

# The 2012 IECC: Changes and Tests

Career Development Seminar  
State of Connecticut  
Office of Education and Data Management  
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## 2012 International Energy Conservation Code (IECC)

- Commercial Provisions
  1. Scope and Administration
  2. Definitions
  3. General Requirements
  4. Commercial Energy Efficiency *(Versus Chapter 5 in 2009 IECC)*
  5. Reference Standards
- Residential Provisions
  1. Scope and Administration
  2. Definitions
  3. General Requirements
  4. Residential Energy Efficiency *(Versus Chapter 4 in 2009 IECC)*
  5. Reference Standards

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## IECC - Buildings

Residential building (definition for this code)

- Detached one- and two-family dwellings
- Multiple single-family dwellings (townhouses)
- R-2, R-3 and R-4 buildings three stories or less in height above grade plane *(Versus all R-3 in 2009 IECC)*

Commercial building (definition for this code)

- All not included in residential building definition

R101.3 & C101.3 Intent: This code regulates the design and construction of buildings for the effective use and conservation of energy over the useful life of each building.

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## Sections R101.4 & C101.4

- Applicability
  - Existing buildings
  - Historic buildings
  - Additions, alterations, renovations or repairs
- Exceptions:
  1. Storm windows over existing fenestration
  2. Glass only replacement in existing sash & frame
  3. Existing cavities exposed during construction that are filled with insulation
  4. Construction where existing cavity not exposed
  5. Reroofing where neither sheathing nor insulation is exposed
  6. Vestibule not required when replacing door
  7. Replacement ≤50% of luminaires in a space\*
  8. Bulb & ballast replacement in existing luminaire\*
- Change in occupancy or use
  - Increasing demand for either fossil fuel or electrical energy
  - Space change from one building/space type to another in lighting tables
- Change in space conditioning
- Mixed occupancy

\*Provided installed interior lighting power does not increase

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## Sections R103 & C103

### Information on construction documents

- Insulation materials and their R-values
- Fenestration U-factors and SHGCs
- Area-weighted U-factor and SHGC calculations
- Mechanical system design criteria
- Mechanical and service water heating system and equipment types, sizes and efficiencies
- Economizer description
- Equipment and systems controls
- Fan motor horsepower (hp) and controls
- Duct sealing
- Duct and pipe insulation and location
- Lighting fixture schedules with wattage and control narrative
- Air seal details

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## Definitions

- Skylights, Glass or other transparent or translucent glazing material installed <60° from horizontal. (*≥15° from vertical in 2009 IECC*)
- Above Grade Wall:
  - Residential, >50% above grade
  - Commercial, >15% above grade

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## Residential Energy Efficiency

### R401.2 Compliance

- With "Mandatory" Sections and
- With either
  - "Prescriptive" Sections or
  - Performance approach

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## Residential Energy Efficiency

### R401.3 Certificate (Mandatory)

- Predominant insulation R-value in/on:
  - Ceiling/roof
  - Walls
  - Foundation (slab, basement walls, crawlspace walls and/or floors)
- Fenestration U-factors and SHGC
- Results from required duct system air leakage testing
- Results from building envelope air leakage testing
- Types and efficiencies of heating, cooling and service water heating equipment

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## Section R402 Residential Thermal Envelope (Prescriptive)

Fenestration U-factor	0.32
Skylight U-factor	0.55
Glazed Fenestration SHGC	NR
Ceiling R-value	49
Wood-Frame Wall R-value	20 or 13+5
Mass Wall R-value	13/17
Floor R-value	30
Basement Wall R-value	15/19
Slab R-value & Depth	10 / 2 ft
Crawlspace Wall R-value	15/19

Fenestration U-factor	0.32
Skylight U-factor	0.55
Ceiling U-factor	0.026
Frame Wall U-factor	0.057
Mass Wall U-factor	0.082
Floor U-factor	0.033
Basement Wall U-factor	0.050
Crawlspace Wall U-factor	0.055

Steel-Frame Wall, 16" O.C.	Steel-Frame Wall, 24" O.C.
R-49	R-49
R-20 or R-19.5 or R-19 or R-18.5 or R-18	R-20 or R-19.5 or R-19 or R-18.5 or R-18

Continuous insulation (ci): Insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings. (from Standard 90.1-2010)

Yellow indicates change from 2009 IECC

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Section R402.2  
Specific Insulation Requirements (Prescriptive)

- R402.2.1 Ceilings with attic spaces

R-38 full height uncompressed insulation extending over wall top plate at eaves satisfies R-49 requirement

(Does not apply to U-factor alternate approach or total UA alternative)



- R402.2.2 Ceilings without attic spaces

R-30 ceiling/roof insulation, up to the lesser of 500 sq. ft. or 20% of total insulated ceiling area, where sufficient space for R-30 exists satisfies above R-30 requirement

(Does not apply to U-factor alternate approach or total UA alternative)

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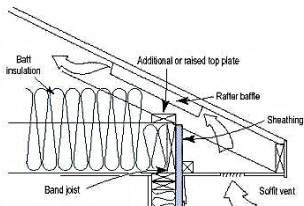
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Section R402.2  
Specific Insulation Requirements (Prescriptive)

- R402.2.3 Eave Baffle *(New)*

For air permeable insulation adjacent to soffit and eave vent in vented attic



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Section R402.2  
Specific Insulation Requirements (Prescriptive)

- R402.2.4 Access hatches and doors
- R402.2.5 Mass walls (above grade walls)
- R402.2.6 Steel-frame ceilings, walls and floors
- R402.2.7 Floors  
Insulation in permanent contact with underside of sub-floor decking
- R402.2.8 Basement walls  
Insulated from top of basement wall down to 10' below grade or to basement floor, whichever is less



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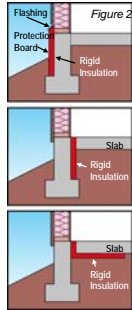
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Section R402.2

Specific Insulation Requirements (Prescriptive)

- R402.2.9 Slab-on-grade floors
  - Floor surface <12" below grade
  - Insulation shall extend from top of slab to 2' below grade
  - Can be interior or exterior and any combination of vertical or horizontal
    - Exterior horizontal insulation protected by pavement or 10" soil
  - R-15 for heated slabs



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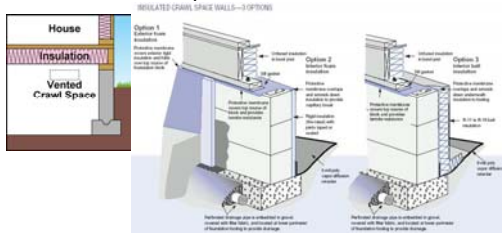
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Section R402.2

Specific Insulation Requirements (Prescriptive)

- R402.2.10 Crawl space walls



- R402.2.11 Masonry veneer

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Sunrooms (Prescriptive)

- R402.2.12 Sunroom insulation
  - Code requirements or
  - Exception for thermally isolated sunrooms *(and non thermally isolated sunrooms in Connecticut Supplement)*
    - R-24 Ceiling insulation *(R-19 installed insulation in Connecticut Supplement)*
    - R-13 Wall insulation *(R-11 installed insulation in Connecticut Supplement)*
- R402.3.5 Sunroom U-factor
  - Code requirements or
  - Exception for thermally isolated sunrooms *(≤500 sq. ft. isolated / ≤350 sq. ft. non isolated sunrooms in Connecticut Supplement)*
    - 0.45 maximum U-factor *(0.50/0.45 in Connecticut Supplement)*
    - 0.70 maximum skylight U-factor *(0.50/0.45 in Connecticut Supplement)*



Thermal isolation (definition). Physical and space conditioning separation from conditioned space(s). The conditioned space(s) shall be controlled as separate zones for heating and cooling or conditioned by separate equipment.

