

Significant Changes from the 2018 to 2021 IECC: Commercial

3.20.2024



SEDAC

SMART ENERGY DESIGN ASSISTANCE CENTER

Providing effective energy strategies for buildings and communities



SEDAC

SMART ENERGY DESIGN ASSISTANCE CENTER

Presenters:

Shawn Maurer



Robert Schlorff



Who We Are



SEDAC

SMART ENERGY DESIGN ASSISTANCE CENTER

Our mission: Reduce the energy footprint of Illinois and beyond



What We Do

We are an applied research program at the University of Illinois.

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

We help facilities become more energy efficient.

We educate.

We research.

We advocate for a greener future.



SEDAC is the Illinois Energy Conservation Code Training Provider



This training program is sponsored by **Illinois EPA Office of Energy**

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



Energy Code Assistance

Technical support

- energycode@illinois.edu
- 800.214.7954

Online resources at

smartenergy.illinois.edu/energy-code

- Workshops
- Webinars
- Online on-demand training modules



SEDAC Energy Code Training Series

Energy Code Webinar Schedule

04.09.24 – Simplified Code Compliance

05.21.24 – Existing Commercial Buildings

06.11.24 – Q&A Review – How We Answer Energy Code Questions

Registration: <https://smartenergy.illinois.edu/events>

SEDAC Energy Code Upcoming Events

Based on popular demand we have added (2) upcoming webinars to cover changes between the 2018 IECC and 2021 IECC

03.19.24 – ARCHIVED - 2021 IECC Updates: Residential

03.20.24 – 2021 IECC Updates: Commercial TODAY!

Illinois Energy Conservation Code

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Illinois Energy Conservation Code

[Home](#) > [Energy Code Training](#) > [Illinois Energy Conservation Code](#)

Click [here](#) for the [2022 Chicago Energy Transformation Code](#).

New Energy Code Coming to Illinois January 1, 2024

In accordance with the [Energy Efficient Building Act](#), the [Capital Development Board](#) (CDB) is required to review and adopt the most current version of the International Energy Conservation Code (IECC) within one year of its publication date. The Code will then become effective in Illinois within 6 months following its adoption by the CDB. The CDB, in conjunction with the [Illinois Environmental Protection Agency](#) and the [Illinois Energy Conservation Advisory Council](#), initiates the cycle for the Illinois Energy Conservation Code to be updated every three years.

At its November 7 meeting, JCAR approved the new rules to update the Illinois Energy Conservation Code from the 2018 IECC with amendments to the 2021 IECC with amendments. On November 14, the Capital Development Board set the effective date for the changes as January 1, 2024. Any projects applying for a permit on or after January 1, 2024 will need to comply with the new code.

The 2021 Illinois Energy Conservation Code can be accessed here:

- [2021 IECC](#)
- [Illinois Amendments](#)



Access to 2021 IECC & IL Amendments

Menu Search all of Digital Codes

All Codes <

Legend Information

CODE SECTIONS MY NOTES

2021 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)

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PREFACE

▶ ARRANGEMENT AND FORMAT OF THE 2021 IECC

ABBREVIATIONS AND NOTATIONS

IECC—COMMERCIAL PROVISIONS

▶ CHAPTER 1 [CE] SCOPE AND ADMINISTRATION

▶ CHAPTER 2 [CE] DEFINITIONS

▶ CHAPTER 3 [CE] GENERAL REQUIREMENTS

▶ CHAPTER 4 [CE] COMMERCIAL ENERGY EFFICIENCY

2021 International (IECC) Add to Favorites

The 2021 IECC® addresses energy efficiency on several resources and the impact of energy usage on the environment.

Related Titles

2021 Complete Revision History to the 2021 I-Codes - IECC: Successful Changes and Public Comments >

2021 Significant Changes to the International Energy Conservation Code >

<https://cdb.illinois.gov/business/codes/illinois-energy-codes/illinois-energy-conservation-code.html>

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Illinois Energy Codes

Illinois Energy Conservation Code

Illinois Stretch Energy Code

Advisory Council Meetings

Illinois Energy Conservation Code (20 ILCS 3125/15)

State Funded Facilities must comply with the IECC per 20 ILCS 3125. See Subpart B of the [Illinois Energy Conservation Code](#) for more information. The 2021 edition of the IECC as amended went into effect on 1/1/24.

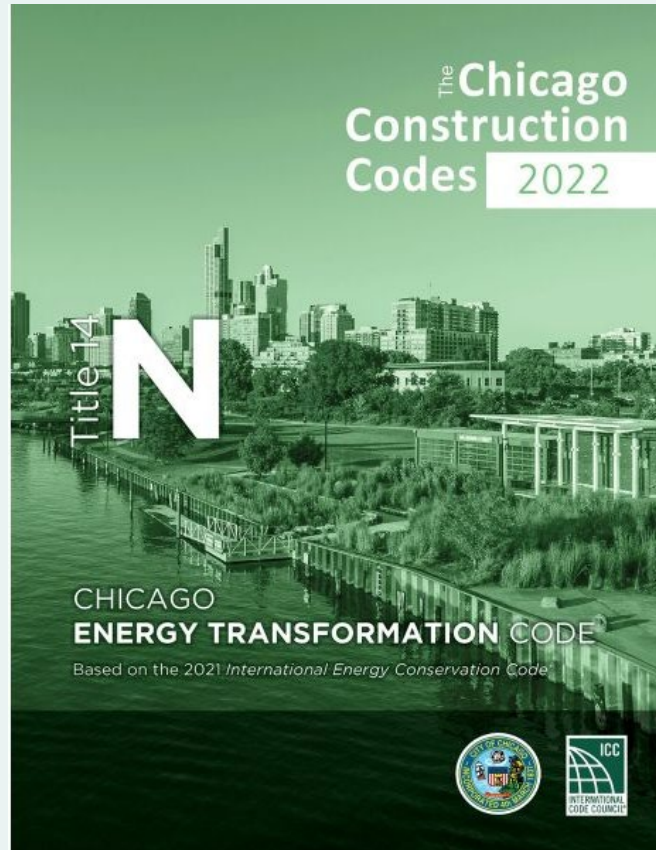
Privately Funded Commercial Facilities must comply with IECC per 20 ILCS 3125. See Subpart C of the [Illinois Energy Conservation Code](#) for more information. The 2021 edition of the IECC as amended went into effect on 1/1/24.

Residential Buildings must comply with IECC per 20 ILCS 3125. See Subpart D of the [Illinois Energy Conservation Code](#) for more information. The 2021 edition of the IECC as amended went into effect on 1/1/24.

- 2021
 - [Illinois Specific Amendments](#)
 - [Illinois Specific Amendments with Modifications Shown](#)

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

Access to Chicago Energy Transformation Code



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

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:

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

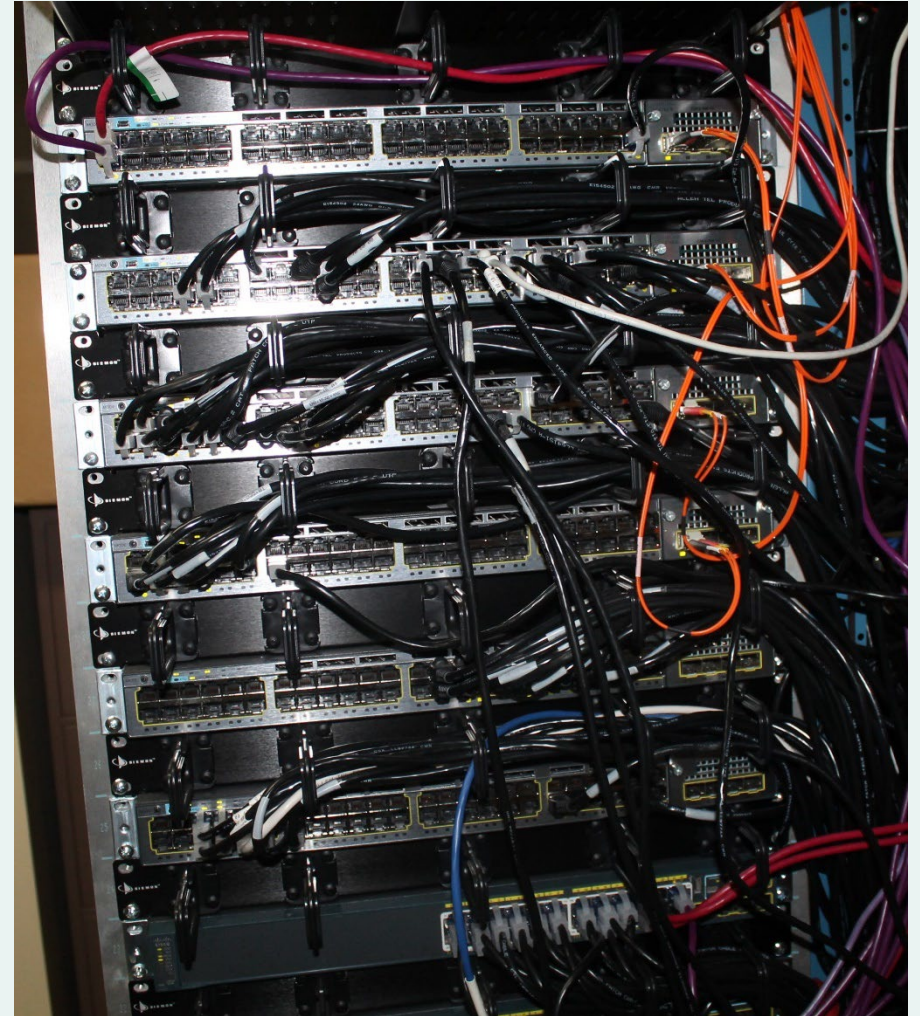
Learning Objectives

1. Identify key changes between the 2018 IECC and 2021 IECC.
2. Identify how compliance with the Illinois Energy Conservation Code will lead to safer buildings.
3. Improve compliance with the updated Illinois Energy Conservation Code for commercial buildings to reduce pollution.
4. Describe the Illinois Amendments to the 2021 IECC for commercial buildings and their impact on compliance.

