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
Buildings use a lot of energy and create a lot of emissions:

• Commercial & residential buildings in the US consumes nearly \( (\_\_) \% \) of the nation’s total primary energy

• Buildings consume \( (\_\_) \% \) of electricity in the US.

• \( (\_\_) \% \) of US total CO\(_2\) emission is attributed to building services
Why Energy Code is important?

Electricity Consumption by Sector (2013):
Commercial, Industrial, and Residential

Transportation 0.2%

Commercial 35%
Residential 37%
Industrial 27%

Commercial (2013)

Other uses 36%
HVAC 26%
Lighting 20%
Appliances and electronics 16%
Water heating 2%

Manufacturing (2010)

Other uses 25%
Water heating 10%
Lighting 12%
HVAC 26%

Machine drive 50%

Direct uses: other process 20%
Direct uses: total nonprocess 17%
Indirect uses: boiler fuel 2%
End-use not reported 2%
Benefits of Energy Code?

• Reduced Energy Consumption: approximately 3.5 quad Btu per year by 2030 (equivalent to power generated by 260 medium power plants)

• Reduced CO$_2$ Emission: approximately 3% of the projected national CO$_2$ emission in 2030.

• Total annual $ savings to building owners would be $30 billion by 2030.
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.


Anticipated to Change to IECC
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 2019).

The Council reviewed proposals for the IL Amendments based on 2018 IECC and now it is at the Joint Committee on Administrative Rules (JCAR).
Illinois Amendments

Public Code Change Proposal Form
To Amend the 2018 Illinois Energy Conservation Code

Code Section: ____________________

<table>
<thead>
<tr>
<th>Office Use Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposal Number:</td>
</tr>
<tr>
<td>Date Submittal Received:</td>
</tr>
</tbody>
</table>

Date:
Name: ____________________________________________
Jurisdiction/Company: ______________________________
Submitted on Behalf of: _____________________________
Address: _________________________________________
Phone: __________________________________________
E-Mail: __________________________________________

Related Sections Impacted by this Amendment:

Revise as Follow (in strike-thru / underline format):

Reason:

Cost Impact:
### Illinois Amendments (based on 2015 IECC)

