Providing effective energy strategies for buildings and communities

2018 IECC Updates from 2012 & Building Codes
01.23.2019
Who we are

We assist buildings and communities in achieving energy efficiency, saving money, and becoming more sustainable.

We are an applied research program at University of Illinois, working in collaboration with 360 Energy Group.

Our goal: Reduce the energy footprint of Illinois.
SEDAC is the Illinois Energy Conservation Code Training Provider

This training program is sponsored by Illinois EPA Office of Energy
Energy Code Assistance

- Technical support
  - 800.214.7954
  - energycode@sedac.org
- Online resources at sedac.org/energy-code
- Workshops
- Webinars
- Online on-demand training modules
Energy Code Training

SEDAC is the Illinois Energy Conservation Code training provider

The Smart Energy Design Assistance Center (SEDAC), in partnership with the Illinois EPA Office of Energy, is providing training to increase awareness of the Illinois Energy Conservation Code and to improve the energy efficiency of new construction and renovation in Illinois. Community code officials, construction professionals and trades, and design professionals such as architects and engineers are invited to participate. SEDAC will be offering workshops, webinars, online training, resources, and technical support.

Funding provided in whole or in part by the Illinois EPA Office of Energy.
www.sedac.org/energy-code


The Illinois Energy Conservation Code sets requirements for new and renovated buildings, assuring reduction in energy use and emissions over the life of the building. Learn more about the requirements for residential buildings.

Illinois Energy Conservation Code: Commercial Envelope

The Illinois Energy Conservation Code sets requirements for new and renovated buildings, assuring reductions in energy use and emissions over the life of the building. Learn more about the requirements for commercial building envelope.

Illinois Energy Conservation Code: Commercial Lighting

The Illinois Energy Conservation Code sets requirements for new and renovated buildings, assuring reductions in energy use and emissions over the life of the building. Learn more about the requirements for commercial lighting systems.

Illinois Energy Conservation Code: Commercial HVAC

Illinois Energy Conservation Code set requirements for new and renovated buildings, assuring reductions in energy use and emissions over the life of the building. Learn more about the requirements of commercial HVAC system.
Why learn about the Illinois Energy Conservation Code?

According to Architecture 2030, an estimated 75% of the buildings in the US will be constructed or renovated in the next 20 years. This presents a tremendous opportunity.

- Will we continue to design buildings that are inefficient, wasting billions of dollars in energy costs and harming the environment?
- Or will we design buildings that are energy efficient, reducing energy costs and contributing to a healthier environment?

It is always easier (and less expensive) to build or renovate for energy efficiency from the start, rather than trying to make a building more energy efficient later. Upfront decisions made when the building is designed or constructed largely determine how energy efficient it will be.

In making these decisions, building energy codes can be extremely useful. According to the US Department of Energy, building energy codes govern up to 80% of a building’s energy load. The code's requirements are based on energy efficiency best practices for HVAC, building envelope, and lighting. Meeting or exceeding code requirements will lead to substantial energy and cost savings over the life of the building.

Illinois Law

Illinois is a leader in energy conservation code compliance. It is one of a handful of states that requires that all new and renovated buildings comply with the
As you take this quiz, feel free to refer to the 2015 IECC, the Illinois Amendments or the Chicago Amendments.

Which of the following details must be on the construction documents? (Choose all that are required)

Choose ALL answers that apply.

A. Mechanical and service water-heating system and equipment types, sizes, and efficiencies

B. Air sealing details

C. Light fixture specifications

D. Insulation materials and their R-values

E. Circuit breaker details

F. Equipment and system controls
Illinois Building Codes & Regulations
Building Codes & Regulations

"The Capital Development Board's Division of Building Codes and Regulations (formerly the Illinois Building Commission) acts as an advisory body assigned the responsibility to assist in streamlining building requirements in Illinois. The Division primarily acts as an informational resource to be used by the various building industry elements, the general public and various governmental units... (20 ILCS 3918)"

Building Codes & Regulations
3rd Floor Stratton - 401 South Spring
Springfield, Illinois 62706

Ray Boosingar
Phone 217-557-6140
Fax 217-524-4208

Ray.Boosingar@illinois.gov

**REQUIREMENT NOTE:** The most current versions of the Illinois Energy Conservation Code and the Illinois Plumbing Code are both required to be followed by Illinois statute.
### State of Illinois
CAPITAL DEVELOPMENT BOARD
COUNTY MUNICIPAL CODE REPORTING FORM

**Building Requirement Adoption Information**
City, County or Fire Protection District
(Paricipation by Fire Protection District is voluntary)

1. **Name of City or County:**

2. **Is this a City or County?**

**REQUIREMENT NOTE:**
The most current versions of the Illinois Energy Conservation Code and the Illinois Plumbing Code are both required to be followed by Illinois statute.