Commercial: Definitions

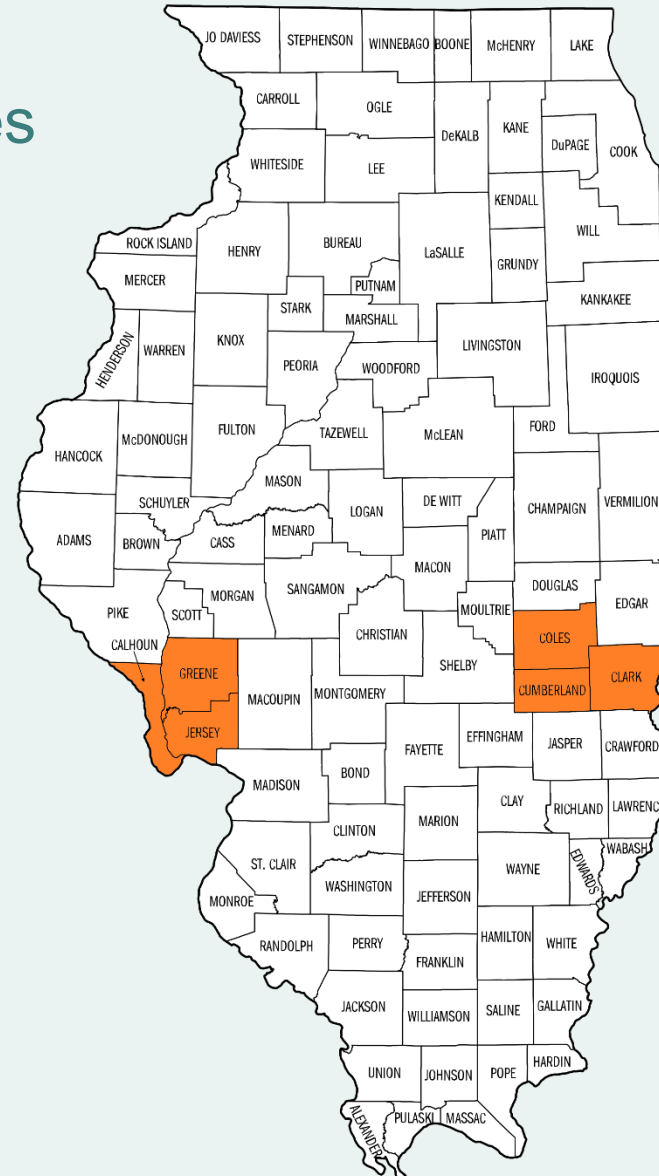
- **Equipment Building:** equipment power ≥ 7 watts/SF (C402.1.2)
- **Computer Room:** ≤ 20 watts/SF or ≤ 10 kW ITE load total (C202)
- **Data Center:** > 20 watts/SF or > 10 kW ITE load total (Uses ASHRAE 90.4) (C202)

ITE = Information Technology Equipment



Climate Zones

- Counties moved to warmer climate zones (5A to 4A)
 - Calhoun
 - Clark
 - Coles
 - Cumberland
 - Greene
 - Jersey



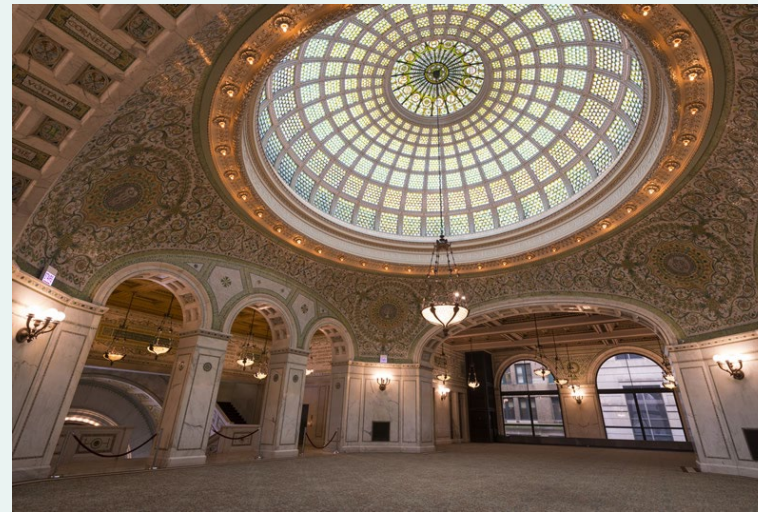
Commercial: Envelope

Building Exemptions from Illinois Energy Code

- Exempt from locally adopted building code
- Doesn't contain conditioned space
- Buildings without comfort conditioning
- Listed historic buildings
- Buildings specified in IECC



Image source: <https://www2.illinois.gov/sites/agr/Pages/default.aspx>



Certificate Requirements



Commercial Thermal Envelope Certificate

Name of Designer/Builder: _____ Location (address): _____

Energy Code Edition: _____

2021 IECC: Yes No Permit Date: _____

ASHRAE 90.1-2019 Yes No Permit #: _____

Other (please indicate): _____ Building Area (sf): _____

1. Insulation Rating

Designation	R-Value <small>(per assembly)</small>	% <small>(of component)</small>	R-Value <small>(area-weighted average)</small>
Ceiling/Roof	_____	_____	_____
Walls (Above Grade)	_____	_____	_____
(Above Grade)	_____	_____	_____
(Below Grade)	_____	_____	_____
(Below Grade)	_____	_____	_____
Floors/Slabs	_____	_____	_____
Ducts (Unconditioned space)	_____	_____	_____
(Outdoor ducts)	_____	_____	_____

2. Fenestration Rating

Designation	NFRC U-Factor <small>(per assembly)</small>	NFRC SHGC <small>(of component)</small>	% <small>(of component)</small>	NFRC U-Factor <small>(area-weighted average)</small>	NFRC SHGC <small>(area-weighted average)</small>
Window	_____	_____	_____	_____	_____
Opaque door	_____	_____	_____	_____	_____
Skylight	_____	_____	_____	_____	_____

3. Air Leakage Test Results

Blower door _____ cfm/sf/ 75 Pa. Test date: _____ Tested by: _____

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 Smart Energy Design Assistance Center, 1 St Mary's Road, Champaign, IL 61820

- R-values of insulation for: roofs, walls, foundations and slabs, basement walls, crawlspace walls and floors, and ducts outside conditioned space
- U-factors and SHGC of fenestration
- Results from building envelope air leakage testing

Certificate template is available at

www.smartenergy.illinois.edu/energy-code

Greenhouses

1. Opaque envelope assemblies must comply with C402.2 (insulation) and C402.4.5 (air sealing)
2. Internal partitions between greenhouse and other conditioned space must comply with C402.2, C402.4.3 and C402.4.5
3. Fenestration in compliance with Table C402.1.1.1

Component	U-Factor
Skylight	0.5
Vertical Fenestration	0.7



Equipment Buildings

- Floor area not more than **1,200 sf**
- House electric equipment ≥ 7 W/sf & not intended for human occupancy
- Heating system capacity $\leq 17,000$ Btu/hr w/ setpoint restricted to 50°F or less
- Average wall and roof U-factor of less than 0.200 in CZ 1-5

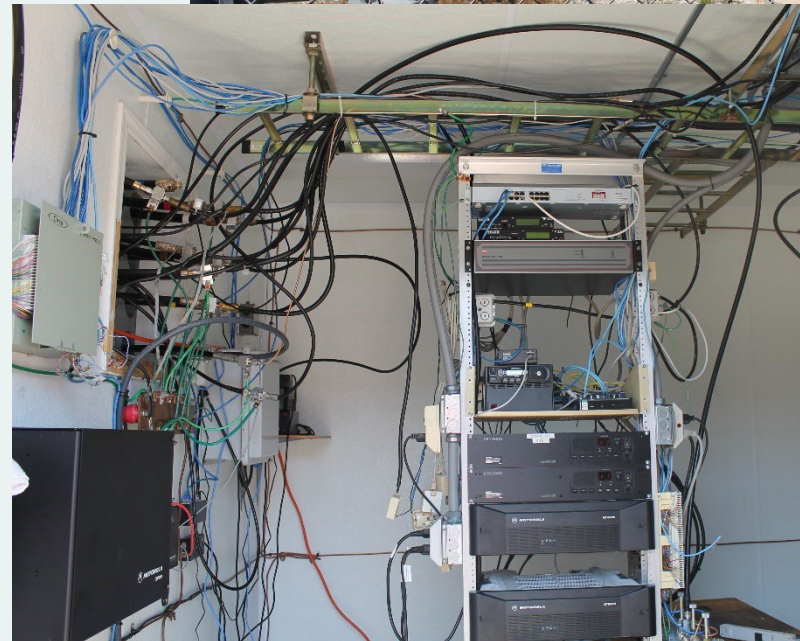


Table
C402.1.3

Excerpts: Insulation Component Min. R-Values

Climate Zone & Group	Roofs			Walls				
	Above Deck	Metal Building	Attic/ Other	Mass	Metal Building	Metal Framed	Wood Framed	Below Grade
CZ 4 Other	R-30 ci	R-19 + R-11 LS	R-49 (R-30)	R-9.5ci	R-13 + R-13ci	R-13 + R-7.5ci	R-13 + R-3.8ci or R-20	R-7.5 ci
CZ 4 Group R	R-30 ci	R-19 + R-11 LS	R-49 (R-30)	R-11.4ci	R-13 + R-14ci (+R-13ci)	R-13 + R-7.5ci	R-13 + R-3.8ci or R-20	R-10ci (R-7.5ci)
CZ 5 Other	R-30 ci	R-19 + R-11 LS	R-49 (R-30)	R-11.4ci	R-13 + R-14ci (+R-13ci)	R-13 + R-10ci (+R-7.5ci)	R-13 + R-7.5ci or R-20 + R-3.8ci (R-13 + R-3.8ci or R-20)	R-7.5 ci
CZ 5 Group R	R-30 ci	R-19 + R-11 LS	R-49	R-13.3ci	R-13 + R-14ci (+R-13ci)	R-13 + R-10ci (+R-7.5ci)	R-13 + R-7.5ci or R-20 + R-3.8ci	R-10 ci (R-7.5ci)

Values are 2021 IECC requirements.

