Agenda Item No.: GB-A

Meeting Date: June 12, 2023

Subject: Consideration of Ordinance 943, adopting by reference, with amendments, the International Energy Conservation Code, 2021 Edition, including Appendices CB and RB, on second reading.

Presenter: Jennifer Krieger, AICP, Community Development Director
Tim Moroney, Chief Building Official, SAFEbuilt

Background: Colorado Governor Jared Polis signed House Bill (HB) 22-1362 into law requiring all jurisdictions to adopt a modern energy code. Beginning July 1, 2023, the new bill requires all of the state's jurisdictions to adopt and enforce the 2021 International Energy Conservation Code (IECC) or an energy code that achieves equivalent or better energy performance when one or more building codes are updated.

This legislation replaces a previous policy requiring that jurisdictions adopting a building code must adopt an energy code that meets or exceeds one of the three prior editions of the IECC.

No changes were made to Ordinance 943 after the first reading.

Staff Recommendation: Staff recommends approval of Ordinance 943 on the second reading.

ORDINANCE NO. 943

AN ORDINANCE ADOPTING BY REFERENCE THE INTERNATIONAL ENERGY CONSERVATION CODE, 2021 EDITION

WHEREAS, the City Council has adopted from time to time certain building and construction standards, including the 2012 edition of the International Energy Conservation Code; and

WHEREAS, it is deemed to be in the interest of the public health, safety and general welfare to adopt by reference thereto the updated edition of such Code; and

WHEREAS, the City Council, after proper notice as required by law, has held a public hearing on this ordinance providing for the adoption of said Code; and

WHEREAS, the updated edition of the above-referenced Code been submitted to the City Council in writing and the City Council has determined that such Code should be adopted as herein set forth.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF DACONO, COLORADO:

Section 1. Section 18-40(9) of the Dacono Municipal Code is hereby repealed and replaced, to read as follows:

> Pursuant to Title 31, Article 16, Part 2, C.R.S., the codes and standards hereinafter described are hereby adopted by reference, subject to the amendments herein set forth. The subject matter of the codes and standards adopted herein includes the regulation of the new construction, alteration and repair of all new and existing structures along with all plumbing, mechanical and installations therein or in connection therewith. In case of any conflict between a code adopted herein and any other specific provision of this Code, the specific provision of this Code shall prevail.
>
> (9) *The International Energy Conservation Code*, 2021 Edition, including appendices CB and RB, as published by the International Code Council, 4051 West Flossmoor Road, Country Club Hills, IL 60478-579, is hereby adopted by reference as the City of Dacono Energy Conservation Code as if fully set out in this ordinance with the additions, deletions, insertions and changes as follows.
>
> a. **IECC Section R101.1** IECC Section C101.1 (Title) is amended by the addition of "City of Dacono" where indicated.

b. **IECC Section R401.2.4** IECC Section R401.2.4 (Tropical Climate Region Option) is deleted in its entirety.

c. **IECC Section R406.4** IECC Section R406.4 (Energy Rating Index) is amended to read as follows: "A HERS Index Score may be utilized in lieu of the ERI score".

d. **IECC Section R407** IECC Section R407 (Tropical Climate Region Compliance Path) is deleted in its entirety.

e. **IECC Section C101.1** IECC Section C101.1 (Title) is amended by the addition of "City of Dacono" where indicated.

f. **IECC Section C401.2.1** Item 2 of IECC Section 401.2.1 is amended to read as follows: "#2 Total Building Performance. The Total Building Performance option requires compliance with ~~Section C407~~ ASHRAE 90.1, Appendix G.

g. **IECC Section C407** IECC Section C407 (Total Building Performance) is deleted in its entirety.

Section 2. Copies of the codes adopted by reference by this ordinance are available for public inspection at the office of the City Clerk between the hours of 8:00 a.m. and 5:00 p.m., Monday through Friday, holidays excepted.

Section 3. If any article, section, paragraph, sentence, clause, or phrase of this ordinance is held to be unconstitutional or invalid for any reason, such decision shall not affect the validity or constitutionality of the remaining portions of this ordinance. The City Council hereby declares that it would have passed this ordinance and each part or parts hereof irrespective of the fact that any one part or parts be declared unconstitutional or invalid.

Section 4. The repeal or modification of any provision of any prior ordinance by this ordinance shall not release, extinguish, alter, modify, or change in whole or in part any penalty, forfeiture or liability, either civil or criminal, which shall have been incurred under such provision, and each provision shall be treated and held as still remaining in force for the purpose of sustaining any judgment, decree, or order which can or may be rendered, entered, or made in such actions, suits, proceedings, or prosecutions.

Section 5. All other ordinances or portions thereof inconsistent or conflicting with this ordinance or any portion hereof are hereby repealed to the extent of such inconsistency or conflict.

Section 6. This ordinance is deemed necessary of the preservation and protection of the health, safety, welfare and property of the inhabitants and owners of property within the City of Dacono.

INTRODUCED, READ, ADOPTED ON FIRST READING, AND ORDERED PUBLISHED AND POSTED BY TITLE this 8th day of May, 2023.

PUBLIC HEARING AND SECOND READING WILL BE THE 12th day of June, 2023, AT 6:00 P.M. AT DACONO CITY HALL ANNEX, 512 CHERRY STREET, BUILDING C, DACONO, CO.

READ, ADOPTED ON SECOND READING, APPROVED, SIGNED, AND ORDERED PUBLISHED BY TITLE this 12th day of June, 2023.