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**Section R402.3 Fenestration (Prescriptive)**

- Exceptions (do not apply to U-factor alternative approach)
  - R402.3.5 Glazed fenestration: Up to 15 sq. ft. per dwelling unit
  - R402.3.4 Opaque door: 1 side-hinged door assembly up to 24 sq. ft.

**Section R402.5 Maximum Fenestration U-factor (Mandatory)**

- Maximum area weighted U-factor when using Section R402.1.4 or R405
  - 0.48 for vertical fenestration
  - 0.75 for skylights

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**Section R402.4 Air Leakage (Mandatory)**

- R402.4.1 Building thermal envelope
  - Continuous air barrier in building envelope
  - Seal air barrier joints & breaks
  - Seal junctions of different envelope assemblies
  - Seal space between jams and framing
  - Insulate narrow cavities & behind showers & tubs
  - Seal shafts & penetrations
  - Air barrier between garage and conditioned space

Component	Barrier
Roof and Sill/Window	A continuous air barrier shall be installed in the building envelope. The barrier shall extend through all exterior walls, floors, and roofs. The barrier shall be installed in accordance with the manufacturer's instructions. The barrier shall be installed in accordance with the manufacturer's instructions.
Windows	The air barrier shall be installed in accordance with the manufacturer's instructions. The air barrier shall be installed in accordance with the manufacturer's instructions. The air barrier shall be installed in accordance with the manufacturer's instructions.
Doors	The air barrier shall be installed in accordance with the manufacturer's instructions. The air barrier shall be installed in accordance with the manufacturer's instructions. The air barrier shall be installed in accordance with the manufacturer's instructions.
Penetrations	The air barrier shall be installed in accordance with the manufacturer's instructions. The air barrier shall be installed in accordance with the manufacturer's instructions. The air barrier shall be installed in accordance with the manufacturer's instructions.
Other	The air barrier shall be installed in accordance with the manufacturer's instructions. The air barrier shall be installed in accordance with the manufacturer's instructions. The air barrier shall be installed in accordance with the manufacturer's instructions.

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**Air Sealing (Mandatory)**

The diagrams illustrate various air sealing methods:
 

- Roof penetrations: Caulking around the base of the penetration.
- Window/Door Frames: Dried caulk, gasket, or sealant applied to the frame.
- Interior Wall Penetrations: Sealant applied to the interior side of the penetration.
- Exterior Wall Penetrations: Sealant applied to the exterior side of the penetration.
- Roof-to-Wall Junctions: Sealant applied to the junction between the roof and the exterior wall.
- Roof-to-Roof Junctions: Sealant applied to the junction between two roof sections.
- Roof-to-Floor Junctions: Sealant applied to the junction between the roof and the floor.

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### Envelope Air Sealing



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### Section R402.4

### Air Leakage (Mandatory)

- R402.4.1 Building thermal envelope
  - R402.4.1.1 Installation
  - R402.4.1.2 Testing (*Visual inspection not an option as in 2009 IECC*)



- Conducted at any time after creation of all penetrations. During test:
  - Exterior doors and windows, fireplace and stove doors closed, but not sealed
  - Dampers closed but not sealed
  - Interior doors open
  - Exterior doors for ventilation systems and heat recovery ventilators closed and sealed
  - Heating and cooling systems, if installed, turned off
  - Supply and return registers, if installed, fully open
- Verified  $\leq 3$  air changes per hour @ 0.2" w.g.
- Signed written report provided by party conducting the test

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### Section R402.4

### Air Leakage (Mandatory)

- R402.4.2 Fireplaces (new wood burning)
  - Tight-fitting flue dampers (*Gasketed doors not required*)
  - Outdoor combustion air
- R402.4.4 Fenestration air leakage rates
  - $\leq 0.3$  cfm per sq. ft. for windows, skylights & sliding glass doors
  - $\leq 0.5$  cfm per sq. ft. for swinging doors
  - Exception: Site-built windows, skylights and doors
- R402.4.4 Recessed lighting (in thermal envelope)
  - IC-rated and  $\leq 2.0$  cfm rated air leakage
  - Sealed between housing and interior wall/ceiling covering

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Section R403  
**Residential Systems**

- R403.1 Controls (Mandatory)
  - At least 1 thermostat for each separate heating & cooling system
  - R403.1.1 Programmable thermostat; at least 1 per dwelling unit where forced-air furnace is primary heating system
  - R403.1.2 Heat pump supplementary heat (Mandatory); controls that prevent operation of supplementary electric-resistance heat when compressor can meet the heating load.

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Section R403  
**Residential Systems**

- R403.2.1 Duct insulation (Prescriptive)
  - Minimum R-8 on supply ducts in attic
  - Minimum R-6 on all other ducts
  - Exception: ducts or portions thereof located inside thermal envelope
- R403.2.3 Building cavities (Mandatory)
  - Framing cavities not used as ducts or plenums

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Section R403  
**Residential Systems**

- R403.2.2 Sealing (Mandatory)
  - Ducts, air handlers and filter boxes sealed
  - Duct tightness verified by either:
    - Postconstruction test: Total leakage  $\leq 4$  cfm per 100 sq. ft. of conditioned floor area across entire system, including air handler enclosure. ( *$\leq 12$  cfm in 2009 IECC, no leakage test to outdoors*)
    - Rough-in test: Total leakage  $\leq 4$  cfm per 100 sq. ft. of conditioned floor area across entire system, including air handler or  $\leq 3$  cfm if air handler not installed. ( *$\leq 6$  cfm and 4cfm in 2009 IECC*)
    - Exception: test not required for ducts and air handlers located entirely within thermal envelope
  - Manufacturer's designated air handler leakage  $\leq 2\%$  of design air flow

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### Duct Tightness Test

The image shows four diagrams of duct components: TRANSITIONS, AIR HANDLER, REGISTER BOOT, and FLEX DUCT CONNECTIONS. A photograph shows a construction site with a duct system being tested, with a person visible in the background.

