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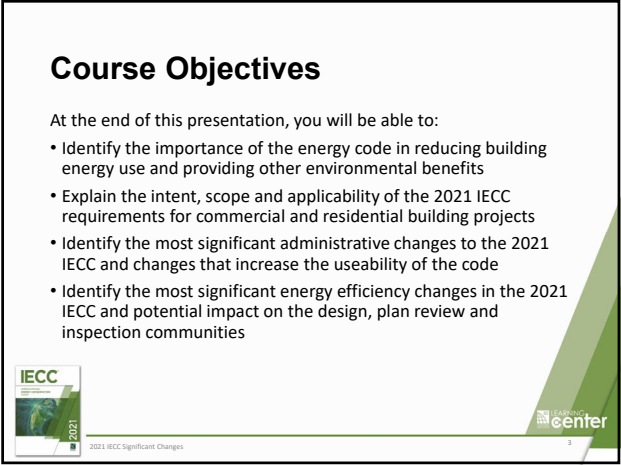
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**Useful Publications**

Available on [shop.iccsafe.org](http://shop.iccsafe.org)

2021 IECC Significant Changes

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**C403.4.2.3 Automatic Start and Stop**

**Selection of Topics**

Provisions addressed based primarily on:

- Frequency of application
- Special significance
- Change in application

2021 IECC Significant Changes

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**About the IECC**

- The IECC regulates the design and construction of buildings for the effective use and conservation of energy over the useful life of each building.
- This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective.
- This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

C/R101.3

2021 IECC Significant Changes

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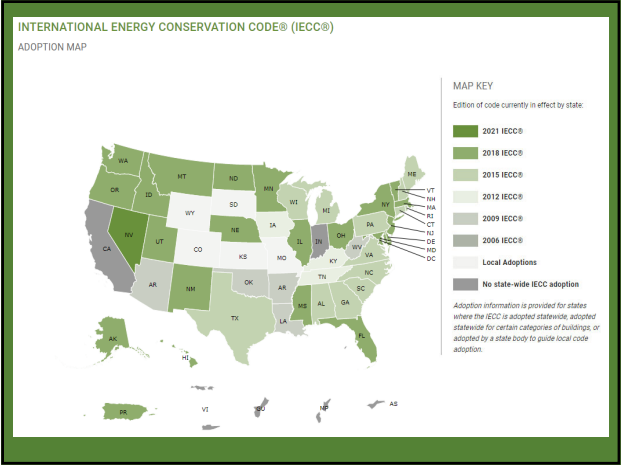
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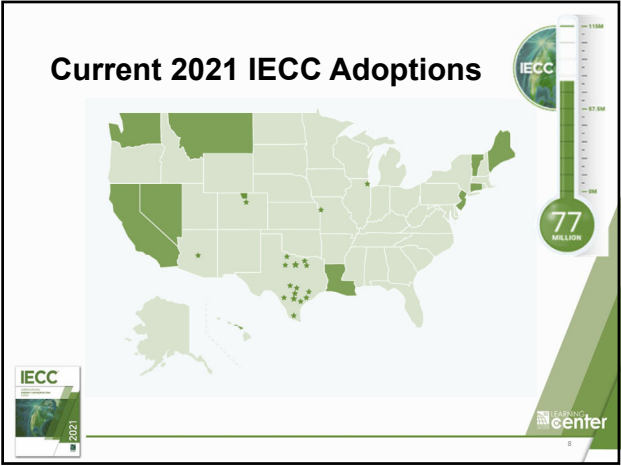
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**The Case for Building Energy Codes**

- Energy savings
- Emissions reductions
- Cost savings
- Enhanced occupant comfort
- Improved grid reliability
- Synchronicity with Suite of I-Codes

IECC center

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### Energy as a Life Safety Code

**Works in Tandem with Model Codes**

- Resiliency**  
Durability ensures home is livable for decades
- Moisture Management**  
Rot, mold, mildew
- Fire Safety**
- Indoor Air Quality**  
"Build tight, ventilate right"
- Extreme Weather Protection**  
Better envelopes – more lives saved

IECC 2021 LEAP center

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### How Energy Codes Affect You

Energy codes govern the efficiency of the lighting, walls, and systems that surround where you live and work. A space built to a more efficient energy code increases comfort and results in lower energy bills for your home and business.

- Dimmer, daylight, and occupancy controls** help to provide light when you need it, and to save energy when you don't.
- Energy-efficient windows** let daylight and views in while recognizing heat gain from the sun.
- Programmable thermostats and other control systems** can help automatically lower costs when the space is empty.
- Increased insulation and tighter construction** reduce energy needs and help you stay warm or cool at the event of power outages.
- Properly sized mechanical equipment** reduces first costs and runs more efficiently, maintaining comfortable temperatures and humidity levels in the space.
- High efficiency lights** like LEDs use less energy and last years longer than incandescents, with LEDs lasting 25-30,000 hours compared to 1,000 for an incandescent.
- Proper sealing around the windows and doors** reduces drafts and makes rooms more comfortable.
- Well-insulated hot water piping** reduces heat loss and helps you get hot water faster.

ENERGY-EFFICIENT CODES COALITION LEAP center

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### Commercial & Residential Buildings Defined

**Residential:** For this code, includes detached one- and two-family dwellings and townhouses as well as Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane.

**Commercial:** For this code, all buildings that are not included in the definition of "residential building."

IECC 2021 LEAP center

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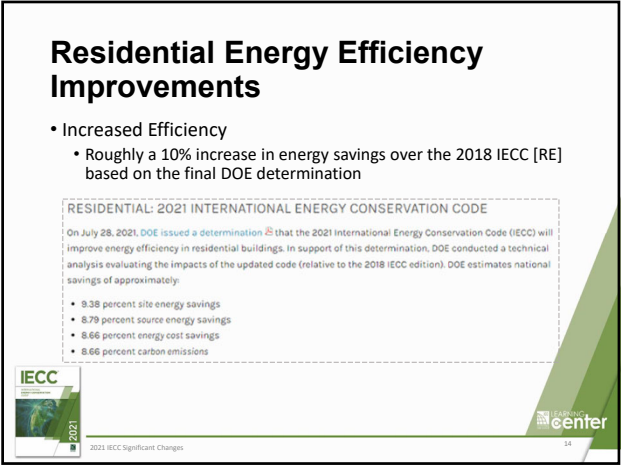
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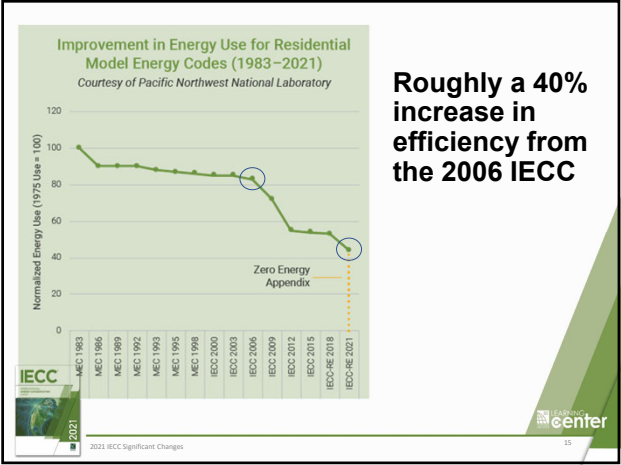
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## Commercial Energy Efficiency Improvements – ASHRAE 90.1

- Increased Efficiency – Commercial
  - ASHRAE 90.1 – 2019 ~ 5% greater energy efficiency

COMMERCIAL: ANSI/ASHRAE/IES STANDARD 90.1-2019

On July 28, 2021, DOE issued a determination that Standard 90.1-2019 will achieve greater energy efficiency in buildings subject to the code. DOE estimates national savings in commercial buildings of approximately:

- 4.7 percent site energy
- 4.3 percent source energy
- 4.3 percent energy cost
- 4.2 percent carbon emissions

2021 IECC Significant Changes 15

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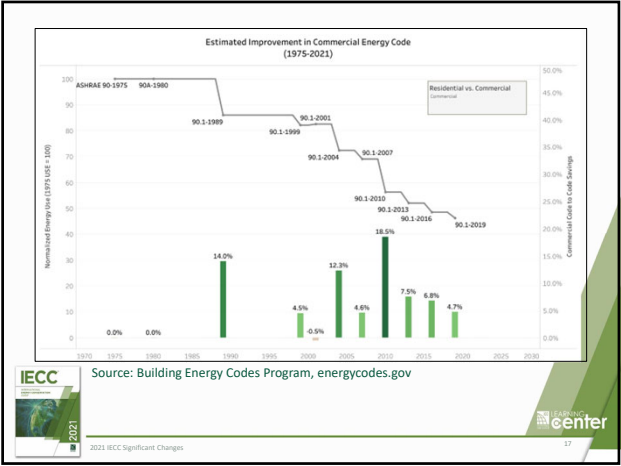
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## Commercial Energy Efficiency Improvements – IECC