3. **Current Code:**

   **Current Edition (year):**

4. **Proposed Code:**

   **Proposed Edition (year):**

   **Local Amendments:** Yes  No

   **Effective Date:**

   **Please complete Page 2 (and 3 if needed) for additional Proposed Codes**

5. **All Current Codes:** Please complete Page 4, listing all current codes used. These are codes which you are NOT updating.

   **DO NOT PROVIDE FULL TEXT COPIES of code adoptions.**

6. **Contact Person for more information regarding the building codes:**

   **Name:**

   **Title:**

   **Office:**

   **Mailing Address:**

   **(Street Address):**

   **(City):**

   **(Zip Code):**

   **(Phone Area Code & Number):**

   **Email Address:**

   **(Required)**

   **City or County Website Address:**

   **(Required)**

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**EMAIL OR FAX COMPLETED FORM TO WINDY GERLACH**
**EMAIL:** windy.gerlach@illinois.gov  **FAX:** 217/524-4208

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**20 ILCS 3918/55**

A municipality with a population of less than 1 million or a county adopting a new building code or amending an existing building code must provide an identification of the code by title & edition, or the amendment to the Commission.
All commercial construction after 7/1/2011, must comply with the 2006 or later editions of the IBC, IEBC, IPMC, and the 2008 or later edition of NEC.

New commercial bldgs. must pass inspection by an inspector qualified per CDB’s standard.
Which Version?

- 70% (391 out of 566) of IL municipalities use IBC*.

![Bar chart showing the percentage of municipalities using different versions of IBC.](chart.png)

* Based on the data from CDB.
I-Codes by ICC
What are the different I-Codes?

- International Residential Code
- International Building Code
- International Fire Code
- International Energy Conservation Code
- International Plumbing Code
- International Green Construction Code
Illinois Energy Conservation Code
Illinois Energy Conservation Code


State Funded Facilities must comply with ASHRAE 90.1 per 20 ILCS 3105/10.09-5. See Subpart B of the Illinois Energy Conservation Code for more information. The 2013 edition of ASHRAE 90.1 went into effect on 1/1/16.


The Illinois Energy Efficient Building Act requires the Illinois Energy Code Advisory Council, through the Capital Development Board (CDB), to review and adopt the most current version of the IECC within one year after its publication date (September 2017).

The Code then becomes effective within 6 months after it is adopted by CDB, unless voted down by JCAR (March 1, 2019).

The Council reviewed proposals for the IL Amendments based on 2018 IECC. They have been through the Joint Committee on Administrative Rules (JCAR) and the comment period just finished.
Energy Conservation Requirements

The Chicago Building Code's energy conservation requirements are found in Chapter 18-13. (These requirements are sometimes referred to as the Chicago Energy Conservation Code.) These requirements are based on the 2015 edition of the International Energy Conservation Code, published by International Code Council, Inc.

Required Energy Conservation Compliance Statement

NOTE: The Registered Energy Professional (REP) program has been discontinued and REP-status is no longer required to complete an energy conservation compliance statement.

Beginning in June 2018, for every permit application with architectural plans, an Illinois-licensed architect or engineer who is familiar with the project and the Chicago Building Code's energy conservation requirements must complete a one-page compliance statement, using the forms available on this page. (The earlier style of REP-signed statement, which was previously required on permit drawings, will also be accepted through July 31, 2018.)

Compliance Statement Forms

- Residential Compliance Statement (residential buildings up to 4 stories)
- Commercial Compliance Statement (all other buildings)

The signed and sealed compliance statement must be uploaded with supporting documents to the E-Plan system as part of the permit application process.

For applications started after May 8, 2018, please upload the completed Compliance Statement(s) and supporting documents to the following folder in E-Plan:

Document Submittals > Energy Conservation Compliance

For older applications, this folder will not be available. If so, please upload to the Document Submittals > Permit Application Folder in E-Plan.

Plan Review

As part of the application screening process, the project manager or project administrator will confirm that the required compliance statement and supporting documents have been uploaded to E-Plan. For projects which are subject to plan review, reviews may also spot-check for compliance with substantive energy conservation requirements and requirements to include certain information on the plans.

Department Inspections

During inspections, Department of Buildings inspectors will spot-check that construction is being completed in accordance with the approved permit plans, which is why it is important that information required by sections C103 and R103 is shown on the plans. If this information is missing, it may require additional inspections or delay approval of the work.

Commissioning and Post-Construction Testing Obligations

For several types of work and methods of compliance, the energy conservation requirements include commissioning and post-construction testing to verify building performance. It is the responsibility of the licensed design professional who completes the compliance statement to inform the permit applicant/building owner in writing of all commissioning and post-construction testing requirements which apply to the permitted work. Written reports of testing do not need to be filed with the Department unless specifically requested.

