



INTERNATIONAL CODE COUNCIL®
CONFERENCE AND HEARINGS

A Conversation on Energy Efficiency, Carbon Reduction and the Codes

Ryan M. Colker, Vice President, Innovation

Kristopher Stenger, Director of Energy Programs, Technical Services



Governments Have Committed



Pledge, Compact, Commitment, or Initiative	Number of Participating US Local Governments
Climate Mayors	407
We are Still In	307
Ready for 100	148
Under2MOU	26
Bloomberg American Cities Climate Challenge	25
Rockefeller 100 Resilient Cities	24
2030 Districts	21
DOE Zero Energy Schools Accelerator	14
DOE Energy Accelerator	11
DOE Zero Energy Districts Accelerator	4

ACCEPTANCE ON BEHALF OF THE UNITED STATES OF AMERICA

I, Joseph R. Biden Jr., President of the United States of America, having seen and considered the Paris Agreement, done at Paris on December 12, 2015, do hereby accept the said Agreement and every article and clause thereof on behalf of the United States of America.

Done at Washington this 20th day of January, 2021.

JOSEPH R. BIDEN JR.



U.S. National Declared Contributions (NDCs)

- 50 to 52 % reduction in GHG emissions by 2030
- From 2005 baseline.

*Special Focus on Equity



[Administration](#) [Priorities](#) [CO](#)

Build, preserve, and retrofit more than two million homes and commercial buildings, modernize our nation's schools and child care facilities, and upgrade veterans' hospitals and federal buildings. President Biden's plan will create good jobs building, rehabilitating, and retrofitting affordable, accessible, energy efficient, and resilient housing, commercial buildings, schools, and child care facilities all over the country, while also vastly improving our nation's federal facilities, especially those that serve veterans.



[Administration](#) [Priorities](#) [CC](#)

- The United States can create good-paying jobs and **cut emissions and energy costs for families by supporting efficiency upgrades and electrification in buildings** through support for job-creating retrofit programs and sustainable affordable housing, wider use of heat pumps and induction stoves, and adoption of modern energy codes for new buildings. The United States will also invest in new technologies to reduce emissions associated with construction, including for high-performance electrified buildings.

Zero-Energy Building Goals:

- 2030 for New Construction
- 2050 for All Buildings



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IECC[®]

INTERNATIONAL
ENERGY CONSERVATION
CODE[®]

A Member of the International Code Family[®]

2021



IRC[®]

INTERNATIONAL
RESIDENTIAL CODE[®]
for One- and Two-Family Dwellings

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2021



INCLUDES
Residential requirements from
NFPA 70: National Electrical Code[®] 2020
*The electrical code designated for
use with the I-Codes[®]*

IgCC[®]

INTERNATIONAL
GREEN CONSTRUCTION CODE[®]
A Comprehensive Solution for High-Performance Buildings

A Member of the International Code Family[®]

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POWERED BY
ANSI/ASHRAE/ICC/USGBC/IES 189.1-2020
Standard for the Design of High-Performance
Green Buildings Except Low-Rise Residential Buildings



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LEADING THE WAY TO ENERGY EFFICIENCY