- September 2022 DOE analysis of commercial provisions of the 2021 IECC
- Site energy savings of 12.1% at the aggregate national level compared to the 2018 IECC edition
- On a national weighted average basis, the 2021 IECC is 6.5% more efficient for site energy use than ASHRAE 90.1-2019
- Full report available at [energycodes.gov](http://energycodes.gov)

2021 IECC Significant Changes 18

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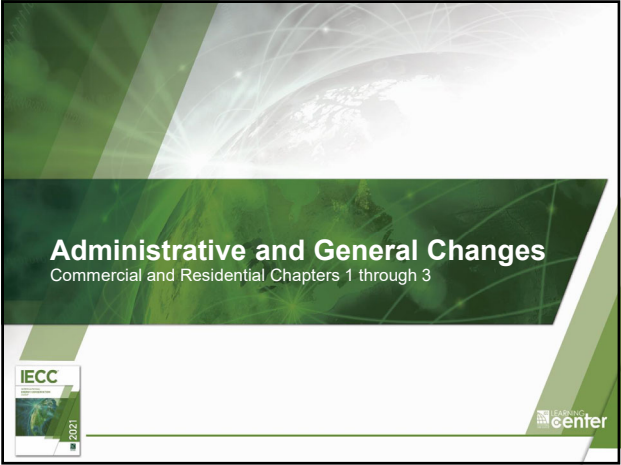
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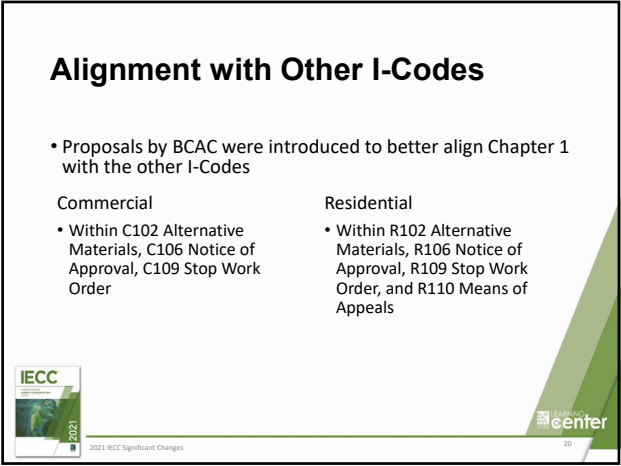
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### Information on Construction Documents

- Information required on the construction documents has been expanded to include an indication of the energy compliance path used
- Clarifies requirements for air barrier and air sealing details and locations

C/R103.2  
2021 IECC Significant Changes



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### Information on Construction Documents Continued

- Energy compliance path.
- Insulation materials and their R-values.
- Fenestration U-factors and solar heat gain coefficients (SHGCs).
- Area-weighted U-factor and solar heat gain coefficient (SHGC) calculations.
- Mechanical system design criteria.
- Mechanical and service water-heating systems and equipment types, sizes and efficiencies.
- Economizer description.
- Equipment and system controls.
- Fan motor horsepower (hp) and controls.
- Duct sealing, duct and pipe insulation and location.
- Lighting fixture schedule with wattage and control narrative.
- Location of daylight zones on floor plans.
- Air sealing details, barrier and air sealing details, including the location of the air barrier.



C103.2  
2021 IECC Significant Changes



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### Other New or Revised Definitions

- Commercial New
  - Biomass
  - Data center, Data center systems
  - Direct Digital Control (DDC)
  - Enthalpy recovery ratio
  - Fault detection and diagnostics (FDD) system
  - Information technology equipment
  - Internal curtain system
  - Large diameter ceiling fan
  - Testing unit enclosure area
  - Thermal distribution efficiency (TDE)
  - Vegetative roofs
  - Visible transmittable, annual
- Commercial Revised
  - General lighting
  - Green houses
  - On-site renewable energy
  - Skylights
  - Wall, above-grade
- Residential New
  - Access (to)
  - Cavity insulation
  - Dimmer
  - Dwelling unit enclosure area
  - Occupant sensor control
  - On-site renewable energy
  - Ready access (to)
  - Renewable energy certificate (REC)
  - Renewable energy sources
  - Thermal distribution efficiency (TDE)
- Residential Revised
  - Demand Recirculation Water System
  - Skylights
  - High-efficacy light sources
  - Roof recover



C/R202  
2021 IECC Significant Changes



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## On-site Renewable Energy and Renewable Energy Resources


- **ON-SITE RENEWABLE ENERGY.** Energy derived from renewable energy resources harvested at the building project site. solar radiation, wind, waves, tides, landfill gas, biogas, biomass or the internal heat of the earth. The energy system providing onsite renewable energy shall be located on the project site.
- **RENEWABLE ENERGY RESOURCES.** Energy derived from solar radiation, wind, waves, tides, landfill gas, biogas, biomass or extracted from hot fluid or steam heated within the earth.





C202

2021 IECC Significant Changes



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## Fan Efficiencies

New definitions related to fans introduce and support the Fan Energy Index




- **FAN ENERGY INDEX (FEI).** The ratio of the electric input power of a reference fan to the electric input power of the actual fan as calculated in accordance with AMCA 208.
- **FAN, EMBEDDED.** A fan that is part of a manufactured assembly where the assembly includes functions other than air movement.
- **FAN ARRAY.** Multiple fans in parallel between two plenum sections in an air distribution system.
- **FAN NAMEPLATE ELECTRICAL INPUT POWER.** The nominal electrical input power rating stamped on a fan assembly nameplate.
- **FAN SYSTEM ELECTRICAL INPUT POWER.** The sum of the fan electrical power of all fans that are required to operate at fan system design conditions to supply air from the heating or cooling source to the conditioned spaces and/or return it to the source or exhaust it to the outdoors.



C202

2021 IECC Significant Changes



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## High-Efficacy Light Sources




**HIGH-EFFICACY LIGHT SOURCES.** Any lamp with an efficacy of not less than 65 lumens per watt, or luminaires with an efficacy of not less than 45 lumens per watt.



R202

2021 IECC Significant Changes



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## Renewable Energy Certificate

- RENEWABLE ENERGY CERTIFICATE (REC).** An instrument that represents the environmental attributes of one megawatt hour of renewable energy; also known as an energy attribute certificate (EAC).

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## Climate Zone Definitions

Climate zones updated

- Align with ASHRAE 169, ASHRAE 90.1, IgCC
- New Climate Zone 0
- 10% of US counties assigned new CZ

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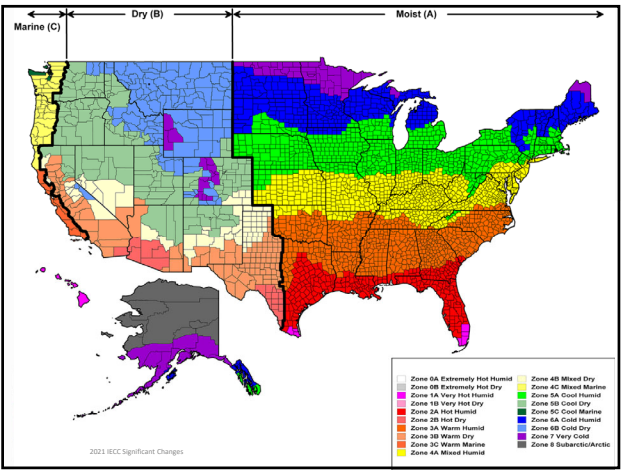
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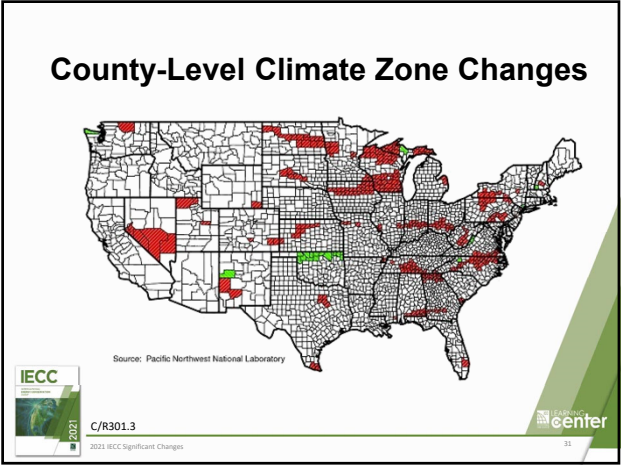
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### Climate Zone Definitions Continued