CITY OF DACONO, COLORADO

_____
Adam Morehead, Mayor

ATTEST:

_____
Valerie Taylor, City Clerk

Summary of Ordinance No. 943, "**AN ORDINANCE ADOPTING BY REFERENCE THE INTERNATIONAL ENERGY CONSERVATION CODE, 2021 EDITION**": Adopts by reference the updated edition of the International Energy Conservation Code previously adopted by the City, for the protection of the public health, safety and general welfare.

The Energy Code Board will be responsible to develop or adopt low energy and carbon code language, model electric ready and solar ready code language. Appointment of the Energy Code Board must be made on or before October 1, 2022. To be considered for appointment an application and a letter of recommendation from a relevant organization i.e., Colorado Chapter of ICC. The Colorado Energy Office (CEO) and Department of Local Affairs (DOLA) will appoint the Energy Code Board.

Energy Code Board Make Up Appointed by CEO	**Energy Code Board Duties by June 1, 2023**
• Director or the designee of the Colorado Energy Office (CEO) • (1) Urban Counties* • (1) Municipalities in Rural Areas* • (2) Environmental or Sustainability Groups • (1) Solar Power Expert • (1) Energy Efficiency Expert • (1) Engineers- work on systems for buildings • (1) Utilities- Gas, or Electric, or Both • (1) Architect • (1) Building Energy Code Expert *At least one of two must be a building official	Adopt or develop a Model Electric Ready Code and Solar Ready Code for Commercial and Residential to include the following: 1. Solar Ready Language or Code 2. EV ready, EV capable requirements for residential 3. EV ready, EV capable, EV charging for multifamily and commercial with a minimum of 20% of all parking spots, garages, and parking areas 4. Electric ready with mixed fuel for residential (SFD) 5. Electric ready with mixed fuel for multifamily and commercial less than 10,000 ft^2 6. Electric ready with mixed fuel for multifamily and commercial 10,000 ft^2 or more with additional requirements 7. Develop a process to potentially waive requirements for natural disasters
Energy Code Board Make Up Appointed by DOLA	**Adopt a Model Low Energy & Carbon Code by June 1, 2025**

• Director or the designee of the Department of Local Affairs (DOLA)
• (1) Rural Counties *
• (1) Municipalities in Urban Areas*
• (2) Affordable Housing Representatives
  ○ (1) For-Rent Nonprofit Builder
  ○ (1) Nonprofit For-Sale Builder
• (2) Electrician, Plumber, Mechanical professional – Licensed
• (1) Statewide Organization for Home Builders
• (1) Building Operations Experience
• (1) Contractor Provides Electrical, Plumbing, or Mechanical Services
 	
*At least one of two must be a building official
	This adoption must include the following:
	
	• Adoption of 2021 or 2024 International Energy Conservation Code with appendices as determined by the Energy Code Board
	• Model electric ready and solar ready code language as developed by the board
	• Provide compliance path for all-electric and mixed fuel for residential and commercial
	• Exempt electricity consumption from renewable energy requirements
	• Allow like for like equipment when replacing space heating or water heating equipment
	• Electric Renewable Credits cannot be double counted (read bill for further information)
	• Take into account home affordability
	• Minimize CO2 emissions generated by construction for new and renovations of homes and commercial buildings
	• Establish a process to waive energy code requirements for natural disasters, or other circumstances as determined by the Energy Code Board
	
	The energy efficiency of the code may be lessened by the board but never increased

Energy Code Board Executive Committee Make Up Appointed Jointly by CEO and DOLA	
• Director or the designee of the Colorado Energy Office (CEO) • Director or the designee of the Department of Local Affairs • (1) Urban or Rural Counties • (1) Urban or Rural Municipalities • (1) Building Energy Code Expert	
All provisions require a 2/3 vote for approval. When a provision fails to obtain 2/3's vote, a majority vote of Executive Committee adopts the required element.	On or before July 1, 2024, the Colorado Energy Office will identify voluntary green energy code language for adoption

IMPORTANT DATES IN BILL

July 1, 2022	Jurisdictions that have adopted an energy code must start enforcing it
Before July 1, 2023	Jurisdictions that adopted and have an effective date before July 1, 2023, still has the option of adopting one of the three latest editions of the International Energy Conservation Code (IECC) 2015, 2018, or 2021
On or after July 1, 2023	Jurisdictions will be required to adopt the 2021 IECC, Energy Code Board developed Model Electric Code (not the NEC), Energy Code Board developed Solar Ready Code
On or before January 1, 2025	The division of fire safety shall adopt and enforce the 2021 IECC or equivalent, Energy Code Board developed Model Electric Code (not the NEC), Energy Code Board developed Solar Ready Code for schools
On or after July 1, 2026	Jurisdictions will be required to adopt a low energy and low carbon code – determined by the Energy Code Board, Energy Code Board developed Model Electric Code (not the NEC), energy Code Board developed Solar Ready Code

GRANTS TO SUPPORT REQUIREMENTS – OVERSEEN BY THE COLORADO ENERGY OFFICE (CEO)

