

2021 IECC Updates

May 25, 2022



SEDAC

SMART ENERGY DESIGN ASSISTANCE CENTER

Providing effective energy strategies for buildings and communities

Learning Objectives

1. Identify new energy code compliance requirements not in previous versions of the IECC
2. Identify changes to existing IECC requirements for commercial and residential buildings
3. Evaluate the impact of code updates on energy code compliance procedures
4. Examine the recommended Illinois amendments to the 2021 IECC

SEDAC is a Preferred Education Provider with the International Code Council (ICC). Credits earned on completion of this program will be reported to ICC for ICC members. Certificates of Completion will be issued to all participants.



This workshop is approved for 1.0 LU/HSW CES credits from the American Institute of Architects (AIA). Credits earned on completion will be reported for AIA members.



Who We Are

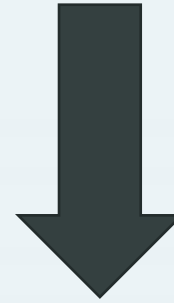
The Smart Energy Design Assistance Center (SEDAC) is an applied research program at University of Illinois.

Our mission: Reduce the energy footprint of Illinois and beyond.



Questions

Questions are encouraged



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Q&A

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SEDAC is the Illinois Energy Conservation Code Training Provider



This training program is sponsored by
Illinois State Energy Office

Energy Code Training Program

Technical support

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ENERGY CODE RESOURCES



What is the Illinois
Energy Conservation
Code?



Illinois Stretch Code



Frequently asked
questions



Useful websites



Energy code smart tips

Access to IECC, Illinois Amendments & Chicago Codes

<https://codes.iccsafe.org/content/IECC2018P4>

<https://codes.iccsafe.org/content/IECC2021P2>

<https://www2.illinois.gov/cdb/business/codes/IllinoisAccessibilityCode/Documents/2018%20Illinois%20Specific%20Amendments%20with%20Modifications%20Shown.pdf>

<https://codes.iccsafe.org/codes/Chicago>

All Codes » I-Codes

Search Code Titles

2018 INTERNATIONAL ENERGY CONSERVATION CODE

ICC INTERNATIONAL CODE COUNCIL®

2018 International Energy Conservation Code

First Printing: Aug 2017

Legend

Use the chapter listing within the bar on the left to navigate contents

The free view provides users with read only access to the code book

The premiumACCESS view includes In premiumACCESS, code change

- Technical code changes from the previous edition of the International Energy Conservation Code
- State amendments to the International Codes are shown in red text
- Indicates deletions
- Active hyperlinks for ease of navigating across section references
- Ability to bookmark or annotate key text with your notes

- Click link sharing () for quick access to key sections
- Click Print icon () for printing section level contents

My Notes and Bookmarks

Recent annotations and bookmarks from this current title. Click here

Purchase premium to take advantage of this feature.

Associated Titles

Available versions for this title.

- 2018 International Energy Conservation Code (Third Printing: Mar 2019)
- 2018 International Energy Conservation Code (Second Printing: Aug 2018)
- 2018 International Energy Conservation Code (Currently Being Viewed (First Printing: Aug 2017))

CHAPTER 1 [CE] SCOPE AND ADMINISTRATION

SECTION C101 SCOPE AND GENERAL REQUIREMENTS

C101.1 Title. This code shall be known as the *International Energy Conservation Code of [NAME OF JURISDICTION]* and shall be cited as such. *Illinois Energy Conservation Code* or "this Code" and shall mean:

With respect to the State facilities covered by 71 Ill. Adm. Code 600, Subpart B:

This Part, all additional requirements incorporated within Subpart B (including the 2018 International Energy Conservation Code, including all published errata but excluding published supplements that encompass ASHRAE 90.1-2016), and any statutorily authorized adaptations to the incorporated standards adopted by CDB are effective July 1, 2019.

With respect to the privately funded commercial facilities covered by 71 Ill. Adm. Code 600, Subpart C:

This Part, all additional requirements incorporated within Subpart C (including the 2018 International Energy Conservation Code, including all published errata and excluding published supplements that encompass ASHRAE 90.1-2016), and any statutorily authorized adaptations to the incorporated standards adopted by CDB, are effective July 1, 2019.

C101.1.2 Adoption. The Board shall adopt

C101.1.3 Adaptation. The Board may appropriately adapt the International Energy Conservation Code to apply to the particular economy, population, distribution, geography and climate of the State and construction within the State, consistent with the public policy objectives of the EEB Act.

C101.5 Compliance. Residential buildings shall meet the provisions of IECC—Residential Provisions. Commercial buildings shall meet the provisions of IECC—Commercial Provisions—the Illinois Energy Conservation Code covered by 71 Ill. Adm. Code 600, Subpart C. The local authority having jurisdiction (AHJ) shall establish its own procedures for enforcement of the Illinois Energy Conservation Code. Minimum compliance shall be demonstrated by submission of:

- Compliance forms published in the ASHRAE 90.1 User's Manual; or
- Compliance Certificates generated by the U.S. Department of Energy's COMcheck™ Code compliance tool; or
- Other comparable compliance materials that meet or exceed, as determined by the AHJ, the compliance forms published in the ASHRAE 90.1 User's Manual or the U.S. Department of Energy's COMcheck™ Code compliance tool; or
- The seal of the architect/engineer as required by Section 14 of the Illinois Architectural Practice Act [225 ILCS 305], Section 12 of the Structural Engineering Licensing Act [225 ILCS 340] and Section 14 of the Illinois Professional Engineering Practice Act [225 ILCS 325].

ARTICLE XIII. CHICAGO ENERGY CONSERVATION CODE

SECTION 1. The Municipal Code of Chicago is hereby amended by inserting a new Title 14N, as follows:

TITLE 14N ENERGY CONSERVATION CODE

PART I – COMMERCIAL PROVISIONS

CHAPTER 14N-C1 SCOPE AND PURPOSE

14N-C1-C001 Adoption of the commercial provisions of the International Energy Conservation Code by reference.

The commercial provisions of the *International Energy Conservation Code*, 2018 edition, second printing, and all erratum thereto identified by the publisher (hereinafter referred to as "IECC-CE"), except Appendix CA, are adopted by reference and shall be considered part of the requirements of this title except as modified by the specific provisions of this title.

If a conflict exists between a provision modified by this title and a provision adopted without modification, the modified provision shall control.

14N-C1-C002 Citations.

Provisions of IECC-CE which are incorporated into this title by reference may be cited as follows:

14N-C[IECC-CE chapter number]-[IECC-CE section number]

14N-C1-C003 Global modifications.

The following modifications shall apply to each provision of IECC-CE incorporated into this title:

- Replace each occurrence of "International Codes" with "Chicago Construction Codes."
- Replace each occurrence of "International Building Code" with "Chicago Building Code."
- Replace each occurrence of "ASME A17.1" or "ASME A17.1/CSA B44" with "the Chicago Conveyance Device Code."
- Replace each occurrence of "NFPA 70" with "the Chicago Electrical Code."