TABLE R301.3(2) R301.3 Thermal Climate Zone Definitions		
ZONE NUMBER	THERMAL CRITERIA	
	IP Units	SI Units
0	10,800 < CDD50°F	6500 < CDD10°C
1	9,000 < CDD50°F < 10,800	5000 < CDD10°C < 6500
2	6,300 < CDD50°F ≤ 9,000	3500 < CDD10°C ≤ 5000
3A and 3B	4,500 < CDD50°F ≤ 6,300 AND HDD65°F ≤ 5,400 & 3,600	CDD10°C < 3500 AND HDD18°C ≤ 3000 & 2000
4A and 4B-1	CDD50°F ≤ 4,500 & 3,000 AND 3,600 < HDD65°F ≤ 5,400	CDD10°C < 2500 & 3500 AND 2000 < HDD18°C ≤ 3000
3C	HDD65°F ≤ 3,600	HDD18°C ≤ 2000
4C	3,600 < HDD65°F ≤ 5,400	2000 < HDD18°C ≤ 3000
5	CDD50°F < 6,300 AND 5,400 < HDD65°F ≤ 7,200	CDD10°C < 3500 AND 3000 < HDD18°C < 4000
6	7,200 < HDD65°F ≤ 9,000	4000 < HDD18°C < 5000
7	9,000 < HDD65°F ≤ 12,600	5000 < HDD18°C ≤ 7000
8	12,600 < HDD65°F	7000 < HDD18°C

For SI: °C = (°F) - 32 / 1.8

C/R301.3

2021 IECC Significant Changes

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### Improved Useability

**Mandatory and Prescriptive labels removed in favor of mandatory tables**

- Total Building Performance
- Energy Rating Index

**2018 IECC**

**C402.5 Air leakage—thermal envelope. (Mandatory).** The thermal envelope of buildings shall comply with Sections C402.5.1 through C402.5.8, or the building thermal envelope shall be tested in accordance with ASTM E 779 at a pressure differential of 0.3 inch water gauge (75 Pa) or an equivalent method approved by the code official and deemed to comply with the provisions of this section when the tested air leakage rate of the building thermal envelope is not greater than 0.40 cfm/ft<sup>2</sup> (2.0 L/s • m<sup>2</sup>). Where compliance is based on such testing, the building shall also comply with Sections C402.5.5, C402.5.6 and C402.5.7.

**2021 IECC**

**C402.5 Air leakage—thermal envelope.** The building thermal envelope shall comply with Sections C402.5.1 through Section C402.5.11.1, or the building thermal envelope shall be tested in accordance with Section C402.5.2 or C402.5.3. Where compliance is based on such testing, the building shall also comply with Sections C402.5.7, C402.5.8 and C402.5.9.

C/R301.3

2021 IECC Significant Changes

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### Improved Useability

SECTION*	TITLE	SECTION*	TITLE
C402.3	Air leakage—thermal envelope	R401.2	General
C403.1.1	Calculation of heating and cooling loads	R401.2.1	Minimum energy efficiency
C403.1.2	Data centers	R401.2.2	Control
C403.2	System design	R401.2.3	Weatherstripping
C403.3	Heating and cooling equipment efficiencies	R401.2.4	Upper retainer
C403.4, except C403.4.3, C403.4.4 and C403.4.5	Heating and cooling system controls	R401.2.5	Lower retainer
C403.5	Economizer fault detection and diagnosis	R401.2.6	Door seals and doors
C403.7, except C403.7.4.1	Ventilation and exhaust systems	R401.2.7	Control space wall construction
C403.8, except C403.8.6	Fan and fan controls	R401.2.8	Weatherstripping
C403.9	Large-diameter ceiling fans	R401.2.9	Weatherstripping
C403.11, except C403.11.3	Refrigeration equipment performance	R401.2.10	Minimum R-value U-factor and UFA
C403.12	Construction of HVAC system elements	R401.3	General
C403.13	Mechanical systems located outside of the building thermal envelope	R401.3.1	Controls
C404	Service water heating	R401.3.2	Decks
C405, except C405.3	Electrical power and lighting systems	R401.3.3	Mechanical system piping installation
C406	Maintenance information and system commissioning	R401.3.4	Roof water collection and temperature maintenance systems
		R401.3.5	Drain water heat recovery units
		R401.3.6	Mechanical maintenance
		R401.3.7	Equipment rating and efficiency rating
		R401.3.8	Systems serving multiple dwelling units
		R401.3.9	Steam and hot water systems
		R401.3.10	Energy recuperation of gas and steam
		R401.3.11	Transfer gas
		R401.3.12	Radon-resistant gas and pressure-resistant construction
		R401.3.13	Minimum Power and Cooling Systems
		R401.3.14	Lighting equipment
		R401.3.15	Interior lighting controls



2021 IECC Significant Changes

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Horizontal lines for notes

### Commercial Significant Changes

Chapter 4, Appendices



2021 IECC Significant Changes

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Horizontal lines for notes

### Compliance Path Options

- Compliance path options named and defined
  - Prescriptive Compliance
  - Total Building Performance
  - ASHRAE 90.1

**C401.2 Application.** Commercial buildings shall comply with Section C401.2.1 or C401.2.2.

**C401.2.1 International Energy Conservation Code.** Commercial buildings shall comply with one of the following:

1. Prescriptive Compliance. The Prescriptive Compliance option requires compliance with Sections C402 through C406 and Section C408. Dwelling units and sleeping units in Group R-2 buildings without systems serving multiple units shall be deemed to be in compliance with this chapter, provided that they comply with Section R406.
2. Total Building Performance. The Total Building Performance option requires compliance with Section C407.

**Exception:** Additions, alterations, repairs and changes of occupancy to existing buildings complying with Chapter 5.

**C401.2.2 ASHRAE 90.1.** Commercial buildings shall comply with the requirements of ANSI/ASHRAE/IESNA 90.1.



C401.2

2021 IECC Significant Changes

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Horizontal lines for notes

# Envelope Certificate

- Permanent thermal envelope certificate
- R-values of insulation
- U-factors and SHGCs of fenestration
- Envelope air leakage test results
- Completed by approved party
- Posted in approved location and copy included in construction files for project



Sample thermal envelope certificate.  
C401.3  
2021 IECC Significant Changes



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# Increased Efficiency: R-Value and U-Factor Overview

- Incremental increases in efficiency for many roof, wall and floor components in CZs 4-8
- R-13 insulation for framed floors in CZs 0 and 1
- R-10 CI for unheated slabs in CZ 3 Group R
- Non-swinging opaque doors moved from R-Value to U-Factor table



Changes align IECC with ASHRAE 90.1-2016 and 2019 requirements



Tables C402.1.3 and C402.1.4  
2021 IECC Significant Changes



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**TABLE C402.1.3 Opaque Thermal Envelope Insulation Component Minimum Requirements, R-Value Method**