#### SECTION R402 BUILDING THERMAL ENVELOPE

**TABLE R402.1.2**

**INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT**

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>FENESTRATION U-FACTOR&lt;sup&gt;b&lt;/sup&gt;</th>
<th>SKYLIGHT&lt;sup&gt;b&lt;/sup&gt; U-FACTOR</th>
<th>GLAZED FENESTRATION SHGC&lt;sup&gt;b,e&lt;/sup&gt;</th>
<th>CEILING R-VALUE</th>
<th>WOOD FRAME WALL R-VALUE</th>
<th>MASS WALL R-VALUE&lt;sup&gt;i&lt;/sup&gt;</th>
<th>FLOOR R-VALUE</th>
<th>BASEMENT WALL R-VALUE</th>
<th>SLAB&lt;sup&gt;d&lt;/sup&gt; R-VALUE &amp; DEPTH</th>
<th>CRAWL SPACE WALL R-VALUE</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>NR</td>
<td>0.75</td>
<td>0.25</td>
<td>30</td>
<td>13</td>
<td>3/4</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>0.40</td>
<td>0.65</td>
<td>0.25</td>
<td>38</td>
<td>13</td>
<td>4/6</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0.35</td>
<td>0.55</td>
<td>0.25</td>
<td>38</td>
<td>20 or 13+5</td>
<td>8/13</td>
<td>19</td>
<td>5/13</td>
<td>0</td>
<td>5/13</td>
</tr>
<tr>
<td>4 except Marine</td>
<td>0.35</td>
<td>0.55</td>
<td>0.25</td>
<td>49</td>
<td>20 or 13+5</td>
<td>8/13</td>
<td>19</td>
<td>10/13</td>
<td>10, 2 ft</td>
<td>10/13</td>
</tr>
<tr>
<td>5 and Marine 4</td>
<td>0.32</td>
<td>0.55</td>
<td>0.25</td>
<td>49</td>
<td>20 or 13+5</td>
<td>13/17</td>
<td>19</td>
<td>15/190/13</td>
<td>10, 2 ft</td>
<td>15/19</td>
</tr>
<tr>
<td>6</td>
<td>0.32</td>
<td>0.55</td>
<td>NR</td>
<td>49</td>
<td>20+5 or 13+10&lt;sup&gt;h&lt;/sup&gt;</td>
<td>15/20</td>
<td>30&lt;sup&gt;g&lt;/sup&gt;</td>
<td>15/19</td>
<td>10, 4 ft</td>
<td>15/19</td>
</tr>
<tr>
<td>7 and 8</td>
<td>0.32</td>
<td>0.55</td>
<td>NR</td>
<td>49</td>
<td>20+5 or 13+10&lt;sup&gt;h&lt;/sup&gt;</td>
<td>15/21</td>
<td>38&lt;sup&gt;g&lt;/sup&gt;</td>
<td>15/19</td>
<td>10, 4 ft</td>
<td>15/19</td>
</tr>
</tbody>
</table>
RESIDENTIAL BUILDING. For this code, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses) as well as Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane. Means a detached one-family or two-family dwelling or any building that is three stories or less in height above grade that contains multiple dwelling units, in which the occupants reside on a primarily permanent basis, such as a townhouse, a row house, an apartment house, a convent, a monastery, a rectory, a fraternity or sorority house, a dormitory, and a rooming house; provided, however, that when applied to a building located within the boundaries of a municipality having a population of 1,000,000 or more, the term “RESIDENTIAL BUILDING” means a building containing one or more dwelling units, not exceeding four (4) stories above grade, where occupants are primarily permanent.
Chicago Energy Conservation Code

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.
3. **C202 General Definitions.** Revise to read:

**CODE OFFICIAL.** The City of Chicago Department of Buildings or Building Commissioner.

4. **C202 General Definitions.** Revise to read:

**HISTORIC BUILDING.** Any building or structure that is one or more of the following:

1. Designated under the Chicago Landmarks Ordinance as a “Chicago Landmark” or recommended for such designation by the Commission on Chicago Landmarks.

2. Identified as a contributing building or structure to any district designated under the Chicago Landmarks Ordinance as a “Chicago Landmark” or recommended for such designation by the Commission on Chicago Landmarks.


4. Listed, or certified as eligible for listing, by the State Historic Preservation Officer or Keeper of the National Register of Historic Places in the National Register of Historic Places.

5. Certified as a contributing resource within a National-Register listed or state-designated historic district.

5. **C202 General Definitions.** Revise to read:

**REGISTERED DESIGN PROFESSIONAL.** The registered design professional of record on the building permit application.
2. **C402.3 Roof solar reflectance and thermal emittance.** Delete existing C402.3. Insert a new C402.3, titled “Urban heat island provisions”:

**C402.3 Urban heat island provisions.** The following are exempt from the reflectance requirements:

1. The portion of the roof acting as a substructure for and covered by a rooftop deck, or vegetation associated with an extensive or intensive green roof as defined by the U.S. Environmental Protection Agency (“USEPA”), or by photovoltaic and solar thermal equipment.

2. A rooftop deck covering a maximum of 1/3 of the rooftop total gross area.

The remainder of the roof area must meet the reflectance requirements set forth in this section.

3. **Table C402.3 Minimum Roof Reflectance and Emittance Options.** Delete existing Table C402.3.

