing compliance shall be demonstrated through performance testing by an *approved agency* in accordance with the methods and standards specified herein. Documentation of testing results shall be submitted to the Building Official prior to approval. When tested with a blower door at a pressure of 50 pascals (33.5 psf), the maximum *building thermal envelope* air leakage rate shall not exceed:

1. three air changes per hour (ACH) in *buildings* with *electric heat*; or

2. **four air changes per hour (ACH) in *buildings* with *non-electric heat.***

Isolation of attached garages from adjoining *conditioned areas* shall be verified with an *approved* differential pressure test.

Testing shall occur after *rough-in* and after installation of penetrations of the *building thermal envelope*, including but not limited to penetrations for utilities, plumbing, electrical, *ventilation* and combustion appliances.

During testing:

1. **exterior windows and doors, *fireplace* and stove doors shall be closed, but not sealed;**
2. ***dampers* shall be closed, but not sealed, including exhaust, intake, makeup air, backdraft, and flue dampers;**
3. **interior doors shall be open;**
4. **exterior openings for continuous *ventilation* systems and heat recovery ventilators shall be closed and sealed;**
5. **heating and cooling system(s) shall be turned off;**
6. **heating, ventilating and air conditioning *ducts* shall not be sealed;**
7. ***supply* and *return air* registers shall not be sealed;**
8. ***combustion air* inlets shall not be closed or otherwise obstructed; and**
9. **garage doors to the exterior shall be closed.**

402.4.2.2 Visual inspection. In additions or alterations to existing *buildings*, air-sealing compliance shall be considered acceptable when the items listed in Table N1102.4.2, applicable to the method of construction, are field-verified.

Section 402.5 Maximum fenestration U-factor and SHGC is hereby amended to read as follows:

402.5 Maximum *fenestration U-factor* and *SHGC*. The area-weighted average maximum *fenestration U-factor* permitted, using trade-offs from ***International Residential Code* Section N1102.1.3 or N1102.4.4, shall be 0.40 for *vertical fenestration* and 0.75 for *skylights*.**

S***ection 403.2.1 Insulation*** is amended to read as follows:

403.2.1 Insulation. (Mandatory) Supply ducts in attics shall be insulated to a minimum of R-8. All other ducts shall be insulated to a minimum of R-6.

EXCEPTION:

Ducts or portions thereof located completely inside the building thermal envelope.

Section 403.6 Equipment sizing is hereby amended as follows:

403.6 Heating and cooling systems. Heating and cooling systems shall be designed in accordance with *International Residential Code* Section M1401.3 and performance will be verified in accordance with *International Residential Code* Section M1507.4.

Section 404.2 Occupant sensor controls, is hereby added to read as follows:

404.2 Occupant sensor controls. In multifamily *buildings*, occupant sensor controls shall be provided to automatically reduce connected lighting power by not less than

50 percent during periods when occupants are not present in common corridors and common enclosed stairwells.

Lighting in *means of egress* shall comply with the luminance or uniformity criteria required by the *International Building Code* when occupied.

Exception: *Automatic* power reduction shall not be used to control battery back-up emergency lighting and *exit* signage.

Section 502.1 General is hereby amended to read as follows:

502.1 General. All insulation shall be installed to Residential Energy Services Network (RESNET) Grade I standard.

Exception: RESNET Grade II is acceptable for cavity insulation in exterior walls that include continuous exterior insulation as specified in Table 502.2(1) installed to RESNET Grade I standard.

An exception to Section 502.1.1 Insulation and fenestration criteria is hereby added to read as follows:

Exception: For *buildings* using *electric heat* at the power density of 1.5 Watts per square foot or greater, *building thermal envelope* values in Table 502.2(3), shall be mandatory.

An exception to Section 502.1.2 U-Factor alternative is hereby added to read as follows:

Exception: For buildings using *electric heat* at the power density of 1.5 Watts per square foot or greater, *building thermal envelope* values in Table 502.2(3), shall be mandatory.

TABLE 502.2(3) BUILDING THERMAL ENVELOPE is hereby added to read as follows:

TABLE 502.2(3)
***BUILDING THERMAL ENVELOPE* REQUIREMENTS FOR ELECTRIC HEAT**

Opaque Elements	Assembly Max.	Insulation Min. R-Value
Roofs		
Insulation Entirely above Deck	**U-0.039**	**R-25.0 ci**
Metal *Building*	**U-0.035**	**R-19.0 + R-11.0 Ls**
Attic and Other	**U-0.021**	**R-49.0**
Walls, Above Grade		
Mass[a]	**U-0.080**	**R-13.3 ci**
	U-0.052	**R-13.0 + R-13.0 ci**
Metal *Building*	**U-0.055**	**R-13.0 + R-10.0 ci**
Steel Framed	**U-0.051**	**R-13.0 + R-7.5 ci**