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### Section R403.3 Mechanical System Piping Insulation (Mandatory)

- Minimum R-3 insulation on piping capable of carrying fluids above 105°F or below 55°F
- R403.3.1 Protection of piping insulation
  - Protection from weather related damages
  - Shielding from solar radiation
  - Adhesive tape not permitted

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### Section R403.4 Service Hot Water Systems

- R403.4.1 Circulating hot water systems (Mandatory)
  - Automatic or readily accessible manual switch to turn off pump when system is not in use
- R403.4.2 Hot water pipe insulation (Prescriptive)
  - Minimum R-3 on piping (*R-2 in 2009 IECC and additional locations*):
    - $\geq \frac{3}{4}$ " nominal diameter
    - Serving more than 1 dwelling unit
    - From water heater to kitchen outlets
    - Located outside conditioned space
    - From water heater to a distribution manifold
    - Located under floor slab
    - Buried
    - In recirculating system other than demand recirculating systems
    - Longer than maximum run lengths in Table R403.4.2

Nominal Pipe Diameter of Largest Diameter Pipe in the Run (Inches)	3/8	1/2	3/4	1
Maximum Run Length (Feet)	30	20	10	5

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Section R403.5

### Mechanical Ventilation (Mandatory)

- R403.5 Mechanical Ventilation (Mandatory)
  - Meets requirements of IRC or IMC
  - Automatic or gravity dampers on outdoor air intakes and exhausts *(New)*
- R403.5.1 Whole-house fan efficacy *(New)*

Mechanical Ventilation System Fan Efficiency			
Fan Location	Air Flow Rate Minimum (cfm)	Minimum Efficacy (cfm/watt)	Air Flow Rate Maximum (cfm)
Range hoods	Any	2.8	Any
In-line fan	Any	2.8	Any
Bathroom, utility room	10	1.4	<90
Bathroom, utility room	90	2.8	Any

Exception: Fans with electrically commutated motors integral to tested and listed HVAC equipment.

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Section 403

### Residential Systems

- R403.6 Equipment Sizing (Mandatory)
  - Heating and cooling equipment
    - Sized in accordance with ACCA Manual S
    - Based on loads calculated in accordance with ACCA Manual J
- R403.7 Systems serving multiple dwelling units (Mandatory)
  - Comply with Sections C403 and C404 of IECC
- R403.8 Snow melt system controls (Mandatory)
  - Automatic shutoff when pavement temperature >50° and no precipitation falling, and
  - Automatic or manual shutoff when outdoor temperature >40°

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Section 403.9

### Pools & Inground Permanently Installed Spas (Mandatory) *(Spas are new)*

- R403.9.1 Heaters
  - Accessible on-off switch without adjusting thermostat setting
  - No constant burning pilot lights
- R403.9.2 Time switches
  - Automatically turn on & off heaters and pumps
- R403.9.3 Covers
  - Vapor-retardant *(R-value requirement eliminated from 2009 IECC)*

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Section 404

### Electrical Power & Lighting System

- R404.1 Lighting equipment (Mandatory)
  - High efficacy lamps installed in:
    - ≥75% of lamps in permanently installed fixtures  
*(≥50% in 2009 IECC)*
    - ≥75% of permanently installed fixtures
  - Electronic ignition in fuel gas lighting systems *(New)*

High efficacy lamps (definition) are:

- Compact fluorescent lamps
- T-8 or smaller diameter linear fluorescent lamps
- Lamps with minimum efficacy of:
  - 60 lumens per watt for lamps >40 watts
  - 50 lumens per watt for lamps >15 watts and ≤40 watts
  - 40 lumens per watt for lamps ≤15 watts

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### Residential Documents at Completion

- Certificate on electrical panel
- Blower door test results
- Duct tightness test results, if required
- Equipment and systems maintenance instructions

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### Commercial Energy Efficiency

- C401.2 Application: comply with ONE of:
  1. ANSI/ASHRAE/IESNA Standard 90.1-2010
  2. Sections C402 (Envelope), C403 (Mechanical Systems), C404 (Service Water Heating), C405 (Electrical Power and Lighting Systems) and with either Section 406.2 (Efficient HVAC Performance), 406.3 (Efficient Lighting System) or C406.4 (On-site Renewable Energy)
  3. Section C407 (Total Building Performance) and all mandatory requirements. Building energy cost shall be ≤85% of standard reference design building. *(New)*
- C401.2.1 Application to existing building
 

Additions, alterations and repairs shall comply with ONE of:

  - Sections C402, C403, C404 and C405, or
  - ANSI/ASHRAE/IESNA Standard 90.1-2010

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## Section C402 Envelope Requirements

### • C402.1.1 Criteria (Prescriptive)

Table C402.3	
Building Envelope Requirements: Fenestration	
Climate Zone 5	
Vertical Fenestration	
	U-factor
Fixed Fenestration	0.38
Operable Fenestration	0.45
Entrance Doors	0.77
	SHGC
Solar Heat Gain Coefficient	0.40
Skylights	
	U-factor
	SHGC
	0.40

Yellow indicates change from 2009 IECC

Continuous insulation (ci): Insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings. (from Standard 90.1-2010)

Table C402.2		
Opaque Thermal Envelope Assembly Requirements		
Climate Zone 5	All Other	Group R
Roofs		
Insulation entirely above deck	R-25ci	R-25ci
Metal buildings with 58 thermal blocks	R-109/R-118ci	R-109/R-118ci
Attic and other	R-38	R-49
Walls, Above Grade		
Mass	R-11.4ci	R-13.3ci
Metal buildings	R-139/R-13ci	R-139/R-13ci
Metal framed	R-139/R-7.5ci	R-139/R-7.5ci
Wood framed and other	R-139/R-3.8ci or R-20	R-139/R-7.5ci or R-20 R-209/R-3.8ci
Walls, Below Grade		
Below-grade wall	R-7.5ci	R-7.5ci
Floors		
Mass	R-10ci	R-12.5ci
Joist/framing	R-30	R-30
Slab-on-Grade Floors		
Unheated slabs	R-10ci or R-4" below	R-10ci or R-4" below
Heated slabs	R-15ci or R-6" below	R-15ci or R-6" below
Opaque Floors		
Swinging	U-0.37	U-0.37
Roll-up/sliding	R-4.75	R-4.75

## Section C402 Envelope Requirements

### • C402.1.2 U-factor alternative (Prescriptive)

Table C402.1.2		
Building Envelope Assembly Requirements		
Climate Zone 5	All Other	Group R
Roofs		
Insulation entirely above deck	U-0.039	U-0.039
Metal buildings	U-0.035	U-0.035
Attic and other	U-0.027	U-0.021
Walls, Above Grade		
Mass	U-0.078	U-0.078
Metal buildings	U-0.052	U-0.052
Metal framed	U-0.064	U-0.064
Wood framed and other	U-0.064	U-0.064
Walls, Below Grade		
Below-grade wall	C-0.119	C-0.119
Floors		
Mass	U-0.074	U-0.064
Joist/framing	U-0.033	U-0.033
Slab-on-Grade Floors		
Unheated slabs	F-0.54	F-0.54
Heated slabs	F-0.58	F-0.58