Building Energy Education

<https://learn.smartenergy.illinois.edu/>
https://smartenergy.illinois.edu/bee_fundamentals/

fundamentals

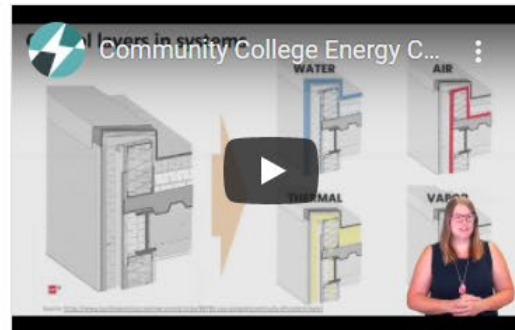
SEDAC's Building Energy Education (BEE) Fundamentals program offers **free** online energy code training that can be accessed anytime, anywhere. There is growing demand for skilled workers who know how to make buildings energy efficient. Today's professionals need training on energy efficiency best practices and how to meet energy code requirements for new and existing buildings. Join us for an exciting opportunity to bring energy code and building science basics to your students!

Check out our [Q&A](#).



Intro Modules

1. Energy Efficiency Careers & Pathways
2. Building Energy Fundamentals
3. Introduction to Energy Codes & Standards
4. Navigating Energy Codes & Standards



Envelope Modules

5. Envelope & Insulation Fundamentals
6. Walls & Openings
7. Roofs & Ceilings
8. Foundations & Floors



Mechanical & Electrical Modules

9. Mechanical Equipment Sizing
10. Duct Design & Installation
11. Mechanical Ventilation
12. Lighting



Advanced Modules

13. Beyond Code
14. Net Zero Buildings
15. Existing Building Renovations

SEDAC Upcoming Energy Code Training

2021 IECC Updates – TODAY!!

Energy Code: Testing & Verification – 6/14/2022




Registration: <https://smartenergy.illinois.edu/energy-code-training/webinars>

Or: <https://smartenergy.illinois.edu/energy-code/workshops/>

Thermal Envelope Updates

C401.3 – Thermal Envelope Certificate

- Mirrors requirements of residential certificate
 - Display insulation R-values for envelope and ducts outside conditioned space
 - Display window U-factors and SHGC
 - Display envelope air leakage results
- Must be installed in approved location (usually utility/mechanical room) and included in construction documents
- Can display area-weighted averages for multiple assemblies if each is $\geq 10\%$ of envelope component area.

Builder, Permit Holder or Registered Design Professional Print Name: <input type="text"/>	
Signature: <input type="text"/>  Signature	
Property Address: <input type="text"/>	
Date: <input type="text"/> 	
Insulation Rating – List the value covering largest area to all that apply	
	R - Value
Ceiling/roof:	R - <input type="text"/>
Wall:	R - <input type="text"/>
Floor:	R - <input type="text"/>
Closed Crawl Space Wall:	R - <input type="text"/>
Closed Crawl Space Floor:	R - <input type="text"/>
Slab:	R - <input type="text"/>
Basement Wall:	R - <input type="text"/>
Fenestration:	
U-Factor	<input type="text"/>
Solar Heat Gain Coefficient (SHGC)	<input type="text"/>
Building Air Leakage	
<input type="checkbox"/> Visually inspected according to 402.4.2.1 OR	
<input type="checkbox"/> Building Air Leakage Test Results (Sec. 402.4.2.2) ACH50 [Target: 5.0] or CFM50/SFSA [Target: 0.30]	
Name of Tester/Company: <input type="text"/>	
Date: <input type="text"/> 	Phone: <input type="text"/>
Ducts:	
Insulation	R - <input type="text"/>

C401.1 – Low Energy Buildings

- Expanded exceptions requirements from 2018 IECC – greenhouses now have specific requirements.
- Must meet low-energy building requirements (1.0 W/sf or less energy, or no conditioned space) or:
 - Opaque envelope complies with C402.2 and C402.4.5 (insulation and air leakage)
 - Partitions between greenhouse and conditioned building meet C402.2, C402.2.3, and C402.4.5
 - Fenestration complies with Table C402.1.1.1:

Component	U-Factor (Btu/h-sf-F)
Skylight	0.5
Vertical Fenestration	0.7



Image source: Pixabay.com

C402.1.3 – Equipment Buildings

2018 IECC

1. Floor area ≤ 500 sf
2. Installed equipment $\geq 7\text{W/sf}$,
not intended for occupancy
3. Heating system $\leq 5\text{kW}$ and
set for $\leq 50\text{F}$
4. Average wall/roof U-factor
 < 0.200 in CZ1-5

2021 IECC

1. Floor area $\leq 1,200$ sf
2. Same
3. Same
4. Same

R-value (U-factor) Table Updates

2018 CZ4		2018 CZ5		2021 CZ4		2021 CZ5		
Component	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R
Roofs								
Attic and Other	R-38 (0.027)	R-38 (0.027)	R-38 (0.027)	R-38 (0.027)	R-49 (0.021)	R-49 (0.021)	R-49 (0.021)	R-49 (0.021)
Above-Grade Walls								
Metal Buildings	R-13 + R-13c.i. (0.052)	R-13 + R-13c.i. (0.052)	R-13 + R-13c.i. (0.052)	R-13 + R-13c.i. (0.052)	R-13 + R-13c.i. (0.052)	R-13 + R-14c.i. (0.050)	R-13 + R-14c.i. (0.050)	R-13 + R-14c.i. (0.050)
Metal Framed	R-13 + R-7.5c.i. (0.064)	R-13 + R-7.5c.i. (0.064)	R-13 + R-7.5c.i. (0.064)	R-13 + R-7.5c.i. (0.064)	R-13 + R-7.5c.i. (0.064)	R-13 + R-7.5c.i. (0.064)	R-13 + R-10c.i. (0.055)	R-13 + R-10c.i. (0.055)
Wood-framed & Other	R-13 + R-3.8c.i. or R-20 (0.064)	R-13 + R-3.8c.i. or R-20 (0.064)	R-13 + R-3.8c.i. or R-20 (0.064)	R-13 + R-3.8c.i. or R-20 (0.064)	R-13 + R-3.8c.i. or R-20 (0.064)	R-13 + R-3.8c.i. or R-20 (0.064)	R-13 + R-7.5c.i. or R-20 + R-3.8 c.i. (0.051)	R-13 + R-7.5c.i. or R-20 + R-3.8 c.i. (0.051)
Below-Grade Walls								
Below-Grade	R-7.5c.i. (C-0.119)	R-7.5c.i. (C-0.119)	R-7.5c.i. (C-0.119)	R-7.5c.i. (C-0.119)	R-7.5c.i. (C-0.119)	R-10c.i. (C-0.092)	R-7.5c.i. (C-0.119)	R-10c.i. (C-0.092)

R-value Table Updates

Component	2018 CZ4		2018 CZ5		2021 CZ4		2021 CZ5	
	All Other	Group R	All Other	Group R	All Other	Group R	All Other	Group R
Floors								
Mass	R-10c.i. (0.076)	R-10.4c.i. (0.074)	R-10c.i. (0.074)	R-12.5c.i. (0.064)	R-10c.i. (0.057)	R-10c.i. (0.051)	R-14.6c.i. (0.057)	R-16.7c.i. (0.051)
Slab-on-Grade Floors								
Unheated Slabs	R-10, 24" down (F-0.054)	R-10, 24" down (F-0.054)	R-10, 24" down (F-0.054)	R-10, 24" down (F-0.054)	R-15, 24" down (F-0.052)	R-15, 24" down (F-0.052)	R-15, 24" down (F-0.052)	R-20, 24" down (F-0.051)
Opaque Doors								
Non-swinging	R-4.75				(U-0.31)			
Swinging	(U-0.61)				(U-0.37)			

2018 IECC footnote f required steel floors to be insulated to R-38. Footnote f is removed in 2021 IECC.

2021 IECC C402.4.5.2 adds horizontally-hinged doors with single row of fenestration 14%-25% of door area shall meet U-factor of 0.440 in CZ 4 and 5.