Wood Framed and Other		
Wall, Below Grade		
Below Grade Wall	**C-0.092**	**R-10.0 ci**
Floors		
Mass	**U-0.064**	**R-12.5 ci**
Steel Joist	**U-0.032**	**R-38.0**
Wood Framed and Other	**U-0.026**	**R-30.0 + R-7.5 ci**
Slab-On-Grade Floors		
Unheated	**F-0.540**	**R-10 for 24 in.**
Heated	**F-0.440**	**R-15.0 for 36 in. + R-5 ci below**
Opaque Doors		
Swinging	**U-0.400**	
Non-Swinging	**U-0.400**	

Fenestration	Assembly Max. U
***Vertical Fenestration*, (up to 40% of Wall maximum)**	
Nonmetal framing: all[b]	**U-0.25**
Metal fr: curtainwall/storefront[c]	**U-0.35**
Metal framing: entrance door[c]	**U-0.70**
Metal framing: all other[c]	**U-0.45**
***Skylight* (up to 3% of Roof maximum)**	**U_{all}-0.60**

The following definitions apply: ci = continuous insulation, Ls = liner system, NR = No (insulation) requirement.

[a] Mass walls with a heat capacity greater than 12 Btu/ft^2·°F which are unfinished or finished only on the interior do not need to be insulated.

[b] Nonmetal framing includes framing materials other than metal with or without metal reinforcing or cladding.

[c] Metal framing includes metal framing with or without thermal break. The "all other" subcategory includes operable windows, fixed windows, and non-entrance doors."

Section 502.2.4 Below-grade walls is amended to read as follows:

502.2.4 Below-grade walls. The minimum thermal resistance (R-value) of the insulating material installed in, or continuously on, the below-grade walls shall be ~~as specified in Table 502.2(1),~~ R-10 and shall extend to a depth of 10 feet (3,048 mm) below the outside finish ground level, or to the level of the floor, whichever is less.

Section 502.2.6 Slabs on grade is amended to read as follows:

502.2.6 Slabs on grade. The minimum thermal resistance (*R*-value) of the insulation around the perimeter of unheated slab-on-grade floors shall be R-10 for 24 inches below. The minimum thermal resistance (*R*-value) of the insulation around the perimeter of heated slab-on-grade floors shall be as specified in Table 502.2(1). The insulation shall be placed on the outside of the foundation or on the inside of a foundation wall. The insulation shall extend downward from the top of the slab for a minimum distance as shown in the table or to the top of the footing, whichever is less, or downward to at least the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table.

Section 502.4.3 Sealing of the building envelope is hereby amended by adding the following:

502.4.3.1 Design requirements. The *building thermal envelope* shall be designed and constructed with a *continuous air barrier* that complies with the following requirements to control air leakage into, or out of, the conditioned space. All *air barrier* components of each *building thermal envelope* assembly shall be clearly identified on construction documents and the joints, interconnections, and penetrations of the *air barrier* components shall be detailed and comply with the following:

1. **The *air barrier* shall be continuous throughout the *building thermal envelope* (at the lowest floor, exterior walls, and ceiling or roof), with all joints and seams sealed and with sealed connections between all transitions in planes and changes in materials and at all penetrations.**

2. **The *air barrier* component of each assembly shall be joined and sealed in a flexible manner to the *air barrier* component of adjacent assemblies, allowing for the relative movement of these assemblies and components.**

3. **The *air barrier* shall be capable of withstanding positive and negative combined design wind, fan, and stack pressures on the *air barrier* without damage or displacement, and shall transfer the load to the structure, and shall not displace adjacent materials under full load.**

4. **The *air barrier* shall be installed in accordance with the manufacturer's instructions and in such a manner as to achieve the performance requirements.**

5. **Where lighting fixtures with *ventilation* holes or other similar objects are to be installed in such a way as to penetrate the *continuous air barrier*, provisions shall be made to maintain the integrity of the *continuous air barrier*.**

502.4.3.2 Compliance. Compliance of the *continuous air barrier* for the opaque *building thermal envelope* shall be demonstrated by the following:

1. **Materials. Using air-barrier materials that have an air permeability not to exceed 0.004 cfm/ft^2 under a pressure differential of 0.3 in. water (1.57 lb/ft^2) (0.02 L/s·m^2 under a pressure differential of 75 Pa) when tested in accordance with ASTM E2178;**

2. **Assemblies. Using assemblies of materials and components that have an average air leakage not to exceed 0.04 cfm/ft^2 under a pressure differential of 0.3 in. water (1.57 lb/ft^2) (0.02 L/s·m^2 under a pressure differential of 75 Pa) when tested in accordance with ASTM E2357 or ASTM E1677;**

3. ***Building*. Testing the completed *building* and documenting that the air leakage rate of the *building thermal envelope* does not exceed 0.25 cfm/ft^2 under a pressure differential of 0.3 in. water (1.57 lb/ft^2) (0.02 L/s·m^2 under a pressure differential of 75 Pa) in accordance with ASTM E779 or an equivalent approved method.**

Section 505.2.2.1 Light reduction controls is hereby amended in its entirety to read as follows:

505.2.2.1 Occupant sensor controls. In new construction and additions that require a building permit, occupant sensor controls shall be provided to automatically reduce connected lighting power by not less than 50 percent during periods when occupants are not present in the following locations:

1. corriders and enclosed stairwells;

2. storage stack areas not open to the public;

3. library stack areas; and

4. parking garages.