A Path Forward on
Energy and Sustainability to
Confront a Changing Climate

www.iccsafe.org



Updated IECC development
process



Enhanced Energy & Carbon
Reduction resources



Energy Efficiency and
Carbon Advisory Council

www.iccsafe.org/energy



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Revised IECC Scope & Intent

RESIDENTIAL ENERGY PROVISIONS

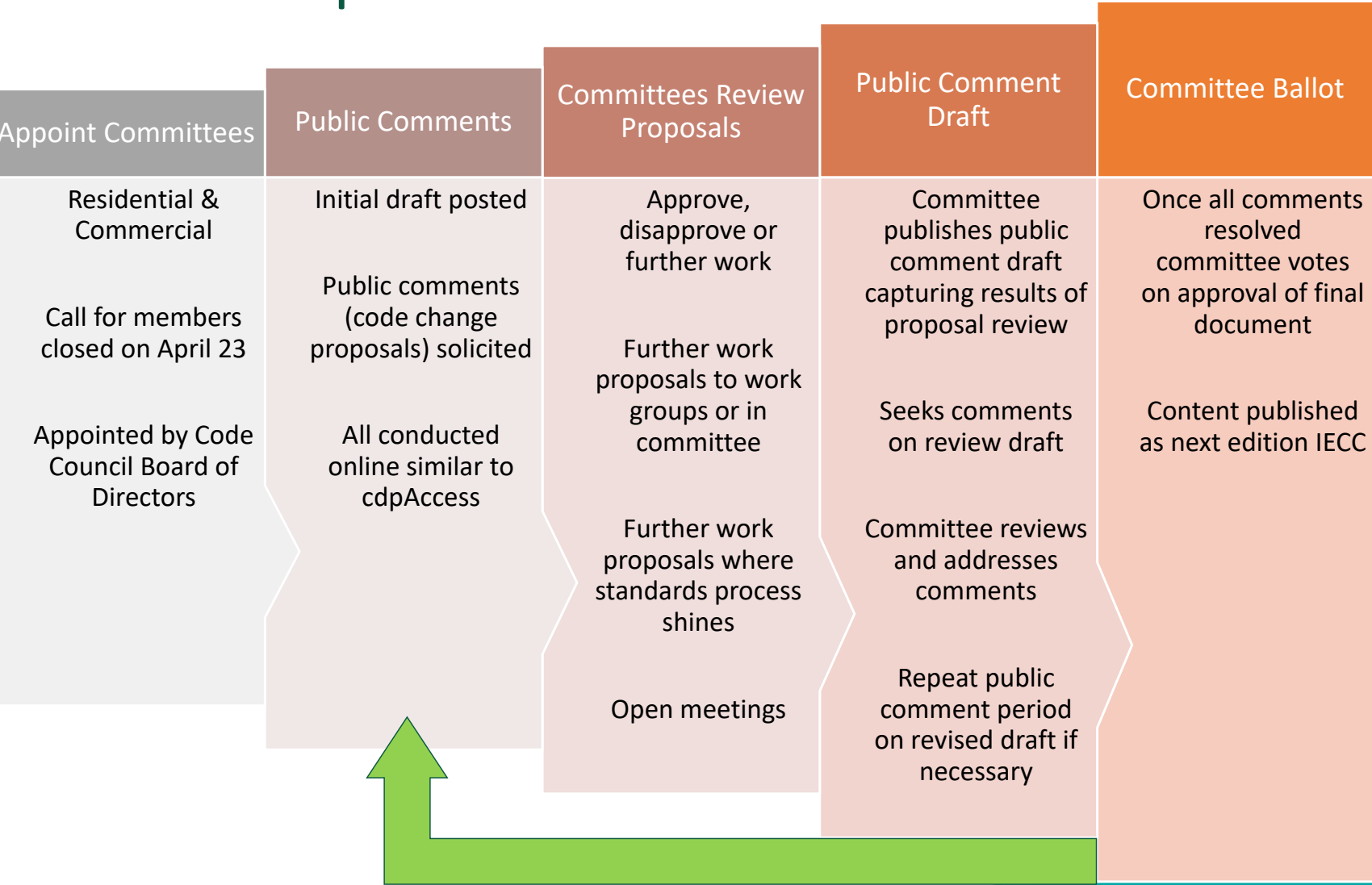
R101.2 Scope

This code applies to the design and construction of residential buildings.

R101.3 Intent

The International Energy Conservation Code-Residential provides market-driven, enforceable requirements for the design and construction of residential buildings, providing minimum efficiency requirements for buildings that result in the maximum level of energy efficiency that is safe, technologically feasible, and life cycle cost effective, considering economic feasibility, including potential costs and savings for consumers and building owners, and return on investment. Additionally, the code provides jurisdictions with optional supplemental requirements, including requirements that lead to achievement of zero energy buildings, presently, and, through glidepaths that achieve zero energy buildings by 2030 and on additional timelines sought by governments, and achievement of additional policy goals as identified by the Energy and Carbon Advisory Council and approved by the Board of Directors. The code may include non-mandatory appendices incorporating additional energy efficiency and greenhouse gas reduction resources developed by the Code Council and others. Requirements contained in the code will include, but not be limited to, prescriptive- and performance-based pathways. The code will aim to simplify code requirements to facilitate the code's use and compliance rate. The code is updated on a three-year cycle with each subsequent edition providing increased energy savings over the prior edition. The IECC residential provisions shall include an update to Chapter 11 of the International Residential Code. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this intent. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

IECC Development Process



IECC Consensus Committees

Residential



JC Hudgison

Chair of the Residential Energy Code Consensus Committee, Chief Building Official, Tampa, FL



Bridget Herring

Vice Chair of the Residential Energy Code Consensus Committee, Energy Program Coordinator, Ashville, NC



Robin Yochum

Vice Chair of the Residential Energy Code Consensus Committee, Energy Program Manager, State of Nevada



Duane Jonlin

Chair of the Commercial Energy Code Consensus Committee, Energy Code & Conservation Advisor, Seattle, WA



Emily Hoffman

Vice Chair of the Commercial Energy Code Consensus Committee, Director of Energy Code Compliance, New York City, NY

Commercial

<https://www.iccsafe.org/about/periodicals-and-newsroom/icc-pulse/iecc-code-committee-selections/>