Free Technical Assistance for Design Professionals

Free technical assistance and training on energy conservation code compliance is available from the University of Illinois's Smart Energy Design Assistance Center: https://smartenergy.illinois.edu/energy-code. These services are funded in whole or in part by the Illinois EPA Office of Energy.
Chicago Energy Conservation Code

New Compliance Statement
Effective June 20, 2018

Must be completed by an Illinois-licensed architect or engineer
# Chicago Energy Conservation Code (Commercial Compliance Method)

## 3. Compliance Method

### A. COMcheck (RECOMMENDED)

A COMcheck compliance certificate demonstrating the project's compliance with IECC-2015 or ASHRAE 90.1-2013 is attached to this compliance statement. Accurate information about the project was entered into COMcheck.

### B1. IECC Prescriptive Path – Simple HVAC Systems

A report or narrative substantiating how the project complies with the prescriptive requirements of the energy conservation code, including C402, C403 (403.3), C404, and C405 is attached to this compliance statement. The project meets C406 by providing (select one):

- more efficient HVAC performance
- on-site supply of renewable energy
- reduced lighting power density system
- dedicated outdoor air system for HVAC
- enhanced lighting controls
- high-efficiency service water heating

### B2. IECC Prescriptive Path – Complex HVAC Systems

A report or narrative substantiating how the project complies with the prescriptive requirements of the energy conservation code, including C402, C403 (403.4), C404, and C405 is attached to this compliance statement. The project meets C406 by providing (select one):

- more efficient HVAC performance
- on-site supply of renewable energy
- reduced lighting power density system
- dedicated outdoor air system for HVAC
- enhanced lighting controls
- high-efficiency service water heating

### C. IECC Total Building Performance Method

The project complies with C407 and a compliance report meeting the requirements of C407.4.1 is attached to this compliance statement. An explanation of any error or warning messages appearing in the simulation tool output is also attached.

### D. ASHRAE 90.1 Prescriptive Path

The project complies with sections 5, 6, 7, 8, 9 and 10 of ASHRAE 90.1-2013 as detailed below and completed compliance forms from the 2013 edition of the 90.1 User's Manual or equivalent documentation is attached to this compliance statement. (select one in each column)

- 5.5 prescriptive building envelope
- 5.6 building envelope trade-off
- 6.3 simplified HVAC
- 6.4 HVAC prescriptive path
- 6.5 HVAC alternative compliance path
- 9.5 lighting – building area method
- 9.6 lighting – space-by-space method

### E. ASHRAE 90.1 Energy Cost Budget

The project complies with ASHRAE 90.1-2013 § 11 and documentation complying with 11.7 is attached to this compliance statement.

### F. ASHRAE 90.1 Performance Rating Method

The project complies with normative appendix G of ASHRAE 90.1-2013 and a simulated performance report, complying with G1.4, is attached to this compliance statement.
Chicago Energy Conservation Code (Residential Compliance Method)

3. Compliance Method

A. REScheck (RECOMMENDED)
   A REScheck compliance certificate demonstrating the project’s compliance with IECC-2015 is attached to this compliance statement. Accurate information about the project was entered into REScheck.

B. Prescriptive Method
   A report or narrative substantiating how the project complies with the prescriptive requirements of the energy conservation code, including R401, R402, R403, and R404 is attached to this compliance statement.

C. Simulated Performance Method
   The project complies with R405 and the provisions of R401 through R404 labeled “Mandatory.” A compliance report meeting the requirements of R405.4.2.1 is attached to this compliance statement.

D. Energy Rating Index
   The project complies with the provisions of R401 through R404 labeled “Mandatory” and R403.5.3. A pre-construction compliance report meeting the requirements of R406.6.2 is attached to this compliance statement. Proof that the permit applicant has hired a third party to provide a post-construction energy rating is also attached to this compliance statement.

NOTE: The City of Chicago accepts reports by RESNET-certified Home Energy Raters in accordance with the HERS® Index.

The following mandatory energy conservation requirements apply to all residential projects:

- R401.3 certificate must be posted on or near the electrical panel with energy values
- R402.4 building thermal envelope must be constructed to limit air leakage:
  - fireplace: tight-fitting flue damper or doors
  - window, skylight, sliding door: ≤ 0.3 cfm/ft²
  - swinging door: ≤ 0.5 cfm/ft²
  - recessed lighting: IC-rated and air-tight
- R403.1 must provide programmable thermostat for heating and cooling systems
- R403.2 ducts must be sealed
- R403.3 ducts must be pressure tested
- R403.5 no using cavities as ducts/plenums
- R403.4 pipes carrying fluids > 105°F or < 55°F must be insulated, R-3 minimum
- R403.5 hot water systems must have controls
- R403.5.3 hot water pipes must be insulated, R-3 minimum
- R403.6 mechanical ventilation must meet Illinois requirements
- R403.7 heating/cooling equipment must be sized per ACCA manuals S & J
- R403.8 multi-family systems must comply with commercial requirements
- R403.9 snow melt systems must have automatic shut-off
- R404.1 Min. 75% of lamps in permanent fixtures must be high-efficacy
- R404.1.1 Continuous-burning pilot lights prohibited
2018 International Energy Conservation Code (IECC)
2018 IECC Commercial Compliance Option