Yellow indicates change from 2009 IECC

## Section C402.2 Specific Insulation Requirements (Prescriptive)

### • C402.2.1 Roof assembly

- Value in Table C402.2
- R-5 Skylight curb insulation
- Exceptions:
  1. Continuously insulated roof assemblies where thickness varies ≤1" and where area-weighted U-factor is equivalent to same assembly with R-25ci
  2. Skylight curbs included as component of NFRA 100 rated assembly

Section C402.2  
**Specific Insulation Requirements  
(Prescriptive)**

- C402.2.4 Thermal resistance of below-grade walls
  - R-7.5ci
  - Installed in, or continuously on, extending down 10 feet below outside finished ground level, or to floor level, whichever is less.
- C402.2.5 Floors over outdoor air or unconditioned space
  - R-10ci installed continuously on the floor assembly, or
  - R-30 installed between the floor framing

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Section C402.2  
**Specific Insulation Requirements  
(Prescriptive)**

- C402.2.6 Slabs on grade
  - Insulation:
    - R-10 (for unheated slab) or R-15 (for heated slab)
    - Placed either on outside or inside
    - From top of slab downward 24" for unheated slab or 36" for heated slab or downward to at least bottom of slab and then horizontally to interior or exterior the 24" or 36"
    - Extending away from building shall be protected by pavement or ≥10" of soil *(New)*
  - Exception: Where floor is ≥24" below finished grade, perimeter insulation is not required *(New)*

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Section C402.2  
**Specific Insulation Requirements  
(Prescriptive)**

- C402.2.8 Insulation of radiant heating systems
  - Minimum R-3.5 insulation *(New)*:
    - Radiant panels and associated U-bends and headers designed for sensible heating of indoor space
    - Bottom surfaces of floor structures incorporating radiant heating

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Section C402.3  
**Fenestration (Prescriptive)**

- C402.3.1 Maximum area:
  - ≤30% of gross above-grade wall area can be vertical fenestration area (not including opaque doors and opaque spandrel panels) *(40% in 2009 IECC)*
  - ≤3% of gross roof area can be skylight area

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Section C402.3  
**Fenestration (Prescriptive)**

- C402.3.1.1 Increased vertical fenestration area with daylighting controls *(New)*
  - ≤40% of gross above-grade wall area permitted to be vertical fenestration area if:
    1. ≥50% of conditioned floor area in daylight zone;
    2. Automatic daylighting controls are installed in daylight zones; and
    3. Visible transmittance (VT) of vertical fenestration ≥0.44 (1.1 times SHGC of 0.40)Exception: Fenestration outside scope of NFRC 200 not required to comply with item 3

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Section C402.3  
**Fenestration (Prescriptive)**

- C402.3.1.2 Increased skylight area with daylighting controls *(New)*
  - ≤5% of roof area permitted to be skylight area if:
    1. Automatic daylighting controls are installed in daylight zones under skylights

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## Daylight Zone (Definitions)

- **Under skylights.** Area under skylights whose horizontal dimension, in each direction, is equal to the skylight dimension in that direction plus either the floor-to-ceiling height or the dimension to a ceiling height opaque partition, or one-half the dimension to adjacent skylights or vertical fenestration, whichever is least.
- **Adjacent to vertical fenestration.** Area adjacent to vertical fenestration which receives daylight through the fenestration. For purposes of this definition and unless more detailed analysis is provided, the daylight zone depth is assumed to extend into the space a distance of 15 feet or to the nearest ceiling height opaque partition, whichever is less. The daylight zone width is assumed to be the width of the window plus 2 feet on each side, or window width plus the distance to an opaque partition, or the window width plus one-half the distance to adjacent skylight or vertical fenestration, whichever is less.

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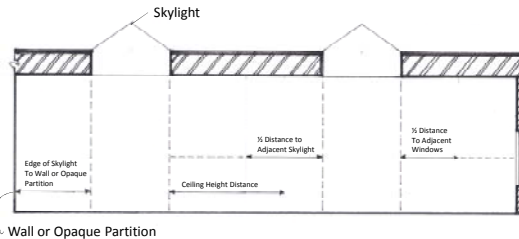
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## Daylight Zone – Under Skylight

Section View



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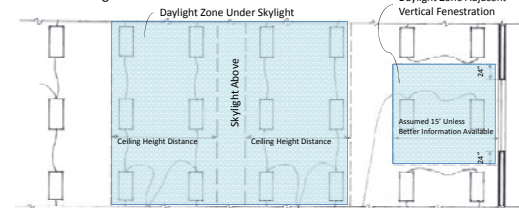
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## Daylight Zones

Reflected Ceiling Plan



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Section C402.3  
**Fenestration (Prescriptive)**

- C402.3.2 Minimum skylight fenestration area *(New)*
  - Above enclosed space
    - >10,000 sq. ft. directly under a roof
    - >15 feet ceiling height
    - Used as office, lobby, atrium, concourse, corridor, storage, gymnasium/exercise center, convention center, automotive service, manufacturing, non-refrigerated warehouse, retail store, distribution/sorting area, transportation, or workshop
  - Minimum areas
    - Total daylight zone  $\geq 50\%$  of floor area
    - Skylight area to daylight zone under skylights
      - $\geq 3\%$  with skylight VT  $\geq 0.40$  or
      - Provide skylight effective aperture  $\geq 1\%$
    - Exceptions:
      - General lighting power density  $< 0.5$  W/sq. ft.
      - Blockage of direct beam sunlight on  $\geq 50\%$  roof over space for more than 1,500 daylight hours per year
      - Daylight zone under roof monitors  $> 50\%$  of enclosed space floor area

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Section C402.3  
**Fenestration (Prescriptive)**

- C402.3.2.1 Lighting controls in daylight zones under skylights *(New)*
  - All lighting in daylight zone shall be controlled by multilevel lighting controls that comply with Section C405.2.2.3.3
    - Exceptions:
      - General lighting power density  $< 0.5$  W/sq. ft.
      - Blockage of direct beam sunlight on  $\geq 50\%$  roof over space for more than 1,500 daylight hours per year
      - Daylight zone under roof monitors  $> 50\%$  of enclosed space floor area
- C402.3.2.2 Haze factor
  - $> 90\%$  for skylights in office, storage, automotive service, manufacturing, non-refrigerated warehouse, retail store, and distribution/sorting area
  - Exception: Skylights designed to exclude direct sunlight

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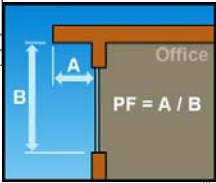
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Section C402.3  
**Fenestration (Prescriptive)**

- C402.3.3.1 SHGC adjustment *(0.40 for PF < 0.25 and NR for PF  $\geq 0.25$  in 2009 IECC)*
  - Multiplier for adjusting SHGC in Table C402.3

Projection Factor	Oriented within 45° of True North	All Other Orientation
$0.2 \leq PF < 0.5$	1.1	1.2
$PF \geq 0.5$	1.2	1.6