More glazing follows vertical fenestration requirements.

Roof/Ceiling Insulation

2018 IECC

C402.2.1: R-value basis.

2 staggered layers at minimum for above deck insulation.

Insulation on suspended ceilings does not comply.

Confusing wording for 3 tapered insulation exceptions.

2021 IECC

C402.1.4.1: U-factor basis

C402.1.4.1.1: tapered insulation used in U-factor calculation shall use average thickness of insulation.

C402.1.4.1.2: insulation on suspended ceilings does not comply

C402.1.4.1.3: 2 layers minimum required, except specific exceptions

Table C402.4 Fenestration Requirements

2018 IECC

CLIMATE ZONE	4 EXCEPT MARINE		5 AND MARINE 4	
Vertical Fenestration				
U-factor				
Fixed fenestration	0.38		0.38	
Operable fenestration	0.45		0.45	
Entrance doors	0.77		0.77	
SHGC				
Orientation ^a	SEW	N	SEW	N
PF < 0.2	0.36	0.48	0.38	0.51
0.2 ≤ PF < 0.5	0.43	0.53	0.46	0.56
PF ≥ 0.5	0.58	0.58	0.61	0.61
Skylights				
U-factor	0.50		0.50	
SHGC	0.40		0.40	

2021 IECC

CLIMATE ZONE	4 EXCEPT MARINE		5 AND MARINE 4	
Vertical fenestration				
U-factor				
Fixed fenestration	0.36		0.36	
Operable fenestration	0.45		0.45	
Entrance doors	0.63		0.63	
SHGC				
	Fixed	Operable	Fixed	Operable
PF < 0.2	0.36	0.33	0.38	0.33
0.2 ≤ PF < 0.5	0.43	0.40	0.46	0.40
PF ≥ 0.5	0.58	0.53	0.61	0.53
Skylights				
U-factor	0.50		0.50	
SHGC	0.40		0.40	

C402.4.2 Minimum Skylight Area

2018 IECC

Effective aperture equation has requirement of 1% VT or more.

$$\text{Skylight Effective Aperture} = \frac{0.85 \times \text{Skylight Area} \times \text{Skylight VT} \times \text{WF}}{\text{Toplit Zone}}$$

WF specified at 0.9 for shallow light wells (<2ft) and 0.7 for deep wells (2ft or more)

2021 IECC

Maintains 1% minimum VT requirement for standard skylights.

Adds 0.66% minimum VT requirement for tubular daylight devices

Also adds WF factor for tubular daylight devices of 1.0

C402.5 Air Leakage – BIG Changes!

2021 IECC makes pressure testing mandatory for all commercial buildings in CZ 4 and 5!

C402.5.2 – **Dwelling and sleeping** unit enclosure testing

- 0.30 cmf/sf exposed envelope @ 50 Pa test pressure
- Test individual units, and area-weighted average applies to whole building
- Sampling protocol allowed for >8 units, 20% sample rate.
 - 2 additional units for each unit in sample that fails test.

C402.5.3 – **Other Building** enclosure testing

- 0.40 CFM/sf exposed envelope @ 75 Pa pressure. Can test portions of building.
 - All areas under roof, all area of stories with building entrance, dock, or below grade, and 25% of remaining portions of building (mid-level floors)
 - If test between 0.40 and 0.60 CFM/sf, can complete non-destructive repairs without re-testing.

C402.5.11 Operable Openings Interlocking

New 2021 IECC Requirement!

- Spaces over 40 sf with operable openings to outdoors shall interlock opening with HVAC
 - When open, reset cooling setpoint to 90F and heating setpoint to 55F
 - Setpoint change shall occur within 10min of opening

Exceptions:

1. Separately zones areas associated with food prep that contribute to HVAC loads
2. Warehouses that utilize overhead doors for the function of occupancy (approval by AHJ)
3. First entrance doors in exterior of vestibule wall



Mechanical Systems Updates

C403.1.2 Data Centers

2021 IECC new section!

Data centers must comply with Sections 6 and 8 of ASHRAE 90.4

1. MLC values from 90.4 replaced with Table C403.1.2(1) & (2) values

Climate Zone	4A	5A
MLC @ 100% and 50% ITE Load	0.23	0.22
HVAC Max Annual MLC @ 100% & 50% ITE Load	0.17	0.17

C403.2.3 Fault Detection & Diagnostics

Expanded from 2018 IECC, which only covered economizers

C403.2.3 requires HVAC systems serving 100 ksf or more to include FDD

1. Permanently installed monitoring sensors
2. Sample interval of 15 min
3. Automatically identify and report faults
4. Automatically notify maintenance personnel
5. Automatically provide prioritized repair recommendations
6. Be able to report to remote authorized maintenance personnel

Tables C403.3.2(1)-(16) Equipment Efficiency

Increasing Federal Efficiency Standards

Following rating changes occur 1/1/23

- SEER to SEER₂
- HSPF to HSFP₂
- COP to COP₂
- Air-cooled heat pump EER to IEER
- Smaller air combustion heating systems see slight efficiency increase

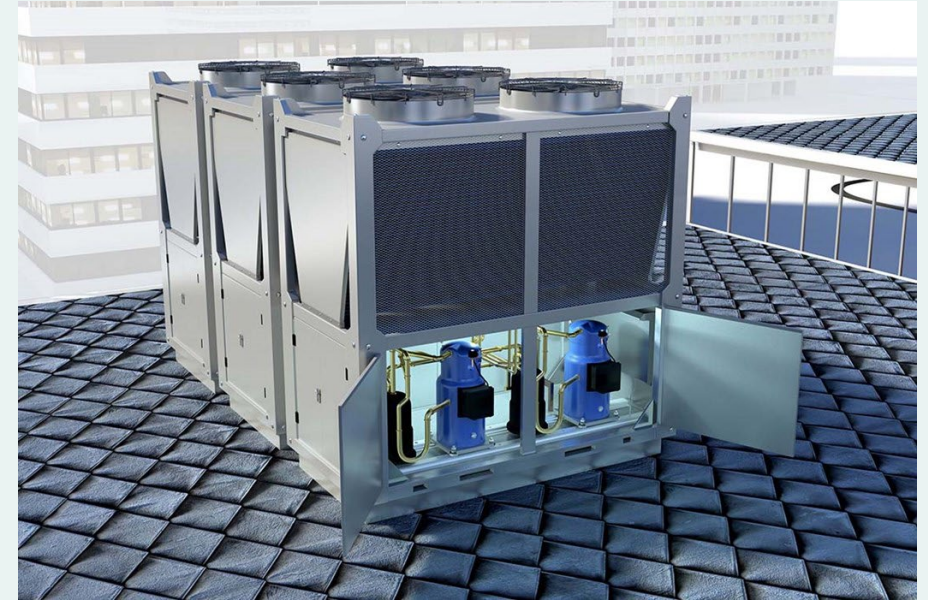


Image sources: danfoss.com, grainger.com



C403.3.2 (7) Heat Rejection Performance

2021 adds 4.5gpm/hp minimum requirement for propeller and axial fan dry coolers.