1. ASHRAE 90.1-2016

2. 2018 IECC - Prescriptive
   - C402 - Envelope
   - C403 - Mechanical
   - C404 - SWH
   - C405 - Lighting
   AND
   - Pick At Least One C406:
     - C406.2 – Eff. HVAC Performance
     - C406.3 – Reduced Lighting Power
     - C406.4 – Enhanced Lighting Controls
     - C406.5 – On-site Supply of Renewable energy
     - C406.6 – Dedicated Outdoor Air System
     - C406.7 – High Eff. Service Water Heating
     - C406.8 – Enhanced Envelope Performance
     - C406.9 – Reduced Air Infiltration

3. 2018 IECC - Performance
   - C407 – Total Building Performance
   - C402.5 – Air Leakage
   - C403.2 – Provisions applicable to all mechanical systems
     - C404 - SWH
   - Lighting Mandatory Sections
     - C405.2
     - C405.3
     - C405.4
     - C405.6
   - Building energy cost to be \( \leq \) 85% of standard reference design building
2018 IECC Residential Compliance Option

**PRESCRIPTIVE**
- R-value (no tradeoffs)
- U-factor (tradeoffs within individual components)
  - UA (tradeoffs between envelope components)

**SIMULATED PERFORMANCE**
- Simulated Performance Alternative R405 (keyed to Prescriptive requirements)

**ENERGY RATING INDEX (ERI)**
- ERI Compliance Alternative R406 (largely independent of prescriptive requirements)
Residential:

- A detached one-family or two family dwelling
- Any building 3 stories or less above grade that contains multiple dwelling units, where occupants reside on a primarily permanent basis (4 stories or less in Chicago)

Examples:

Townhouse  
Row house  
Apartment house  
Convent  
Monastery

Rectory  
Fraternity or sorority house  
Dormitory  
Rooming house
Commercial or Residential?

- 5 story mixed use building with 2 stories of retail stores and 3 stories of apartments in Chicago
- 3 story mixed use building with 1 story of retail stores and 2 stories of apartments in Bloomington
- 5 story single family home
- 3 story hotel
History of Model Codes Improvement

- Residential
- Commercial

- MEC/IECC
- Ashrae 90/90.1 Standard
History of Model Codes Improvement

2012 → 2015 IECC
0.98 % Savings

2015 → 2018 IECC
0 % Savings
Access to 2018 IECC

https://codes.iccsafe.org/public/document/iecc2018

Table Of Contents

- LEGEND
- COPYRIGHT
- PREFACE
- EFFECTIVE USE OF THE INTERNATIONAL ENERGY CONSERVATION CODE
- IECC—COMMERCIAL PROVISIONS
- CHAPTER 1 [CE] SCOPE AND ADMINISTRATION
• Energy efficiency improvement (initial estimate of 13-15% improvement)

• New Chapter (Ch.5) for existing buildings – 2015

• Mechanical Section (C 403): Reorganized, so all provisions for a type of equipment or system are in one place – 2018
• Additional efficiency package options (total of 8):
  Enhanced lighting control (C406.4) – 2015
  Dedicated outdoor air system (C406.6) - 2015
  High efficiency service water heating (C406.7) – 2015
  Enhanced envelope performance (C406.8) – 2018
  Reduced air infiltration (C406.9) – 2018

• Appendix CA Solar-Ready Zone – 2018
ASHRAE 90.1-2016

• New climate zone map (6 counties in Illinois – Calhoun, Clark, Coles, Cumberland, Greene, Jersey: from 5A to 4A)

• New performance-based compliance path (Appendix G)
• C103.2 Information on construction documents - 2015
  1. Insulation materials & their R-values
  2. Fenestration U-factors and SHGC
  3. Area-weighted U-factor and SHGC calculation
  4. Mechanical system design criteria
  5. Mechanical & SWH systems, equipment type, sizes, efficiencies
  6. Economizer description
  7. Equipment and system control
  8. Fan motor hp and controls
  9. Duct sealing, duct & pipe insulation & location
 10. Lighting fixture schedule & control narrative
 11. Location of daylight zones on floor plans
 12. Air sealing details

• C103.2.1 Building thermal envelope depictions – 2015
  The building thermal envelope shall be represented on the CD
2018 IECC Commercial Changes: Admin

- C103.6 Building documentation and closeout submittal requirements: Record documents, compliance documents shall be provided to the owner within 90 days of certificate of occupancy. Also training for maintenance shall be provided.