4. **C402.3.1 Aged roof solar reflectance.** Delete existing C402.3.1. Insert a new C402.3.1, titled “Solar reflectance”:

**C402.3.1 Solar reflectance.** All roof exterior surfaces shall have a minimum solar reflectance as specified in Section C402.3.2 through C402.3.5 when (i) tested in accordance with ASTM E903 or ASTM E1918, (ii) tested with a portable reflectometer at near ambient conditions; (iii) labeled by the Cool Roof Rating Council, or (iv) labeled as an Energy Star qualified roof product. Any product that has been rated by the Cool Roof Rating Council or by Energy Star shall display a label verifying the rating of the product.
Chicago Energy Conservation Code

REP: Registered Energy Professional

June 2018
REP program discontinued. REP status is no longer required.
Chicago Energy Conservation Code

Commercial Compliance Statement

This form must be completed by an Illinois-licensed architect or engineer and submitted with every application to construct or alter a building, other than a residential building four stories or less above grade. A Residential Compliance Statement must be filed for a residential building up to four stories. If a mixed occupancy building contains both a non-residential occupancy and a residential occupancy up to four stories, both forms must be submitted. This form is not required for temporary structures, minor permit applications, and electrical permit applications.

1. Project Information
   - Address:
   - Permit App. No.:

2. Professional Certification of Compliance with Chicago Energy Conservation Requirements
   - To the best of my knowledge, belief, and professional judgment, all work shown in the plans submitted with this permit application is:
     - in compliance with the commercial energy conservation requirements of the Chicago Building Code as detailed in section 2.1.
     - exempt from the energy conservation requirements of the Chicago Building Code and/or not subject to this form as listed:
       - the reconstruction, renovation or addition to an existing building for its maintenance or to correct damage (NO alterations or additions)
       - the alteration, relocation, or change of occupancy of a historic building
       - a building or structure that will be erected for less than 60 days or to a contractor that will be erected for less than 1 year (temporary structure)
   - In addition, the plans submitted with this application comply with the specific requirements of section C102.2 of the energy conservation code (if applicable) and the general requirements of section 16-12-080 and chapter 12-40 of the Chicago Building Code.
   - I hereby certify that I am in compliance with the energy conservation code which are applicable to the project based on the scope of work identified in the permit application and compliance method identified below.

   Name: __________________________
   IL License No.: __________________________
   Seal: __________________________
   Signature: __________________________

3. Compliance Method
   - A. COMMISSION (RECOMMENDED)
   - Visit www.chicago.gov/energy for more information.
   - B. IECC Prescriptive Path - Simple HVAC Systems
   - C. IECC Total Building Performance Method
   - D. ASHRAE 90.1 Prescriptive Path
   - E. ASHRAE 90.1 Energy Cost Budget
   - F. ASHRAE 90.1 Performance Rating Method

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:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R401.3</strong> certificate must be posted on or near the electrical panel with energy values</td>
<td></td>
</tr>
</tbody>
</table>
| **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 ≤ 85% of standard reference design building
2018 IECC Residential Compliance Option

**PREScriptive**
- 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)
Commercial or Residential?

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
Access to 2018 IECC

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

2018 International Energy Conservation Code

This title is available for premiumACCESS. Click to purchase a premium subscription to this content.

Table Of Contents

- LEGEND
- COPYRIGHT
- PREFACE
- EFFECTIVE USE OF THE INTERNATIONAL ENERGY CONSERVATION CODE
- IECC—COMMERCIAL PROVISIONS
- CHAPTER 1 [CE] SCOPE AND ADMINISTRATION
2018 IECC Commercial Changes: Highlights

- No significant energy efficiency improvement (initial estimate of 2-5% improvement)

- Mechanical Section (C 403): Reorganized, so all provisions for a type of equipment or system are in one place

- Additional efficiency package options: Enhanced envelope performance (C406.8) & Reduced air infiltration (C406.9)

- More detailed requirements for controls: Change from “be capable of” to “be configured”
2018 IECC Commercial Changes: Highlights

• Appendix CA Solar-Ready Zone

• ASHRAE 90.1-2016

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

<table>
<thead>
<tr>
<th>Q</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>• How does the Code apply to a proposed building without heating or cooling?</td>
<td>• C402.1.1 May qualify as a &quot;low-energy building&quot;. But if the building is changed in the future and no longer qualifies as a low-energy building, it may require substantial effort to install slab or foundation insulation to comply with the Code.</td>
</tr>
</tbody>
</table>
Q

• Do net zero buildings (geothermal wells, natural roof area, roof-mounted photo voltaic panels) need to comply with the Code?