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IECC Development Process

- Opportunities for Participation
 - IECC Development Committee Membership
 - Residential
 - Commercial
 - Submit code changes
 - Development Committee Work Groups
 - Participate in development committee meetings (open)
 - Review and comment on public review drafts



Energy and GHG Reduction Resources

- Potential topics:

- Electric Vehicle Charging (Coming Soon)
- Electrification and Decarbonization
- Zero Energy and Zero Carbon
- Embodied Carbon
- Grid Interactivity/Efficiency
- Performance Standards for Existing Buildings
- Enhancing Energy Savings through Water Efficiency and Reuse
- Integration of On-site Renewable Energy Generation and Energy Storage



<https://www.iccsafe.org/advocacy/energy-efficiency-and-carbon-reduction/>



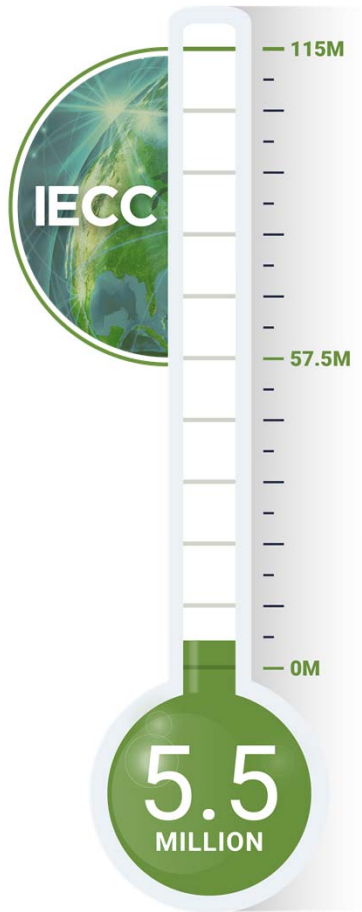
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Energy and Carbon Advisory Council

- Inform development of IECC and Resources
- Support adoptability, implementation
- Membership could include:
 - Mayors, county executives, or other local government sustainability/resilience leaders.
 - State government sustainability/resilience leaders
 - Federal agency representatives.
 - Leaders from public interest and private industry organizations, including, but not limited to, finance, academia, research, manufacturing, building, affordable housing, energy and climate policy, and insurance stakeholders.



Code on a Mission Campaign



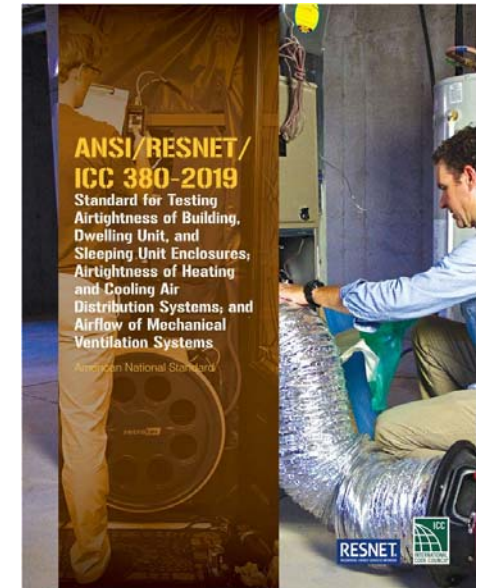
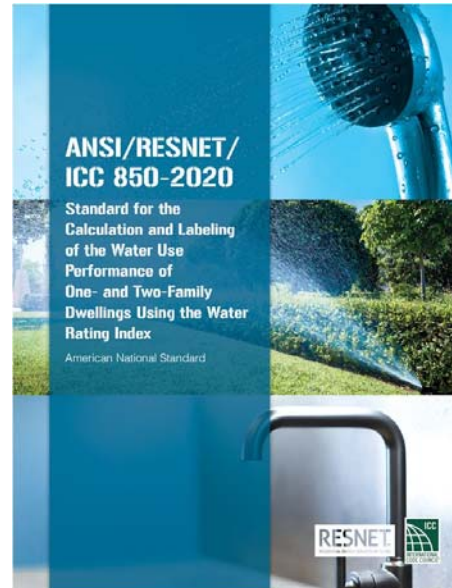
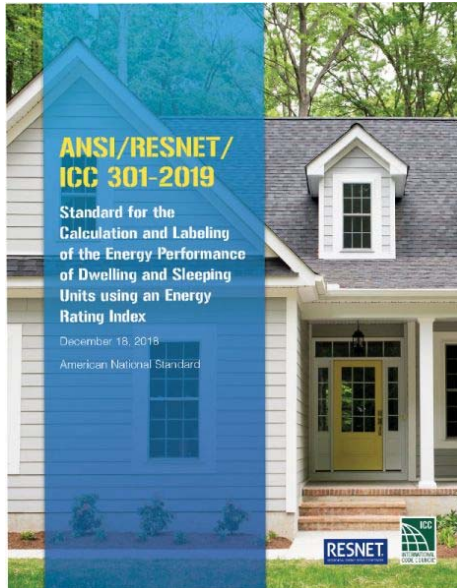
Supporting Organizations