- C105.1 Inspection: from “Construction work shall remain accessible and exposed” to “visible and accessible”

- C105.2.2 Thermal envelope inspection: from “Framing and rough-in inspection” to “Thermal envelope inspection”
C202 Definition

- Air barrier: added “continuous manner”
- Alteration: removal of “requires a permit” language
- Approved: from “Approval by the code official as a result of investigation and tests conducted by him or her, or by nationally recognized organizations” to “Acceptable to the code official”
• C201.3 Terms defined in other codes

Terms that are not defined in this code but are defined in the IBC, IFC, IFGC, IMC, IPC or IRC shall have the meanings ascribe to them in those codes.
Above-grade wall: A wall associated with the building thermal envelope that is more than 15% above grade… - 2015

Below-grade wall: A wall associated with the basement or first story of the building that is part of the building thermal envelope that is not less than 85% below grade… - 2015

Air curtain: A device that generates & discharges a laminar air system intended to prevent the unconditioned exterior air - 2015
• More detailed requirements for controls: Change from “be capable of” to “be configured”)}
• C303.1.1 Building thermal envelope insulation. For roof insulation installed above the deck, R-value shall be labeled as required by the material standards specified in the Table 1508.2 of IBC

• C303.2 Installation. Materials, systems and equipment shall be installed in accordance with the manufacturer’s instruction and IBC.
R202 Definition

- Air barrier: added “continuous manner”
- Alteration: removal of “requires a permit” language
- Approved: from “Approval by the code official as a result of investigation and tests conducted by him or her, or by nationally recognized organizations” to “Acceptable to the code official”

- Air-impermeable insulation: An insulation that functions as an air barrier material
Commercial
Low-energy Building

Space conditioning peak load of <1.0 watt per square foot (<3.41 Btuh per square foot)

Exempt from the building thermal envelope requirements
Exempt from the building thermal envelope requirements

5 criterion

Typically at the base of a radio or cellular tower for equipment
Envelope R-Values

Improvement in R-values for continuous insulation for insulation entirely above roof deck from R-25 continuous to R-30 continuous
Heated Slab Insulation

R-5 continuous insulation required under heated slabs for both commercial and residential
New section on Daylight zones, includes both top lit and side lit daylight zones

(a) Section view
(b) Plan view of daylight zone under a roof fenestration assembly

Image courtesy of International Code Council
Daylight Zones

Envelope [C402.4.4]
Air sealing

Requires sealing to allow for expansion, contraction, vibration, etc.

Photo Courtesy of Matt Risinger
Equipment Efficiency

Increases minimum AFUE for furnaces from 78% to 80%
Gas fired boilers <300 kbtu cannot have a constant burning pilot light

Hot water boilers <300 kbtu must have temperature reset unless providing tankless domestic hot water production
Heat Rejection

New section for hydronic heat pump systems using cooling towers for heat rejection

Specifically talks about automatic control of the bypass valve or turning off the circulation pump
Thermostat Deadband Exception

New exception for occupancies or applications requiring precision indoor temperature control as approved by the code official
Expanded VFDs

• Pumps and fans with 2hp and larger now required
• Increased allowance for DDC controlled systems
Improved HVAC Turndown

Reduced minimum airflow from 30% to 20% of maximum

2012 IECC

2018 IECC
Parallel-flow VAV

New section for parallel-flow fan powered VAV air terminal control

Requires fan be off unless trying to provide heating, then fan comes on to provide heat before activating heating coil
Ventilation system controls now **mandatory**

- Demand Control Ventilation
- Enclosed Parking Garage Ventilation Controls
- Ventilation Air Heating Control
- Energy Recovery Ventilation Systems
- Kitchen Exhaust Systems
- Automatic Control of HVAC Systems Serving Guestrooms
- Shutoff Dampers
New section for Ventilation air heating control

Ventilation air can not exceed 60F when majority of zones require cooling
Split the airflow requirements based on operating hours per year into (less than 8,000 and 8,000 or more)
Ventilation Energy Recovery

Provides for de minimis ventilation without requiring energy recovery

Table C403.7.4(2) (excerpt)
ENERGY RECOVERY REQUIREMENT [Zone 4A, 5A, 6A, 6B, 7, 8]
(Ventilation systems operating not less than 8,000 hours per year)