Exchanges requirements using R-507A test fluid for R-448A test fluid.

- Significantly reduces Btu/hr x HP requirements in table due to lower efficiency of test fluid.
- R-507A has a critical pressure of 537.37 bar and temperature of 70.62 C.
- R-448A has a critical pressure of 46.84 bar and temperature of 83.70 C.
- Allows for lower compression energy, and slightly higher heat transfer rate, reflected in new efficiency requirements.



Image source: evapco.com

Table C403.3.2(10) Computer Room AC Efficiency

2018 IECC

Excerpt of Table C403.3.2(9)

Equip. Type	Sensible Cap. (MBH)	SCOP Up/Down flow	Test Procedure
Air Cooled	<65	2.20/ 2.09	ANSI/ ASHRAE 127
Water Cooled	<65	2.60/ 2.49	
Water Cooled w/ Economizer	<65	2.55/ 2.44	

2021 IECC

Excerpt of Table C403.3.2(10)

Equip. Type	Standard Model	Sensible Cap. (MBH)	SCOP	RA Rating Condition	Test Procedure
Air Cooled	Downflow	<80	2.70	85 F db/ 52 F wb	AHRI 1360
	Upflow-ducted	<80	2.67		
	Upflow – non-ducted	<65	2.16	75 F db/ 52 F wb	
	Horizontal	<65	2.65	95F db/ 52F wb	
Water Cooled	Downflow	<80	2.82	85F db/ 52 F wb	AHRI 1360

2021 HVAC Controls Updates

- C403.4.2.3 Adds auto-stop to auto-start function (Increase/decrease setpoints by at least 2°F before scheduled unoccupancy)
- C403.5 Economizers: Adds an exception for VRF systems employing DOAS systems.
- C403.6.5 Supply Air Reset Controls: Adds allowance for zone humidity reset-based control in humid climate zones.
 - Also adds that zone max airflow shall be selected based on max reset temperature.

2021 HVAC Controls Updates (cont.)

- C403.7.1 Demand Control Ventilation expanded
 - **All single-zone systems** complying with C403.5 through C403.5.3 added to spaces required to have DCV
 - Occupant load requirement reduced from 25 ppl/1000sf to **15 ppl/1000sf**.
 - DCV exception modifications:
 - **Multi-zone systems w/ design OA <750cfm**
 - **Changes 1,200cfm make-up/transfer air exception to 75% of ventilation**
 - **Removed process load exception**
 - **Added occupancy classification exceptions: correctional cells, educational labs, barber, salons, and bowling alley seating.**

C403.7.2 Enclosed Garage Ventilation

2018 IECC

- Exceptions
 - Total cap. <22,500 cfm with no heating/mech. cooling
 - Motor nameplate ratio exceeding 1125 cfm/hp and no heating/mech. cooling

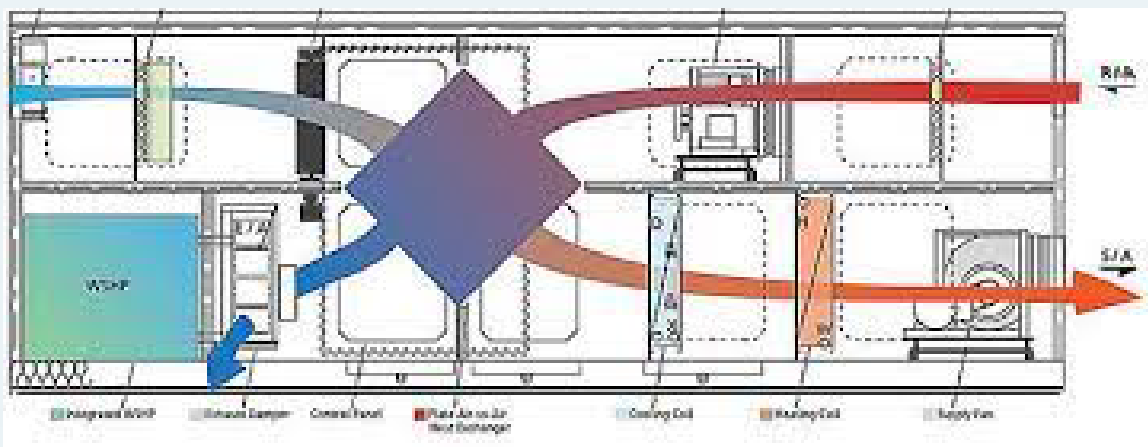
2021 IECC

- Exceptions
 - Total cap. <8,000 cfm and no heating/mech. cooling
 - Motor nameplate ratio exceeding 1125 cfm/hp and no heating/mech. cooling

C403.7.4 Energy Recovery Systems

2018 IECC

- Single section with requirements and 11 exceptions or conditional uses



2021 IECC

- Adds section for nontransient dwellings: CZ 4 & 5 have required to have recovery but exempted from recovery ratios listed.
- All other occupancy types match 2018 IECC requirements

C403.7.6 Guest Room Controls

Re-organized for readability and understanding, but requirements mostly unchanged in 2021 IECC

- Automatic exhaust off control shortened from 30 minutes after unoccupancy in 2018 IECC to **20 minutes** in 2021 IECC.



C403.8 Fans and Controls

2018 IECC

C403.8.2 Nameplate HP shall be If
<6bhp, at most, 1.5x's bhp

- Else, at most, 1.3x's bhp
- Systems complying with nameplate HP sizing method

Exceptions

- Nameplate hp <1 hp

2021 IECC

C403.8.2 adds additional exceptions:

- Fans with VSDs
- Fans with nameplate electrical input <0.89 kW
- Nameplate HP sizing method moved to exceptions.

C403.8 Fans and Controls (cont.)

2018 IECC

C403.8.3 Fan efficiency based on fan efficiency grade (FEG)

- Less accurate measure of total fan system efficiency
- 6 exceptions to FEG requirements

2021 IECC

C403.8.3 Fan efficiency based on fan efficiency index (FEI)

- Better accounts for VSD applications, fan arrays, etc...
- 11 Exceptions to having FEI, similar to 2018 exceptions

Service Hot Water Updates

C404.2.1 High input service water heating

2018 IECC

Where single heater serves whole building and has input 1 MMBH or more, thermal efficiency shall be 90%

Multiple units with combined input 1 MMBH or more, thermal efficiency shall be 90%

2021 IECC

Where single heater serves whole building and has input 1 MMBH or more, thermal efficiency shall be **92%**

Multiple units with combined input 1 MMBH or more, thermal efficiency shall be 90%

Power and Lighting Updates

C405.2.1.2 Occupant Sensors in Warehouses

2018 IECC

- Aisleways controlled independently.
- Open areas controlled independently.
- Lighting power reduce by 50% within 20 min.