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<https://www.iccsafe.org/iecc-on-a-mission/>

RESNET Collaborations



New RESNET/ICC Standard on Remote Virtual Inspections (RVI) in development

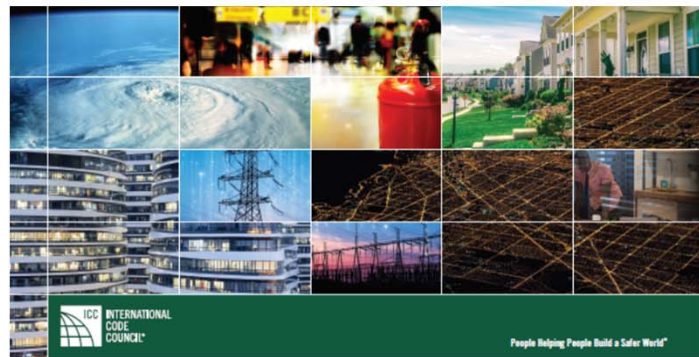
- Energy Code Compliance
- Energy and Water Efficiency Performance of Buildings



New Digital Codes Premium Energy Collection



Energy Codes are a Resilience Strategy



The Important Role of Energy Codes in Achieving Resilience



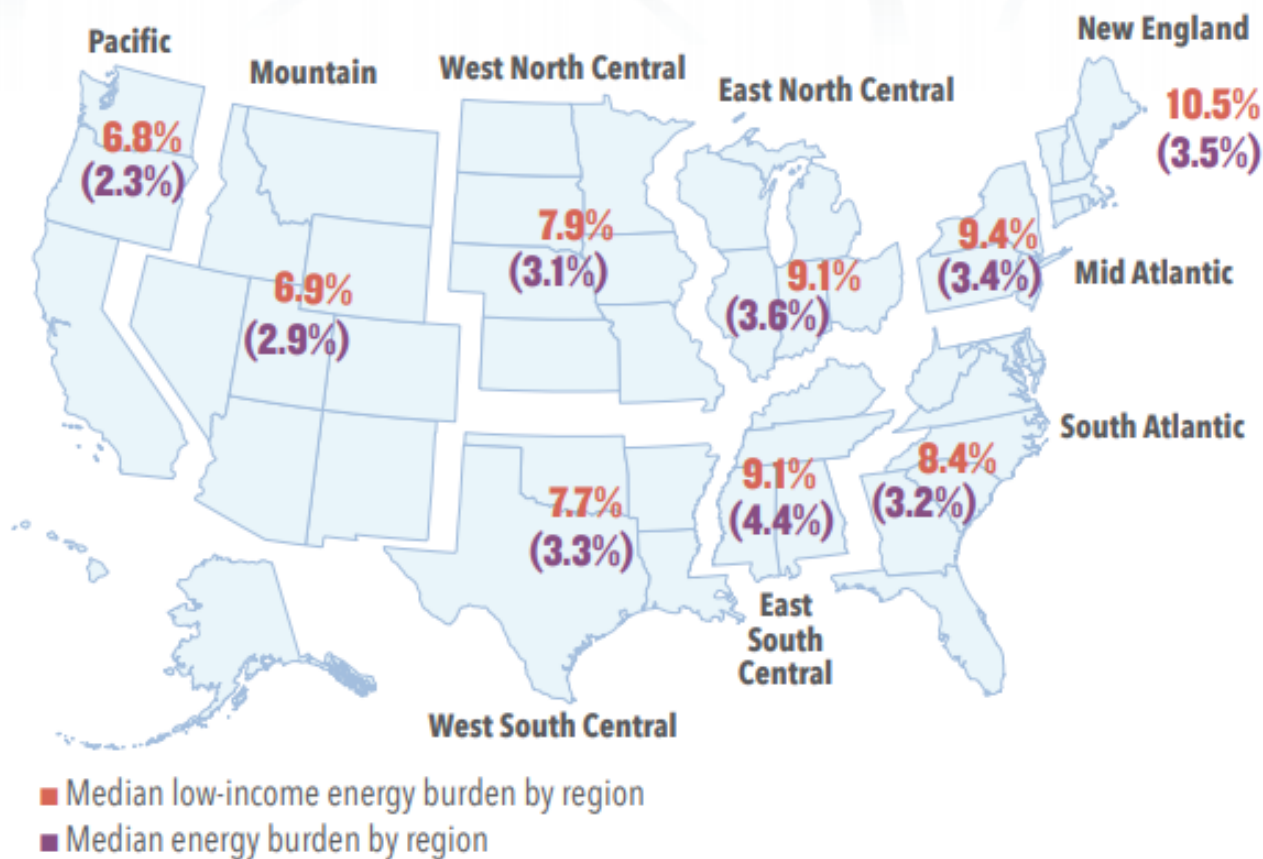
[https://www.iccsafe.org/wp-content/uploads/19-18078 GR ANCR IECC Resilience White Paper BRO Final midres.pdf](https://www.iccsafe.org/wp-content/uploads/19-18078_GR_ANCR_IECC_Resilience_White_Paper_BRO_Final_midres.pdf)