Training and code adoption – $1 million

Support for code adoption and enforcement - $2 million

Building Electrification for Public Buildings Grant - $10 million

High-Efficiency Electric Heating and Appliances Grant - $10.8 million

2018 Code Section	2009 Summary	2009-2018 Change Summary	2018-2021 Change Summary	Things to consider	Conflicts with other codes
101.2	101.2 Scope. This code applies to residential and commercial buildings.	Scope changed so that code applies to residential buildings and their associated sites and systems since the code regulates things like exterior lighting, pools and spas, site renewables...	No change		
101.3	101.3 Intent. This code shall regulate the design and construction of buildings for the effective use of energy. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve the effective use of energy. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.	Intent changed to state that the design and construction shall be regulated for the effective use and conservation of energy over the useful life of each building.	No change		
101.4.1		Mixed residential and commercial buildings: changed the wording from mixed occupancy to mixed residential and commercial buildings to more closely represent the intent of the scope.	No change		
103.1	Construction documents must be submitted in one or more sets and code official has the right to ask that they be done by a registered design professional.	Adds technical reports and other supporting data to be included with the construction documents.		REScheck and Performance reports are not technical documents. They are compliance reports, therefore do not need signed and stamped by a registered design professional	

103.2	The information on the construction documents must include everything in order to verify compliance with the thermal envelope, mechanical, service hot water, and lighting requirements, including air sealing details, duct sealing details, mechanical system design, etc.	No substantial change, just reworked the layout of the section	Added noting which energy compliance path was chosen (i.e. prescriptive, total UA, peformance, ERI)		
103.2.1	Non-existent in 2009 code	The building's thermal envelope must be depicted on the plans so that the reviewer knows what is inside the envelope or not in order to verify compliance.	No change		
103.3	Brought over the wording from other codes regarding examination of documents to be consistent with other codes	Code official has authority to use a registered design professional or other approved entity to review the plans for compliance.	No change		
103.4	103.4 Amended construction documents. Changes made during construction that are not in compliance with the approved construction documents shall be resubmitted for approval as an amended set of construction documents.	Any changes made in the field must be corrected on updated set of construction documents and submitted for reapproval.	No change		

105	Construction or work for which a permit is required shall be subject to inspection by the code official.	Now calls out required inspections and when you should be able to verify energy code requirements while looking at other items. It brings in third party testing and inspections as permitted by the code official. Removed the words "accessible" and replaced with "able to be accessed" to remove confusion with terms used differently in other codes.	No change		
106	Non-existent in 2009 code	Non-existent in 2018 code	Added Notice of Approval section for code offical to approve work complies after tests and inspections are completed. The code official is also able to revoke an approval if there is an issue with the certificate, incorrect information or the building is deemed in violation.		
108	Stop Work Orders – clarifies when and how stop work orders are to be issued as well as failure to comply provisions.	Copies wording regarding stop work orders from other codes for consistency.	Now section 109		
202	New definitions added	New definitions added	New definitions and Revised definitions		
301.4	Non-existent in 2009 code	New Tropical Climate Zone added	No change		
Table R301.1	Climate zone tables by county	Colorado Climate Zones – Added County of Broomfield as it was missing from the table.	Revised the Climate Zone Map and County Lists by State to match the new climate zones used in ASHRAE 90.1		
303.1.2	Non-existent in 2009 code	Manufacturer's R-value mark obervable at inspection	Requires insultation certificate for materials without an obersevable manufacturer's R-value mark.		

Tables R303.1(1) and (2)		Default tables: changed titles to clarify the difference in requirements for glass doors vs opaque doors.	No change		
303.1.4.1	Non-existent in 2009 code	Insulated Siding – Because the code now allows some insulated siding to count as a certain level of continuous insulation the section is brought in to give referenced standard for calculating R-Value.	No change		
303.1.5	Non-existent in 2009 code	Non-existent in 2018 code	Defines air-impermeable insulation as great than 0.004 cfm/ft^2 under 75 Pa and tested inaccordance with ASTM E2178		
401.2	Paths of compliance include Prescriptive, including Total UA, and Performance	Added ERI Path to optional compliance paths	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. Also clarifies which path of compliance options there are and what sections to refer to.	Always download any errata from ICC's website at https://www.iccsafe.org/errata-central/ so that you have the most recent version of the code. The first few printings have errors so they post the corrections online and when they have enough corrections they will print a new version.	

401.3	Certificate required to be posted on or in the electrical distribution panel that tells what R-values ad U-factors went into the house as well as any ducts outside of conditioned space. Also include efficiencies of equipment.	The certificate that used to be on the electrical panel to show what R and U values went into the house is now posted on a wall in the space where the furnace is located or a utility room or other approved location inside the building. It also must contain much more information including duct and blower door test results, equipment efficiencies, where any gas fired unvented room heater, electric furnace or baseboard electric might be, etc. Added option for the certificate to be completed by the builder or "other approved party" instead of by the "registered design professional".	Certificate requirements are revised to require code editions to be included as well as compliance path utilized for the project. Other items that must now be disclosed on the certificate include the ERI score if applicable, the array capacity plus inverter efficiency and panel tilt/orientation. If there is more than one value for any component of the building envelope, the certificate will require both the value covering largest area and the area weighted average value if available.	With more and more trade-offs being allowed in the code you can no longer assume what went into the home for energy efficiency based on what year the home was built or what code it was built under. They could have traded off some insulation by adding better windows or vise versa. It is important to have the certificate so that anyone doing future remodels or furnace replacements will have access to the information.	
402.1	101.5.2 Low energy buildings	The provisions for low energy use buildings have moved to this location from Chapter 1. General: Added an exception to when buildings must comply with the thermal envelope provisions for log homes complying with ICC 400.	No changes		
402.1.1	Non-existent in 2009 code	A pointer was brought in reminding you to go to the IRC or IBC for vapor retarder provisions.	No changes		