CLIMATE ZONE	0 AND 1		2		3		4 EXCEPT MARINE		5 AND MARINE 6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
<b>Roofs</b>														
Insulation ceiling above roof deck	R-30 <sup>a</sup>	R-25 <sup>a</sup>	R-25 <sup>a</sup>	R-25 <sup>a</sup>	R-25 <sup>a</sup>	R-25 <sup>a</sup>	R-30 <sup>a</sup>	R-30 <sup>a</sup>	R-30 <sup>a</sup>	R-30 <sup>a</sup>	R-30 <sup>a</sup>	R-30 <sup>a</sup>	R-30 <sup>a</sup>	R-30 <sup>a</sup>
Metal building <sup>b</sup>	R-19 <sup>a</sup>	R-19 <sup>a</sup>	R-19 <sup>a</sup>	R-19 <sup>a</sup>	R-19 <sup>a</sup>	R-19 <sup>a</sup>	R-19 <sup>a</sup>	R-19 <sup>a</sup>	R-19 <sup>a</sup>	R-20 <sup>a</sup>	R-20 <sup>a</sup>	R-20 <sup>a</sup>	R-20 <sup>a</sup>	R-20 <sup>a</sup>
Attic and floor	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30
<b>Walls, above grade</b>														
Mans <sup>c</sup>	R-5.7 <sup>d</sup>	R-5.7 <sup>d</sup>	R-5.7 <sup>d</sup>	R-5.7 <sup>d</sup>	R-5.7 <sup>d</sup>	R-5.7 <sup>d</sup>	R-5.7 <sup>d</sup>	R-5.7 <sup>d</sup>	R-5.7 <sup>d</sup>	R-5.7 <sup>d</sup>	R-5.7 <sup>d</sup>	R-5.7 <sup>d</sup>	R-5.7 <sup>d</sup>	R-5.7 <sup>d</sup>
Metal building	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>
Metal framing	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>
Wood framing and other	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>	R-13 <sup>a</sup>
<b>Walls, below grade</b>														
Below-grade wall <sup>e</sup>	NR	NR	NR	NR	NR	NR	R-7.5 <sup>f</sup>	R-7.5 <sup>f</sup>	R-7.5 <sup>f</sup>	R-7.5 <sup>f</sup>	R-7.5 <sup>f</sup>	R-7.5 <sup>f</sup>	R-7.5 <sup>f</sup>	R-7.5 <sup>f</sup>
<b>Floors</b>														
Mans <sup>c</sup>	NR	NR	R-3.0 <sup>g</sup>	R-3.0 <sup>g</sup>	R-3.0 <sup>g</sup>	R-3.0 <sup>g</sup>	R-3.0 <sup>g</sup>	R-3.0 <sup>g</sup>	R-3.0 <sup>g</sup>	R-3.0 <sup>g</sup>	R-3.0 <sup>g</sup>	R-3.0 <sup>g</sup>	R-3.0 <sup>g</sup>	R-3.0 <sup>g</sup>
Slab-on-grade floor	NR	NR	R-3.0	R-3.0	R-3.0	R-3.0	R-3.0	R-3.0	R-3.0	R-3.0	R-3.0	R-3.0	R-3.0	R-3.0
<b>Slab-on-grade floors</b>														
Unheated slab <sup>h</sup>	NR	NR	NR	NR	NR	NR	R-10	R-10	R-10	R-10	R-10	R-10	R-10	R-10
Heated slab <sup>i</sup>	R-5	R-5	R-5	R-5	R-5	R-5	R-5	R-5	R-5	R-5	R-5	R-5	R-5	R-5
Opaque doors	U-1.0	U-1.0	U-1.0	U-1.0	U-1.0	U-1.0	U-1.0	U-1.0	U-1.0	U-1.0	U-1.0	U-1.0	U-1.0	U-1.0

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**TABLE C402.1.4 Opaque Thermal Envelope Assembly Maximum Requirements, U-Factor Method<sup>1</sup>**

CLIMATE ZONE	0 AND 1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
<b>Roofs</b>																
Insulation entirely above roof deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.028	U-0.028	U-0.028	U-0.028
Metal buildings	U-0.054	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.032	U-0.029	U-0.029	U-0.029	U-0.029
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.024	U-0.024	U-0.024	U-0.024
<b>Walls, above grade</b>																
Mass <sup>2</sup>	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.099	U-0.099	U-0.089	U-0.089	U-0.071	U-0.071	U-0.071	U-0.064	U-0.064
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.062	U-0.062	U-0.062	U-0.062	U-0.062	U-0.062	U-0.062	U-0.059	U-0.059	U-0.059	U-0.059
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.054	U-0.054	U-0.054	U-0.054	U-0.052	U-0.052	U-0.052	U-0.052
Wood framed and other <sup>3</sup>	U-0.094	U-0.094	U-0.094	U-0.084	U-0.084	U-0.084	U-0.084	U-0.084	U-0.084	U-0.084	U-0.084	U-0.084	U-0.084	U-0.084	U-0.084	U-0.084
<b>Walls, below grade</b>																
Below-grade wall <sup>4</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>	C-1.140 <sup>5</sup>
<b>Floors</b>																
Mass <sup>2</sup>	U-0.322 <sup>6</sup>	U-0.322 <sup>6</sup>	U-0.307	U-0.287	U-0.287	U-0.287	U-0.287	U-0.287	U-0.287	U-0.287	U-0.287	U-0.287	U-0.287	U-0.287	U-0.287	U-0.287
Isolating framing	U-0.060 <sup>7</sup>	U-0.060 <sup>7</sup>	U-0.053	U-0.053	U-0.053	U-0.053	U-0.053	U-0.053	U-0.053	U-0.053	U-0.053	U-0.053	U-0.053	U-0.053	U-0.053	U-0.053
<b>Slab-on-grade floors</b>																
Unheated slab <sup>8</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>	F-0.71 <sup>9</sup>
Heated slab <sup>8</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>	F-0.60 <sup>9</sup>
<b>Garage doors</b>																
Nonopening door	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31
Swinging door <sup>10</sup>	U-0.44	U-0.44	U-0.44	U-0.44	U-0.44	U-0.44	U-0.44	U-0.44	U-0.44	U-0.44	U-0.44	U-0.44	U-0.44	U-0.44	U-0.44	U-0.44
Garage door <14% glazing <sup>11</sup>	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31

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**Table C402.1.4 Footnotes**

- a. Where assembly U-factors, C-factors and F-factors are established in ANSI/ASHRAE/IES 90.1 Appendix A, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table, and provided that the construction, excluding the cladding system on walls, complies with the appropriate construction details from ANSI/ASHRAE/IES 90.1 Appendix A.
- b. Where U-factors have been established by testing in accordance with ASTM C1363, such opaque assemblies shall be a compliance alternative where those values meet the criteria of this table. The R-value of continuous insulation shall be permitted to be added to or subtracted from the original tested design.
- c. Where heated slabs are below grade, below-grade walls shall comply with the U-factor requirements for above-grade mass walls.
- d. "Mass floors" shall be in accordance with Section C402.2.3.
- e. These C-, F- and U-factors are based on assemblies that are not required to contain insulation.
- f. ~~The first value is for perimeter insulation and the second value is for full under-slab insulation.~~
- g. Swinging door U-factors shall be determined in accordance with NFRC-100.
- h. Garage doors having a single row of fenestration shall have an assembly U-factor less than or equal to 0.44 in Climate Zones 0 through 6 and less than or equal to 0.36 in Climate Zones 7 and 8, provided that the fenestration area is not less than 14 percent and not more than 25 percent of the total door area.



Table C402.1.4  
2021 IECC Significant Changes

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**Fenestration U-Factor and SHGC Requirements Continued**


**TABLE C402.4 Building Envelope Fenestration Maximum U-Factor and SHGC Requirements**

CLIMATE ZONE	0 AND 1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
<b>Vertical Fenestration</b>																
<b>U-factor</b>																
Fixed fenestration	0.50	0.50	0.45	0.45	0.42	0.42	0.38	0.38	0.36	0.36	0.34	0.34	0.29	0.29	0.25	0.25
Operable fenestration	0.49	0.50	0.45	0.45	0.42	0.42	0.43	0.43	0.43	0.43	0.42	0.42	0.37	0.38	0.37	0.32
Entrance doors	1.40	0.83	0.83	0.77	0.68	0.68	0.77	0.63	0.77	0.63	0.77	0.63	0.77	0.63	0.77	0.63
<b>SHGC</b>																
Orientation:	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N
Fixed	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Operable	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
PF < 0.2	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.2 < PF < 0.5	0.28	0.25	0.30	0.28	0.28	0.28	0.43	0.43	0.46	0.56	0.60	0.58	0.41	0.43	NR	NR
PF ≥ 0.5	0.40	0.40	0.40	0.40	0.40	0.40	0.50	0.50	0.61	0.65	0.52	0.61	0.54	0.54	NR	NR
<b>Skylights</b>																
U-factor	0.70	0.65	0.55	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.46	0.44	0.40	0.41
SHGC	0.30	0.30	0.30	0.30	0.30	0.30	0.40	0.40	0.40	0.40	0.40	0.40	NR	NR	NR	NR

Table C402.4  
2021 IECC Significant Changes

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### Air Leakage – Thermal Envelope Change Summary



- Dwelling unit testing required for Group R and Group I occupancies
- Building envelope testing required for occupancies other than Group R and I
- Buildings exempt from testing
  - Material or assembly
  - Performance verification

IECC 2021 C402.5 2021 IECC Significant Changes LEAP center 43

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### Air Leakage

- **C402.5 Air leakage—thermal envelope.** The building thermal envelope shall comply with Sections C402.5.1 through Section C402.5.11.1, or the building thermal envelope shall be tested in accordance with Section C402.5.2 or C402.5.3. Where compliance is based on such testing, the building shall also comply with Sections C402.5.7, C402.5.8 and C402.5.9.
  - Air intakes, exhaust openings, stairways and shafts
  - Loading dock weather seals
  - Vestibules

This language picks up Section C402.5.1.2 Air barrier compliance

- Requires testing

IECC 2021 C402.5 2021 IECC Significant Changes LEAP center 44

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### Air Barrier Testing – Group R and I

- Buildings with Group R and I occupancies must be tested using the **dwelling and sleeping unit enclosure testing method**
  - Required in all CZ except 2B, 3C and 5C
  - Adds new definition of testing unit enclosure area
  - Building thermal envelope must be tested in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM E1827 or an equivalent method
  - Air leakage limited to 0.30 cfm/ft<sup>2</sup> of testing unit enclosure area at 50 Pa

**TESTING UNIT ENCLOSURE AREA.** The area sum of all the boundary surfaces that define the *dwelling unit, sleeping unit* or occupiable *conditioned space* including top/ceiling, bottom/floor and all side walls. This does not include interior partition walls within the *dwelling unit, sleeping unit*, or occupiable *conditioned space*. Wall height shall be measured from the finished floor of the *conditioned space* to the finished floor or roof/ceiling air barrier above.