2021 IECC

Same requirements PLUS:

- **Lighting not controlled by sensors shall be on time-clock**
- **Manual off control shall be provided**

C405.2.1.3 Open Plan Office Controls

2018 IECC

Open offices over 300sf shall have:

- Control areas no more than 600sf
- Turn lights off within 20 min.
- Lights shall turn off by no less than 80% within 20 min (includes full off)
- Daylight responsive controls only active if occupied.

2021 IECC

Updated requirements:

- Auto-on is permitted in occupied zone, other unocc. Zones can turn on to 20% or less.
- Exception allows time-switch control
- Lights shall automatically turn off to 20% of full power after 20 min.

C405.2.1.4 Corridors

New to 2021 IECC!

- Occupant sensors shall reduce lighting by 50% or less within 20 min of unoccupancy
- Exception for low-light corridors (<2 fc)



C405.2.3 Light Reduction Controls

2018 IECC

Manual control shall allow occupant to reduce lighting power by 50% in uniform pattern

2021 IECC

Exceptions added for spaces:

1. With 1 luminaire <60W
2. Less than 0.45 W/sf
3. Corridors, lobbies, and elec. /mech. rooms
4. Now requires intermediate step not more than 50% full power or cont. dimming

C405.2.4 Daylight Responsive Controls

2018 IECC

Only has primary side-lit zone for daylighting control

2021 IECC

Adds requirements for secondary side-lit zone.

Adds interaction with occupant sensors and dimming controls.

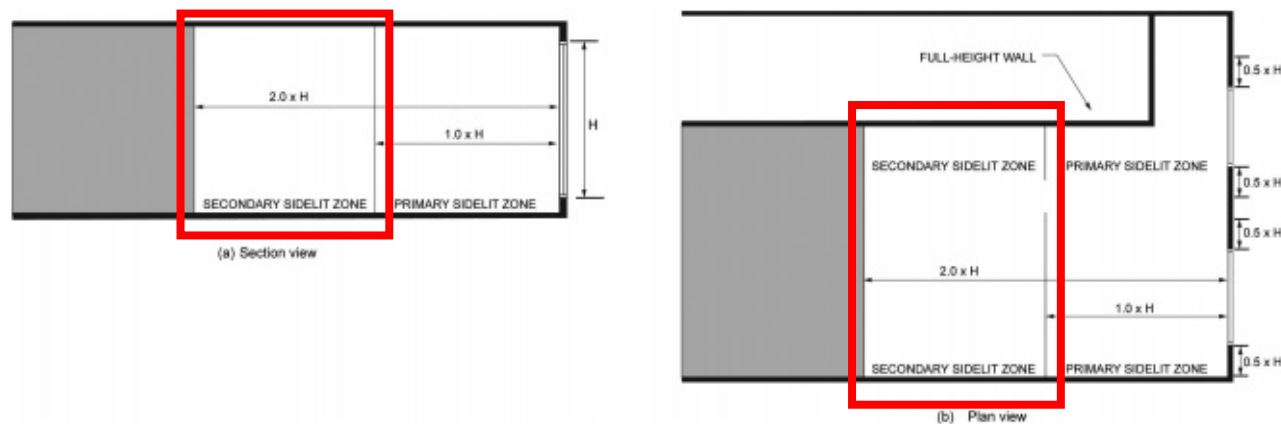


FIGURE C405.2.4.2(1) PRIMARY AND SECONDARY SIDELIT DAYLIGHT ZONES

C405.2.4 Daylight Responsive Controls

2018 IECC

Only has primary side-lit zone for daylighting control

2021 IECC

Adds requirements for secondary side-lit zone.

Adds interaction with occupant sensors and dimming controls.

Also added fenestration with North PF <1 and all others with PF <1.5 required to have daylighting control

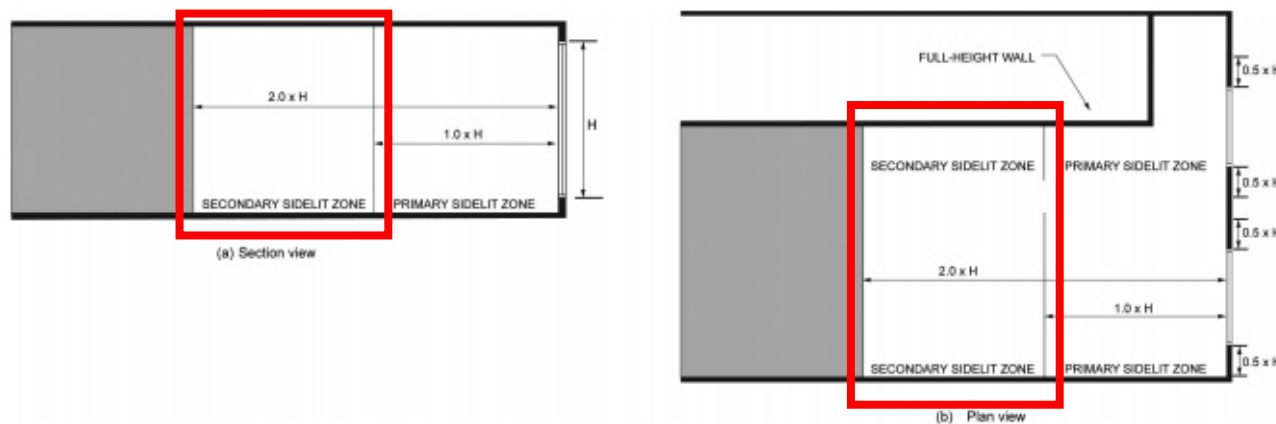
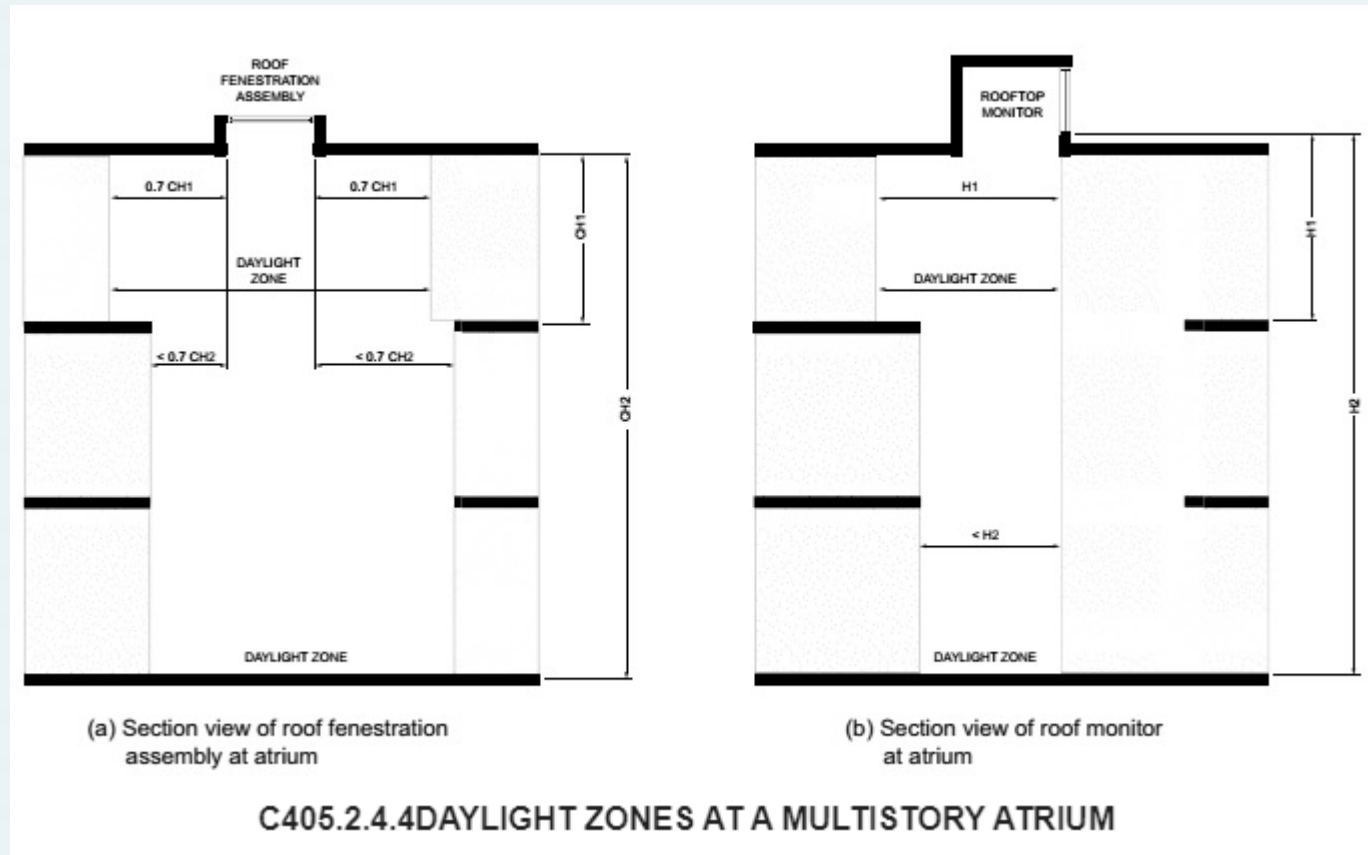