Table R402.1.2	Insulation and Fenestration requirements by component. Climate Zone 5: Fenestration U factor .35; skylight U-Factor .60; ceiling R-Value R-38; basement and crawl space walls R-10/13	Insulation and Fenestration Requirements by Component: 1. Lowered the U-factors in Climate Zones 3-8 2. Footnote d: adds requirement for R-5 insulation under the entire slab in addition to the slab edge insulation required, if the slab is heated. 3. Footnote i: adds pointer to Section R402.2.5 for mass wall requirements.	Assemblies must have a U-factor equal to or less than the values in this table. Added climate zone 0 and adds a footnote to the table that recognizes different U-Factors in high altitude climates or in windborne debris regions. U-factor and SHGC revisions have been made for all climate zones		Actually removes a conflict by allowing the drop in any exterior insulation requirements when structural sheathing is required.
Table R402.1.3	While there is a Section 402.1.3 in the 2009, it deals with the U Factor alternative. The new requirements in the 2015 were non-existent in 2009 code	New Section brings in a reduction of R-Value if using insulated siding to meet the envelope requirements. Equivalent U-Factors 1. Lowered the U-factors for fenestration in Climate Zones 3-8 2. Footnote b: adds pointer to Section R402.2.5 for mass wall requirements	All climate zones will have a cavity only option and a continuous only option and most climate zones will have at least one cavity plus continuous option.		
402.2	Specific insulation requirements that clarifies how to install insulation in different components of the code	Clarifies that the specific insulation requirements are in addition to those found throughout Section R402.1.	No change		
402.2.1	Ceilings with attic spaces. Allows reduction for R-value if using raised heel trusses.	Clarifies that if using the trade for lower insulation if using raised heel trusses, the lower insulation can be used over 100% of the roof area, not just at the eaves.	Clarifies 100% coverage of the insulation R-38 and R-49 meets insulation requirement if R-49 and R-60 respectively is compressed		
402.2.2		Ceilings without attic spaces: specifies that in ceilings without attic spaces and the framing won't allow for R38+ insulation, R30 is allowed but only if it extends over the top late of the wall to the outer edge of wall and cannot be compressed.	No change		

402.2.3	Access hatches and doors in the 2009 moves in the 2015 to make room for requirements for eave baffles	Eave baffles are required if air permeable insulation is used in vented attics.	Clarifies how the baffle must be installed to the outer edge of the exterior wall to provide max space for insulation.		
402.2.4	Was mass walls in 2009, becomes attic hatches due to renumbering when adding eave baffles.	When using vertical doors for access doors into unconditioned space they are permitted to use the fenestration requirements instead of R-Value method	Added exception for horizontal pull-down, stair type access hatches in ceilings that provide access from conditioned to unconditioned spaces with certain insulation requirements.		
402.2.5		Mass Walls: clarifies that a mass wall is an above grade wall made of certain material or a wall having a specific heat capacity.	No change		
Table R402.2.6	Was Table 402.2.5 in 2009. Because main R-value table only speaks to wood framed walls, this table tells how to convert those values when using steel framed walls	Updated requirements for insulation in steel framed walls, floors and ceilings	Updated requirements for steel-frame wall 16 and 24 inches o.c.		
402.2.7	Footnote h is a footnote in the main R-value table that gave an exception for exterior insulation when using structural sheathing. Moves out of a footnote into its own code section in the 2015	This is where footnote h landed. Deals with how to handle when exterior insulation is used and there is structural sheathing used so that you can maintain an even surface for exterior finishes.	Walls with partial structural sheathing removed from 2021.		
402.2.8	Was 402.2.6 in 2009: floor cavity insulation must maintain permanent contact with the subfloor.	Gives new exception to allow floor cavity insulation to not be in contact with the subfloor if insulation meeting the above grade wall values is installed from the bottom to top of all perimeter floor framing.	Now 402.2.7- Clarifies the intent behind the exception to the requirement that floor insulation be installed in permanent contact with the subfloor. Breaks it up into floor insulation options instead of an exception.		

402.2.13	Was 402.2.11 in 2009: Thermally isolated sunrooms: gives a break on U-factor and R-value in exterior walls of sunrooms if they are thermally separated from the home and have their own conditioning system.	Changed from Thermally Isolate Sunrooms to just sunrooms but brings thermally isolated back into the exception.	Now 402.2.12 and includes heated garages		
402.3.2	Non-existent in 2009 code	Dynamic glazing isn't required in the code but if you use it there are specific provisions for their use.	No change		
402.3.5	U-factors for thermally isolated sunrooms	Speaks to sunroom fenestration requirements, again bringing back thermal isolation into the exception.	Now includes heated garages		

402.4	Allowed option of blower door test or inspection to Table R402.4.1.1 for verification of air leakage in the thermal envelope.	Blower doors became mandatory in the 2012 as well as verification to Table R402.4.1.1. The metric also went from 7 ACH/50 to 3 ACH/50 for Climate Zones 3-8. No change in 2015 or 2018	No change	Building tight requires ventilating right. Always enforce the mechanical ventilation requirements of the mechanical section of IRC to ensure a safe and healthy environment for the occupants. Also, consider that it doesn't matter which edition of the code you are on to get a tight building, it matters what building materials are being used. The use of weather resistive barriers, spray foams, continuous sheathing, good window assemblies, etc. is making the building tighter. Testing many homes that are on an older code but using newer materials shows them all to be under 3ACH/50 or very close to it. Attention to detail gets them the rest of the way there.	There seems to be a disconnect between fire code and energy code when it comes to attached dwellings. It is hard for attached dwellings to meet the 3ACH/50 because of both the smaller size of the units (less volume of air so harder to pass the test) and the common wall between dwelling units. If the entire assembly isn't sealed up tight, including any electrical boxes or penetrations in the wall, then it is very difficult to pass the test at 3ACH/50. Many jurisdictions have amended attached dwellings to be 4 or 5 ACH and to allow a CFM per square foot test on smaller units to make it a fair test.