IECC 2021 C402.5.1.2 and C402.5.2 2021 IECC Significant Changes LEAP center 45

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### Air Barrier Testing – Group R and I Continued

- Where multiple dwelling/sleeping units or other occupiable conditioned spaces are contained within one building thermal envelope, each unit must be tested separately with an unguarded blower door test
  - The building air leakage is the weighted average of all testing unit results, weighted by each testing unit's enclosure area
  - 8 or less units, test them all
  - 8 or more units, test the greater of 7 units or 20 percent of all units
    - Top floor unit, ground floor unit, unit with largest area
    - For each unit that exceeds maximum air leakage rate (fails), test two more



C402.5.1.2 and C402.5.2

2021 IECC Significant Changes



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### Air Barrier Testing - All Other Occupancies

- Buildings or portions of buildings other than Group R and I occupancies must be tested using the **building thermal envelope testing method**
  - Tested in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM E3158 or ASTM E1827 or an equivalent method
  - Air leakage limited to 0.40 cfm/ft<sup>2</sup> of building thermal envelope area at 75 Pa
  - Alternatively, portions of the building can be tested and measured air leakage area weighted
    - Entire envelope area of all stories that have any spaces directly under a roof
    - Entire envelope area of all stories that have a building entrance, exposed floor, or loading dock, or are below grade
    - Representative above-grade sections of the building totaling at least 25 percent of the wall area enclosing the remaining conditioned space



C402.5.1.2 and C402.5.3

2021 IECC Significant Changes



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### Air Barrier Testing - All Other Occupancies Continued

- If the building air leakage rate exceeds 0.40 cfm/ft<sup>2</sup> but does not exceed 0.60 cfm/ft<sup>2</sup>
  - Diagnostic evaluation using smoke tracer or infrared imaging while building is pressurized required along with a visual inspection of the air barrier
    - Any leaks noted must be sealed where such sealing can be made without destruction of existing building components
    - A report identifying corrective actions taken to seal leaks must be submitted to the code official and building owner
    - Building is deemed to comply, no retest required


**Exceptions:**

- Buildings in CZ 2B, 3B, 3C and 5C
- Buildings larger than 5,000ft<sup>2</sup> in CZ 0B, 1, 2A, 4B and 4C
- Buildings between 5,000ft<sup>2</sup> and 50,000ft<sup>2</sup> in CZs 0A, 3A and 5B



C402.5.1.2 and C402.5.3

2021 IECC Significant Changes



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### Buildings Exempt From Air Barrier Testing


Select Compliance Option

- Materials
- Assemblies

➔


Verify Performance

- Review construction documents
- Inspect air barrier
- Final commission report provided
- Deficiencies found during plan review and inspection and corrective actions



C402.5.1.2 and C402.5.1.5

2021 IECC Significant Changes



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### Operable Openings Interlocking

- Large, operable openings (>40ft<sup>2</sup>) such as roll-up doors and windows must now be interlocked with the heating and cooling system
- Time and temperature specific
  - System adjustments within 10 minutes of opening operable opening
  - Controls raise cooling setpoint to 90°F and lower heating setpoint to 55°F
  - Controls shut off the system entirely when outdoor temperatures are below 90°F or above 55°F




C402.5.11 and C403.14

2021 IECC Significant Changes



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### Fault Detection and Diagnostics

- HVAC systems serving a gross conditioned floor area of >100,000 ft<sup>2</sup> must include FDD system
- The system must include permanently installed sensors to measure HVAC system performance


Sample performance every 15 minutes

Identify and report faults

Provide recommendations for repair


Transmit recommendations to remotely located authorized personnel

Exception: R-1 and R-2 occupancies



C403.2.3

2021 IECC Significant Changes



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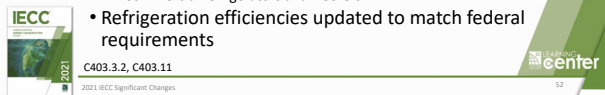
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### Equipment Performance Requirements

- Equipment must meet the minimum efficiency requirements of Tables C403.3.2(1) - (16)
  - HVAC equipment efficiency updated to match ASHRAE tables directly and Federal appliance manufacturing requirements
- Additional tables added for
  - DOAS units
  - Water source heat pumps
  - Variable refrigerant flow cooling and heat pumps
  - Heat pump and heat reclaim chiller packages
  - Ceiling mounted computer room air conditioners
  - Commercial refrigerators and freezers
- Refrigeration efficiencies updated to match federal requirements

**C403.3.2, C403.11**



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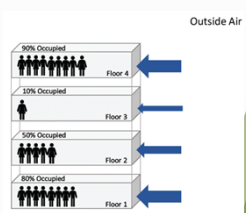
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### Demand Control Ventilation

- Required for all single-zone systems required to comply with Sections C403.5 through C403.5.3
  - Economizers
- Required for spaces larger than 500 ft<sup>2</sup> and with an average occupant load of at 15 people or greater per 1,000 ft<sup>2</sup> of floor area
- Served by systems with
  - Air-side economizer
  - Automatic modulating control of the outdoor air damper
  - Design outdoor airflow greater than 3,000 cfm



**C403.7.1**



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### Fan Efficiency

- FEI Website: [www.amca.org/fei](http://www.amca.org/fei)
- Technical papers and educational resources about Fan Energy Index

Fan Energy Index (FEI) replaces Fan Efficiency Grade (FEG) metric


FEI ≥ 1.00 for covered fans  
AMCA 208  
Ratings from approved third-party lab and labeled

FEI includes effects (losses) of motors and drives, if sold with fan; otherwise, FEI ratings for bare fan include default motor/drive losses

Sizing / selection window eliminated

- "15 percentage points from peak total efficiency" was difficult to enforce.

**C403.8.3**



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### Low-Capacity Ventilation Fans

- Requirements for low-capacity ventilation fans apply the efficiencies of ventilation fans typical of residential construction to mid-rise residential occupancies and small commercial buildings
  - Except when part of listed HVAC appliance
  - Except dryer exhaust, range hood main or booster fans



**TABLE C403.8.5** Low-Capacity Ventilation Fan Efficacy\*

FAN LOCATION	AIRFLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)	AIRFLOW RATE MAXIMUM (CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	2.8 cfm/watt	≤ 90
Bathroom, utility room	90	3.5 cfm/watt	Any

IECC 2021 LEAP center  
2021 IECC Significant Changes 55

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### High Input Service Water-Heating Systems

- Large (over 1,000,000 Btu/h) service hot water system efficiency increases from 90% to 92%
- Capacity weighted average




Photo credit: PNNL

IECC 2021 LEAP center  
2021 IECC Significant Changes 56

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### Occupant Sensor Controls in Warehouse Storage Areas

- Lighting in aisleway must be independent
- Time delay for occupants leaving the warehouse area and turning off or reducing the lighting is 20 minutes
- Occupancy sensor or time-switch control required



IECC 2021 LEAP center  
2021 IECC Significant Changes 57

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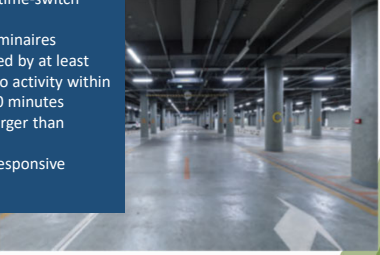
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### Parking Garage Lighting Control

- Occupant sensor or time-switch control required
- Lighting power of luminaires automatically reduced by at least 30% when there is no activity within a lighting zone for 20 minutes
- Lighting zones not larger than 3,600ft<sup>2</sup>
- Perimeter daylight responsive controls



IECC 2021  
C405.2.8  
2021 IECC Significant Changes  
LEAP center

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### Lighting for Plant Growth



- At least 95% of permanently installed luminaires used for plant growth and maintenance must have a photon efficiency of not less than 1.6  $\mu\text{mol}/\text{J}$
- ANSI/ASABE S640

IECC 2021  
C405.4  
2021 IECC Significant Changes  
LEAP center

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### Automatic Receptacle Control