Original 2018 IECC values in white text (R-value)

Table
C402.1.3

Excerpts: Insulation Component Min. R-Values

Climate Zone & Group	Floors			
	Mass	Joist /Framed	Unheated Slab	Heated Slab*
4 Other	R-14.6ci (R-10ci)	R-30	R-15 24" below (R-10 24")	R-15 24" below grade + R-5 under
4 Group R	R-16.7ci (R-10.4ci)	R-30	R-15 24" below (R-10 24")	R-15 24" below grade + R-5 under
5 Other	R-14.6ci (R-10ci)	R-30	R-15 24" below (R-10 24")	R-15 36" below grade + R-5 under
5 Group R	R-16.7ci (R-12.5ci)	R-30	R-20 24" below (R-10 24")	R-15 36" below grade + R-5 under

*Note for heated slab-on-grade, insulation is permitted to stop at bottom of slab

Required non-swinging door insulation slightly reduced and moved to U-factor table.

Tapered Roof Assembly

- **Average R-value** can be used for tapered deck insulation (C402.2.1.1)
- Min. thickness shall be 1" (C402.2.1.2)
- Min. of 2 staggered layers except at gutter edge, drain, or scupper (C402.2.1.4)
- C402.1.4.1.1 sets comparable requirements for U-factor compliance

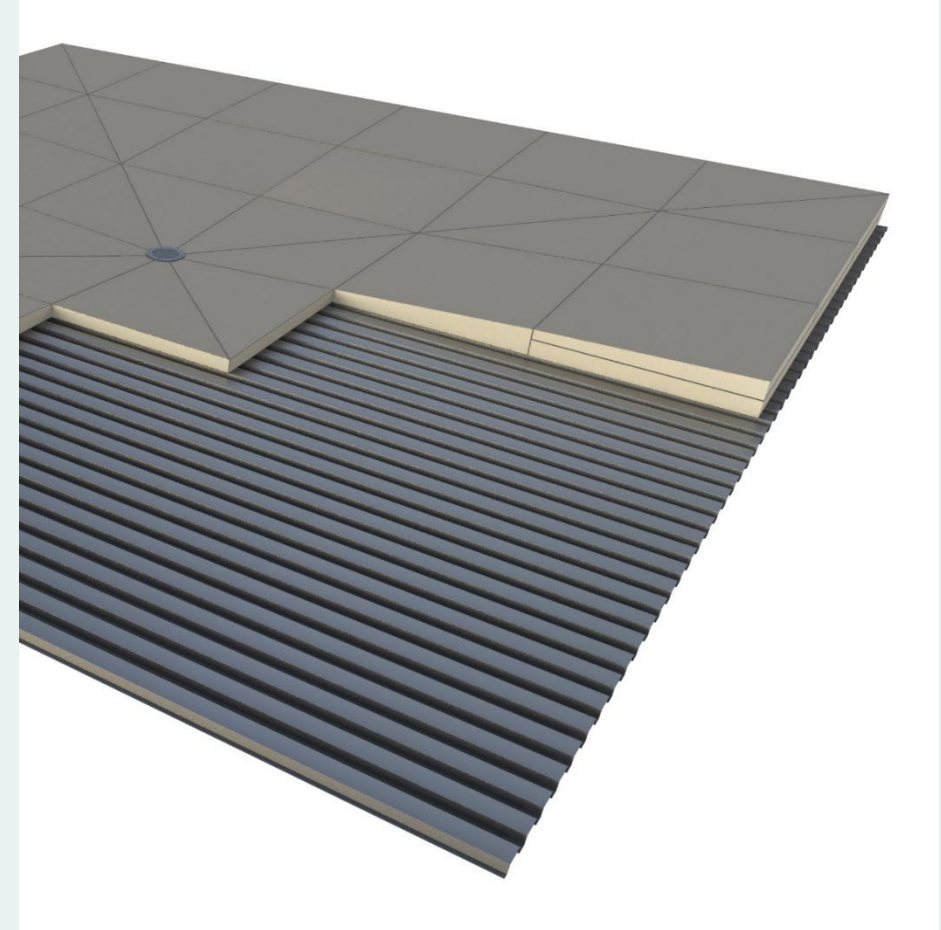


Image courtesy of PIMA

Skylight Minimum Exception

- Excludes spaces designated as storm shelters designed in accordance with ICC 500

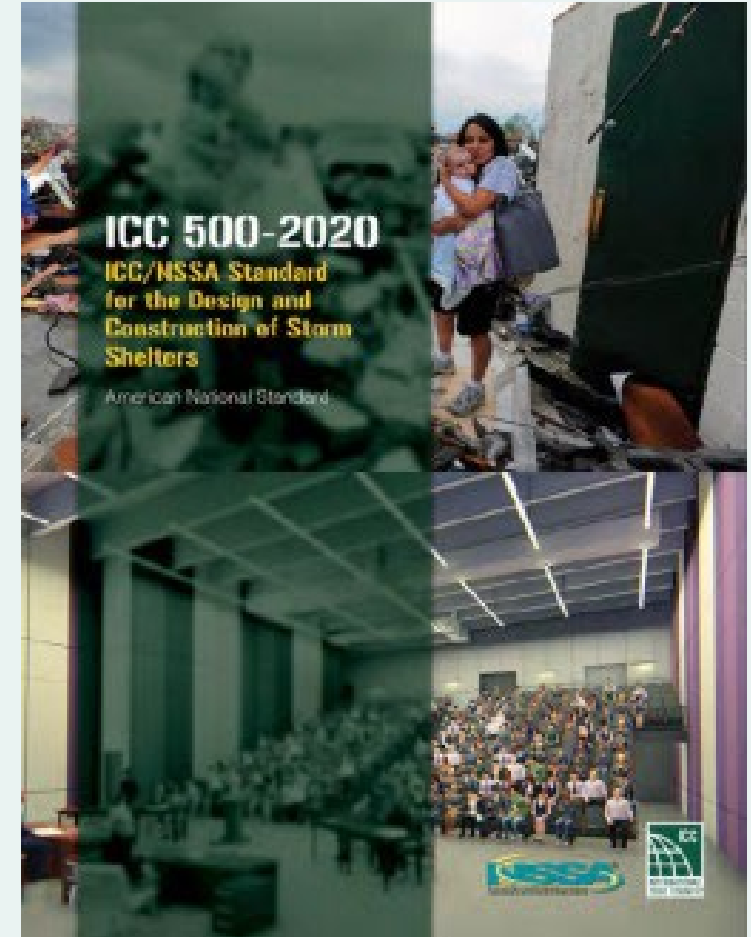


Image courtesy of ICC

Table
C402.4

Fenestration Max. U-Factor & SHGC Requirements

2018 IECC

CLIMATE ZONE	4 EXCEPT MARINE	5 AND MARINE 4		
Vertical Fenestration				
U-Factors				
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-Factors				
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		



Buildings with more east/west fenestration than north/south fenestration have increased performance criteria determined by following:

$$A_{W \text{ or } E} \leq A_T/4$$

OR

$$A_{W \text{ or } E} * SHGC_{W \text{ or } E} \leq (A_T * SHGC_C)/5$$

Area west/east/total
SHGC west/east/code table C402.4
value



Minimum Skylight Area

Same required toplit areas as 2018, but determination updated:

1. VT not less than 0.40 **OR** VT_{annual} **not less than 0.26**
2. Effective aperture:
 1. 1% using VT for standard skylights
 2. **0.66% using Tubular Daylight VT_{annual}**

Update accounts for differences in traditional vs tubular daylight systems

Similar minor updates made throughout C402.4 to account for tubular daylight devices

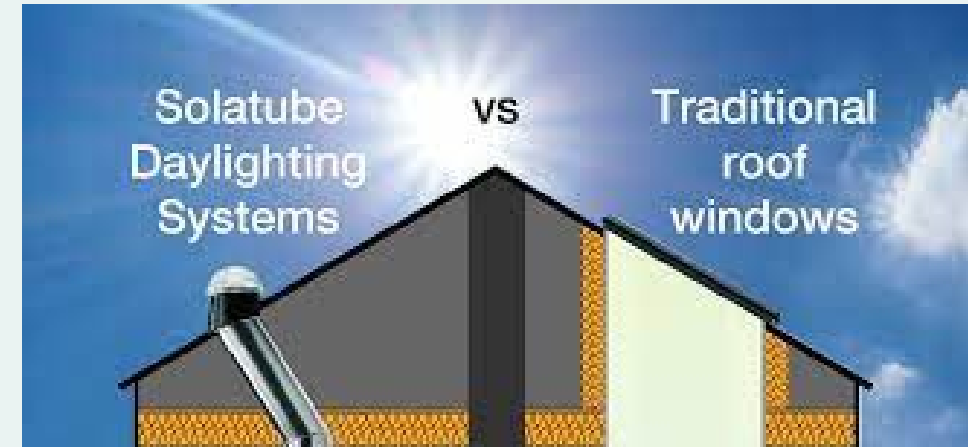


Image source: <https://www.solatubesouth.co.uk/solatube-vs-roof-windows/>

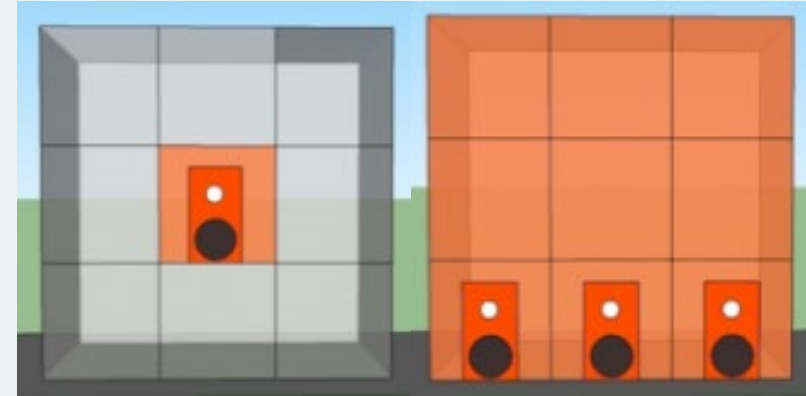
Air Barrier Compliance

- Buildings or spaces including Group R & I occupancies shall meet C402.5.2:
Dwelling & sleeping unit enclosure testing (C402.5.2)
- Buildings or spaces other than Group R & I occupancies shall meet C402.5.3:
Building thermal envelope testing (C402.5.3)
- No exceptions for Climate Zones 4A or 5A
- **ALL COMMERCIAL BUILDINGS IN IL MUST BE PRESSURE TESTED**