Table 402.4.1.1	Was Table 402.4.2. This table is an option to blower door testing. One of them is mandatory. This table tells how to seal up the building's thermal envelope.	The table was divided into two columns to separate the requirements for air barriers from the requirements for insulation. Air Barrier and Insulation Installation: 1. Changed the wording for recessed lighting from "to be sealed to the drywall" to "to be sealed to the finished surface" 2. Clarifies that the separation for shower/tub on exterior wall is between the wall and the shower/tub. 3. Clarifies that both supply and return register boots that penetrate the building thermal envelope are sealed to the surface that the boot penetrates (subfloor, wall covering, ceiling)	Rim joists, basement rawl spaces and slab foundations, shaft, narrow cavatities and plumbing, wiring and other obstructions all have added details for air sealig and insulation.		

402.4.1.2		Testing: brings in RESNET/ICC 380 as a testing standard in addition to the ASTM E779 or E1827. Also, removed the wording of exterior doors and clarifies that exterior and interior terminations for continuous ventilation systems shall be sealed.	An exception is added to the air leakage testing section to address testing individual dwelling units to an optional metric of 0.30 cfm per square foot of dwelling unit enclosure area in accordance with RESNET/ICC380, ASTM E 779 or ASTM E 1827, instead of the 3 ACH/50 metric. The requirement is also changed to say that testing is mandatory, but the amount of leakage is prescriptive, meaning it can be traded off using one of the performance approaches. Finally, adds a .0 after the ACH requirement to clarify that anything over the 5.0 or 3.0 ACH/50 is non-compliant.		
402.4.2	Was 402.4.3 Fireplaces: requires gasketed doors and combustion air for fireplaces.	New wood burning fireplaces must have tight fitting flue dampers and doors as well as combustion air. The doors must be listed for the fireplace they are used on.	No changes		

402.4.4	Non-existent in 2009 code	Rooms containing fuel burning appliances that bring combustion air into the space need to be within a mechanical room or closet that is separated from the rest of the dwelling unit so that the unconditioned air isn't added to the space being heated or cooled.	No change	The biggest thing to consider is whether or not your whole house mechanical ventilation system is taking into consideration the heating and cooling equipment. If you use an exhaust only strategy for your ventilation and you are exhausting out air but don't have that combustion air opening to bring some new air into the space and your building is tighter than about 2ACH/50, you might need to think about using a balanced system instead or there will be pilot light and possibly Carbon monoxide issues. It's good to control the amount of air that comes into the space but you do need to provide enough to keep everyone safe.	The codes are aligned on ventilation and appliance location.
402.4.5	Recessed lights must be IC (insulation contact) rated when installed next to insulation and sealed tight for air leakage	Recessed Lighting – in addition to IC rating and air leakage rates, must also be sealed with gasket or caulk between the housing and interior wall or ceiling covering.	No change	Only requires air sealing if the recessed lights are located within the thermal envelope.	
403.1.1	Forced air furnaces require programmable thermostats	Changed from requiring programmable thermostat only if you have forced air furnace to now requiring it on any primary heating or cooling system and gives specifics on control settings.	Added capability to set controls on different days of the week.		

403.2	Non-existent in 2009 code	Hot water boilers that supply heat to the building must have outdoor setback controls that lower boiler temp based on outdoor temp.	Change apply to all boilers except tankless to allow adjust of water temperature through outdoor reset, indoor reset or water temp sensing.		
403.3.2	Duct sealing is mandatory. All ducts, air handlers, filter boxes and building cavities must be sealed	Leaves out cavity sealing as they are no longer allowed to be used as ducts. 403.3.2.1 requires air handlers to be sealed from the manufacturer. 2018 removed exceptions for when ducts do not need to be sealed.	Section is revised to define ducts that are located within wall and floor cavities as either inside or outside the conditioned space based on how the air barrier and insulation is installed.	Leaky air handlers cause duct testing to worse at final when the air handler is installed so they require that it is now sealed from the factory, thus the reason the test got tighter at final.	
403.3.3 and 403.3.4	Duct testing became mandatory in the 2009. The 2009 edition is actually more stringent than the 2015 and 2018 because the rate at which the ducts can leak is set.	Still mandatory to test if any ducts are outside of the conditioned space but the rate you can leak is prescriptive, meaning it can be traded off if using a performance approach. If your ducts are tighter than the set amount, you get a credit. If they are not as tight, you just have to make it up somewhere else in the building. In 2018, the only changes have to do with whether you are testing total duct leakage (leakage to inside and outside) or just leakage to outside. Duct Testing: Added an exception out of duct testing for ducts serving HRVs or ERVs that are not integrated with ducts serving the heating or cooling system.	Now 403.3.5 and 403.3.6: A requirement is added (by removing the exception) to mandate that all ducts be tested, including those inside the thermal envelope. Those inside the envelope can leak more than those outside of the envelope per the changes made to prescriptive section 403.3.4. Testing must be in accordance with ANSI/RESNET/ICC380 or ASTM E1554. Also, ducts serving ventilation systems are not required to be tested.	Duct leakage does cause an energy penalty because the equipment has to work harder to get the same amount of air through the system to the register in order to keep the room to a desired temperature. It also carries a hazard to the building by causing portions of the building to be over or under pressurized, depending on where the leaks are, which forces conditioned air out through any holes in the envelope and because a house will always try to stay at a neutral pressure, it will force air to come in from the outside through any holes it can find. This can degrade the building envelope assemblies and bring moisture or contaminants with it.	All codes say that ducts must be sealed tight but realize that there may be some amount of leakage so there is no conflict.

