

# 2009 -2015 IECC Commercial Significant Changes Summary

## Tier I

The first change is in the layout of the book. Instead of having Chapters 1-3 that applied to all projects and then having Chapter 4 Residential Energy, Chapter 5 Commercial Energy and Chapter 6 as the Referenced Standards, now there is a chapter C1-6 Commercial and R1-6 Residential.

Chapter 5 in both books became the Existing Buildings Chapter, moving Referenced Standards to Chapter 6. Chapter 1 no longer has the requirements for historical buildings, additions, remodels or anything regarding existing buildings. That has all moved to Chapter 5 for both Commercial and Residential.

C401.2 – Application -- Commercial buildings must comply with the IECC prescriptively, including new mandatory options of C406, or ASHRAE 90.1, or performance path with mandatory items but performance must show the building energy cost equal to or less than 85% of the standard reference design.

Table C402.1.3 and Table C402.1.4 – Opaque Thermal Envelope Insulation Component Minimum Requirements --

- R-Value of insulation entirely above deck increased from R-20 to R30
- R-Value for metal building roofs increased to R 19 +11 with a liner system
- R-Value of insulation in attics of residential occupancies increased to R49
- R-Value of insulation in metal building walls increased to R13 + 13
- R-Value of insulation for wood framed walls changed to allow option of R-20 cavity insulation in lieu of Cavity plus Continuous R13 +3.8.
- R-Value of unheated slabs increased from 0 to R-10 for 24" below grade
- Slab insulation in heated slabs must go below grade for 36".
- Opaque swinging doors comply with Table C402.1.4 (U-Factor), non-swinging doors must comply with C402.1.3 (R-Value).
- Footnote a in Table C402.1.4 allows use of ASHRAE 90.1 for construction details and U-, F-, and C-Factors of opaque assemblies.

C402.4.1 – Fenestration (prescriptive) – Gross window to wall area cannot exceed 30% for vertical glazing and 3% for skylights.

C402.4.2 – Minimum skylight fenestration area – Calls out specific requirements for certain occupancies that have enclosed space greater than 2500 sq. ft floor area, and ceiling heights greater than 15 ft, requiring the total daylight zone under skylights must cover at least half of the floor area.

C402.4.2.1 – Lighting Controls in daylight zones under skylights – all daylight zones under skylights must have controls complying with C405.2.3.1.

C402.3 – U-Factor of windows no longer is based on framing materials but rather if fixed or operable so now metal windows have the same U-Factor as all others. SHGC is now based on the amount of overhangs and the cardinal direction the window is facing. Skylight U-Factor and SHGC can be higher than the table if utilizing daylight zones and automatic controls.

C402.5 – Air leakage – Buildings must have a continuous air barrier around the entire thermal envelope, with specific sealing requirements. They can use materials from a list of “deemed to comply” materials or assemblies or the building must get a blower door test.

C402.5.3 – Rooms containing fuel-burning appliances – open combustion space conditioning fuel-burning appliances and their combustion air openings must be outside the building envelope or enclosed in a room isolated from inside the thermal envelope.

C403.2.3 – HVAC equipment performance requirements – Equipment shall meet minimum efficiencies as found in Tables C403.2.3 (1) – (9). Certain Water-Cooled Centrifugal Chilling Packages must have maximum full-load and Part-load rating requirements that are adjusted using given equations.

C404.5 – heated water supply piping – There are now maximum flow rates for various sizes of piping. Included in this section are maximum allowable pipe lengths from source to fixture, maximum allowable pipe volume and how to determine volume.

C404.11 – Service Water Heating Commissioning and completion requirements – water heating systems, swimming pool water heating systems and spa water heating systems and all of their controls must be commissioned per C408.2.

C405.2.3 – Daylight-responsive controls must be provided to control electric lights within daylight zones in spaces with more than 150 watts of general lighting next to vertical glazing (sidelight daylight zone) or from skylights (toplight daylight zone). Exceptions for health care facilities, dwelling units and sleeping units and specific occupancies. A section exists that specifies how those controls must also function.