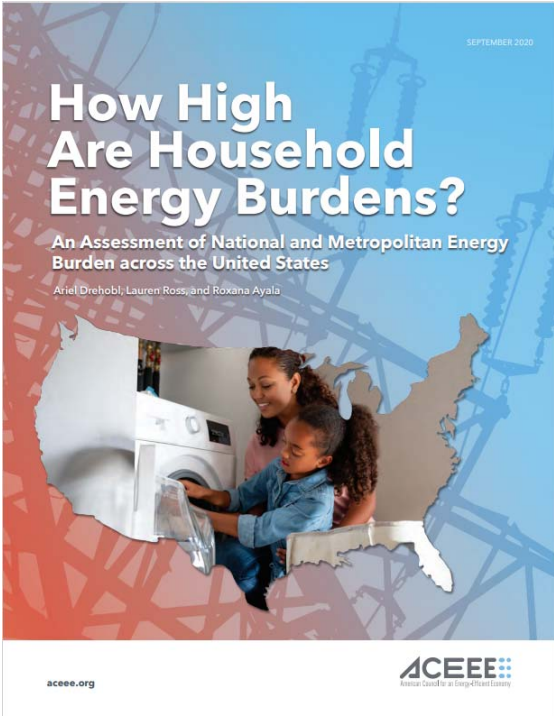
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Energy Burdens & Low-Income Households

FIGURE 3. Median low-income (< 200% FPL) energy burdens by region (red) compared to median energy burdens by region (purple)

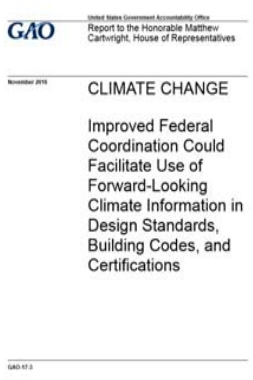
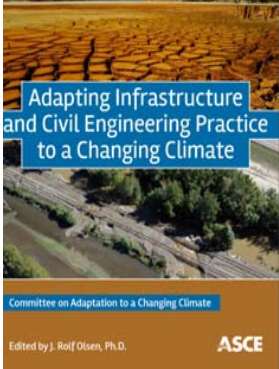
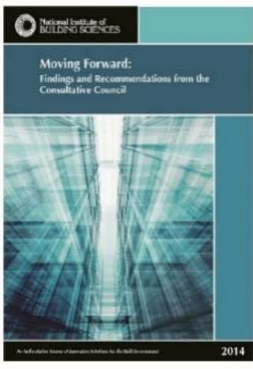
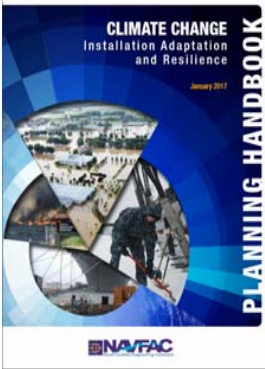


<https://www.aceee.org/research-report/u2006>



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An Essential Resilience Issue: Designing for Future Risk



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Code Council launches global initiative on building resilience

NOVEMBER 22ND, 2019
by ICC

QUICK HITS


The International Code Council launched a new global initiative to bring together experts from the U.S., Australia, Canada and New Zealand to improve building resilience worldwide. This new collaborative forum provides a valuable opportunity for participants to discuss common struggles, and to share knowledge, research, and best practices, as they consider the role of building codes in resilience and durability in the face of increasingly severe weather events.

The Code Council hosted the first roundtable in Newport Beach, California, from October 29-30, 2019. The gathering included building code developers and experts in emergency management, climate science and resilience. The discussion was moderated by Alice Hill, Senior Fellow for Climate Change Policy at the Council on Foreign Relations. The group explored a broad range of issues such as extreme wind, rain, flooding, sea level rise, tidal surge, wildfires and heat stress, and how they create differing approaches to the regulation of buildings and building safety.