FIGURE C405.2.4.2(1) PRIMARY AND SECONDARY SIDELIT DAYLIGHT ZONES

C405.2.4.4 Atriums

2021 IECC adds a new section covering atrium spaces to align with ASHRAE 90.1



C405.2.8 Parking garage controls

New section in 2021 IECC

- Lighting shall have occupant sensor or time switch controls
- Power reduced by 30% or more when unocc. 20min.
- Control zones max of 3,600 sf
- Perimeter lighting shall have daylight control (20ft from edge, 50% reduction or more)



Image source: energy.gov

Lighting Power Updates

2018 IECC

TABLE C405.3.2(1)
INTERIOR LIGHTING POWER ALLOWANCES: BUILDING AREA METHOD

BUILDING AREA TYPE	LPD (w/ft ²)
Automotive facility	0.71
Convention center	0.76
Courthouse	0.90
Dining: bar lounge/leisure	0.90
Dining: cafeteria/fast food	0.79
Dining: family	0.78
Dormitory ^{a, b}	0.61
Exercise center	0.65
Fire station ^a	0.53
Gymnasium	0.68
Health care clinic	0.82
Hospital ^a	1.05
Hotel/Motel ^{a, b}	0.75
Library	0.78
Manufacturing facility	0.90
Motion picture theater	0.83
Multifamily ^c	0.68
Museum	1.06
Office	0.79

2021 IECC

TABLE C405.3.2(1)
INTERIOR LIGHTING POWER ALLOWANCES: BUILDING AREA METHOD

BUILDING AREA TYPE	LPD (w/ft ²)	
Automotive facility	0.75	✗
Convention center	0.64	✓
Courthouse	0.79	✓
Dining: bar lounge/leisure	0.80	✓
Dining: cafeteria/fast food	0.76	✓
Dining: family	0.71	✓
Dormitory ^{a, b}	0.53	✓
Exercise center	0.72	✗
Fire station ^a	0.56	✗
Gymnasium	0.76	✗
Health care clinic	0.81	✓
Hospital ^a	0.96	✓
Hotel/Motel ^{a, b}	0.56	✓
Library	0.83	✗
Manufacturing facility	0.82	✓
Motion picture theater	0.44	✓
Multiple-family ^c	0.45	✓
Museum	0.55	✓
Office	0.64	✓

New Plug Load Requirements

- C405.11 Automatic Receptacle Control
 - 50% of all 125V 15 & 20 amp circuits
 - Offices, conference rooms, copy rooms, breakrooms, classrooms, and workstations
 - 25% of branch feeders for modular furniture
- Control methods
 - 7-day timer, 5,000sf or less served, 1 floor only, 2 hr manual override
 - Occupant sensor (20min delay)
 - Automated signal from alt. system (alarm system, lighting sensor)



Image source: Leviton

New Power Monitoring Requirements

- C405.12 Energy Monitoring
 - Required in buildings 25,000sf +
- Submetering required on
 - HVAC and service water heating
 - Lighting systems
 - Plug loads
 - Process loads
 - Misc. loads
- Meters/submeters shall automatically report to BAS
- BAS shall store data for 36 months and generate graphical reports



Additional Efficiency Measures

Additional Efficiency Options

2018 IECC

1. Efficient HVAC
2. Reduced LPD
3. Enhanced lighting controls
4. On-site renewables
5. DOAS on specific HVAC
6. Efficiency service hot water
7. Enhanced envelope
8. Reduced air infiltration

2021 IECC

- 3 New Options
- Add energy monitoring where not already required
 - Add fault detection where not already required
 - Efficient kitchen equipment

2021 Efficiency Package Updates

Now need to obtain 10 credits in added efficiency

Multiple tables of available credits for efficiency options based on building type and climate zone

TABLE C406.1(5) ADDITIONAL ENERGY EFFICIENCY CREDITS FOR OTHER^a OCCUPANCIES

SECTION	CLIMATE ZONE																
	0A & 1A	0B & 1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
C406.2.1: 5% heating efficiency improvement	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	3
C406.2.2: 5% cooling efficiency improvement	5	5	4	4	3	3	2	2	2	1	1	2	1	1	1	1	1
C406.2.3: 10% heating efficiency improvement	NA	NA	NA	1	1	1	1	2	2	3	3	3	3	4	3	5	5
C406.2.4: 10% cooling efficiency improvement	8	9	8	7	5	5	3	4	4	2	2	3	2	2	2	2	2
C406.3: Reduced lighting power	8	8	9	9	9	9	10	8	9	9	7	8	8	8	8	8	7
C406.4: Enhanced digital lighting controls	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	1
C406.5: On-site renewable energy	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7

C406.2 HVAC Efficiency Credits

HVAC Efficiency Increase	Climate Zone 4					Climate Zone 5				
	B	R&I	E	M	Other	B	R&I	E	M	Other
Building Group	B	R&I	E	M	Other	B	R&I	E	M	Other
5% heating	NA	1	1	1	1	1	1	1	2	1
5% cooling	3	1	2	2	2	2	1	1	1	1
10% heating	NA	1	2	2	2	2	2	3	3	3
10% cooling	6	2	4	4	4	4	1	2	2	2