Dwelling & Sleeping Unit Enclosure Testing

- Measured air leakage not to exceed **0.30 cfm/sf** of testing unit enclosure area @ **0.2 inch water gauge (50 Pa)**
- For multiple units within single thermal envelope, test individual units and use envelope area-weighted average.
- Units tested separately with unguarded blower door test
 - Test all if <8 units, test 20% (7 min) if >8 units
 - Sample to include a top floor, ground floor, and unit with the largest enclosure area).
 - Each unit not in compliance requires 2 additional units to be tested

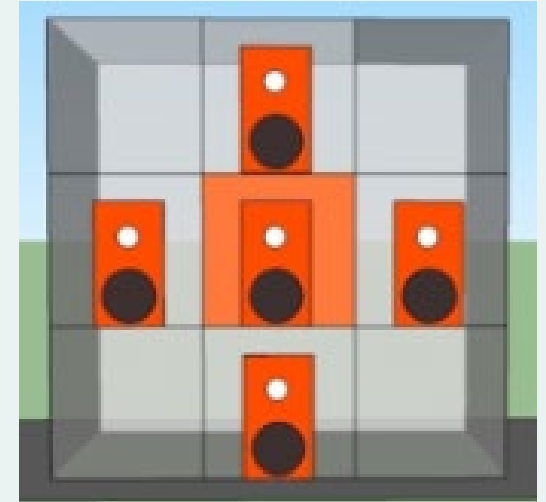


Unguarded and whole-building testing images
source:

<https://www.greenbuildingadvisor.com/article/testing-air-leakage-in-multifamily-buildings>

Building Envelope Pressure Testing

- Measured leakage ≤ 0.40 cfm/sf of thermal envelope area @ 0.3 inch water gauge (75 Pa) for whole building test.
- Alternative sampling approach for larger buildings:
 - Area-weighted average can't exceed whole building leakage limit
 - Required testing samples:
 - Entire envelope area of spaces directly under a roof and with entrance, exposed floor, loading dock, or below grade
 - 25% or more representative sample of remaining envelope
- If total leakage **between 0.40 cfm/sf and 0.60 cfm/sf**, allowed to complete diagnostic testing and non-destructive remediation **without additional testing**.
 - Must submit report of corrective actions



Guarded image source:
<https://www.greenbuildingadvisor.com/article/testing-air-leakage-in-multifamily-buildings>

Operable Openings Interlock

- Conditioned space with a door opening >40 sq ft to the outdoors shall be provided with controls that change HVAC settings when door is opened:
- Disable heating or lower setpoint to 55 F (or lower)
- Disable cooling or raise setpoint to 90 F (or higher)
- within 10 min of door opening



Photo Courtesy of Control By Web



Additional Efficiency Requirements

SECTION
C406.2.1: 5% heating efficiency improvement
C406.2.2: 5% cooling efficiency improvement
C406.2.3: 10% heating efficiency improvement
C406.2.4: 10% cooling efficiency improvement
C406.3: Reduced lighting power
C406.4: Enhanced digital lighting controls
C406.5: On-site renewable energy
C406.6: Dedicated outdoor air
C406.7.2: Recovered or renewable water heating
C406.7.3: Efficient fossil fuel water heater
C406.7.4: Heat pump water heater
C406.8: Enhanced envelope performance
C406.9: Reduced air infiltration
C406.10: Energy monitoring
C406.11: Fault detection and diagnostics system

- Formerly (2018), choose 1 measure
- **Now (2021), collect 10 points (~2.5% savings)**
- Point Value Tables based on Occupancy Group

C406.8 (enhanced envelope) offers 1-10 credits, depending on climate zone and occupancy group

C406.9 (reduced infiltration) offers 0-11 credits, depending on climate zone and occupancy group

Additional Efficiency Measures (need 10 pts)

Section – Climate Zone (Group)	4A (B)	5A (B)	4A (R & I)	5A (R & I)	4A (E)	5A (E)
5% heat improvement	NA	1	1	1	1	1
10% heat improvement	3	2	1	1	2	1
5% cooling improvement	NA	2	1	2	2	3
10% cooling improvement+	5	4	2	1	4	2
Reduced lighting power+	8	7	2	2	8	8
Enhanced lighting controls	2	2	N/A	N/A	2	2
On-site renewable energy+	9	9	7	7	6	6
Dedicated outdoor air	5	5	6	8	N/A	N/A
Recovered/renewable water heat	N/A	N/A	14	14	1	1
Efficient water heater	N/A	N/A	8	9	2	2
Heat pump water heater	N/A	N/A	5	5	1	1
Enhanced envelope performance	7	10	4	4	1	2
Reduced air infiltration	8	11	7	9	N/A	1
Energy monitoring	3	2	1	1	2	2
Fault detection and diagnostics	1	1	1	1	1	1

12. HVAC demand responsive controls and more efficient HVAC performance in accordance with Section C406.2 and Section C406.13.
13. Water heating demand responsive controls and high-efficiency service water heating in accordance with Section C406.7 and Section C406.14.

Modify Table C406.1(1) as follows:

Table C406.1(1) Additional Energy Efficiency Credits for Group B Occupants

Climate Zone:	4A	5A
C406.13 HVAC demand responsive controls	2	2
C406.14 Water heating demand responsive controls	1	1

Illinois Amendments added (2) additional options

C406.13 (Demand responsive HVAC controls) offers 2-4 credits, depending on climate zone and occupancy group

C406.14 (Demand responsive water heating controls) offers 0-2 credits, depending on climate zone and occupancy group

Refer to Illinois Amendments



Commercial: HVAC

2018 IECC fault detection and diagnostics was only required on economizer systems

- High energy impacts if system is not working properly

Now, if 100,000 sf or larger facility, whole HVAC system required to have FDD system

- Permanently installed sensors monitoring HVAC performance
- Sample HVAC system performance on 15min intervals
- Automatically identify and report faults
- Automatically notify authorized personnel
- Automatically prioritize recommended repairs based on data analysis
- Transmit prioritized recommendations to remote personnel

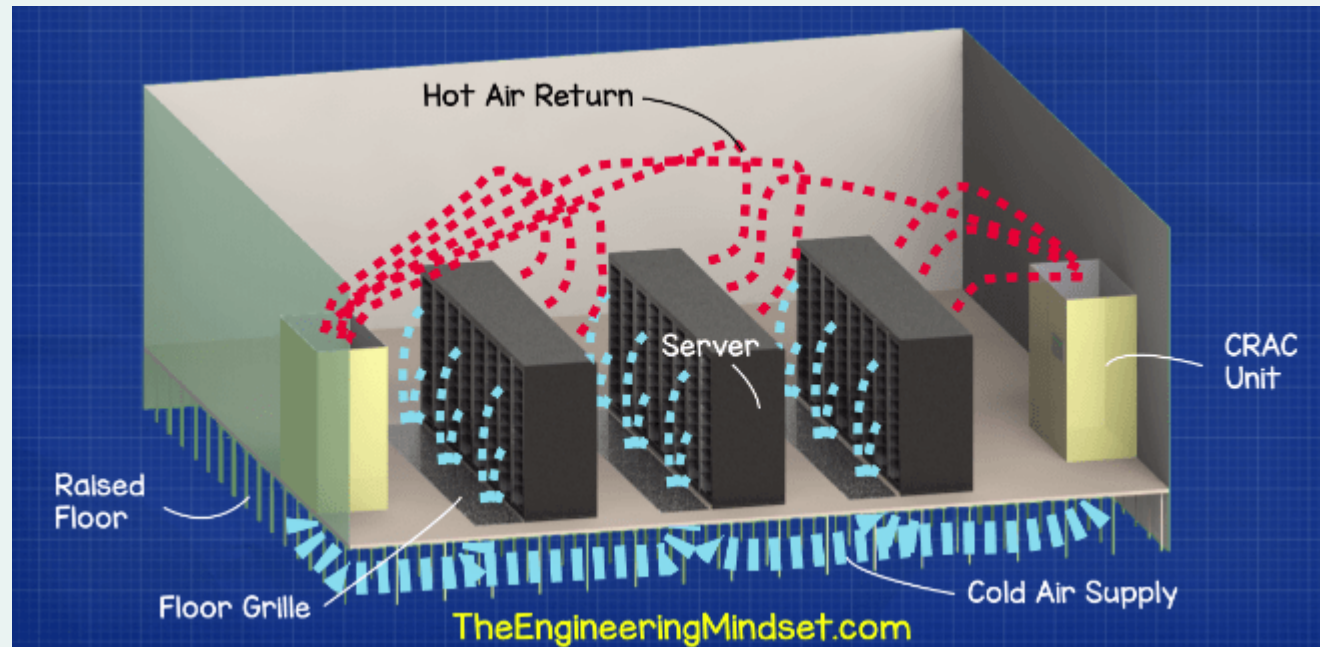
R1 & R2 occupancies are excepted.