SUBMISSIONS

Check out upcoming BSJ topics and send us articles for consideration:

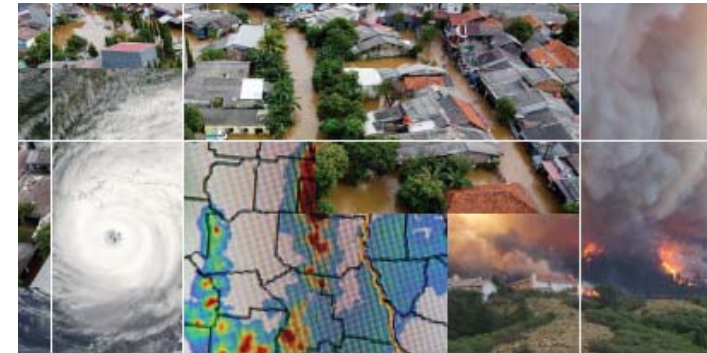
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The Use of Climate Data and Assessment of Extreme Weather Event Risks in Building Codes Around the World: Survey Findings from the Global Resiliency Dialogue

January 2021

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BUILDING PERFORMANCE
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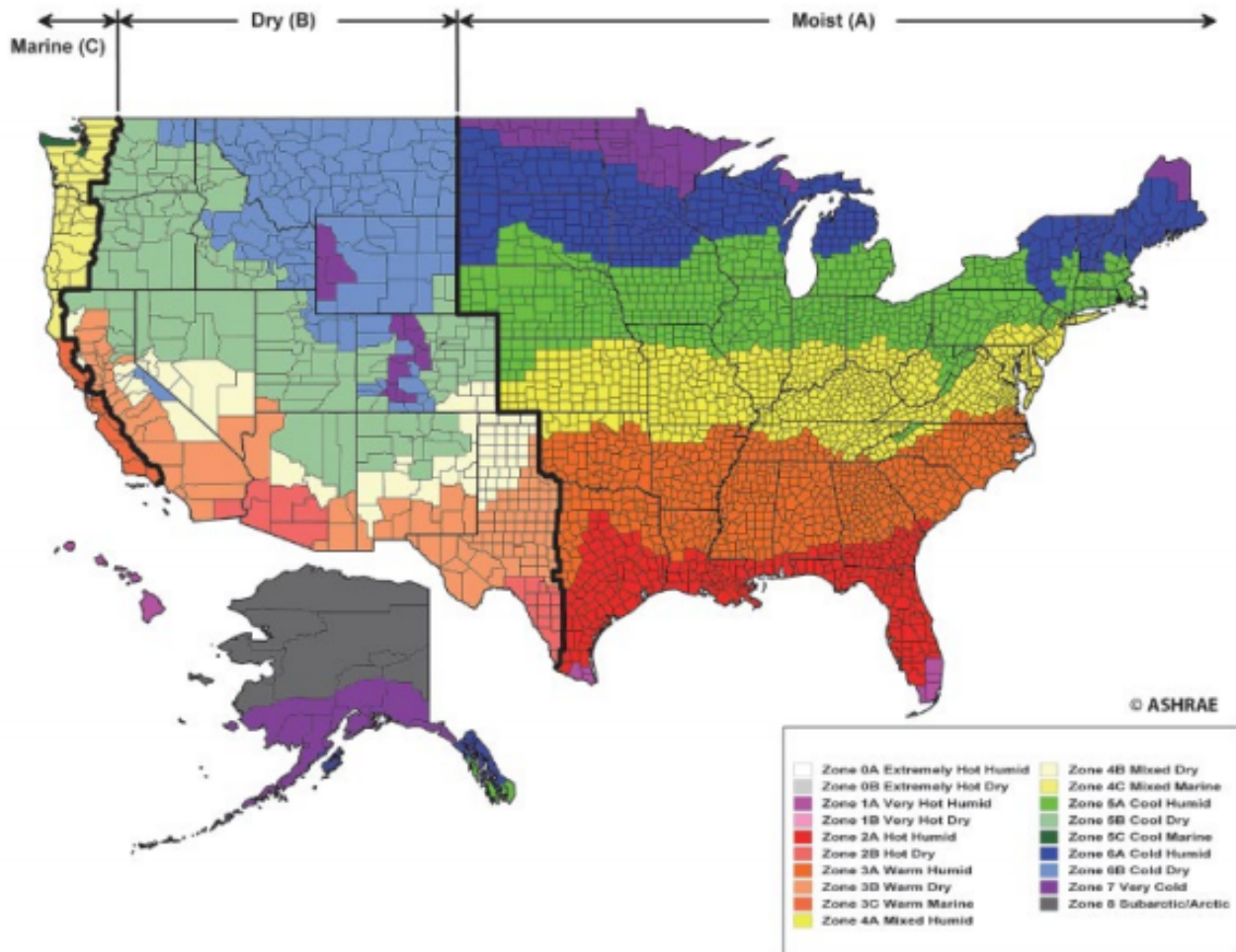
www.globalresiliency.org | page 1

www.globalresiliency.org



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Climate Change and the Codes



IECC C301/R301

- ASHRAE 169-2013
- Creates Climate Zone 0
- Approximately 400 U. S. counties out of more than 3,000 were reassigned, most to warmer climate zones.