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Section C402.3

**Fenestration (Prescriptive)**

- C402.3.3.3 Increased skylight SHGC *(New)*
  - Maximum 0.60 permitted when located above daylight zone provided with automatic daylighting controls
- C402.3.3.4 Increased skylight U-factor *(New)*
  - Maximum 0.75 permitted when installed above daylight zone provided with automatic daylighting controls
- C402.3.3.5 Dynamic glazing *(New)*
  - Use manufacturer’s lowest-rated SHGC & VT/SHGC ratio
  - Cannot be area-weighted averaged with non-dynamic glazing

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Section C402.4

**Air Leakage (Mandatory)**

- C402.4.1 Air barriers *(New)*
  - Continuous throughout building thermal envelope
- C402.4.1.1 Air barrier construction *(New)*
  - Continuous for all envelope assemblies and across joints & assemblies
  - Seal joints & seams including transitions in places and changes in materials
  - Seal penetrations per C402.4.2
  - Ability to resist positive and negative pressure
  - Exception for buildings passing air leakage test

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Section C402.4

**Air Leakage (Mandatory)**

- C402.4.1.2 Air barrier compliance options *(New)*
  - C402.4.1.2.1 Materials
    - Air permeability  $\leq 0.004$  cfm/sq. ft. @ 0.3"wg
    - List of 15 material deemed to comply provided joints are sealed and installed per manufacturer’s instructions
  - C402.4.1.2.2 Assemblies
    - Air leakage rate  $\leq 0.04$  cfm/sq. ft. @ 0.3" wg
    - List of 2 assemblies deemed to comply
  - C402.4.1.2.3 Building test
    - Building air leakage rate  $\leq 0.40$  cfm/sq. ft. @0.3" wg

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Section C402.4  
**Air Leakage (Mandatory)**

- C402.4.3 Air leakage of fenestration *(Revised from 2009 IECC)*

Fenestration Assembly	Max Rate (cfm/sf)
Windows	0.20
Sliding doors	0.20
Swinging doors	0.20
Skylights with condensation weepage openings	0.30
Skylights with others	0.20
Curtain walls	0.06
Storefront glazing	0.06
Commercial glazed swinging entrance doors	1.00
Revolving doors	1.00
Garage doors	0.40
Rolling doors	1.00

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Section C402.4  
**Air Leakage (Mandatory)**

- C402.4.4 Doors & access openings to shafts, chutes, stairways and elevator lobbies
  - Meet table C402.4.3 or be gasketed, weatherstripped or sealed.

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Section C402.4  
**Air Leakage (Mandatory)**

- C402.4.5 Air intakes, exhaust openings, stairways and shafts integral to building envelope *(Revised from 2009 IECC)*
  - Motorized dampers with leakage rate  $\leq 4$  cfm/sf @ 1.0" wg
    - Exception:
      - Gravity dampers with leakage rate  $\leq 20$  cfm/sf
        - » For building exhaust and relief dampers
        - » Buildings <3 stories above grade
        - »  $\leq 300$  cfm air intake and exhaust capacity
      - Dampers <24" in either dimension with leakage rate  $\leq 40$  cfm @ 1" wg

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Section C402.4  
**Air Leakage (Mandatory)**

- C402.4.6 Loading dock weatherseals
- C402.4.7 Vestibules
  - All doors equipped with self-closing devices
  - Revolving doors do not eliminate requirement for vestibule on any door adjacent to revolving doors *(New)*
  - Exceptions:
    - Doors not intended for public use or intended solely for employee use
    - Doors opening directly to sleeping unit or dwelling unit
    - Doors opening directly from space <3,000 sq. ft.
    - Revolving doors
    - Doors primarily for vehicles or material handling and adjacent personnel doors

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Section C402.4  
**Air Leakage (Mandatory)**

- C402.4.8 Recessed lighting
  - Installed in building thermal envelope
    - IC-rated
    - Labeled air leakage rate  $\leq 2.0$  cfm @ 1.57 psf
    - Sealed with gasket or caulk between housing and interior wall or ceiling covering

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Section C403.2  
**Provisions Applicable to All Mechanical Systems (Mandatory)**

- C403.2.1 Calculation of heating and cooling loads
  - In accordance with ASHRAE Standard 183
  - Accounting for all loads based on project design *(New)*
  - Adjusted to account for load reduction due to energy recovery
- C403.2.2 Equipment and system sizing
  - Output capacity shall not exceed calculated loads

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Section C403.2  
Provisions Applicable to All Mechanical  
Systems (Mandatory)

- C403.2.3 HVAC equipment performance requirements *(Revised from 2009 IECC)*
  - Unitary air conditioners and condensing units
  - Unitary and applied heat pumps
  - Packaged terminal air conditioners, package terminal heat pumps, room air conditioners and room air-conditioner heat pumps
  - Single-packaged vertical air conditioners and single-package vertical heat pumps *(New)*
  - Warm air furnaces and combination warm air furnaces/air-conditioning units, warm air duct furnaces and unit heaters
  - Gas- and oil-fired boilers
  - Electrically operated condensing units
  - Water chilling packages
  - Heat rejection equipment *(New)*
  - Heat transfer equipment *(New)*

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Section C403.2  
Provisions Applicable to All Mechanical  
Systems (Mandatory)

- C403.2.4 HVAC system controls
  - C403.2.4.1 Thermostatic controls
    - Individual control located in zone being controlled
      - Exception for independent perimeter systems designed to offset only building envelope heat losses
    - ≥1 humidity control device for each humidification system
    - C403.2.4.1.1 Heat pump supplementary heat
      - Limit operation of supplementary electric resistance heat when heat pump can meet heating load

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Section C403.2  
Provisions Applicable to All Mechanical  
Systems (Mandatory)

- C403.2.4 HVAC system controls (continued)
  - C402.4.2 Set point overlap restrictions
    - 5° deadband between heating & cooling in each zone
  - C403.2.4.3 Off-hour controls
    - Automatic setback controls for each zone
    - Exception:
      - Zone with full HVAC load demand <6,800 Btu/h, and
      - Readily accessible manual shutoff switch
  - C403.2.4.3.1 Thermostatic setback capabilities
    - Automatic control to set back or temporarily operate system
  - C403.2.4.3.2 Automatic setback & shutdown capabilities
    - 7 different daily schedules per week
    - 10 hour backup power to retain time and programming
    - Manual override for up to 2 hours or occupancy sensor

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Section C403.2  
**Provisions Applicable to All Mechanical Systems (Mandatory)**

- C403.2.4 HVAC system controls (continued)
  - C403.2.4.3.3 Automatic start capabilities *(New)*
    - Adjust daily start time to have occupied temperature immediately prior to occupancy
  - C403.2.4.4 Shutoff damper controls
    - Automatically shut both outdoor air supply and exhaust dampers when systems or spaces served not in use
    - Exception for allowed gravity dampers
  - C403.2.4.5 Snow melt system control
    - Automatic shutoff when pavement temperature >50° & no precipitation falling, and
    - Automatic or manual shutoff when outdoor temperature >40°

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Section C403.2  
**Provisions Applicable to All Mechanical Systems (Mandatory)**