- At least 50% of covered receptacles and 25% of branch circuit feeders to be on automatically controlled receptacles
- Multiple control options
- All controlled receptacles must be permanently marked per NFPA 70



IECC 2021  
C405.11  
2021 IECC Significant Changes  
LEAP center

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# Energy Monitoring


- Applies to new buildings 25,000 ft<sup>2</sup> or larger
- Must be equipped to measure, monitor, record and report energy consumption data
- Exception: R-2 occupancies and individual tenant spaces if the space has its own utility services and meters and has less than 5,000 ft<sup>2</sup>

LOAD CATEGORY	DESCRIPTION OF ENERGY USE
Total HVAC system	Heating, cooling and ventilation, including but not limited to fans, pumps, boilers, chillers and water heating. Energy used by 120-volt equipment, or by 208/120-volt equipment that is located in a building where the main service is 480/277-volt power, is permitted to be excluded from total HVAC system energy use.
Interior lighting	Lighting systems located within the building.
Exterior lighting	Lighting systems located on the building site but not within the building.
Plug loads	Devices, appliances and equipment connected to convenience receptacle outlets.
Process load	Any single load that is not included in an HVAC, lighting or plug load category and that exceeds 5 percent of the peak connected load of the whole building, including but not limited to data centers, manufacturing equipment and commercial kitchens.
Building operations and other miscellaneous loads	The remaining loads not included elsewhere in this table, including but not limited to vertical transportation systems, automatic doors, motorized shading systems, ornamental fountains, ornamental fireplaces, swimming pools, in-ground spas and snow-melt systems.



C405.12

2021 IECC Significant Changes



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# Additional Efficiency Requirements

Required for prescriptive compliance


- Revised structure of C406
  - Points-based
  - 10 points (credits) required
    - 1 point equivalent to 0.25% energy savings
  - Equity of efficiency options across climate zones
- Expanded options
  - 11 options total, 3 new





C406

2021 IECC Significant Changes



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# Additional Energy Efficiency Credit Options

1. More efficient HVAC performance
2. Reduced lighting power
3. Enhanced lighting controls
4. On-site supply of renewable energy
5. Dedicated outdoor air systems
6. High-efficiency service water heating
7. Enhanced envelope performance
8. Reduced air infiltration
9. *Energy monitoring system*
10. *Fault detection and diagnostics*
11. *Efficient kitchen equipment*



C406.1

2021 IECC Significant Changes



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### Appendix CA: Board of Appeals

- Appendix CA provides guidance for establishing a board of appeals, including criteria for membership and instruction for developing rules and procedures
- Consistent with other I-Codes




Appendix CA  
2021 IECC Significant Changes



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### Appendix CB: Electrical Energy Storage System-Ready Area

- Appendix CB is intended to encourage the installation of renewable energy systems by preparing buildings for the future installation of solar energy equipment, piping and wiring
- New provision for system-ready area for electrical energy storage
  - 2 x 4 ft area on construction docs

Appendix CB  
2021 IECC Significant Changes



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### Appendix CC: Zero Energy Commercial Building Provisions

- Appendix CC provides a model for states and jurisdictions to require renewable energy systems capable of achieving net zero carbon
- Applies to new buildings
- Supplemental definitions
  - Adjusted off-site renewable energy
  - Building energy
  - Energy Utilization Intensity (EUI)
  - Off-site renewable energy system
  - On-site renewable energy system
  - Renewable energy system
  - Semiheated space
  - Zero Energy Performance Index (ZEPI PB/EE)



Appendix CC  
2021 IECC Significant Changes



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# Zero Energy Commercial Building Provisions

## ZERO CODE

Commercial • Institutional • Mid-Rise/High-Rise Residential Buildings for the 2021 IECC

MEETING THE CODE

- 1**

Design an energy efficient building in compliance with the 2021 IECC or better.
- 2**

Establish the building's renewable energy requirement from:

  - an energy simulation
  - or
  - default renewable energy table
- 3**

Meet the requirement by integrating onsite renewable energy when feasible.
- 4**

If necessary, procure offsite renewable energy.

Source: Architecture 2020, Graphix, Architecture, Safety, DOE, Green Ideas

Appendix CC

2021 IECC Significant Changes

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# Minimum Renewable Energy

**CC103.1 Renewable energy.** On-site renewable energy systems shall be installed, or off-site renewable energy shall be procured to offset the building energy as calculated in Equation CC-1.

$$RE_{on-site} + RE_{off-site} \geq E_{building} \quad (\text{Equation CC-1})$$

where:

- $RE_{on-site}$  = Annual site energy production from on-site renewable energy systems (see Section CC103.2).
- $RE_{off-site}$  = Adjusted annual site energy production from off-site renewable energy systems that may be credited against building energy use (see Section CC103.3).
- $E_{building}$  = Building energy use without consideration of renewable energy systems.

- If complying with Total Building Performance or ASHRAE 90.1, building energy is determined from energy simulations
- If complying with the Prescriptive Compliance option, building energy is determined:

*gross conditioned floor area + gross semihated floor area of the proposed building × EUI from Table CC103.1*

Appendix CC

2021 IECC Significant Changes

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# Energy Utilization Intensity

**TABLE CC103.1** Energy Utilization Intensity for Building Types and Climates (kBtu/ft<sup>2</sup> - yr)

Building Area Type	Climate Zone																
	0A/1A		0B/1B		2A		3A		3B		4A		4C		5A		
	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Healthcare/hospital (E-2)	119	120	119	113	116	109	106	116	109	106	118	110	105	126	116	131	142
Hotel/motel (R-1)	73	76	73	68	70	67	65	69	66	65	71	68	65	77	72	81	89
Multiple-family (R-2)	43	45	41	41	43	42	36	45	43	41	47	46	41	53	48	53	59
Office (B)	31	32	30	29	29	28	25	28	27	25	29	28	25	33	30	32	36
Restaurant (A-2)	389	426	411	408	444	420	395	483	437	457	531	484	484	589	538	644	750
Retail (M)	46	50	45	46	44	44	37	48	44	44	52	50	46	60	52	64	77
School (E)	42	46	42	40	40	39	36	39	40	40	39	43	37	44	40	45	54
Warehouse (S)	9	12	9	11	12	11	10	17	13	14	23	17	15	32	23	32	32
All others	55	58	54	53	53	51	48	54	52	51	57	54	50	63	57	65	73

Table CC103.1

2021 IECC Significant Changes

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### Qualifying Off-Site Procurement Methods

- Community renewables:** an off-site renewable energy system for which the owner has purchased or leased renewable energy capacity along with other subscribers.
- Renewable energy investment fund:** an entity that installs renewable energy capacity on behalf of the owner.
- Virtual power purchase agreement:** a power purchase agreement for off-site renewable energy where the owner agrees to purchase renewable energy output at a fixed price schedule.
- Direct ownership:** an off-site renewable energy system owned by the building project owner.
- Direct access to wholesale market:** an agreement between the owner and a renewable energy developer to purchase renewable energy.
- Green retail tariffs:** a program by the retail electricity provider to provide 100-percent renewable energy to the owner.
- Unbundled Renewable Energy Certificates (RECs):** certificates purchased by the owner representing the environmental benefits of renewable energy generation that are sold separately from the electric power.

CC103.3.1

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### Residential Significant Changes

Chapter 4 and Appendices




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### Compliance Path Options

- Compliance path options for the residential provisions of the IECC are named and the sections required for each option are outlined
- Tropical Climate Region Option formally recognized as a compliance path

**R401.2 Application.** Residential buildings shall comply with Section R401.2.5 and either Sections R401.2.1, R401.2.2, R401.2.3 or R401.2.4.

**Exception:** Additions, alterations, repairs and changes of occupancy to existing buildings complying with Chapter 5.



**R401.2.1 Prescriptive Compliance Option.** The Prescriptive Compliance Option requires compliance with Sections R401 through R404.

**R401.2.2 Total Building Performance Option.** The Total Building Performance Option requires compliance with Section R405.

**R401.2.3 Energy Rating Index Option.** The Energy Rating Index (ERI) Option requires compliance with Section R406.

**R401.2.4 Tropical Climate Region Option.** The Tropical Climate Region Option requires compliance with Section R407.

R401.2

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# Certificate

- Requirements for the certificate are expanded to include
  - Code edition
  - Compliance path
  - Additional energy efficiency option
  - PV system information
  - Energy Rating Index score

**Energy Efficiency Certificate**

Code edition: \_\_\_\_\_  
 Compliance path: \_\_\_\_\_  
 Insulation Rating: \_\_\_\_\_  
 Fenestration: \_\_\_\_\_  
 Air Leakage Test Results: \_\_\_\_\_  
 Energy Rating Index Score: \_\_\_\_\_



R401.3

2021 IECC Significant Changes

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# Insulation and Fenestration Criteria

- The assembly U-Factor is established as the primary insulation metric, and R-Value is an alternative.