403.3.5	Framing cavities can't be used as supply ducts	Building Cavities (mandatory) – building framing cavities shall not be used as ducts or plenums for supply or return air.	Now 403.3.7		
403.3.6		Ducts buried within ceiling insulation: Allows ducts to be buried in the attic insulation and not interfere with the required ceiling R-values as long as ALL of the requirements are met for insulation above and below the ducts as well as insulation on the ducts.	Now 403.3.3		
R403.3.7		Ducts located in conditioned space: brings in an allowance for ducts installed in an unconditioned attic to be considered inside the building's envelope as long as the ducts are either under the air barrier or ducts are buried in the ceiling insulation meeting specific requirement.	Now 403.3.2- Criteria 3 & 4 are added to address duct work in floor cavities and duct work within exterior walls. This addresses what criteria is necessary based on how the air barrier and insulation is installed.		
403.4.1	Non-existent in 2009 code	HVAC piping that is required to be insulated must have insulation protected from elements.	No change		
403.5	403.4 circulating hot water systems: piping insulated to R-2. include auto or readily accessible manual switch to turn off the circulating pump when not in use.	Service hot water system requirements moved out of 403.4 for mechanical and into its own section 403.5. Heated-water circulating and temperature maintenance systems – New requirements for circulations systems, heat trace systems and controls for hot water storage.	No change		

403.5.2	Non-existent in 2009 code	Water distribution systems with recirculation pumps that pump water from a heated water supply to the heated water source through a cold water supply must be demand recirculation water systems with specific controls. In 2018, took away some of the wording that defined what the system was because it is already defined in Chapter 2. Also made "controls" plural in both of the requirements.	Now 403.5.1.1.1		
403.5.3	Non-existent in 2009 code	Hot water pipe insulation (prescriptive) – R3 insulation on hot water pipe over ¾ inch or serving more than one dwelling unit, or located outside the conditioned space, or from the water heater to a distribution manifold, or located under a floor slab or buried piping as well as supply and return piping in recirculating systems other than demand controlled systems.	Now 403.5.2 includes circulation systems		
403.5.4	Non-existent in 2009 code	a new section is brought in for drain water heat recovery units. The code doesn't reflect that the entire section is new, only portions, but it is all new. Drain water heat recover units must comply with CSA B55.2 and cannot have a potable water press loss more than 10psi at maximum design flow.	Now 403.5.3		

403.6	403.5 in 2009. doesn't mention mechanical ventilation. Only addresses gravity dampers on exhaust openings. Ventilation is found in IRC only.	Whole House Mechanical Ventilation – this code gives a pointer to the IRC requirements for mechanical ventilation and doesn't contain any requirements other than the fans used to meet the requirement must be efficient per Table R403.6.1.	Applies to buildings and dwelling units R403.6.2 Testing: New section requiring the Testing for Mechanical Ventilation system flow rates is added as well as an Exception to address Kitchen range hoods.		
403.6.1		Whole House mechanical ventilation system fan efficacy: no change in requirements, just rearranged words to make sentence read better. The exception was changed to clarify that it only applies to HVAC equipment that is tested and listed. Also added efficacy requirements in the table for ERVs and HRVs because they were not in previous tables.	R403.6.1 is now heat or energy recovery ventilation: New section that will require homes in Climate Zones 6 and 7 to use an ERV or HRV unless they use a performance path for compliance. R403.6.2 Whole-dwelling mechanical ventilation system fan efficacy: Revised to address compliance with Table T403.6.2 at rating points. Fans shall be tested with HVI Standard 916 and listed, as well as requiring the airflow be reported in the product listed or on the label.		
403.7	403.6 equipment sizing. Refers you to M1401.3 of IRC, which calls for Manual J.	Equipment sizing (mandatory) – heating and cooling equipment must be sized using ACCA Manual S, based on the loads calculated using ACCA Manual J or other approved methodologies.	No change		
403.10	403.9 requires heated pools to have a vapor retardant cover. Pools or spas heated to over 90 degrees must have an R-12 insulated cover. Heater pumps have to have automatic time switches.	Energy consumption of pools and permanent spas (mandatory) – readily accessible on/off switches, time switches to turn off heaters when not in use or on a preset schedule, vapor retardant pool cover, exception for pools deriving at least 70% of energy for heating from site-recovered energy.	No change		