Beyond 10% reduction:

Credit = 10% reduction credit * [1 + ((CEI - 10%) / 10%)]

CEI = lesser of 15% and efficiency beyond 10%

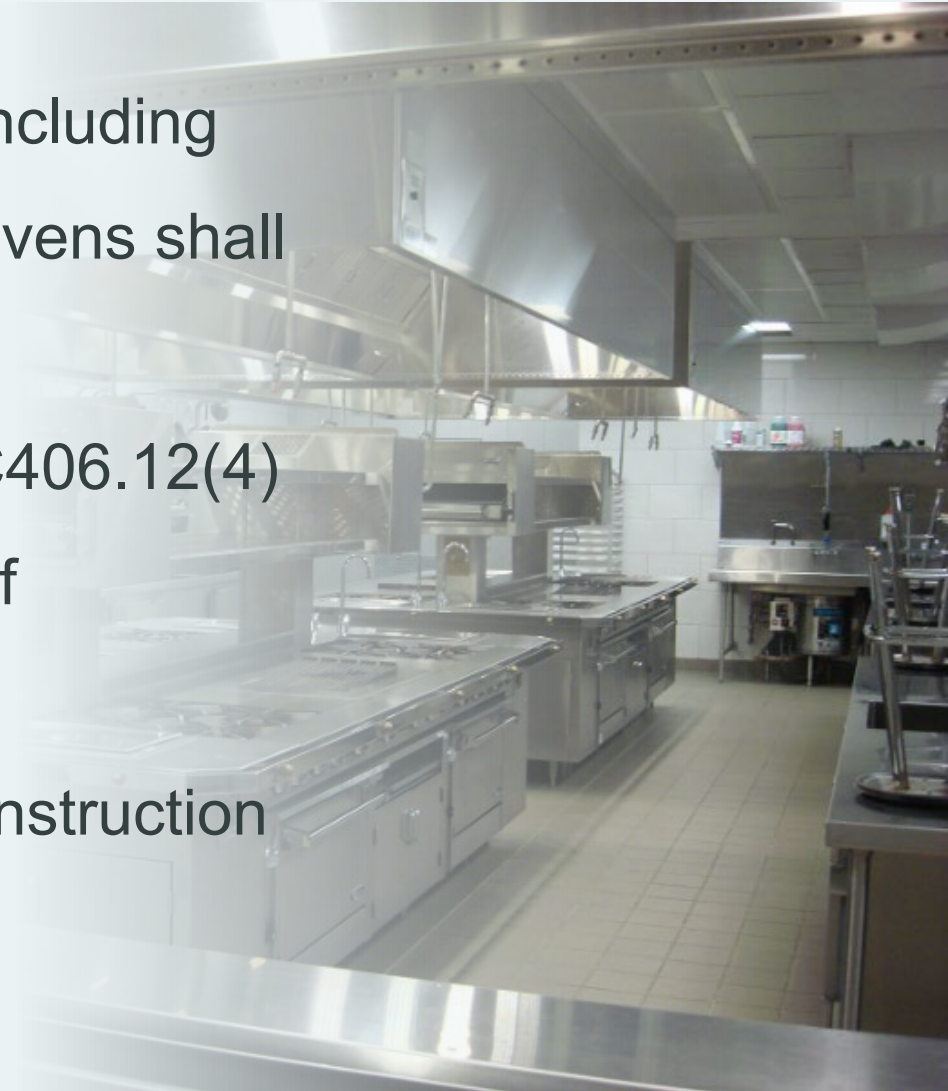
C406.12 Efficient Kitchen Equipment

For Group A-2 facilities with a commercial kitchen including gas or electric fryer, dishwashers, steam cookers, ovens shall comply with:

- Tables of efficiency requirements C406.12(1) – C406.12(4)
- Equipment must be installed prior to Certificate of Occupancy
- Equipment efficiency must be documented in Construction Docs.

Credit = $20 \times \text{kitchen area} / \text{building area}$

ALL equipment must meet requirements of this section



Residential Buildings

C402.2.4 Attic Access

2018 IECC

Insulate and weather strip access doors to level equivalent with surrounding envelope.

Ceiling access shall have retention means to hold insulation in place.

Single exception for vertical doors complying with Table R402.1.2 requirements.3

2021 IECC

Adds more exceptions:

Pulldown stairs in CZ4 permitted if

1. R-10 or U-0.10 on average
2. 75%+ of panel area shall be R-13
3. Opening area of 13.5sf or less
4. Hatch perimeter is weather stripped

R402.2.8 Basement Walls

2018 IECC

General requirement for foundation wall insulation to comply with Table R402.1.2 values.

Unconditioned basements allowed to have no wall insulation if floor insulated

2021 IECC

Adds clarity on conditioned vs unconditioned basement

1. Floor overhead and access stairs insulated and air sealed
2. No uninsulated ducts or heating piping/panels
3. No HVAC supply/returns
4. Door insulated and weather stripped

Mechanical Systems

2021 IECC mostly has some organizational updates for clarity of prescriptive measures, with couple notes:

- Duct testing required for ducts within conditioned space!
 - Leakage allowed to be higher, 8cfm/100sf floor area as opposed to 4 cfm/100sf.
- Updates to whole-house fan efficiencies

System	Airflow CFM	2018 Efficacy	2021 Efficacy
HRV/ERV	Any	1.2	1.2
In-line Supply/Exhaust	Any	2.8	3.8
Other Exhaust	<90	1.4	2.8
Other Exhaust	90+	2.8	3.5
Integrated air handler	Any	No Requirement	1.2
Range Hood	Any	2.8	Item Removed

Efficiency Packages

New to 2021 IECC!

- 1 efficiency package option must be included if complying with prescriptive compliance method
- For performance path, either 1 package option installed, but not modeled, OR:
- 5% decrease in energy cost or ERI of modeled building

Efficiency Package Options

New to 2021 IECC!

- Enhanced Envelope: 5% improvement in UA
- Efficiency HVAC: heating AND cooling meets one of the following
 - 95% AFUE/10 HSPF and 16 SEER
 - 3.5 COP GSHP
- Reduced service water energy:
 - 0.82 EF gas fired, 2.0 EF electric, 0.4 SEF solar
- Efficient Duct Thermal Distribution: all in conditioned space
- Improved Air Sealing & Ventilation:
 - 3.0 ACH₅₀ with H/ERV 75% efficiency
 - 1.1cfm/W or less, no recirculation defrost
 - ERV must have 50% latent recovery



Improvements to ERI Scores

Climate Zone	2018 ERI	2021 ERI
4	62	54
5	61	55

2021 IECC also added requirements for ERI reporting:

Need proposed documentation and confirmed documentation

- Score should be on cover page and plan documents
- Produce certificate showing ERI score, R-values, duct and envelope leakage results, etc...