Equipment Sizing

2018 IECC sizing language is maintained for most equipment

2021 IECC adds details on sizing for Data Center HVAC systems

- Must comply using modified ASHRAE 90.4 Sections 6 and 8
- HVAC component minimum efficiencies added to tables in section C403.3.2 HVAC equipment performance requirements



New Information!

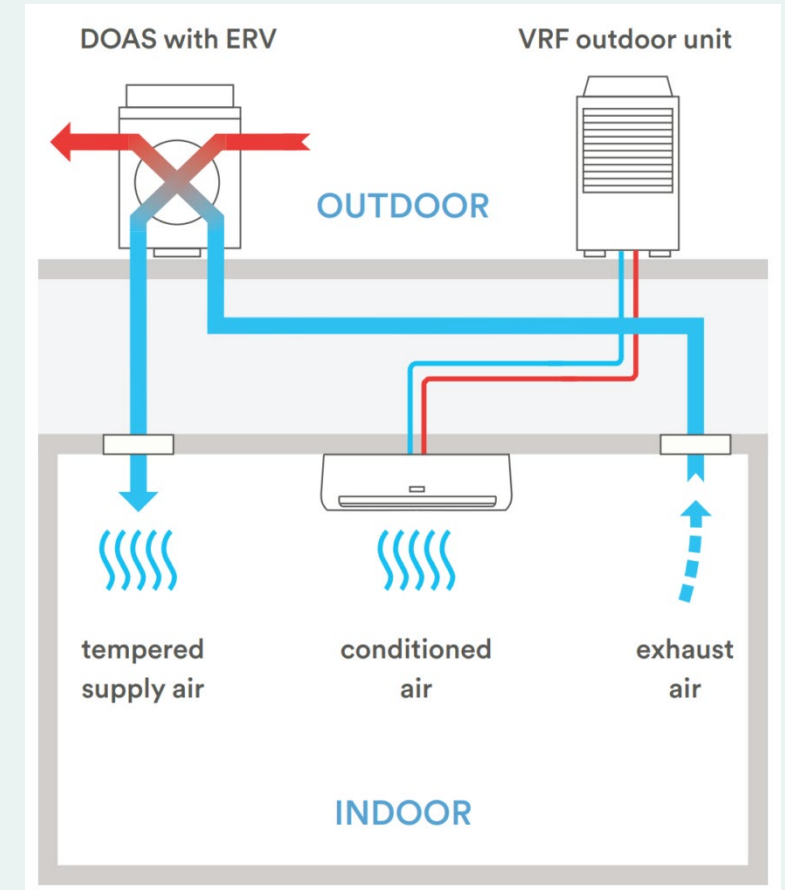
Added minimum efficiency tables for:

- VRF systems
- Indoor pool dehumidifiers
- Dedicated outdoor air systems
- Heat pump and heat recovery chillers

Clarifications

Expanded or separated out table content for:

- Computer room air conditioners and condensing units
 - Floor mounted
 - Ceiling mounted
- Water-source heat pumps



- Unitary Air Conditioners or Heat Pumps
 - Increased efficiency and/or new testing standard (SEER to SEER2, HSPF to HSPF2, etc...)
- Gas-fired warm air furnaces

Note: SEER2/HSPF2/COP2 ratings should result in slightly higher value for equivalent older rating.



Image source: USNews.com

Supplemental Heat Controls

- Heat pumps w/ supplemental electric resistance elements shall limit use only to times when one of the following apply:
 - Vapor compression cannot provide adequate heat
 - Heat pump is in defrost mode
 - Vapor compression malfunctions
 - Thermostat malfunctions

2018 stated “allowed when heat pump compressor can not meet heating load”

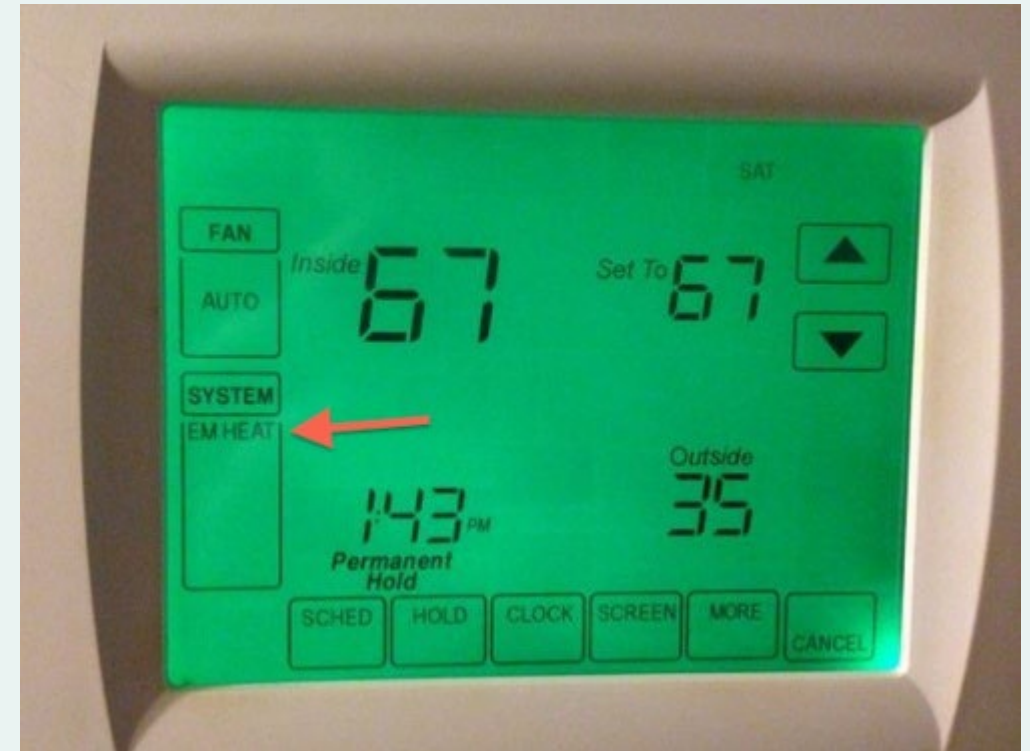


Image source: energyvanguard.com

Heat Pump Isolation

- Water source heat pump loops 10kW and larger require 2 position automatic valves **interlocked with compressor**

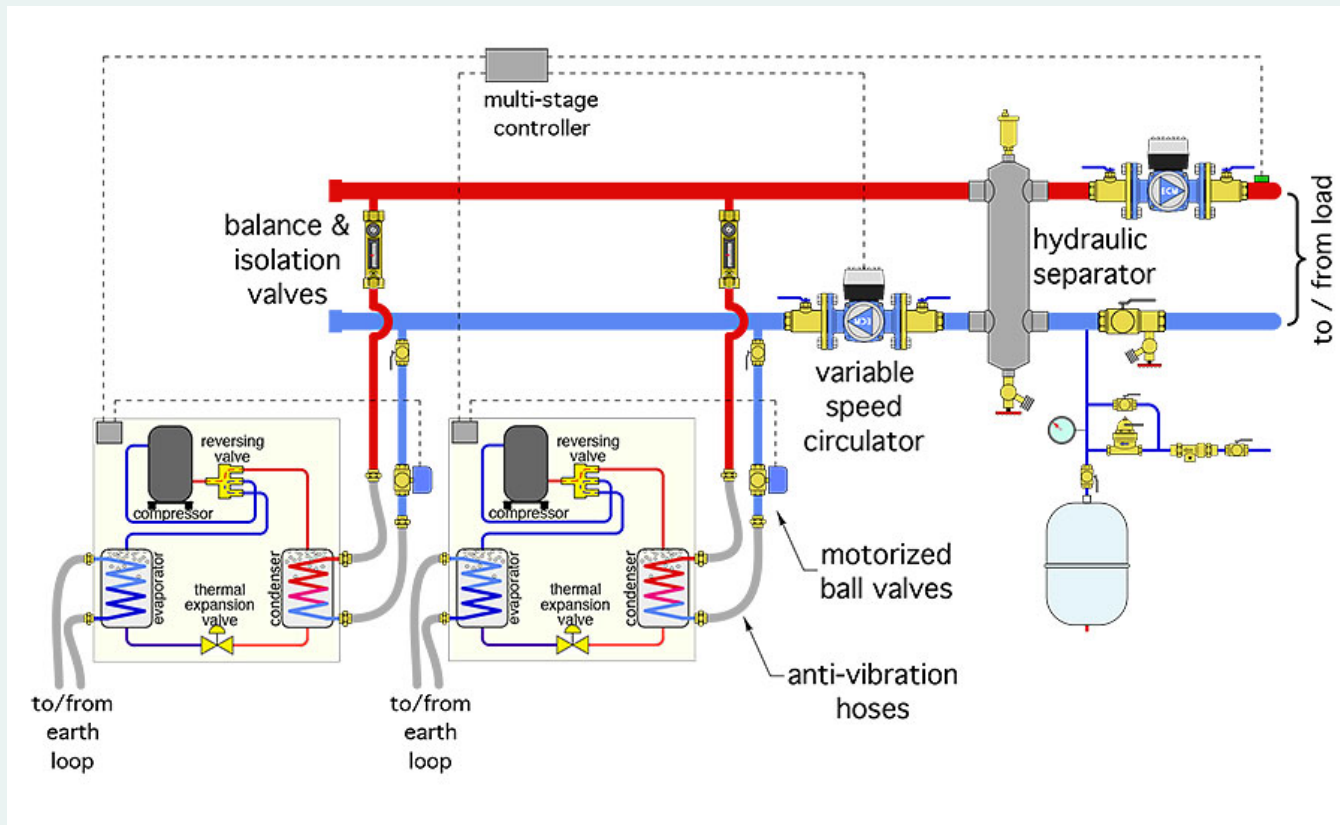
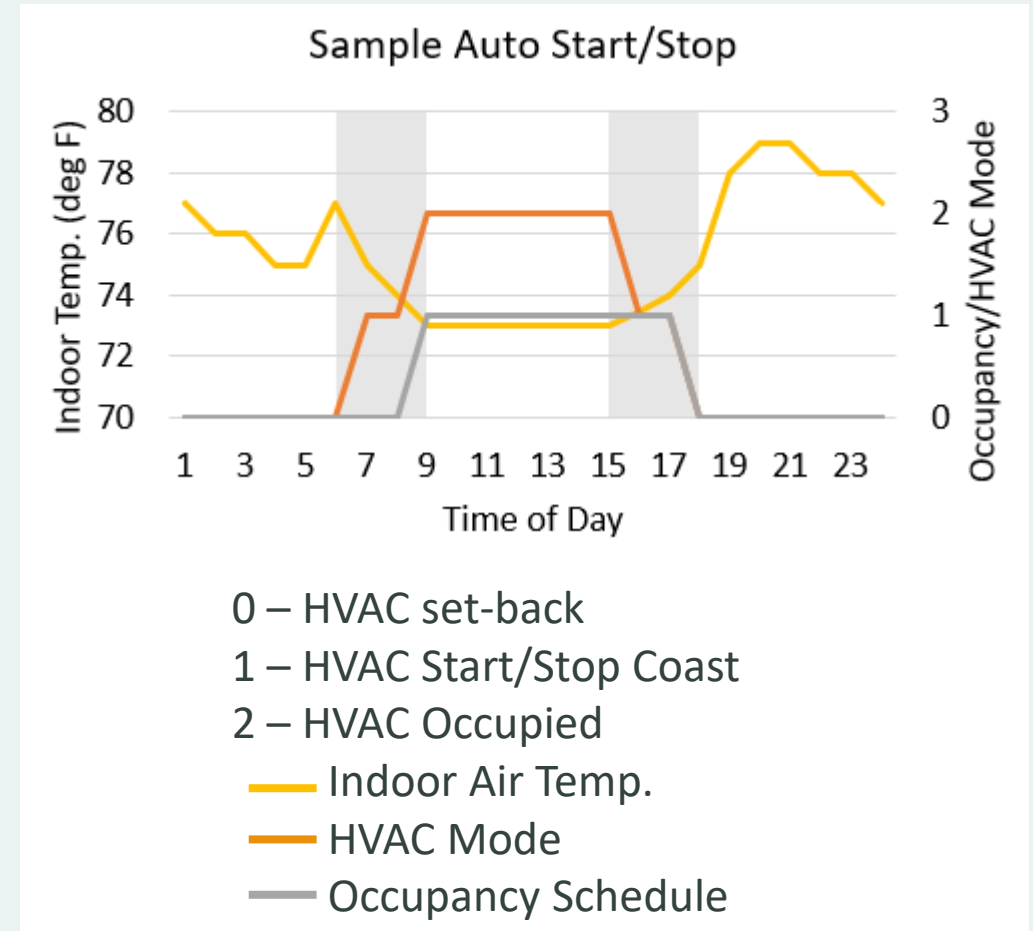