- C403.2.5 Ventilation
  - Capability to reduce outdoor air to minimum required by IMC
  - C403.2.5.1 Demand controlled ventilation
    - Provided for:
      - spaces >500 sq. ft., and
      - Average occupant load of 25 people per 1,000 sq. ft. *(40 people in 2009 IECC)*, and
      - Served by systems with one or more of:
        - » Air-side economizer
        - » Automatic outdoor air modulating damper control
        - » Design outdoor airflow >3,000 cfm
    - Exceptions:
      - Systems with energy recovery
      - Multiple zone systems without DDC with central control panel
      - Design outdoor airflow <1,200 cfm
      - Supply airflow rate minus makeup or transfer air requirement <1,200 cfm
      - Ventilation provided for process loads only

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Section C403.2  
**Provisions Applicable to All Mechanical Systems (Mandatory)**

- C403.2.6 Energy recovery ventilation systems
  - Required for fans systems in Climate Zone 5A when *(Revised)*

Percentage Outdoor Air at Full Design Airflow Rate	Design Supply Airflow Rate (cfm)
≥30% and <40%	≥5,500
≥40% and <50%	≥4,500
≥50% and <60%	≥3,500
≥60% and <70%	≥2,000
≥70% and <80%	≥1,000
≥80%	>0

- Capability to:
  - Provide change in enthalpy ≥50% of difference between outdoor and return air, and
  - Permit cooling with outdoor air where required

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Section C403.2  
Provisions Applicable to All Mechanical Systems (Mandatory)

- C403.2.7 Duct & plenum insulation and sealing
  - ≥R-6 insulation located in unconditioned spaces
  - ≥R-8 insulation where located outside building
  - ≥R-8 insulation separating duct or plenum from exterior or unconditioned or exempt space
- C403.2.7.1 Duct construction
  - All longitudinal and traverse joints, seams and connections securely fastened and seal with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems, or tapes installed per manufacturer’s instructions
  - High pressure duct test testing with air leakage rate ≤6.0

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Section C403.2  
Provisions Applicable to All Mechanical Systems (Mandatory)

- C403.2.8 Piping insulation *(Revised)*

FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F)	INSULATION CONDUCTIVITY		NOMINAL PIPE OR TUBE SIZE (inches)				
	Conductivity (Btu-in/h-ft <sup>2</sup> -°F)	Mean Rating Temperature, °F	< 1	1 to < 1½	1½ to < 4	4 to < 8	≥ 8
> 350	0.32 - 0.34	250	4.5	5.0	5.0	5.0	5.0
251 - 350	0.29 - 0.32	200	3.0	4.0	4.5	4.5	4.5
201 - 250	0.27 - 0.30	150	2.5	2.5	2.5	3.0	3.0
141 - 200	0.25 - 0.29	125	1.5	1.5	2.0	2.0	2.0
105 - 140	0.21 - 0.28	100	1.0	1.0	1.5	1.5	1.5
40 - 60	0.21 - 0.27	75	0.5	0.5	1.0	1.0	1.0
< 40	0.20 - 0.26	75	0.5	1.0	1.0	1.0	1.5

- C403.2.9 Mechanical system commissioning and completion requirements *(Revised & New)*
  - In accordance with Section C408.2

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Section C403.2  
Provisions Applicable to All Mechanical Systems (Mandatory)

- C403.2.10 Air system design and control
  - For each system with total fan system motor nameplate horsepower >5 hp

Table C403.1.10.1(1)			
Fan Power Limitation			
	Limit	Constant Volume	Variable Volume
Option 1: Fan system motor nameplate hp	Allowable nameplate motor hp	hp ≤ CFM × 0.0013	hp ≤ CFM × 0.0015
Option 2: Fan system bhp	Allowable fan system bhp	bhp ≤ CFM × 0.00094 × A	bhp ≤ CFM × 0.0013 × A

- C403.2.11 Heating outside a building
  - Radiant heating system controlled by occupancy sensing device or timer switch

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Section C403  
HVAC Systems & Equipment (Prescriptive)

C403.3 Simple systems (one zone)  
C403.4 Complex systems

- C403.3.1 Economizers
  - Either air or water side
  - On systems  $\geq 33,000$  Btu/h (54,000 in 2009 IECC)
- C403.3.1.1 Air economizer
  - Modulates outdoor air and return dampers
  - Provide outside air up to 100% of design supply air
  - Sequenced with mechanical cooling
  - Shutoff when no longer reduces cooling energy use
  - Relieves excess outdoor air

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Section C403  
HVAC Systems & Equipment (Prescriptive)

- C403.3.2 Hydronic system controls
  - $\geq 300,000$  Btu/h design output heating and cooling capacity
  - Meet complex system requirements
- C403.4.1 Economizer
  - Water side serving up to 100% cooling load when outdoor air 50° dry bulb & 45° wet bulb
  - <15 feet water side pressure drop or secondary loop
  - Integrated with mechanical cooling system
  - Does not increase heating energy use

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Section C403  
HVAC Systems & Equipment (Prescriptive)

- C403.4.2 Variable air volume (VAV) fan control
  - Individual fans  $\geq 7.5$  hp (10 in 2009 IECC)
    - Variable speed (mechanical or electrical)
    - Variable-pitch vane-axial fan (New), or
    - $\leq 30\%$  of design wattage at 50% design airflow &  $\frac{1}{2}$  total design static pressure
    - Static pressure reset for systems with direct digital control of zone boxes reporting to central control

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Section C403  
HVAC Systems & Equipment (Prescriptive)

- C403.4.3 Hydronic system controls
  - No three pipe systems
  - $\geq 15^\circ$  deadband on two-pipe changeover systems
  - Part load controls for systems  $\geq 300,000$  Btu/h
    - Automatic supply-water temperature reset, or
    - Pump system flow control
  - Automatic isolation of equipment in central plant with  $>1$  chiller or  $>1$  boiler

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Section C403  
HVAC Systems & Equipment (Prescriptive)

- C403.4.3.3 Hydronic (water loop) heat pumps systems
  - $\geq 20^\circ$  deadband between heat rejection and heat addition by central device
  - Open- or closed-circuit cooling tower:
    - Separate heat exchanger to isolate tower from loop
    - Automatic shutoff of tower loop pump, and
    - Automatic valve on tower loop to stop flow
  - Two-position valve on each hydronic heat pump with total pump system power  $>10$  hp

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Section C403  
HVAC Systems & Equipment (Prescriptive)

- C403.4.4 Heat rejection equipment fan speed control
  - Automatic speed control on each fan with motor  $\geq 7.5$  hp
- C403.4.5 Requirements for complex mechanical systems serving multiple zones
  - Shall be variable air volume (VAV) systems
    - Single duct terminal device reduce primary airflow before reheating or recooling
    - Dual duct/mixing terminal device reduce flow from one duct to minimum before mixing air from other duct
    - No economizer on single fan dual duct/mixing systems  $>90,000$  Btu/h
  - Automatic supply air temperature reset control

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Section C403

HVAC Systems & Equipment (Prescriptive)