C406 – Additional Efficiency Package Options – to get increased efficiency in buildings, at least one of the 6 additional efficiency package options must be chosen prescriptively. Options include more efficient HVAC performance, reduced lighting power density system, enhanced lighting controls, on-site supply of renewable energy, and provisions of a dedicated outdoor air system for certain HVAC equipment or high-efficiency service water heating. Tenant spaces cannot choose the renewables option for compliance, the entire building would have to have it.

C408 – System Commissioning – Mechanical systems and service water heating systems in buildings where the total mechanical equipment capacity exceeds 480,000 Btu/h, cooling capacity and 600,000 Btu/h combined service water-heating and space-heating capacity must have systems commissioned by a registered design professional or approved agency. Lighting controls must be functionally tested as well. Specifics for commissioning are called out for the plan, balancing, testing, reports and documentation requirements.

Chapter 5 CE – New chapter for existing buildings. Moved many of the requirements in Chapter 1 to Chapter 5, revised some of the requirements and added some new ones.

C501.6, 202 – The definition of a historical building has changed, making it a bit tougher to be considered historic. Also, all provisions of the code apply to historic buildings unless the registered design professional 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.

## Tier II

C101.2 – Scope – modified to say that the code applies not only to the building but to the building sites and associated systems and equipment.

C103.2.1 – Building Thermal Envelope Depiction – The building’s thermal envelope has to be represented on the construction drawings.

C104 – Inspections – 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.

C401.2.1 – Replacement Fenestration – went from only requiring compliance if you replace the entire window assembly to compliance if you change some or all of a fenestration unit.

C402.1.2 – new section that exempts thermal envelope provisions for the following: separate buildings smaller than 500 sq ft; intended to house electronic equipment with low equipment power and not intended for human occupancy; heating system not greater than 17K Btu/hr and thermostat set to not more than 50 degrees; extremely low wall and roof U-Factors based on climate zones; comply with roof solar reflectance and thermal emittance provisions of Climate Zone 1.

C402.1.5 – Use Equation 4-2 to comply with the envelope provisions in lieu of U-, F-, and C-Factors in Table C402.1.3 – C402.1.4 and the maximum allowable fenestration areas.

C402.2.4 – Floors – Floor insulation doesn’t have to be in contact with the subfloor anymore as long as insulation meeting the above grade wall values is installed from the bottom to top of all perimeter floor framing. Also, insulation applied to the underside of slabs may have an airspace 1” or less.

C402.2.6 – Insulation of radiant heating systems: components of the thermal envelope that have radiant heating system panels must have an R3.5 on all surfaces not facing the space to be heated. Slabs would need R-5 per IMC (conflict) but are exempted if they are insulated per the slab edge requirements.

C402.4.1.1 – Increased vertical fenestration -- vertical fenestration area can be increased to 40% provided certain daylighting requirements are met.

C402.4.1.2 – Increased Skylight Area – skylight area can be increase to 5% provided certain daylighting provisions are met.

C402.5.7 – Vestibules – required for main entry doors that open into space exceeding 3000 sq ft, not required on revolving doors but are required on doors next to revolving doors, not required if using an air curtain meeting the functional testing requirements of exception #6.

C403.1 – Walk in coolers and freezers and refrigerated warehouse coolers and freezers must comply with their own new sections.

C403.2.1 – heating and cooling loads – loads calculated to ASHRAE 183 and must include design parameters of Chapter 3 and account for load reductions achieved where energy recover systems are used.

C403.2.2 – System Sizing – equipment cannot exceed the calculated loads.

C403.2.4.2.3 – Automatic start up capabilities – HVAC systems need auto start controls to bring the space to the desired temperature just before occupants are scheduled to arrive.

C403.2.4.4 – Zone Isolation – Zones over 25,000 sq ft or that span more than one floor shall be divided into isolation areas with separate controls.

C403.2.4.7 – Economizers must have a fault detection and diagnostics system meeting 7 specific capabilities and requirements.