Image source: John Siegenthaler, Pmmag.com

Automatic Start/Stop

- Automatic **START** and **STOP**
 - Auto-start was 2018 requirement
 - Weather-adjusted HVAC start so building is at comfort conditions by time of occupancy
 - Auto-stop **added** for 2021
 - Not same as auto-off/set-back!
 - Sets back thermostats 2 degrees before scheduled unoccupancy to allow slow drift before occupants leave.



- C405.3 Exceptions added for VRF systems
 7. Economizers not required for VRF systems with a DOAS

Frequent question last year as code did not explicitly address VRF+DOAS systems.

Previously, economizer might have been required for VRF-DOAS due to more vague language

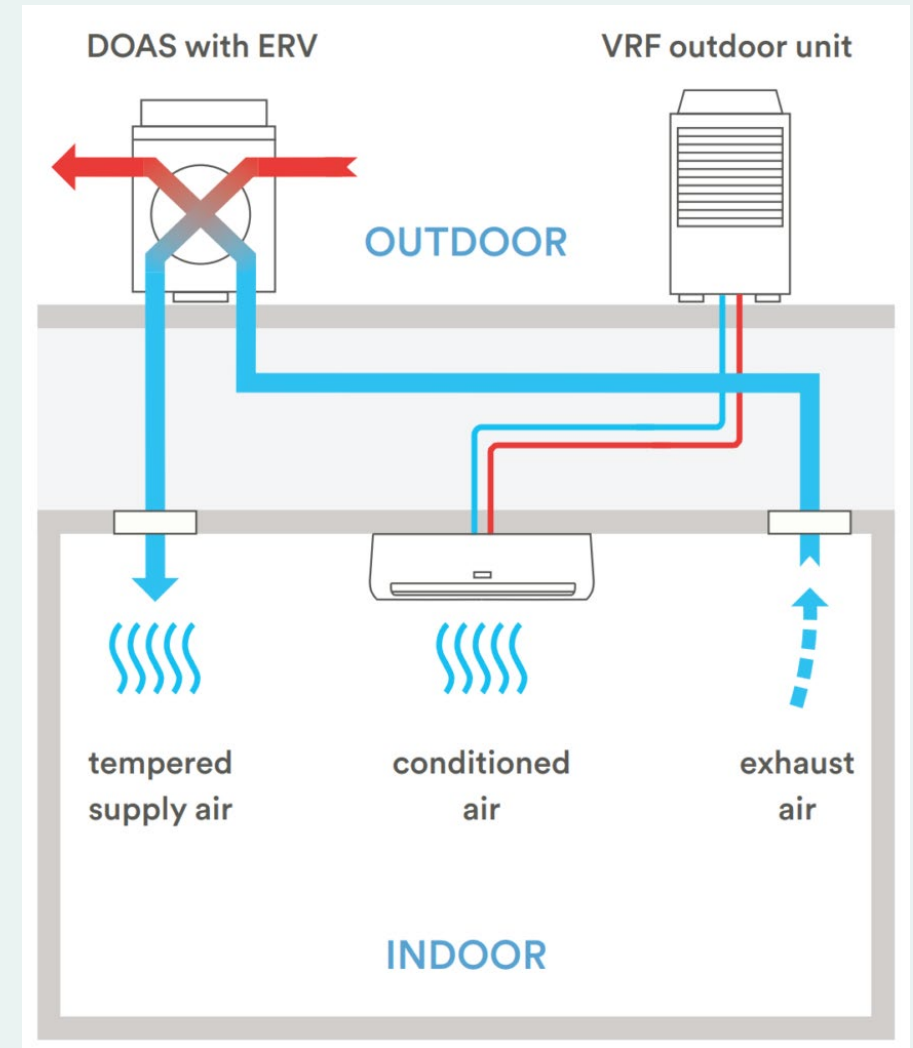


Image source: be-exchange.com

Demand Control Ventilation (DCV)

2018 required DCV for spaces greater than 500sf with average occupant density of **25 ppl/1,000sf** or more.

2021 IECC updated to require for occupant density of **15ppl/1,000sf or more**

All other requirements unchanged

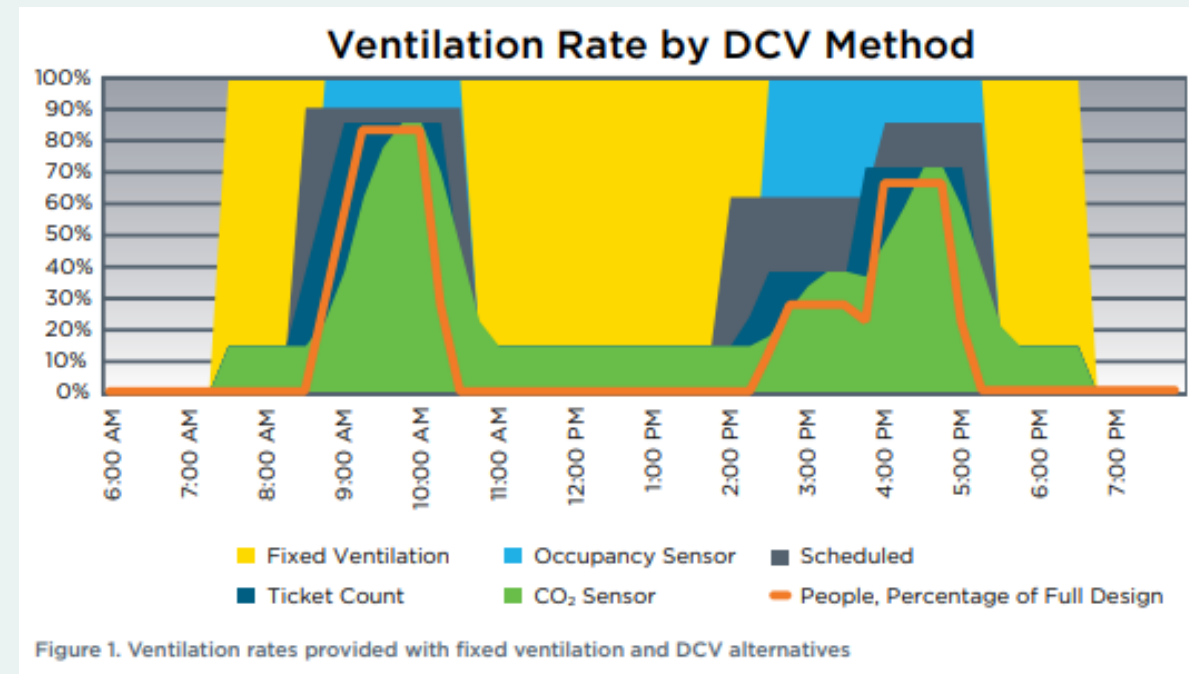
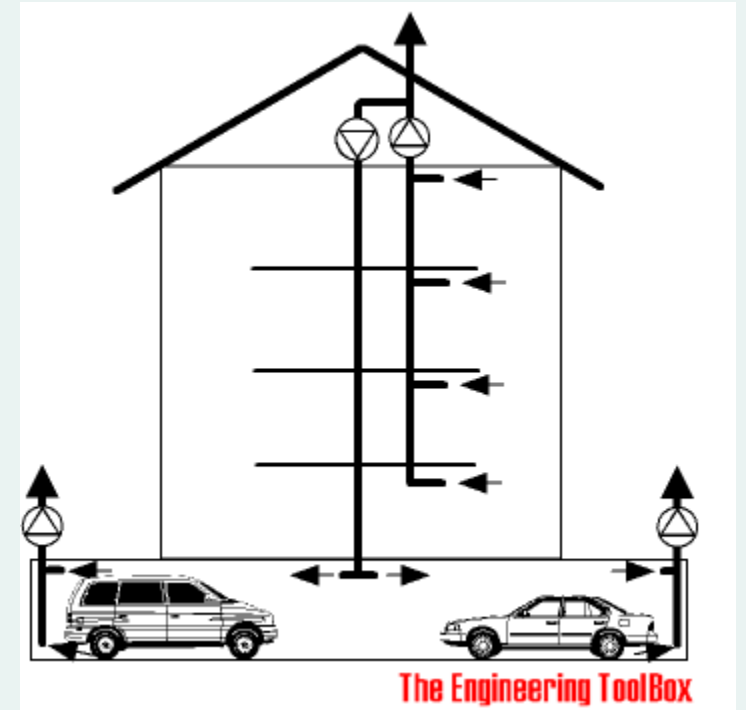