## 2018 IECC

**R402.1.2 Insulation and fenestration criteria.** The building thermal envelope shall meet the requirements of Table R402.1.2, based on the climate zone specified in Chapter 3.

**R402.1.4 U-factor alternative.** An assembly with a U-factor equal to or less than that specified in Table R402.1.4 shall be an alternative to the R-value in Table R402.1.2.

## 2021 IECC

**R402.1.2 Insulation and fenestration criteria.** The building thermal envelope shall meet the requirements of Table R402.1.2, based on the climate zone specified in Chapter 3. Assemblies shall have a U-factor equal to or less than that specified in Table R402.1.2. Fenestration shall have a U-factor and glazed fenestration SHGC equal to or less than that specified in Table R402.1.2.

**R402.1.3 R-value alternative.** Assemblies with R-value of insulation materials equal to or greater than that specified in Table R402.1.3 shall be an alternative to the U-factor in Table R402.1.2.



R402.1.2 and R402.1.3

2021 IECC Significant Changes

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**TABLE R402.1.4 R402.1.2 Equivalent Maximum Assembly U-Factors\* and Fenestration Requirements**

CLIMATE ZONE	FENESTRATION U-FACTOR <sup>a</sup>	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC <sup>b,c</sup>	CEILING U-FACTOR	WOOD FRAME WALL U-FACTOR	MASS WALL U-FACTOR <sup>d</sup>	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CREWL SPACE WALL U-FACTOR
1	0.50	0.75	0.25	0.035	0.084	0.102	0.064	0.360	0.477
2	0.40	0.65	0.25	0.030	0.084	0.102	0.064	0.360	0.477
3	0.30	0.55	0.25	0.025	0.080	0.098	0.047	0.091 <sup>e</sup>	0.136
4 except Marine	0.20	0.55	0.30	0.020	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.30	0.55	NR	0.020	0.082	0.033	0.050	0.055	0.055
6	0.30	0.55	NR	0.020	0.045	0.060	0.033	0.050	0.055
7 and 8	0.30	0.55	NR	0.020	0.045	0.057	0.028	0.050	0.055

For SI: 1 foot = 304.8 mm.  
 a. Nonfenestration U-factors shall be obtained from measurement, calculation or an approved source.  
 b. Mass walls shall be in accordance with Section R609.5.5. Where mass that half the insulation from the interior, the mass wall U-factor shall not exceed 0.12 in Climate Zones 0 and 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.08 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.  
 c. In Warm Humid locations as defined by Figure R301.1 and Table R301.1, the basement wall U-factor shall not exceed 0.360.  
 d. The SHGC shall be as specified in Table R602.1.2.  
 e. Exception: In Climate Zones 6 through 8, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.40.  
 f. There are no SHGC requirements in the Marine Zone.  
 g. A maximum U-factor of 0.32 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:  
 1. Above 4,000 feet in elevation above sea level, or  
 2. In windborne debris regions, where protection of openings is required by Section R301.2.1.2 of the International Residential Code.



Table R402.1.2

2021 IECC Significant Changes

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**TABLE R402.1.2 TABLE R402.1.3 Insulation Minimum R-values and Fenestration Requirements by Component\***

CLIMATE ZONE	FENESTRATION U-FACTOR**	SKYLIGHT FENESTRATION U-FACTOR	GLAZED FENESTRATION SHGC**		CEILING R-VALUE	WOOD FRAME WALL R-VALUE*	MASS WALL R-VALUE*	FLOOR R-VALUE	BASEMENT* R-VALUE	SLAB* R-VALUE & DEPTH	CRAWL SPACE* WALL R-VALUE
			0.75	0.25							
0	NR	0.25	0.25	30	13 or 8.5 <sup>b</sup>	3/4	13	0	0	0	0
1	NR	0.75	0.25	30	13 or 8.5 <sup>b</sup>	3/4	13	0	0	0	0
2	0.40	0.65	0.25	98.85	13 or 8.5 <sup>b</sup>	4/6	13	0	0	0	0
3	0.39, .30	0.55	0.25	98.85	20 or 19.4 <sup>b</sup> or 11.8. or 8.5 <sup>b</sup>	8/13	19	8/19 <sup>c</sup> or 15.1 <sup>c</sup>	9/10 <sup>c</sup> or 2 R	8/19 <sup>c</sup> or 15.1 <sup>c</sup>	8/19 <sup>c</sup> or 15.1 <sup>c</sup>
4 except Marine	0.39, .30	0.55	0.40	49.05	30 or 20 & 5c <sup>d</sup> or 13 & 10c <sup>d</sup> or 8 & 20c <sup>d</sup>	8/13	19	8/19 <sup>c</sup> or 15.1 <sup>c</sup> or 18 or 13 & 5c <sup>d</sup>	10c <sup>d</sup> , 8 & R	8/19 <sup>c</sup> or 15.1 <sup>c</sup> or 18 or 13 & 5c <sup>d</sup>	8/19 <sup>c</sup> or 15.1 <sup>c</sup> or 18 or 13 & 5c <sup>d</sup>
5 and Marine 4	0.39	0.55	errata NR	49.05	30 or 20 & 5c <sup>d</sup> or 13 & 10c <sup>d</sup> or 8 & 20c <sup>d</sup>	13/17	30 <sup>e</sup>	8/19 <sup>c</sup> 15c <sup>d</sup> or 18 or 13 & 5c <sup>d</sup>	10c <sup>d</sup> , 8 & R	8/19 <sup>c</sup> or 15.1 <sup>c</sup> or 18 or 13 & 5c <sup>d</sup>	8/19 <sup>c</sup> or 15.1 <sup>c</sup> or 18 or 13 & 5c <sup>d</sup>
6	0.39	0.55	NR	49.05	30 or 20 & 5c <sup>d</sup> or 13 & 10c <sup>d</sup> or 8 & 20c <sup>d</sup>	15/20	30 <sup>e</sup>	8/19 <sup>c</sup> 15c <sup>d</sup> or 18 or 13 & 5c <sup>d</sup>	10c <sup>d</sup> , 4 R	8/19 <sup>c</sup> or 15.1 <sup>c</sup> or 18 or 13 & 5c <sup>d</sup>	8/19 <sup>c</sup> or 15.1 <sup>c</sup> or 18 or 13 & 5c <sup>d</sup>
7 and 8	0.39	0.55	NR	49.05	30 or 20 & 5c <sup>d</sup> or 13 & 10c <sup>d</sup> or 8 & 20c <sup>d</sup>	19/21	30 <sup>e</sup>	8/19 <sup>c</sup> 15c <sup>d</sup> or 18 or 13 & 5c <sup>d</sup>	10c <sup>d</sup> , 4 R	8/19 <sup>c</sup> or 15.1 <sup>c</sup> or 18 or 13 & 5c <sup>d</sup>	8/19 <sup>c</sup> or 15.1 <sup>c</sup> or 18 or 13 & 5c <sup>d</sup>

\*For R1: 1 foot × 304.8 mm.  
NR = Not Required, if a continuous insulation.

**Table R402.1.3**

2021 IECC Significant Changes

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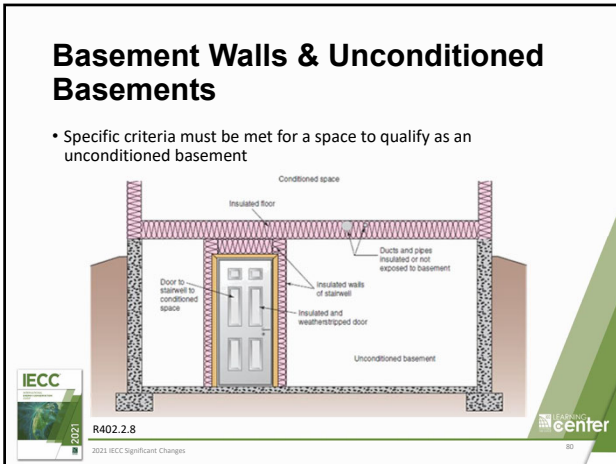
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### Air Leakage Testing

- Reduced maximum air leakage rate to 5 air changes (ACH) per hour for all compliance paths
- Reduced to 3 ACH for climate zones 3-8 for dwellings using the Prescriptive compliance path
  - Exception for heated attached/detached garages
- Alternative compliance method for attached single and multi-family dwelling units and detached dwelling units that are 1,500 ft<sup>2</sup> or smaller.
  - Limited to .3 cubic feet per minute at 50 Pa

**R602.4.1.1 and R602.4.1.2**

2021 IECC Significant Changes

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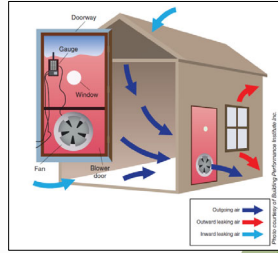
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### Air Leakage Testing Continued

- Testing conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827
- Testing performed at any time after creation of all penetrations of the building thermal envelope have been sealed



R402.4.1.2  
2021 IECC Significant Changes



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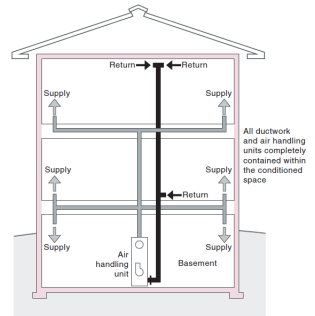
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### Duct Testing

- Testing in accordance with ANSI/RESNET/ICC 380 or ASTM E1554
  - Rough-in test
  - Postconstruction test
- Testing not required for ducts serving ventilation systems that are not integrated with ducts serving heating or cooling systems



Note: Colored shading depicts the building's thermal barrier and pressure boundary. The thermal barrier and pressure boundary enclose the conditioned space.