C403.2.5 Hot water boilers supplying heat to the building shall have outdoor setback control that lowers the water temp based on outdoor temp.

C403.2.6.2 – Enclosed parking garages operating under their own power must have contamination sensing devices and auto controls to shut the airflow rates down to 50% or less of design capacity or operate intermittently when unoccupied, with specific requirements from IMC.

C403.2.7 – Energy recovery ventilation systems required where supply airflow rate of fan system exceeds specified values. Must include bypass controls that allow economizer to function. 11 exceptions to this requirement.

C403.2.8 – Kitchen Exhaust Systems – replacement air entering through the exhaust hood cavity must not be more than 10% of the hood exhaust airflow rate. Specifics are given for conditioned supply air rates and for large hoods.

C403.2.9 – Ducts outside the building or integral to the building envelope now need R-12 in our climate zone.

Table C403.2.1 – piping insulation table expanded to be more in line with what actually gets used. Insulation must be protected from the elements

C403.2.12.1 – Allowable fan floor horsepower – adjusted to add requirement that single zone VAV systems comply with constant volume fan power limitations and removed the exception for fans exhausting air from fume hoods.

C403.2.14 – refrigeration equipment performance – refrigeration equipment must have an energy use not greater than Tables C403.2.14 (1) and (2).

C403.2.15 – 11 new requirements for refrigerated warehouse coolers/freezers and walk in coolers/freezer not site built as well as 11 new requirements for site constructed walk in coolers and freezers.

C403.2.17 – Refrigerated display cases that are site assembled or site build must comply with new lighting requirements, defrost controls and anti-sweat heater controls.

C403.3 – Economizers (prescriptive) – Economizer section completely rewritten with new table, 9 exceptions of when you don't need economizers and the requirement for integrated economizer controls. Economizer operation cannot increase building heating energy use. Complete new sections for requirements for Air Economizers and requirements for water-side economizers.

C403.4 – New section for Hydronic and multiple-zone HVAC systems controls and equipment. This section applies prescriptively only and includes requirements for fan airflow control, static pressure sensor location, set points for direct digital control, hydronic system controls, heat pump systems, heat rejection, required heat exchangers for cooling towers, part load controls, boiler turndown, pump isolation, heat rejection equipment, and fan speed controls.

C403.4.4 – complete rewrite of requirements for complex mechanical systems serving multiple zones.

C403.5 – New section for refrigerated display cases, walk in coolers or walk in freezers that are served by remote compressors and remote condensers not located in a condensing unit.

C404.2 – Service water heating equipment must meet efficiencies in Table C404.2. Gas fired water heating equipment in new buildings that serve as the only piece of water heating equipment for an entire build with an input rating of 1 million Btu/h or more must be 90% efficient. A new table and requirements have been set for insulation of piping.

C404.5 – Heated-water circulating and temperature maintenance systems – New requirements for circulations systems, heat trace systems and controls for hot water storage.

C404.7 – 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.

C404.8 – 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.

C405.1 – Lighting requirements are mandatory. Exceptions out of some control and density requirements are found for dwelling units within commercial buildings if the dwelling unit lighting complies with the residential provisions of R404.1

C405.2 – mandatory lighting controls except for emergency or security areas meant to be continually lighted, interior exit stairways, ramps and passageways, and emergency egress lighting that is normally off.

C405.2.1 – requires occupant sensor controls in 12 locations. The sensors must turn off lights within 30 minutes of occupant leaving space and there must be manual on or automatic controls that turn the lighting on to no more than 50%. Some exceptions where full auto-on controls are allowed. Separate occupant sensor controls for warehouses.

C405.2.2 – Time switch controls required where occupant sensors are required, exceptions for sleeping units, patient care spaces, occupant safety or security is at risk, shops or classrooms. Time switch controls must have override switching with specific requirements.

C405.2.2.2 – spaces requiring light reduction controls must have a manual control allowing the occupant to reduce lighting by 50%. Exceptions for lighting in daylight zones with daylight zone controls.