403.10.3		Pool covers: Exception was tightened to only allow the exception to the requirement if more than 75 (was 70) percent of the energy for heating, is from a heat pump or on-site renewable energy system...	No change		
403.11	Non-existent in 2009 code	Portable Spas comply with APSP 14	No change		
403.12	Non-existent in 2009 code	Pools and permanent spas comply with APSP 15	No change		
404.1	50% of the lamps in permanently installed light fixtures (includes indoors and out) must be high efficacy.	75% of the lamps in permanently installed light fixtures must be high efficacy. In 2018, changed the requirement from "not less than 75% of permanently installed lighting fixtures" to be high efficacy to "not less than 90%". Also removed the exception for low voltage lighting.	Changed from not less than 90 percent to All permanently installed lighting fixtures must be high efficacy. (see revised definition of high efficacy lamps).	Feel the heat that comes off of older bulbs, especially an lights or vanity fixtures. It's enough to make you sweat if you are in an enclosed space like a bathroom. That much heat put off by that many bulbs means the air conditioner works harder.	
404.1.1	Non-existent in 2009 code	Non-existent in 2018 code	New section for exterior lighting of R2, R3 and R4 buildings that requires them to meet commercial exterior lighting provisions.		

404.2	Non-existent in 2009 code	Non-existent in 2018 code	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.		
405.1		Performance Scope: added mechanical ventilation to the performance analysis.	Clarifies for total building		
405.2			Mandatory Requirements of the simulated performance path section are revised to require that the building thermal envelope shall be greater than or equal to levels of efficiency and SHGC in Table R402.1.1 or R402.1.3 of the 2009 IECC.		

405.4.2	Specifies what has to be included in compliance reports when using the simulated performance path.	Clarifies what must be in a compliance report if using the simulated performance path and prohibits batch sampling of buildings to determine compliance. Also clarifies that worst-case scenario may be used when using the same design on varying lots facing different cardinal directions as well as worst case building air leakage and duct leakage. In 2018, compliance report brings in allowance for batch sampling in stacked multifamily units only.	Now 405.3.2 - Removes the allowance for batch sampling under the simulated performance approach. This section also changed to make sure that a report based on the proposed design is submitted for permitting and a "confirmed" report is submitted prior to C.O. Clarifies the requirements that must be included in a compliance report that is submitted at plan review stage, prior to permit issuance. Clarifies the requirements that must be included in a compliance report that is submitted after final inspection and prior to C. of O.		

Table 405.5.2(1)	Specifies what must be used in the standard reference design for simulation software when using the performance report. Also calls out how to enter the proposed design into the software.	Was updated to reflect any changes in prescriptive requirements for the standard reference design. In 2018, specifications for the standard reference and proposed designs: Revised calculations for standard reference design mechanical ventilation and revised how the duct system is looked at in the standard reference design.	Now Table 405.4.2(1)- Air Exchange Rate: requires the standard reference design and proposed design to be the same (as proposed). Also, for the Mechanical Ventilation component, the standard reference design efficacy of fans must be according to the prescriptive table in R403.6 based on the system type. Service water heating: credit for a compact hot water distribution design. Additionally, the formula in the table that specifies the volume of domestic hot water usage is reduced by 15%. Thermal Distribution System: specifies that the duct location is the same in the proposed and standard reference design. Also clarifies the duct leakage to outside is the test that is used in modeling to assess the true energy penalty. Dehumidistat (new): Establishes a method for accounting for the latent energy savings of ERVs if they are specified in the proposed design.		

406.3	Non-existent in 2009 code	Allows the use of a HERS score or energy rating index to meet code compliance instead of cost or prescriptive or UA. Must build an envelope no worse than the 2009 because you are allowed more tradeoffs than any other path. Tradeoffs include high efficient mechanical and other equipment and even a trade for Solar PV. Must meet a specific score based on climate zone. Numbers are very low and hard to meet without solar. In 2018, the numbers increased in order to be more in line with what the numbers would come out to if you used one of the other paths in the code but still a little lower because of all of the allowed tradeoffs. The backstop now is the 2015 for your thermal envelope if you want to use solar to drop the score or 2009 without solar per footnote a in the table.	Now 406.2 -Revises compliance with the ERI path to remove the backstop of the 2009 IECC and replaces it with a total UA that is within 15% of the current code edition requirement. Moved the thermal envelope backstop when using renewable energy into the code requirement instead of as a footnote in the Maximum Energy Rating Index Table. Also changed the backstop to be the 2018 thermal envelope instead of the 2015. Revised by adding a 5 percent cap on the trade-off credit allowed for on-site power.	Many who have adopted the 2015 codes have amended this section to use the 2018 requirements that are more easily understood and easier to comply with.	
Table R406.4		Maximum ERI: raised the scores in all climate zones to keep this path somewhat equivalent to the other paths of compliance for residential buildings. Added footnote a, which states that if renewables are used to get to the required score, the building envelope must meet at least the 2015 IECC requirements.	Now 406.5 - Lowered scores in all climate zones.		

R407	Non-existent in 2009 code	Non-existent in 2018 code	New Additional Efficiency Package Options section is added requiring you to do everything in the code that your path of compliance requires but then to also pick one of these options on top of that. 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), highly efficient mechanical equipment, more efficient water heating system, more efficient duct system or a more improved air sealing/ventilation combination.		
R408	Non-existent in 2009 code	Non-existent in 2018 code	Provides decriptions of all additional efficiency packages referenced in R401.2.5.		