Building to COP26



**Global Alliance
for Buildings and
Construction**

Cities, Regions and Built Environment Day

- November 11th

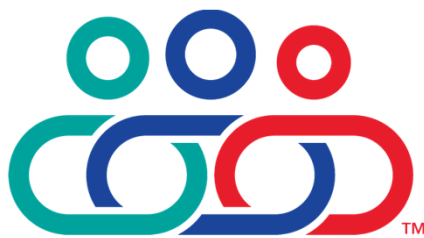
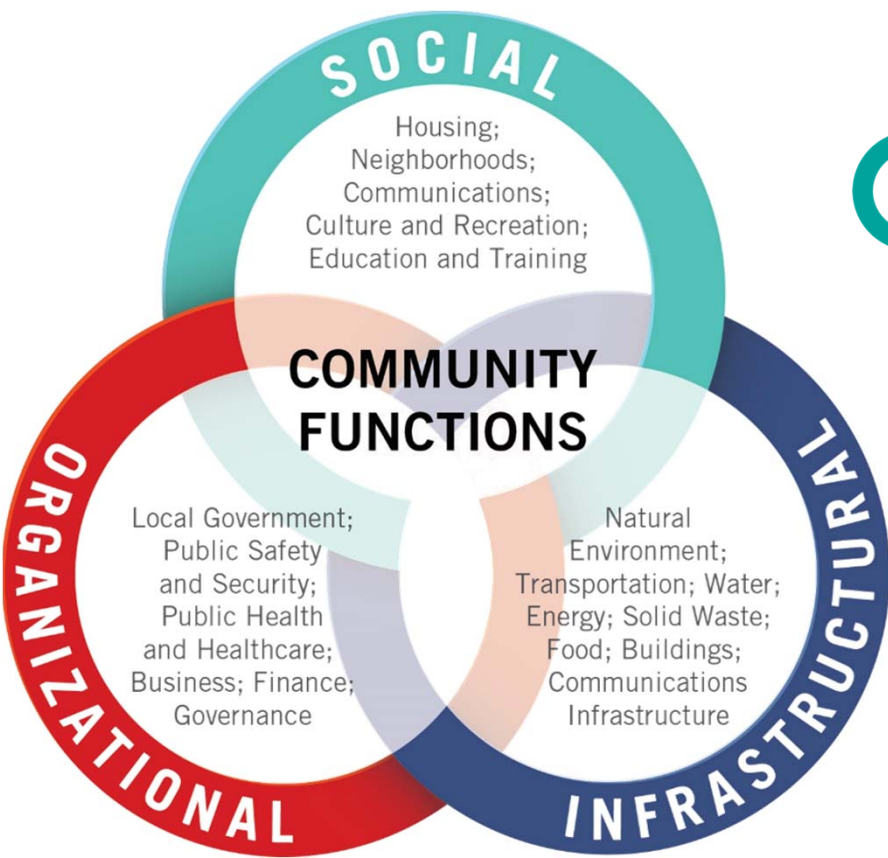
1.5°C Paris Agreement Target

- 65% Emissions Reduction by 2030
- Zero CO₂ Emissions by 2040



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Supporting Community Resilience



Alliance for
National & Community
Resilience®



www.resilientalliance.org | @ANCResilience



Off-Site Construction



QUALITY



WORKFORCE



SUSTAINABILITY



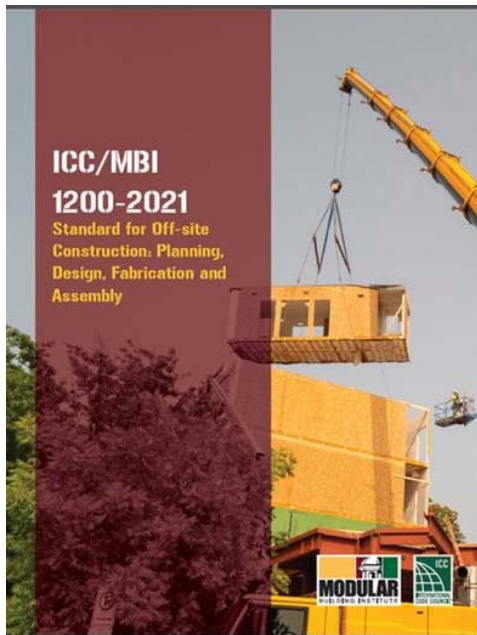
SPEED TO
MARKET



AFFORDABILITY



JOBSITE
SAFETY



ICC/MBI Standard 1210 (upcoming)