Image Source: Energycodes.gov

Exceptions for parking garage ventilation have been made more stringent

- 2018 exception allowed for garage with total exhaust capacity of **22,500 cfm or less** that does not use mechanical heating.
- 2021 updates to **8,000 cfm or less**

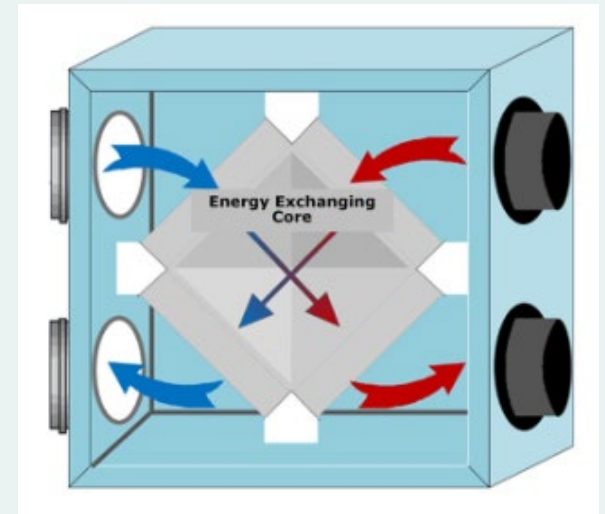


C403.7.4.1 Non-transient Dwelling Units

- Enthalpy recovery of 50% cooling design and 60% heating design
- The cooling enthalpy recovery ratio is excepted for Climate Zones 4 & 5
 - Best performance on cooling side with heating meeting 60% enthalpy recovery ratio.

C403.7.4.2 All Other Spaces

- Tables & Exceptions unchanged from 2018 IECC



- Minimum airflow requirements in Tables C403.7.4.2 (1) & (2) unchanged

Fan Efficiency

Now Uses Fan Energy Index

1.00 or higher

VAV fans can have FEI of 0.95

Exclusions for smaller fans/arrays,
ceiling fans, high temperature fans,
fans used in explosive atmosphere,
and emergency fans

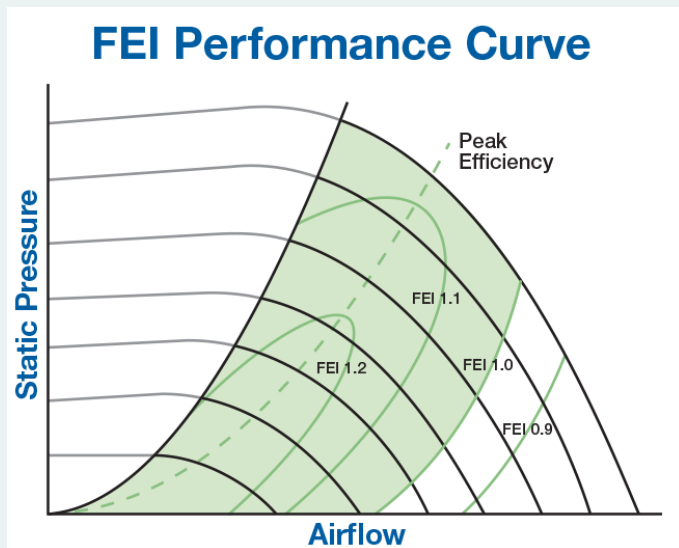


Photo Courtesy of Greenheck

Low-capacity ventilation fan efficacy

- For mechanical ventilation system fans less than 1/12 hp
 - Excludes ventilation fans as a component of a listed heating or cooling appliance
 - Dryer exhaust & range hoods that operate intermittently

Fan Location	Airflow Rate (CFM)	Minimum Efficacy (CFM/watt)
HRV or ERV	Any	1.2
In-line Fan	Any	3.8
Bathroom, utility room	10 to <90	2.8
Bathroom, utility room	90+	3.5

Additional Efficiency Requirements

SECTION
C406.2.1: 5% heating efficiency improvement
C406.2.2: 5% cooling efficiency improvement
C406.2.3: 10% heating efficiency improvement
C406.2.4: 10% cooling efficiency improvement
C406.3: Reduced lighting power
C406.4: Enhanced digital lighting controls
C406.5: On-site renewable energy
C406.6: Dedicated outdoor air
C406.7.2: Recovered or renewable water heating
C406.7.3: Efficient fossil fuel water heater
C406.7.4: Heat pump water heater
C406.8: Enhanced envelope performance
C406.9: Reduced air infiltration
C406.10: Energy monitoring
C406.11: Fault detection and diagnostics system

- Formerly (2018), choose 1 measure
- **Now (2021), collect 10 points (~2.5% savings)**
- Point Value Tables based on Occupancy Group

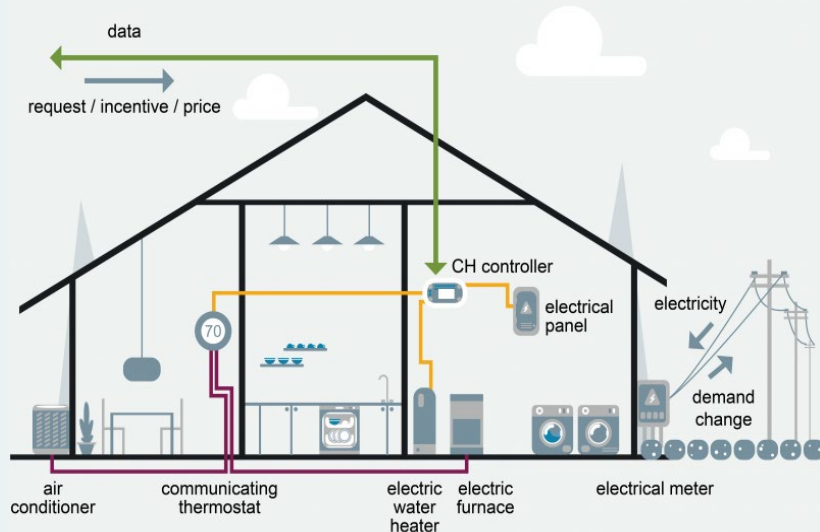
IL Amendments:

- Grid Integrated HVAC controls
- Grid integrated water heating controls

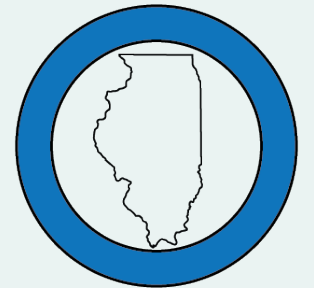


Grid integrated HVAC controls

- Automatically increasing zone cooling setpoint by 1°F to 4°F
- Automatically decreasing zone heating setpoint by 1°F to 4°F
- Both ramp-up and ramp-down logic to prevent peak demand from exceeding that expected without the demand response (DR) implementation



- DHW 40-120 gallons with input rating 12W or less shall also have DR controls meeting one of two protocols
- Credits range from 2-4 for HVAC
- Credits range from 0-2 for DHW



Additional Efficiency Measures (need 10 pts)