Lighting in *means of egress* shall comply with the luminance or uniformity criteria required by the *International Building Code* when occupied.

Exception: *Automatic* power reduction shall not be used to control battery back-up emergency lighting and exit signage.

Section 505.2.3 Sleeping unit controls is hereby amended in its entirety by adding the following:

505.2.3 Sleeping unit controls. In hotels and motels with over 20 guest rooms, the lighting switched outlets, permanently wired luminaires, television, and heating, ventilating and air conditioning system equipment serving each guest room shall be automatically controlled so that lighting, switched outlets, permanently wired luminaires, and televisions will be turned off and the heating, ventilating and air conditioning system set point raised at least 5 degrees Fahrenheit (3 degrees centigrade) in the cooling mode and lowered at least 5 degrees Fahrenheit (3 degrees centigrade) in the heating mode whenever the guest room is unoccupied.

505.2.3.1 Sleeping unit bathroom controls. All permanently wired luminaires located in bathrooms within sleeping units in hotels, motels, boarding houses or similar *buildings* shall be equipped with occupant sensors that require manual intervention to energize circuits.

Section 505.2.4 Exterior lighting controls is hereby amended in its entirety by adding the following:

505.2.4 Exterior lighting controls. In addition to any other applicable requirements of this IECC, all outdoor lighting controls shall comply with the following requirements: For lighting of *building* façades, parking lots, garages, canopies (sales and non-sales), and all outdoor sales areas, *automatic* controls shall be installed to reduce the sum of all lighting power (in Watts) by a minimum of 50 percent two hours after normal business closing and to turn off outdoor lighting within 30 minutes after sunrise.

Exceptions:

1. **Lighting required by a health or life safety statute, ordinance, or regulation, including but not limited to, emergency lighting.**
2. **Lighting that is controlled by a motion sensor and photo-control.**
3. **Lighting for facilities that have equal lighting requirements at all hours and are designed to operate continuously.**
4. **Temporary outdoor lighting.**
5. **Externally illuminated signs and signs that are internally illuminated or have integral lamps.**

Section 505.8 Electricity distribution design is hereby added to read as follows:

505.8 Electricity distribution design requirements and load type isolation. Electric distribution systems within, on or adjacent to and serving a *building* shall be designed in such fashion that each primary panel supplies only one electricity load type as defined in Sections 505.8.1 through 505.8.5. The energy load type served by each distribution panel shall be clearly designated on the panel with the use served, and adequate space shall be provided for installation of metering equipment or other data collection devices, temporary or permanent, to measure the energy use associated with each distribution panel.

Exceptions:

1. ***Buildings* with less than 15,000 square feet of floor area are exempted from this requirement.**
2. **Electrical systems that are designed and constructed in such fashion that the total usage of each of the load types as described in Sections 505.8.1 through 505.8.5 shall be permitted to be measured through the use of installed sub-*meters* or other equivalent methods as *approved*.**

505.8.1 Heating, ventilating, and air conditioning system electric load. This category shall include all electricity used to heat, cool, and provide *ventilation* to the *building* including, but not limited to, fans, pumps, and cooling energy.

505.8.2 Lighting system electric load. This category shall include all electricity for interior and exterior lighting used in occupant spaces and common areas.

505.8.3 Plug loads. This category shall include all electricity use by devices, electric appliances and equipment connected to convenience receptacle *outlets*.

505.8.4 Process loads. This category shall include all electricity used by any single load associated with activities within the *building*, such as, but not limited to, data centers, manufacturing equipment and commercial kitchens, that exceed 5% of the total energy use of the whole *building*."

505.8.5 Miscellaneous loads. This category shall include all electricity use for all other *building* operations and other operational loads.

Chapter 6 REFERENCED STANDARDS is hereby amended by adding the following additional referenced standard in alphabetical sequence:

Under the heading of ICC:
IgCC PV 2-10*International Green Construction Code*®…….609.3

RESNET® Residential Energy Services Network, Inc.
P.O. Box 4561
Oceanside, CA 92052-4561
http://resnet.us

RESNET® reference standard Grade I and Grade II Insulation
Referenced in Amended 09 IECC Section 502.1 General.