- C403.4.6 Heat recovery for service water heating
  - Facility operating 24 hours per day
  - >6,000,000 Btu/h water-cooled heat rejection
  - >1,000,000 Btu/h design service water load
- C403.4.7 Hot gas bypass limitation
  - On systems without multiple steps of unloading or continuous capacity modulation
  - Maximum hot gas bypass capacity
    - 50% on units ≤240,000 Btu/h
    - 25% on units >240,000 Btu/h
    - Exception for unitary packaged systems ≤90,000 Btu/h

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Section C404

Service Water Heating (Mandatory)

- C404.2 Service water-heating equipment performance
  - Table C404.2
- C404.3 Temperature controls
- C404.4 Heat traps
- C404.5 Pipe insulation
  - ≥1" for automatic-circulating hot water and heat-traced systems *(Heat-traced new)*
  - ½" for first 8' in non temperature maintenance systems without integral heat traps in equipment *(Called noncirculating systems in 2009 IECC)*
- C404.6 Hot water system controls
  - Automatic or manual circulating pump or heat trace shut-off when limited hot water demand
  - Readily accessible controls

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Section C404

Service Water Heating (Mandatory)

- C404.7 Pools and inground permanently installed spas *(Spas added to 2009 IECC)*
  - Readily accessible on-off switch without adjusting thermostat setting
  - Automatic time control to turn heaters and pumps off and on
  - Vapor-retardant covers on heated pools and spas *(Insulated cover not required)*
    - Exception for pools deriving >70% heating energy from site-recovered energy

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Section C405  
**Lighting Systems (Mandatory)**

- C405.2 Lighting controls (Mandatory)
  - C405.2.1 Manual lighting controls
    - ≥1 interior lighting controls for each enclosed area
    - Bi-level switching for each area requiring manual control
      - Exception: Need not be provided in following areas or spaces
        1. Only 1 luminaire with rated power <100 watts
        2. Controlled by occupant-sensing device
        3. Corridors, equipment rooms, storerooms, restrooms, public lobbies, electrical or mechanical rooms
        4. Sleeping units
        5. <0.6 w/sf
        6. With automatic daylight zone control *(New)*

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Section C405  
**Lighting Systems (Mandatory)**

- C405.2 Lighting controls (Mandatory)
  - C405.2.2 Additional lighting controls *(Revised)*

For each area required to have manual controls

    - Automatic time switch control in all areas of building *(For buildings >5,000 sq. ft. in 2009 IECC)*
    - Occupancy sensors *(New)*
      - Required in classrooms, conference/meeting rooms, employee lunch & break rooms, private offices, restrooms, storage rooms, janitorial closets, and other spaces ≤300 sq. ft.
      - Automatic off within 30 minutes
      - Manual on or automatic on to ≤50% power

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Section C405  
**Lighting Systems (Mandatory)**

- C405.2 Lighting controls (Mandatory)
  - C405.2.2.3 Daylight zone control *(Revised)*

Daylight zone control

    - Independent of general area lighting
    - C405.2.2.3.1 manual controls
    - C405.2.2.3.2 automatic controls
      - Required for increased vertical fenestration area and increased skylight area, U-factor, SHGC
      - Continuous dimming to <35% rated power
      - Stepped dimming with one control step between 50% & 70% and one step ≤35% of design power
    - C405.2.2.3.3 multi-level lighting controls
      - » Required for minimum skylight area spaces
      - » Reduces lighting in response to available daylight in space
      - » When daylight illuminance > design general illuminance, automatically reduces general lighting to ≤35% of design power

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Section C405  
**Lighting Systems (Mandatory)**

- C405.2 Lighting controls (Mandatory)
  - C405.2.3 Specific application controls *(New)*
    - Dedicated independent controls for display & accent light
    - Dedicated independent controls for display cases
    - Master control device for hotel & motel sleeping units and guest suites
    - Integral or readily accessible control for supplemental task lighting
    - Dedicated independent controls for nonvisual applications
    - Dedicated independent controls lighting display and equipment sales
  - C405.2.4 Exterior lighting control
    - Time switch & photosensor or astronomical time switch for non dusk-to-dawn operation
    - Astronomical time switch or photosensor for dusk-to-dawn operation

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Section C405  
**Lighting Systems (Mandatory)**

- C405.3 Tandem wiring (Mandatory)
  - Exception for electronic high-frequency ballasts
  - Luminaires on emergency circuits
  - Luminaires with no available pair
- C405.4 Exit signs (Mandatory)
  - ≤5 watts per side for internally illuminated signs

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Section C405  
**Lighting Systems (Mandatory)**

- C405.5 Interior lighting power requirement (Prescriptive)
 

Section C405.5.1 wattage not greater than Section C405.5.2 wattage

  - C405.5.1 Total connected interior lighting power
    - Sum of all interior lighting equipment in watts
      - Screw lamp holders (maximum labeled wattage)
      - Low-voltage lighting (transformer wattage)
      - Other luminaires (verified data)
      - Line-voltage lighting track and plug-in busway
        - Specified wattage of luminaires with minimum of 30 W/lin. ft.
        - Wattage limit circuit breaker or other permanent current limiting device
      - Exceptions as listed
  - C405.5.2 Interior lighting power
    - Calculated by
      - Building Area Method, or
      - Space-by-Space Method *(New)*

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## Interior Lighting Power Allowance

### • Building Area Method

BuildingAreaType	LPD	BuildingAreaType	LPD	BuildingAreaType	LPD
AutomotiveFacility	0.9	Hospital	1.2	PerformingArtsTheater	1.6
ConventionCenter	1.2	Hotel	1.0	Police	1.0
CourtHouse	1.2	Library	1.3	PostOffice	1.1
DiningBarLoungeLeisure	1.3	ManufacturingFacility	1.3	ReligiousBuilding	1.3
DiningCafeteriaFastFood	1.4	Motel	1.0	Retail	1.4
DiningFamily	1.6	MotionPictureTheater	1.2	SchoolUniversity	1.2
Dormitory	1.0	Multifamily	0.7	SportsArena	1.1
ExerciseCenter	1.0	Museum	1.1	TownHall	1.1
FireStation	0.8	Office	0.9	Transportation	1.0
Gymnasium	1.1	ParkingGarage	0.3	Warehouse	0.6
HealthCareClinic	1.0	Penitentiary	1.0	Workshop	1.4

Yellow indicates change from 2009 IECC

(Additional lighting power allowance under building area method in 2009 IECC is not permitted. It can be used in the 2012 IECC space-by-space method)

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## Interior Lighting Power Allowance