<table>
<thead>
<tr>
<th>PERCENT (%) OF OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE</th>
<th>10-19%</th>
<th>20-29%</th>
<th>30-39%</th>
<th>40-49%</th>
<th>50-59%</th>
<th>60-69%</th>
<th>70-79%</th>
<th>80%+</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESIGN SUPPLY FAN AIRFLOW RATE (cfm)</td>
<td>200+</td>
<td>130+</td>
<td>100+</td>
<td>80+</td>
<td>70+</td>
<td>60+</td>
<td>50+</td>
<td>40+</td>
</tr>
</tbody>
</table>
Guestroom Automatic Controls

Automatic HVAC control now required for buildings with over 50 guestrooms

Image courtesy of Wattstopper
Pressure Drop Adjustment

Adds systems required to maintain a pressure differential between rooms for allowance for pressure drop adjustment

Clarifies adjustment for energy recovery devices for each air stream
New Exception:
Fans smaller than 1 hp are not required to be listed on the drawings
Heat Rejection Fan Control

Changes the control scheme for fan speed control on heat rejection equipment (5hp or more total fan power)

Fan speed to vary based on leaving fluid temperature or condensing temperature and pressure of the heat rejection device (must use VFDs)
Most sections for equipment efficiency now mandatory

- Walk-in coolers/freezers, Warehouse coolers/freezers
- Walk-in coolers/freezers
- Refrigerated display cases
Several new requirements for walk-in and reach-in coolers
Includes things such as:
- automatic door closers
- insulation
- night covers
- occupancy sensors
- electronically commutated motors
- efficient lighting
Walk-in Door Performance

New section for performance standards for walk-in coolers effective Jan 1, 2020
Sets maximum energy consumption
HVAC Construction

Consolidated section, now mandatory
• Duct and plenum insulation and sealing
• Duct construction
• Piping insulation
C404 Service Water Heating
High Input Service Water Heating

1 million btu/h or more of service water heating equipment requires efficiency of 90% or more

Exceptions for site recovered energy or small units
Volume from heated water supply to fixture is no more than 2 oz for lavatories and ½ gallon for other fixture types.
Water Storage Tank Heat Traps

Heat Traps now required for hot water storage tanks, not just water heaters
Pool Cover Exception

Increases threshold of site recovered or renewable energy to qualify for exception to a pool cover from 70% to 75%
Residential Lighting Restriction

- Residential lighting provisions allowed ONLY for multifamily buildings
- All others use commercial lighting provisions
Luminaire Level Lighting Controls

- Allows for luminaire lighting controls to take the place of centralized controls
- Must include occupancy sensor, ambient light sensor, and wireless zoning with reprogramming capability
Occupancy/Vacancy Sensor

1. Classrooms/lecture/training rooms
2. Conference/meeting/multipurpose rooms
3. Copy/print rooms
4. Lounges/breakrooms
5. Enclosed offices
6. Open plan offices*
7. Restrooms
8. Storage rooms
9. Locker rooms
10. Warehouse storage areas*
11. Other spaces 300 square feet of less enclosed by floor-to-ceiling height partitions
Occupancy Sensor Time

Reduces the occupancy sensor time delay from 30 minutes to 20 minutes
Daylight Responsive Exception

Does not require daylight-responsive if less than 150 watts in the side lit or toplit zone
Daylight Responsive Exception

- Does not require daylight-responsive controls if 40% lower than wattage allowance of the daylit area.
- If 50% of the building is in the daylit area, then no controls if at least 20% lower than the total allowance (50% of 40%).
Roof Monitors

- Provides calculation methodology for roof monitors

(a) Section view and (b) Plan view of daylit area under a rooftop monitor

[Diagram showing section and plan views of a rooftop monitor and a daylit area]
Daylit Zones

Lighting
[C405.2.3.3]
Lighting Controls

- No longer allows captive key systems for sleeping units
Increased Exterior Lighting Controls

- Daylight shutoff
- Time switch control functionality
- Decorative lighting shut off during non-business hours
- Lighting setback – 30% watts minimum
- Exception for dwelling controlled exterior lighting
Track Lighting Demand Reduction

Reduces demand from 30W/ft to 8W/ft
Reduced Lighting Power Allowances

- Office 0.9 to 0.79 – 12% reduction
- Library 1.3 to 0.78 – 40% reduction
Additional exceptions to exterior lighting calculations

- Approved lighting for safety considerations
- Emergency lighting
- Exit signs
- Art
- National flag
- Water features and swimming pools
- Lighting controlled from within dwelling units in compliance with R404.1
Exterior Lighting Allowance

- Lower power allowances for exterior lighting
- ~30% Lower
Gas Lighting Pilot

- Continuous burning pilot light for gas lighting is prohibited

Image courtesy of This Old House
Increased Efficiencies

Dry-type transformers & Motors

Images courtesy of Schneider Electric

Image courtesy of Baldor
Additional Efficiency

- New section of additional efficiency options [Required for prescriptive path]
  1. More efficient HVAC (10%)
  2. Reduce lighting power density (by 10%)
  3. Enhanced lighting controls
  4. On-site renewables (0.5 W/SF or 3%)
  5. Dedicated OA
  6. High efficiency service water heating
  7. Enhanced envelope (15%)
  8. Reduced air infiltration
Reduced Infiltration