R403.3.5  
2021 IECC Significant Changes



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### Duct Testing Continued

- Exception for duct testing of ducts in conditioned spaces is deleted



R403.3.5  
2021 IECC Significant Changes



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### Duct Leakage

Rough-in Test	Postconstruction	Test for ducts within thermal envelope
<ul style="list-style-type: none"> <li>4.0 cfm/100ft<sup>2</sup> of conditioned floor area where the air handler is installed at the time of the test</li> <li>3.0 cfm/100ft<sup>2</sup> where air handler not installed</li> </ul>	<ul style="list-style-type: none"> <li>4.0 cfm/100ft<sup>2</sup> of conditioned floor area</li> </ul>	<ul style="list-style-type: none"> <li>8.0 cfm/100ft<sup>2</sup> of conditioned floor area</li> <li>All ducts and air handlers entirely within building thermal envelope</li> </ul>



2021 IECC Significant Changes

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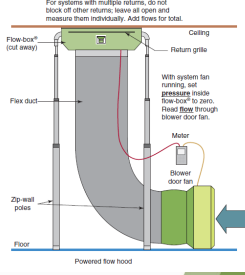
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### Mechanical Ventilation System Testing

- Each dwelling is required to have a minimum mechanical ventilation rate per IRC Section M1505
- New provisions for testing not only the whole-house ventilation referenced in the IRC, but also spot ventilation such as bathroom fans
- Kitchen range hoods with ducts 6 inches or larger in diameter are exempt from the requirement



For systems with multiple returns, do not block off other returns; leave at open and measure them individually. Add flows for total.

With system fan running, seal pressure inside flow box to zero. Read flow through blower door fan.



2021 IECC Significant Changes

center

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### Exterior Lighting

- Connected exterior lighting must comply with the commercial requirements for exterior lighting power, C405.5




**Exceptions:**

1. Detached one- and two-family dwellings.
2. Townhouses.
3. Solar-powered lamps not connected to any electrical service.
4. Luminaires controlled by a motion sensor.
5. Lamps and luminaires that comply with Section R404.1.



2021 IECC Significant Changes

center

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### Interior Lighting Controls

- Lighting controls required for all permanently installed lighting fixtures
- Exceptions
  - Bathrooms
  - Hallways
  - Exterior lighting fixtures
  - Lighting designed for safety or security



Occupant sensors, dimmers, automatic daylight sensors meet requirements



R404.2  
2021 IECC Significant Changes



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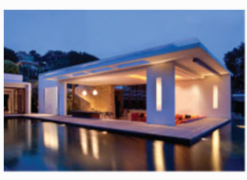
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### Exterior Lighting Controls



Total permanently installed exterior lighting power greater than 30 watts

- Manual on/off switch
  - Exception: lighting serving multiple dwelling units
- Daylight sensor
- Overrides must reset after 24 hours



R404.3  
2021 IECC Significant Changes



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### Total Building Performance

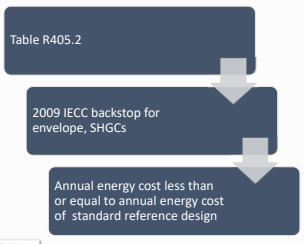


TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE	
SECTION	TITLE
General	
R401.2.5	Additional energy efficiency
R401.3	Certificate
Building Thermal Envelope	
R402.1.1	Vapor barrier
R402.2.3	Erve barrier
R402.2.4.1	Access barriers and doors
R402.2.10.1	Crown space wall assembly installation
R402.4.1.1	Insulation
R402.4.1.2	Testing
R402.5	Maximum Resistance U-factor and SHGC
Mechanical	
R403.1	Controls
R403.3 (including R403.3.1 energy sections R403.3.2, R403.3.3 and R403.3.6)	Ducts
R403.4	Mechanical system piping insulation
R403.5.1	Heated water circulation and temperature maintenance systems
R403.5.3	Drain water heat recovery units
R403.6	Mechanical ventilation
R403.7	Equipment sizing and efficiency rating
R403.8	Systems serving multiple-dwelling units
R403.9	Swim staff and ice systems
R403.10	Energy consumption of pools and spas
R403.11	Portable spas
R403.12	Residential pools and permanent residential spas
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls



R405.2  
2021 IECC Significant Changes



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### Additional Energy Efficiency

- Prescriptive Compliance Option
  - Select one additional efficiency package option in Section R408.2
- Total Building Performance option
  - Select one additional efficiency package option in Section R408.2
  - OR
  - Proposed design must have annual energy cost less than or equal to 95% of the referenced design
- Energy Rating Index
  - ERI value must be at least 5% less than ERI target



IECC 2021  
R401.2.5  
2021 IECC Significant Changes

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### Additional Energy Efficiency Package Options

Enhanced envelope performance

More efficient HVAC equipment performance

Reduced energy use in service water heating

More efficient duct thermal distribution system

Improved air sealing and efficient ventilation system

IECC 2021  
R408.2  
2021 IECC Significant Changes

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### Appendix RA: Board of Appeals

- Appendix RA provides guidance for establishing a board of appeals, including criteria for membership and instruction for developing rules and procedures
- Consistent with other I-Codes



IECC 2021  
Appendix RA  
2021 IECC Significant Changes

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## Appendix RB: Solar-Ready Provisions

- Appendix RB does not require solar systems to be installed for a building
- It requires the space for installing such systems, providing pathways for connections and requiring adequate structural capacity of roof systems to support the systems
- Shading
  - Panel placement zones based on existing or permanently installed site elements
- Capped roof penetration sleeve
  - Provided on roofs with less than 1/12 pitch



Appendix RB  
2021 IECC Significant Changes

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## Appendix RC: Zero Energy Residential Building Provisions


ERI zero energy score for compliance

- ERI values calculated in accordance with RESNET/ICC 301 with and without on-site power production (OPP)

**TABLE RC102.2 - Maximum Energy Rating Index\***

CLIMATE ZONE	ENERGY RATING INDEX not including OPP	ENERGY RATING INDEX including Adjusted OPP (as proposed)
1	43	0
2	45	0
3	47	0
4	47	0
5	47	0
6	46	0
7	46	0
8	46	0

a. The building shall meet the requirements of Table R406.2, and the building thermal envelope shall be greater than or equal to the levels of efficiency and SSI/EC in Table R409.1.4 or Table R309.1.1 of the 2015 International Energy Conservation Code.



2021 IECC Significant Changes

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## Thank you for Attending

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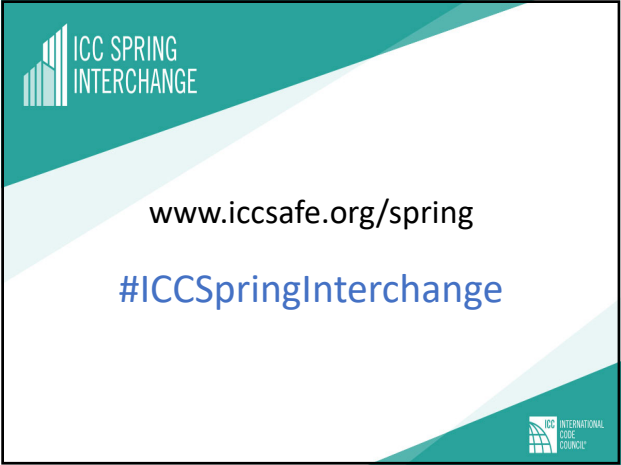
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