Illinois Recommended Amendments

Code Stringency

Local governments can not enforce an Energy Code more or less stringent for both commercial and residential buildings

Excludes those that had adopted 2006 or newer IECC before May 15, 2009

Stretch Energy Code becoming available 2024

Residential


Compliance Path Option

Passive House Certification (2021) for residential buildings



Fenestration Backstop

Fenestration can not be less efficient than the 2009 IECC, including tradeoffs

 National Fenestration Rating Council CERTIFIED	Restorations Windows Vinyl Extruded, UltraCore Frame, Triple Glazed, Krypton90, Low-E Product Type: Vertical Slider	
ENERGY PERFORMANCE RATINGS		
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient	
0.18	0.22	
ADDITIONAL PERFORMANCE RATINGS		
Visible Transmittance	Air Leakage (U.S./I-P)	
0.42	0.1	
Condensation Resistance		
70		
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>		
Actual test sample .03 air leakage.		

Insulation Requirements

Zone	Fenestration U-Factor	Skylight U-Factor	Fenestration SHGC	Ceiling R-value	Wood Frame Wall R-Value	Mass Wall R-Value	Floor R-Value	Basement Wall R-value	Slab R-Value & Depth	Crawl Space Wall R-Value
4 (2021)	0.30	0.55	0.40	60	30 or 20+5ci or 13+10ci or 0+20ci	8/13	19	10ci or 13	10, 4 ft	10ci or 13
4 (IL)	0.30	0.55	0.40	49/30ci	20 or 13+5ci	8/13	19	10ci or 13	10, 4 ft	10ci or 13
5 (2021)	0.30	0.55	0.40	60	30 or 20+5ci or 13+10ci or 0+20ci	13/17	30	15ci or 19 or 13+5ci	10, 4 ft	15ci or 19 or 13+5ci
5 (IL)	0.30	0.55	0.40	49/30ci	20 or 13+5ci	13/17	30	10ci or 13	10, 4 ft	15ci or 19 or 13+5ci

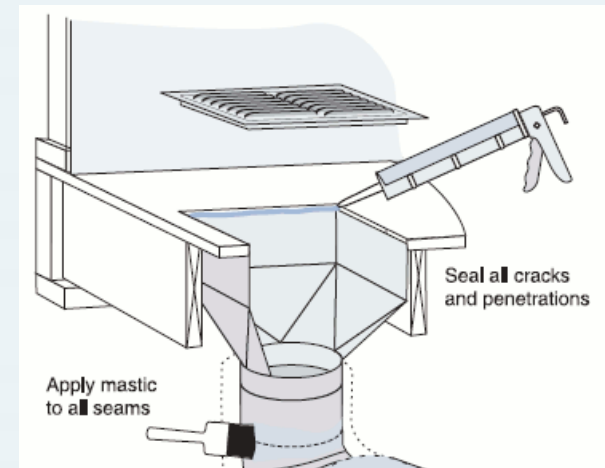
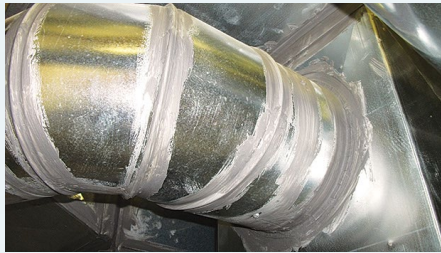
Air Barrier Leakage

5 ACH 50 Performance Limit (Must be equal to or less than model)
3 ACH 50 Prescriptive Limit



Duct Leakage Floor

Buildings 1,500 SF or less have allowable duct leakage limit of 60 cfm with the air handler installed



Ventilation Controls Labeled

Ventilation controls shall include text or symbol indicating their function

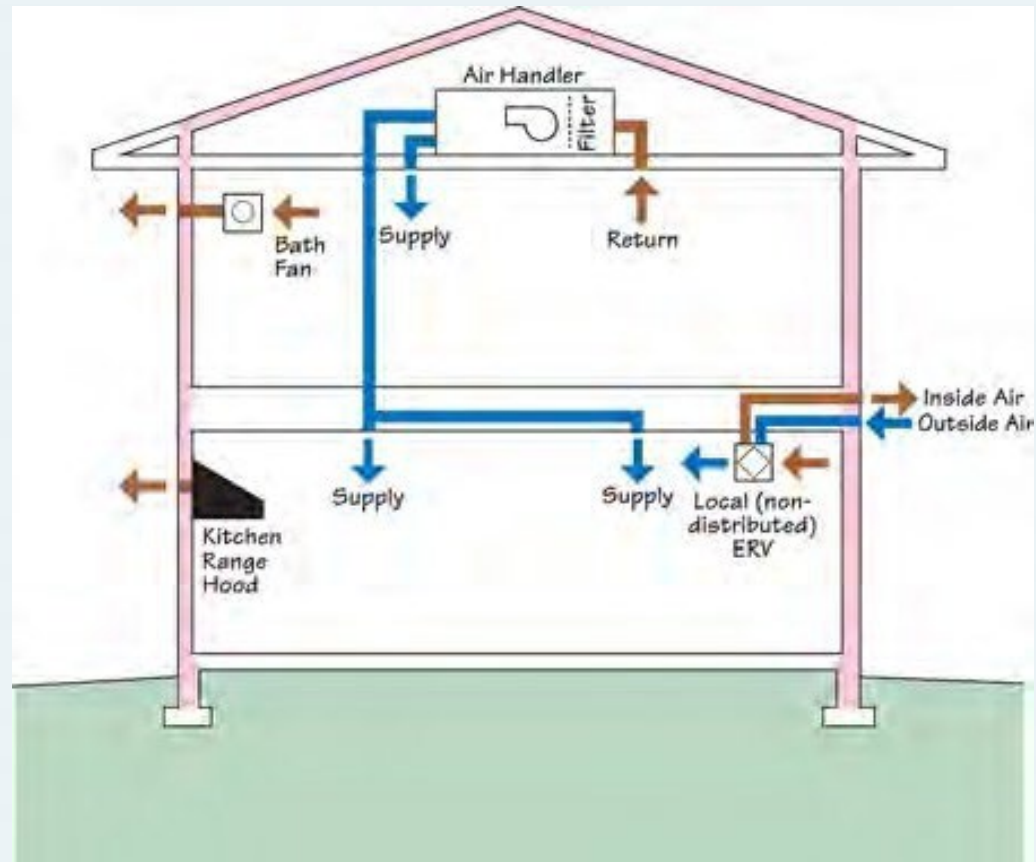


Ventilation Credit (30%)

Supplies ventilation directly to each bedroom and 1 of the following: living room, dining room, kitchen

AND

Is a balanced system



Commercial

Lighting for Plants

Buildings with more than 40kW aggregate horticultural lighting not cannabis facilities subject to 410 ILCS 705/10-45

Photosynthetic photon efficacy of not less than $1.7 \mu\text{mol}/\text{J}$ for greenhouses and not less than $2.2 \mu\text{mol}/\text{J}$ for all other indoor growing spaces



Image courtesy of DOE

Additional Efficiency Options

Additional points available for grid interconnected HVAC controls or water heating controls



Fenestration Orientation Performance Adj.

No more than 25% of fenestration faces east & No more than 25% of fenestration faces west

OR

No more than 20% of fenestration weighted SHGC faces east & No more than 20% of fenestration weighted SHGC faces west

Otherwise, requires increasing fenestration performance, exception for heavily shaded fenestration

Questions?

energycode@illinois.edu

800-214-7954

Next Event: Energy Code: Testing & Verification – 6/14/2022