- New section for enhanced envelope performance
- Building tested air leakage of 0.25 cfm/ft$^2$ at 75 Pascals
- Buildings over 250,000 ft$^2$ may be tested in sections of not less than 25% of floor area
Electric Vehicles

- Electric vehicles excluded from energy calculation
Renewable Energy Credit Limits

• Limits on-site renewable credits in energy model to 5%
• Allows Code Official to request documentation on renewables used for credit
Building O&M must be provided to building owner

Image courtesy of Berkeley
Adds functional performance test procedures to the commissioning report, required to be provided to the Code Official
CHAPTER 5
Existing Buildings
Change in Space Conditioning

Allows for performance alternatives for compliance

• Can not exceed 110% of either allowed UA or allowed annual energy cost depending on path chosen
Excess Fenestration

• Provides exception for buildings with fenestration areas above code

Image courtesy of Providence Daily
Residential
1. Insulation materials and their R-values
2. Fenestration U-factors and SHGC
3. Area-weighted U-factor and SHGC calculations
4. Mechanical system design criteria
5. Mechanical and service water-heating systems and equipment types, sizes, and efficiencies
6. Equipment and system controls
7. Duct sealing, duct and pipe insulation and location
8. Air sealing details

R103.2.1 Building thermal envelope depiction: The building’s thermal envelope shall be represented on the construction documents.
Inspections

1. Footing & Foundation
2. Framing & rough-in
3. Plumbing
4. Mechanical
5. Final
Inspections associated with footings and foundations shall verify compliance with the code as to **R-value, location, thickness, depth of burial and protection of insulation** as required by the code and approved plans and specifications.
Inspections at framing and rough-in shall be made before application of interior finish and shall verify compliance with the code as to: types of insulation and corresponding R-values and properties such as U-factor and SHGC and proper installation; and air leakage controls as required by the code; and approved plans and specifications.
Inspections at plumbing rough-in shall verify compliance as required by the code and approved plans and specifications as to **types of insulation and corresponding R-values and protection, and required controls**.
Inspections at mechanical rough-in shall verify compliance as required by the code and approved plans and specifications as to installed HVAC equipment type and size, required controls, system insulation and corresponding R-value, system air leakage control, programmable thermostats, dampers, whole-house ventilation, and minimum fan efficiency.
Final Inspection

The building shall have a final inspection and shall not be occupied until approved. The final inspection shall include verification of the installation of all required building systems, equipment and controls and their proper operation and the required number of high-efficacy lamps and fixtures.
Residential Certificate

Permanent certificate shall be completed by the builder or other approved party and posted …

- Predominant R-values of insulation
- U-factors of fenestration
- SHGC of fenestration
- Results for components covering largest areas where multiples occur
- Results from duct/envelope leakage tests
- Types & efficiencies of heating, cooling, and service water heating equipment
### Residential Certificate

#### Energy Efficiency Certificate

<table>
<thead>
<tr>
<th>Insulation Rating</th>
<th>R-Value</th>
<th>R-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceiling/Roof</td>
<td>R-</td>
<td>R-</td>
</tr>
<tr>
<td>Walls</td>
<td>Frame</td>
<td>R-</td>
</tr>
<tr>
<td></td>
<td>Basement</td>
<td>R-</td>
</tr>
<tr>
<td>Floors</td>
<td>Over unconditioned space</td>
<td>R-</td>
</tr>
<tr>
<td>Ducts</td>
<td>Attic</td>
<td>R-</td>
</tr>
</tbody>
</table>

#### Air Leakage Test Results

<table>
<thead>
<tr>
<th>Blower door</th>
<th>ACH/50 Pa.</th>
<th>Duct testing</th>
<th>Cfm/100 ft²</th>
</tr>
</thead>
</table>

#### Fenestration Rating

<table>
<thead>
<tr>
<th>Window</th>
<th>U-</th>
<th>NFRC SHGC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opaque door</td>
<td>U-</td>
<td></td>
</tr>
<tr>
<td>Skylight</td>
<td>U-</td>
<td></td>
</tr>
</tbody>
</table>

#### Equipment Performance

<table>
<thead>
<tr>
<th>Heating system</th>
<th>Type</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling system</td>
<td></td>
<td>SEER</td>
</tr>
<tr>
<td>Water heater</td>
<td></td>
<td>EF</td>
</tr>
</tbody>
</table>

Indicate if the following have been installed (an efficiency shall not be listed):  
- electric furnace
- gas-fire unvented room heater
- baseboard electric heater

Designer/builder:  
Code edition:  
Date:
Log Homes

Log homes designed in accordance with ICC 400 exempted from the thermal envelope requirements

Image courtesy of Log Home Living
Modest improvement in window U-factors

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>2012 U-Factor</th>
<th>2018 U-Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>U-0.35</td>
<td>U-0.32</td>
</tr>
<tr>
<td>5</td>
<td>U-0.32</td>
<td>U-0.30</td>
</tr>
</tbody>
</table>
Reduced Insulation

Provides allowance for reduced insulation in ceilings without attic spaces, but insulation must extend over the top plate.