A

• C402.1.1 If a building qualifies as a “low-energy building”, it is not required to comply with the envelope provisions. But the building needs to be comply with the electrical and lighting provisions (C405)
R-5 continuous insulation required under heated slabs for both commercial and residential
Daylight Zones

New section on Daylight zones, includes both top lit and side lit daylight zones

Image courtesy of International Code Council
Daylight Zones
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
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

2015 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
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>DESIGN SUPPLY FAN AIRFLOW RATE (cfm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-19%</td>
<td>20-29%</td>
</tr>
</tbody>
</table>
Garstroom Automatic Controls

Automatic HVAC control now required for buildings with over 50 guest rooms

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.
Motor Nameplates

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)
Refrigeration Equipment

Most sections for equipment efficiency now mandatory

- Walk-in coolers/freezers, Warehouse coolers/freezers
- Walk-in coolers/freezers
- Refrigerated display cases
Walk-in 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
Efficiency Exception

Changes on-site solar to on-site renewables, providing for other renewables
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%

Image courtesy of Royal Swimming Pools
Requirement for commissioning for service water heating systems REMOVED
• Residential lighting provisions allowed ONLY for multifamily buildings
• All others use commercial lighting provisions
• Allows for luminaire lighting controls to take the place of centralized controls
• Must include occupancy sensor and ambient light sensor
Occupancy Sensors

Requires occupancy sensor control for lounges/breakrooms, enclosed offices, open office areas, and warehouse storage areas
Occupancy Sensor Time

Reduces the occupancy sensor time delay from 30 minutes to 20 minutes
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%).
Daylighting Control

Q

• Are manual daylighting controls permitted?

A

• C405.2.3 No. Daylight-responsive controls are required to be automatic, not manual.
Roof Monitors

• Provides calculation methodology for roof monitors

(a) Section view and
(b) Plan view of daylit area under a rooftop monitor
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 0.82 to 0.79 – 4% reduction
• Library 1.19 to 0.78 – 34% reduction
Exterior Lighting Exceptions

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
Enhanced Envelope

- New section for enhanced envelope performance
- 15% better UA
Reduced Infiltration

• New section for enhanced envelope performance
• Building tested air leakage of 0.25 cfm/ft² at 75 Pascals
• Buildings over 250,000 ft² may be tested in sections of not less than 25% of floor area
Electric Vehicles

• Electric vehicles excluded from energy calculation

Image courtesy of Chevrolet
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

Performance [C407.3]

Image courtesy of solartrader.ca
Building O&M must be provided to building owner.
Commissioning Report

Adds functional performance test procedures to the commissioning report, required to be provided to the Code Official.
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
Residential
Information on Construction Documents

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
### 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></td>
<td></td>
</tr>
<tr>
<td>Walls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ducts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Leakage Test Results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blower door</td>
<td>ACH/50 Pa.</td>
<td>Duct testing</td>
</tr>
<tr>
<td>Fenestration Rating</td>
<td>NFRC U-Factor</td>
<td>NFRC SHGC</td>
</tr>
<tr>
<td>Window</td>
<td>U-</td>
<td></td>
</tr>
<tr>
<td>Opaque door</td>
<td>U-</td>
<td></td>
</tr>
<tr>
<td>Skylight</td>
<td>U-</td>
<td></td>
</tr>
<tr>
<td>Equipment Performance</td>
<td>Type</td>
<td>Efficiency</td>
</tr>
<tr>
<td>Heating system</td>
<td></td>
<td>AFUE</td>
</tr>
<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 designed in accordance with ICC 400 exempted from the thermal envelope requirements
### Window U-Factors