### • Space-by-Space Method

Space-by-SpaceMethod	2012IECC	Space-by-SpaceMethod	2012IECC
CommonSpaceTypes	LPD(W/ft)	CommonSpaceTypes	LPD(W/ft)
AtriumAbove0ftto8ftHeight	0.03(A/ft)	LaboratoryForBiologic	1.0
Auditorium	1.0	Lobby	0.8
ForBallroom	0.9	LobbyForElevator	0.8
ForPerformingArtsTheater	2.6	LobbyForPerforming	0.8
ForMotionPictureTheater	1.2	LobbyForMotionPicture	0.8
ClassroomLectureTraining	1.3	LockerRoom	0.8
ConferenceMeetingMultiPurpose	1.2	LoungeReception	1.0
CorridorTransition	0.7	OfficeEnclosed	0.8
DiningArea	1.4	OfficeOpenPlan	0.8
BarLoungeRescueDining	1.4	Restroom	0.8
FamilyRecreation	1.4	SalesAreaWithDisplay	0.8
DressingRoomForPerformingArtsTheater	1.1	Stairway	0.8
ElectricalMechanical	1.2	Storage	0.8
FoodPreparation	1.2	Workshop	1.4

Additional lighting power allowance for retail

Space-by-SpaceMethod	2012IECC	Space-by-SpaceMethod	2012IECC
Living Space (see 3)	1.0	Building Space (see 3)	1.0
Bedroom	1.0	Office	1.0
Kitchen	1.0	Office (see 3)	1.0
Bathroom	0.8	Office (see 3)	1.0
Garage	0.3	Office (see 3)	1.0
Basement	0.3	Office (see 3)	1.0
Attic	0.3	Office (see 3)	1.0
Staircase	0.8	Office (see 3)	1.0
Hallway	0.8	Office (see 3)	1.0
Entry	0.8	Office (see 3)	1.0
Reception Area	1.0	Office (see 3)	1.0
Waiting Area	1.0	Office (see 3)	1.0
Shop	1.4	Office (see 3)	1.0
Warehouse	0.6	Office (see 3)	1.0
Garage	0.3	Office (see 3)	1.0
Basement	0.3	Office (see 3)	1.0
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Shop	1.4	Office (see 3)	1.0
Warehouse	0.6	Office (see 3)	1.0
Garage	0.3	Office (see 3	



**Section C406  
Additional Efficiency Package Options**

- C406.3 Efficient lighting system
  - Reduced whole building lighting power density

ReducedInteriorLightingPower			
BuildingAreaType	LPD	BuildingAreaType	LPD
AutomotiveFacility	0.82	Hotel	1.10
ConventionCenter	1.08	Library	1.18
CourtHouse	1.05	ManufacturingFacility	1.11
DiningBarLoungeLeisure	0.99	Motel	0.88
DiningCafeteriaFastFood	0.90	MotionPictureTheater	0.83
DiningFamily	0.89	Multifamily	0.60
Dormitory	0.61	Museum	1.06
ExerciseCenter	0.88	Office	0.90/ 0.85*
Gymnasium	0.71	PerformingArtsTheater	1.39
HealthcareClinic	1.00	PermittedEnergyEfficientExcluded	
Hospital	0.87	Retail	1.40/ 1.30*
		SchoolUniversity	0.99
		SportsArena	0.78
		TownHall	0.92
		Transportation	0.77
		Warehouse	0.60
		Workshop	1.20

\*In LPD calculations, the building is assumed to be conditioned floor area by lighting zones. In automatic lighting control situations, the lighting zone is assumed to be the requirements of Section C405.2.2.1. See also other sections for additional requirements.

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**Section C406  
Additional Efficiency Package Options**

- C406.4 On-site renewable energy
  - Total minimum rating comply with one of:
    1.  $\geq 1.75$  Btu or  $\geq 0.50$  watts/sf of conditioned floor area
    2.  $\geq 3\%$  energy used in building for
      - Building mechanical equipment
      - Water heating equipment, and
      - Regulated lighting

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**Section C408  
System Commissioning**

- C408.1 General *(New)*
  - Covers commissioning of
    - Building mechanical systems in Section C403
    - Electrical power and lighting systems in Section C405
- Definition *(New)*  
 Building commissioning. A process that verifies and documents that the selected building systems have been designed, installed and function according to the owner's project requirements and construction documents, and to minimum code requirements.

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Section C408

System Commissioning

- C408.2 Mechanical systems commissioning and completion requirements
  - Prior to passing final mechanical inspection
    - Registered design professional shall provide
      - Evidence of mechanical system commissioning
      - Evidence of completion
  - Construction document notes to clearly indicate
    - Commissioning & completion requirements
  - Documents
    - Given to owner & available to building official

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Section C408

System Commissioning

- C408.2 Mechanical systems commissioning and completion requirements
  - Exception:
    1. Total mechanical equipment capacity in building:
      - <480,000 Btu/h cooling capacity, and
      - <600,000 Btu/h heating capacity
    2. Systems serving
      - Dwelling units
      - Sleeping units in hotels, motels, boarding houses, or similar units

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Section C408

System Commissioning

- C408.2.1 Commissioning plan *(New)*
  - Narrative description of activities
  - List of specific equipment, appliances or systems to be tested and description of tests to be performed
  - Functions to be tested
  - Conditions at which tests will be performed
  - Measurable performance criteria

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Section C408  
**System Commissioning**

- C408.2.2 Systems adjusting and balancing  
*(Relocated and revised from 2009 IECC)*
  - C408.2.2.1 Air system balancing
    - Discharge dampers prohibited on fan w/motors  $\geq 10$  hp
    - Exception for fans with motors  $\leq 1$  hp *(New)*
  - C408.2.2.2 Hydronic system balancing
    - Exceptions:
      - Pumps with motors  $\leq 5$  hp
      - Throttling results in  $\leq 5\%$  of nameplate hp draw if impeller were trimmed

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Section C408  
**System Commissioning**

- C408.2.3 Functional performance testing
  - Equipment (components, systems and system-to-system interfacing)
    - All modes in sequence of operation
    - Redundant or automatic back-up mode
    - Performance of alarms; and
    - Operation upon loss of power and restoration of power
  - Controls
  - Economizers

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Section C408  
**System Commissioning**

- C408.2.4 Preliminary commissioning report *(New)*
  - Completed & certified by registered design professional or approved agency
  - Identifies:
    - Itemization of deficiencies that have not been corrected
    - Deferred tests because of climate conditions
    - Climate conditions for deferred tests
  - Acceptance of report
    - Letter from building owner acknowledging receipt
  - Copy of report

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Section C408

System Commissioning

• C408.2.5 Documentation requirements

Provided to building owner within 90 days of receipt of CO

– Drawings *(New)*

– Manuals

- Submittal data
- Manufacturer's operation manuals and maintenance manuals
- Name and address of service agency
- HVAC controls system maintenance and calibration information
- Narrative of how each system is intended to operate

– System balancing report

– Final commissioning report

- Functional performance tests results
- Disposition of deficiencies including used or proposed corrective measures
- Functional performance test procedures

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Section C408

System Commissioning

• C408.3 Lighting system functional testing

– Construction documents define who will conduct required test

– Procedures for installed controls:

- Confirm placement, sensitivity and time-out adjustments for occupant sensors
- Confirm time switches and programmable schedule controls are programmed to turn lights off
- Confirm placement and sensitivity adjustments for photosensor controls

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Further Questions  
and/or  
Discussions

Thank You!

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Energy Code Consultant  
860-644-5150  
wajcsff@cox.net

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