Image courtesy of Pacific Northwest National Labs
Access Doors Exception

New exception to allow vertical doors to meet the fenestration requirements in Table R402.1.2
New provision to allow reduced insulation where structural sheathing is used to provide consistent total sheathing thickness.
Floor Insulation Exception

New exception to allow Alternative insulation methods using continuous insulation or insulating the top side of the sheathing.

Option for floor insulation above rigid insulation

Image courtesy of International Code Council
Sunrooms enclosing conditioned space shall meet the insulation requirements of this code

Exception: Sunrooms with thermal isolation and enclosing conditioned space

- Min. ceiling insulation R-19 for zone 4 and R-24 for zone 5
- Min. exterior wall insulation R-13
Sunroom Fenestration

Sunrooms enclosing conditioned space shall meet the fenestration requirements of this code.

Exception: Sunrooms with thermal isolation and enclosing conditioned space

Max U-factor of 0.45 for windows

Max U-factor of 0.70 for skylights

Envelopes

[R402.3.5]
Table R402.4.1.1 can be very useful
Covers many errors in installation
Ductwork Testing

Provides exception for testing ERV and HRV ductwork from testing

Image courtesy of Panasonic
Ducts Buried in Ceiling Insulation

Provides allowance for duct insulation in buried duct work (for simulated energy performance analysis)
Hot Water Maintenance Systems

Provides provisions for heat maintenance systems including circulating or heat trace
Drain water heat recover units shall comply with CSA B55.2.
• Minimum fan efficiency of 1.2 \text{cfm/w} is added for Heat Recovery Ventilator and Energy Recovery Ventilator for whole house mechanical ventilation system.
Ducts in Conditioned Space

Provides criteria to determine if ducts are inside conditioned space or not.

- Completely inside air barrier OR
- Buried in the ceiling insulation AND
  - Air handler within air & thermal barrier
  - Duct leakage <1.5 cfm per 100 sf
  - Full depth insulation above duct
Equipment Sizing

Heating and cooling equipment shall be sized in accordance with ACCA Manual S based on building loads calculated in accordance with ACCA Manual J or other approved heating and cooling calculation methodologies.
Pool Cover Exception

Increases minimum renewable or site-recovered energy for pools from 70% to 75% to not need a pool cover

Image courtesy of Royal Swimming Pools
High Efficiency Lighting

- Increases high efficiency lighting to 90% from 75%
- Eliminates the low-voltage exception
Ventilation system must be included in energy model

Image courtesy of Panasonic
Batch sampling is allowed for stacked multifamily units
Reference Model

Includes mechanical ventilation in the reference design

Image courtesy of Calcs Plus
Energy Rating Reference

- Changes reference design from IECC 2006 to RESNET/ICC 301
- Clarifies electric vehicle charging is excluded from rating
Energy Rating Index

• Increase of Max. ERI score

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>2018 ERI Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>62</td>
</tr>
<tr>
<td>5</td>
<td>61</td>
</tr>
</tbody>
</table>

Image courtesy of Energy IQ
Energy Rating Software

• Removes calculation software listing
CHAPTER 5
Existing
Buildings
Fenestration Compliance

- Allows for weighted area average for multiple fenestrations for compliance

Image courtesy of Providence Daily
Residential air leakage decreasing to 4 ACH

For low-rise multifamily buildings, dwelling units shall be tested and verified as having a leakage rate of not exceeding 0.25 cfm/ft² of enclosure area (all six sides of the dwelling unit) … Testing shall be conducted with an unguarded blower door at a pressure of 50 Pa. Where required by the code official, testing shall be conducted by an approved third party…
... For buildings with more than 7 units, a sampling protocol is allowed by an approved third party. The sampling protocol requires the first 7 units to be tested without any failures. Upon successful testing of those initial 7 units, remaining units can be sampled at a rate of 1 in 7. If any sample unit fails compliance with the maximum allowable air leakage rate, two additional units in the same sample set must be tested. If additional failures occur, all units in the sample set must be tested. In addition, all units in the next sample set must be tested for compliance before sample of further units can be continued.