C405.2.5 – Exterior lighting controls – except for emergency, security or safety lighting, exterior lighting must be controlled to automatically turn off lights when there is available daylight, dawn/dusk lighting controls for façade and landscape lighting, and controls to reduce lighting power by 30% in very specific timeframes and situations.

C405.4.1 – Total connected interior lighting power – New formula for calculating the total connected interior lighting power. Many of the exceptions for what does not have to be included stayed the same.

C405.4.4.2 – Interior lighting power can be determined by using the building area method (set occupancy x set watts per sq ft) or space by space method (different watts per sq ft for each use of the different spaces). The additional interior lighting power allowance calculation was revised and is only allowed if using the space by space method. The tables for power allowances have also gotten more efficient.

C405.6 – Each dwelling unit of an R-2 building must have separate electrical meters.

C405.7 – Electrical transformers – minimum efficiencies have been set for electric transformers with 14 exceptions.

C405.8 – Electrical motors (mandatory) – new efficiencies for electric motors.

C405.9 – New requirements for lighting and ventilation fans and their controls in elevator cabs and for the control of escalators and moving walks. Also a new requirement for variable frequency regenerative drives when an escalator is designed either for one way down or reversible operation.

C502 – Additions – additions must comply as new construction without requiring untouched portion to comply. New vertical fenestration and skylights installed would either need to comply prescriptively and stay under 40% of the total building fenestration area or the performance path must be chosen. Any new mechanical or service water heating system would need to comply as new. The interior and exterior lighting power can comply as the addition alone or may show compliance as a single building.

C503 – 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 such as storm windows, roof recover and air barriers for roof recover where no work is being done to the rest of the envelope. Roof replacements that include insulation entirely above deck must comply as new construction. Vertical fenestration and skylights must comply prescriptively or must use performance if over 40% of the total building fenestration area. Lighting must comply as new unless less than 10% of the luminaires in a space are replaced and the installed interior lighting power is not increased.

### **Tier III**

C403.2.4.1.2 – Deadband – thermostats that control both heating and cooling must have Deadband of at least 5 degrees so that equipment shuts down before cycling between heating and cooling.

C403.2.4.1.3 – If separate controls are used for heating and cooling within same zone they have to have controls that allow the same type of Deadband as mentioned in above section.

C403.2.4.3 – Shutoff Dampers – outdoor air intake exhausts need air tight automatic dampers with auto controls, with specific requirements for stairway and shaft vent dampers and an allowance for gravity dampers in certain buildings and climates.

C403.2.4.6 – Freeze Protection systems need automatic controls to shut system off when outside temp is above 40 degrees.

C403.2.5.1 – Demand control ventilation rates were changed to be more in line with the IMC.

C403.2.9.1.3 – high pressure ducts must be tested to an air leakage rate of 4.0 or less, was 6.0 prior.

C403.2.11 – A pointer to the mandatory requirement for mechanical system commissioning per C408.2.

C404.9 – 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.

C404.10 – portable spas shall follow APSP 14

C405.2.3.2 – Sidelight daylight zone – describes what floor area is considered a sidelight daylight zone next to vertical fenestration. New figures have been added to the code to illustrate the requirement.

C405.2.3.3 – Toplight daylight zone – describes what floor area is considered a toplight daylight zone under skylights. New figures have been added to the code to illustrate the requirement.

C405.2.4 – Specific application controls – dedicated controls, independent of the controls for other lighting, is required for display and accent lighting, lighting in display cases, task lighting, plant growth and food warming lighting and lighting equipment for sale or demonstration. Hotel and motel sleeping units must have a master control automatically switching off all luminaires and switched receptacles within 20 minutes after all occupants leave the room.

C407 – Total Building Performance – The table has been updated to reflect increased efficiencies in the envelope, mechanical, service water heating and lighting requirements for the standard reference design.

C501.3 – 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.

C504 – 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 and air barriers for roof repairs.