Chapter 5	Non-existent in 2009 code	Created new chapter for existing buildings. Includes historic buildings, as well as additions, alterations, repairs and changes in occupancy. Removed a lot of those requirements that were in Chapter 1 of the IECC and brought them to chapter 5 as it dealt with additions, alterations and repairs. In 2018, provided some better guidance for historic buildings, added more options for window replacements and the use of more tradeoff paths to comply.	Reworked to remove redundant language, change sections so that they were more in order and to combine sections so that the entire chapter is more understandable and easier to navigate. It consolidates and clarifies all the provisions regarding changes from unconditioned to conditioned spaces. Removes requirement for additions to be air leakage tested. Removes requirement for duct leakage testing on duct extensions. Changes requirements in lighting alterations to kick in if more than 10% of the lighting is replaced instead of 50%. A change to 505.1 and 505.2 to require that changes of occupancy only must comply with the existing buildings chapter and not the entire code.		
501.3	Non-existent in 2009 code	Maintenance – All buildings and structures and parts thereof must be maintained in a safe and sanitary condition. Devices and systems that are required by the code must also be maintained in conformance to the code edition under which they were installed.	No change		
501.4		Compliance: added IEBC to list of referenced codes.	No change		

501.6 & 202	Historic buildings is covered in chapter 1, Section 101.4.2, which basically exempts all historic buildings from complying with the energy code requirements	Definition of a historic building changed, making it a bit tougher to be considered historic. Also, all provisions of the code apply to historic buildings unless the registered design profession or a representative of the State Historic Preservation Office or the historic preservation authority provides a report to the code official demonstrating that compliance would threaten, degrade or destroy the historic form, fabric or function of the building.	No change	Many of the requirements for mechanical only apply to NEW systems, not existing. Whatever you don't touch you don't have to bring up to code. You can use the different paths of compliance for residential buildings but if you use the performance path, it often says that you have to prove that the home will not use any more energy than it did before you altered it or added an addition so many people use Prescriptive or Total UA (RESCHECK) when doing additions and alterations.	
502.1.1.1	101.4.3 Additions, alterations, renovations or repairs states that they must conform to the code as if new construction but what you don't touch, you don't fix. You can't make the house any worse than it was or more non compliant than it may have been before and you cannot create an unsafe or hazardous condition. There are 8 exceptions of when an alteration doesn't have to comply at all with the energy code	Building envelopes of additions must comply prescriptively as new construction. If non-conditioned space becomes conditioned, the thermal envelope of the addition must comply if the total building's UA is less than or equal to the UA of just the addition	Changed to 502.3.1 and added exception for new envelope assemblies.		

502.1.1.2	Non-existent in 2009 code	Heating and cooling systems for additions must comply as new except ducts from an existing heating and cooling system that extend into the addition less than 40 linear feet are not required to be tested. For 2018, R502.1.1.2 and R503.1.2 Heating and cooling systems: Instead of referencing only some provisions of the mechanical section of the code, new heating and cooling systems must comply with all of R43.	Now 502.3.2		
502.1.1.3 and 502.1.1.4	Non-existent in 2009 code	Service hot water systems and new lighting systems for additions must comply as new construction.	Now 502.3.3 and 502.3.4		
502.1.2	Non-existent in 2009 code	performance approach for existing plus addition – if the annual energy cost or energy use of the addition and the existing building is less than or equal to that of the existing building the addition shall comply with the full performance path requirements.	Removed		
503.1	Covered with additions in 101.4.3	Alterations – Alterations cannot make the existing structure any less conforming to the provisions of the code that it was prior to the alteration. There is a list of 6 items that need not comply with the envelope provisions provided the energy use of the building is not increased.	No change		

503.1.1.1	Non-existent in 2009 code	If you replace a window in an alteration, where some or all of the fenestration unit is replace it must comply as new. Used to be only if you replaced entire assembly. BE sure to look at R504.2 though for repairs as there is more wording on window replacement. in 2018, Replacement Fenestration: brought in the allowance for area weighted averaging of U-factor and SHGC when doing replacement fenestration.	No change		
503.1.2	Non-existent in 2009 code	Heating and cooling systems in alterations must comply as new with the same exception for ducts as found in additions.	No change		
503.1.3	Non-existent in 2009 code	Service hot water systems that are new must comply as new.	No change		
503.1.4	Non-existent in 2009 code	Lighting in alterations – new lighting must comply as new construction with the exception of alterations that replace less than 50% of the luminaires in a space provided installed interior lighting power is not increased.	Exception is now for only if alteration only replace less than 10% of lighting		
504	Non-existent in 2009 code	Most routine maintenance, repairs exempt from permit and abatement of wear due to normal service conditions is not subject to the requirements. Glass only replacements in an existing sash and frame are considered repairs as well as roof repairs.	No change	Each building department has their own take on what a repair is so you have to go through this section to make sure it doesn't conflict with jurisdiction policies	

505	Spaces undergoing a change in occupancy that would increase the demand for fossil fuel or electric energy must comply with the code. Even if not changing anything in the building, the lighting must be evaluated for the new occupancy and if the new occupancy would require less lighting then lighting must be removed to bring it into compliance.	Change of occupancy or use – spaces undergoing a change in occupancy that would increase the demand of fossil fuel or electrical energy must comply. Spaces that are converted to a dwelling unit or portion thereof from another use or occupancy must comply. If the simulated performance path is use to verify compliance they the annual energy cost of the proposed design is permitted to be 110% of the annual energy cost allowed by Section R405.3.	Any unconditioned or low-energy space that is converted to conditioned, needs to comply with additions code (502)		