Modest improvement in window U-factors

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>2015 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>
Provides allowance for reduced insulation in ceilings without attic spaces, but insulation must extend over the top plate.
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
### Fireplace in a 3-Season Room

<table>
<thead>
<tr>
<th>Q</th>
<th>• Does a 3-season room have to meet the Code? Does a fireplace count as a heater for determining if a 3-season room is a low-energy building?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>• R402.1 A 3-season room must comply with the Code, but may qualify as a low-energy building (or portion). Fireplaces do count as heaters for determining low-energy qualifications.</td>
</tr>
</tbody>
</table>
### Heated Garage

<table>
<thead>
<tr>
<th>Q</th>
<th>A</th>
</tr>
</thead>
</table>
| • If you install some form of permanent heating (radiant, warm-air, forced-air, or heat-pump) in a garage, does the garage have to meet the thermal envelope requirements? | • R402.1 If the space is considered "conditioned", the building thermal envelope must be insulated.  
• Per Exception 2 of R402.4.1.2 (IL Amendment), as long as the heated garage is “thermally isolated” from other habitable, conditioned areas of the home, the air-leakage testing provisions of the code (R402.4.1.2) do not apply to new construction. |
### Roof Insulation

<table>
<thead>
<tr>
<th>Q</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>• What is the minimum continuous insulation level required for low-sloped (flat) roofs without attic spaces?</td>
<td>• R402.2.2 These roofs must comply with residential building insulation provisions, R-49 (U-0.026), unless the AHJ determines that the installation of insulation above the structural roof deck is deemed &quot;technically infeasible&quot; to accommodate the added thickness.</td>
</tr>
</tbody>
</table>
### Moisture Control Requirements

<table>
<thead>
<tr>
<th>Q</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Please clarify the moisture control requirements of the Code, with regard to the use of vapor retarders in framed walls?</td>
<td>• The Code does not contain provisions for moisture control. The moisture control provisions have been relocated to the International Residential Code.</td>
</tr>
</tbody>
</table>
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)
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
• Increases high efficiency lighting to 90% from 75%
• Eliminates the low-voltage exception
Ventilation system must be included in energy model
Batch sampling is allowed for stacked multifamily units
Includes mechanical ventilation in the reference design

Image courtesy of Calcs Plus
• Changes reference design from IECC 2006 to RESNET/ICC 301
• Clarifies electric vehicle charging is excluded from rating
Increase of Max. ERI score

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>2015 ERI Score</th>
<th>2018 ERI Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>54</td>
<td>62</td>
</tr>
<tr>
<td>5</td>
<td>55</td>
<td>61</td>
</tr>
</tbody>
</table>

Image courtesy of Energy IQ
Energy Rating Software

- Removes calculation software listing
Fenestration Compliance

• Allows for weighted area average for multiple fenestrations for compliance
Insulation for Alterations

Q

- If a wood-framed wall of an existing home is being re-insulated, what is the required R-value? This is not for whole wall assembly, but rather interior alterations which require removing and replacing wall cavity insulation and applying new interior drywall finish.

A

- R503.1.1 The work constitutes an "alteration," requiring replacement with insulation having a density of at least R-3 per inch.
- Exception: Existing ceiling, wall or floor cavity exposed during construction provided that these cavities are filled with insulation.
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/ft$^2$ 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.
### Sealed Crawlspaces

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Can see problems during temperate times of year</td>
<td></td>
</tr>
<tr>
<td>• One sample home, 79 days of no H/AC, 20 days ¼ hr of H/AC</td>
<td></td>
</tr>
<tr>
<td>• 27% of the year with nearly no H/AC</td>
<td>• Use HRV/ERV to draw air out of crawl space, put air in occupied space thus preventing air from going stale by transferring air from conditioned space into crawl space</td>
</tr>
</tbody>
</table>
Questions?

energycode@sedac.org
800-214-7954