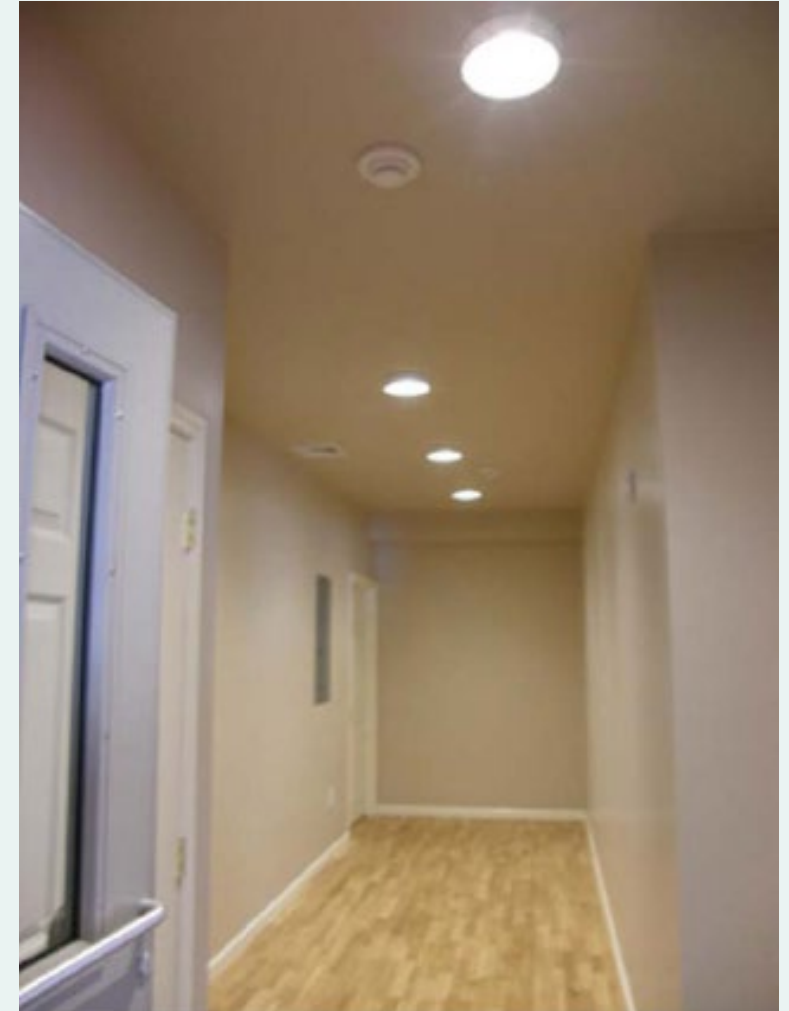
Section – Climate Zone (Group)	4A (B)	5A (B)	4A (R & I)	5A (R & I)	4A (E)	5A (E)
5% heat improvement	NA	1	1	1	1	1
10% heat improvement	3	2	1	1	2	1
5% cooling improvement	NA	2	1	2	2	3
10% cooling improvement+	5	4	2	1	4	2
Reduced lighting power+	8	7	2	2	8	8
Enhanced lighting controls	2	2	N/A	N/A	2	2
On-site renewable energy+	9	9	7	7	6	6
Dedicated outdoor air	5	5	6	8	N/A	N/A
Recovered/renewable water heat	N/A	N/A	14	14	1	1
Efficient water heater	N/A	N/A	8	9	2	2
Heat pump water heater	N/A	N/A	5	5	1	1
Enhanced envelope performance	7	10	4	4	1	2
Reduced air infiltration	8	11	7	9	N/A	1
Energy monitoring	3	2	1	1	2	2
Fault detection and diagnostics	1	1	1	1	1	1

Commercial: Lighting

Dwelling Lighting Equipment (Mandatory)

Not less than 90% of the permanently installed fixtures shall contain only high-efficacy lamps

Different from Residential Building Provision



Occupant sensing controls are required in

1. Classrooms/lecture/training rooms
2. Conference/meeting/multi-purpose rooms
3. Copy/print rooms
4. Lounges/breakrooms
5. Enclosed offices
6. Open plan office areas
7. Restrooms
8. Storage rooms
9. Locker rooms
- 10. Corridors**
11. Other spaces 300 sf or less enclose by floor-to-ceiling height partitions
12. Warehouse storage areas



Occupant Sensor Control Function in *Warehouse*

- Must reduce lighting power by at least 50% when unoccupied. (within 20 min)
- Controls must cover aisles and open areas.
- Control for each aisleway shall be independent and shall not control beyond the aisleway.



1. Zones limited to 600 sf
2. Must reduce lighting power by at least 80% in a reasonably uniform pattern within 20 minutes after no occupancy
3. Turn off general lights in all zones within 20 minutes of occupants leaving
 - or reduce lighting to unoccupied setpoint of 20% or less
4. Daylight responsive controls may activate fixtures only if occupants present



Image from <https://www.focalpointlights.com>

Occupant Sensor Control Function in *Corridors*

1. Must reduce lighting power by at least 50% in a reasonably uniform pattern within 20 minutes after no occupancy

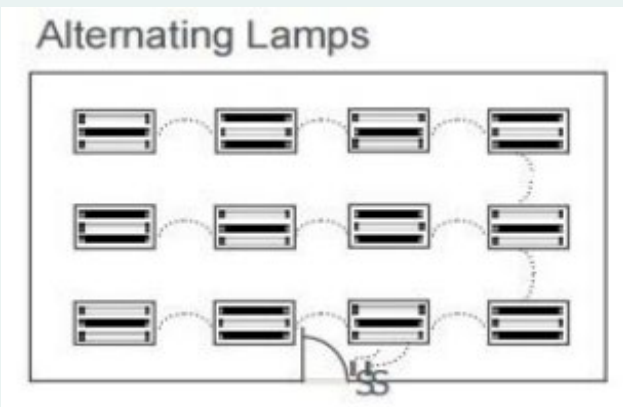
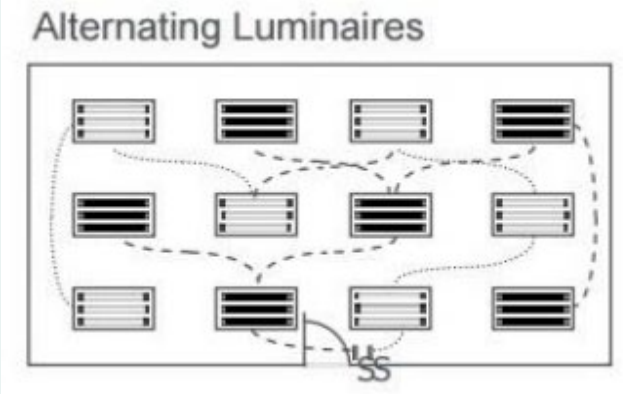
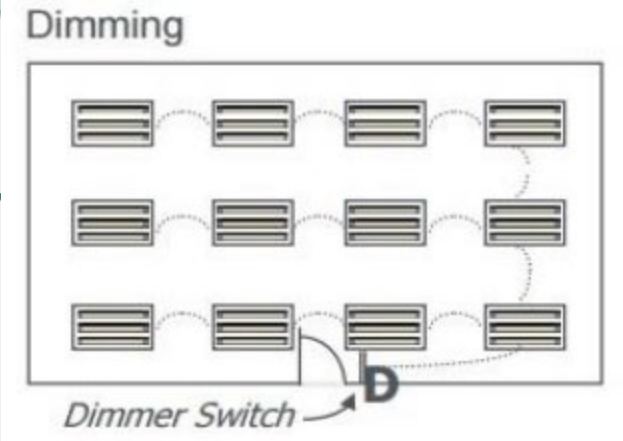
Exception for corridors with less than 2 fc on floor at darkest point with all lights on.



Image from <https://cltc.ucdavis.edu/adaptive-corridors>

Light-reduction Controls

1. Manual control to uniformly reduce lighting by at least 50%. **Include an intermediate step between 70% and 30% power or with continuous dimming control (min of 20% or less)**
 1. Control all lamps/luminaires
 2. Switching alternate rows or luminaires
 3. Switching inner/outer lamps
 4. Switching each lamp/luminaire
2. *Exceptions for:*
 1. Spaces with daylight responsive or special application controls
 2. Manually-controlled spaces with:
 1. Spaces with 1 luminaire rated less than 60 watts
 2. Spaces <0.45 watts/SF
 3. Corridors, lobbies, electrical / mechanical rooms



Daylight Controls

Daylight controls are largely the same as the 2018 IECC

EXCEPT:

Now incorporates primary and secondary daylight zone aligning IECC with ASHRAE 90.1

Note the exception to requiring daylighting (by reducing allowable lighting power per equation below) may be more enticing with added secondary zone control requirements:

$LPA_{adj} = LPA * (1 - 40\% * \text{uncontrolled daylight zone floor area} / \text{total building floor area})$



2021 IECC = Façade & Landscape Lighting

C405.2.7 Exterior Lighting Control

Exterior Lighting

C405.2.7.1

C405.2.7.3

C405.2.7.4

Decorative Lighting

C405.2.7.1

C405.2.7.2

C405.2.7.4

C405.2.7.1:
Daylight Shutoff

C405.2.7.2:
Façade & Landscape Lighting Shutoff

C405.2.7.3:
Lighting Setback

C405.2.7.4:
Time-switch Function

Parking Garage Lighting Controls

- Daylight responsive controls w/i 20 feet of perimeter wall openings to reduce lighting power by at least 50% (*exceptions may apply*)
- Occupant sensing to reduce lighting power by at least 30% within 20 minutes of inactivity (*excluding zones provided with less than 1.5 fc on the floor at the darkest point with all lights on*)
- Eye adaption zones to be controlled separately, reduce power by at least 50% from sunset to sunrise

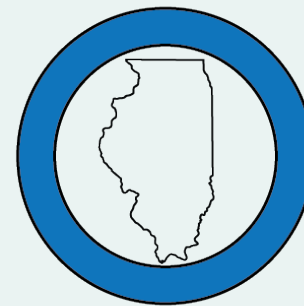


Lighting for Plant Growth

- All permanent installed luminaires shall have photon efficiency of not less than **1.7 $\mu\text{mol}/\text{J}$** per ANSI/ASABE S640 for greenhouses and **2.2 $\mu\text{mol}/\text{J}$** for all other indoor growing spaces
- *Exceptions* for buildings with no more than 40kW of aggregate horticultural lighting load and Cannabis facilities subject to 410 ILCS 705/10-45



Image courtesy of DOE



Automatic Receptacle Control

- At least 50% of receptacles in all enclosed offices, conference rooms, rooms used primarily for print and/or copy functions, break rooms, classrooms, and individual workstations.
- At least 25% of *branch circuit* feeders installed for modular furniture not shown on the *construction documents*.

Time of day basis, occupant, or control signal based



Image by Leviton

Measurement devices shall be installed in new *buildings* to monitor the electrical *energy* use for:

- a. HVAC systems
- b. Interior lighting
- c. Exterior lighting
- d. Receptacle circuits
- e. Large process loads
- f. Building operations/Misc





Questions?

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800-214-7954