- Mechanical, Electrical, Plumbing Systems, Energy Efficiency and Water Conservation

<https://www.iccsafe.org/offsite>



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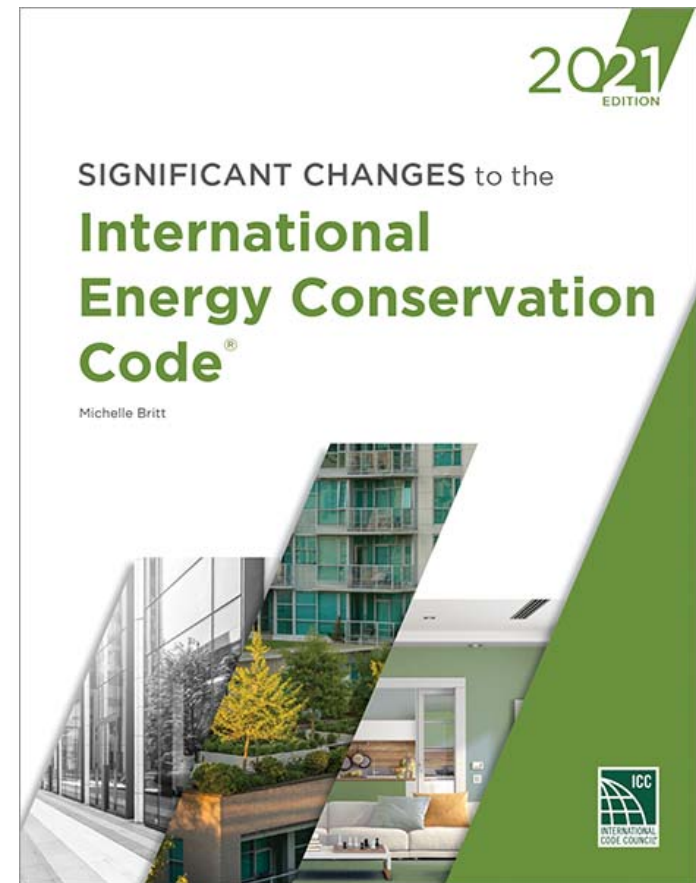


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Significant Changes from the 2018 to the 2021 International Energy Conservation Code (IECC)

Helpful Documents

- Significant Changes to the IECC
- Commentary to the IECC



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Energy Efficiency Improvements

- Increased Efficiency
 - Roughly a 10% increase in energy savings over the 2018 IECC [RE] based on the final DOE determination
 - Commercial determination later this year

The screenshot shows the U.S. Department of Energy's Building Energy Codes Program website. The header includes the DOE logo and navigation links for EERE Home, Programs & Offices, and Consumer Information. The main heading is "Building Energy Codes Program" with a search bar. Below this is a navigation menu with links to HOME, EVENTS, and ABOUT. A breadcrumb trail reads: DOE » EERE » BTO » BECP » Development. On the right, there are links for Site Map, Printable Version, and a SHARE button. The left sidebar contains a menu with categories: DEVELOPMENT, COMMERCIAL, RESIDENTIAL, DETERMINATIONS (highlighted), FEDERAL BUILDINGS, ADOPTION, COMPLIANCE, and RESOURCE CENTER. The main content area is titled "Determinations" and has two tabs: "Commercial Determination" and "Residential Determination" (selected). Under the "Residential Determination" tab, the heading is "2021 International Energy Conservation Code". The text states: "On May 16, 2021, DOE issued a preliminary determination that the 2021 International Energy Conservation Code (IECC) will improve energy efficiency in residential buildings. In support of this determination, DOE conducted a technical analysis evaluating the impacts of the updated code (relative to the 2018 IECC edition). DOE estimates national savings of approximately:" followed by a bulleted list of savings: 9.38 percent site energy savings, 8.79 percent source energy savings, 8.66 percent energy cost savings, and 8.66 percent carbon emissions.

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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Building Energy Codes Program

Building Energy Codes

HOME EVENTS ABOUT

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DEVELOPMENT
COMMERCIAL
RESIDENTIAL
DETERMINATIONS
FEDERAL BUILDINGS
ADOPTION
COMPLIANCE
RESOURCE CENTER

Determinations

Commercial Determination Residential Determination

2021 International Energy Conservation Code

On May 16, 2021, DOE issued a *preliminary* determination that the 2021 International Energy Conservation Code (IECC) will improve energy efficiency in residential buildings. In support of this determination, DOE conducted a technical analysis evaluating the impacts of the updated code (relative to the 2018 IECC edition). DOE estimates national savings of approximately:

- 9.38 percent *site* energy savings
- 8.79 percent *source* energy savings
- 8.66 percent *energy cost* savings
- 8.66 percent *carbon emissions*

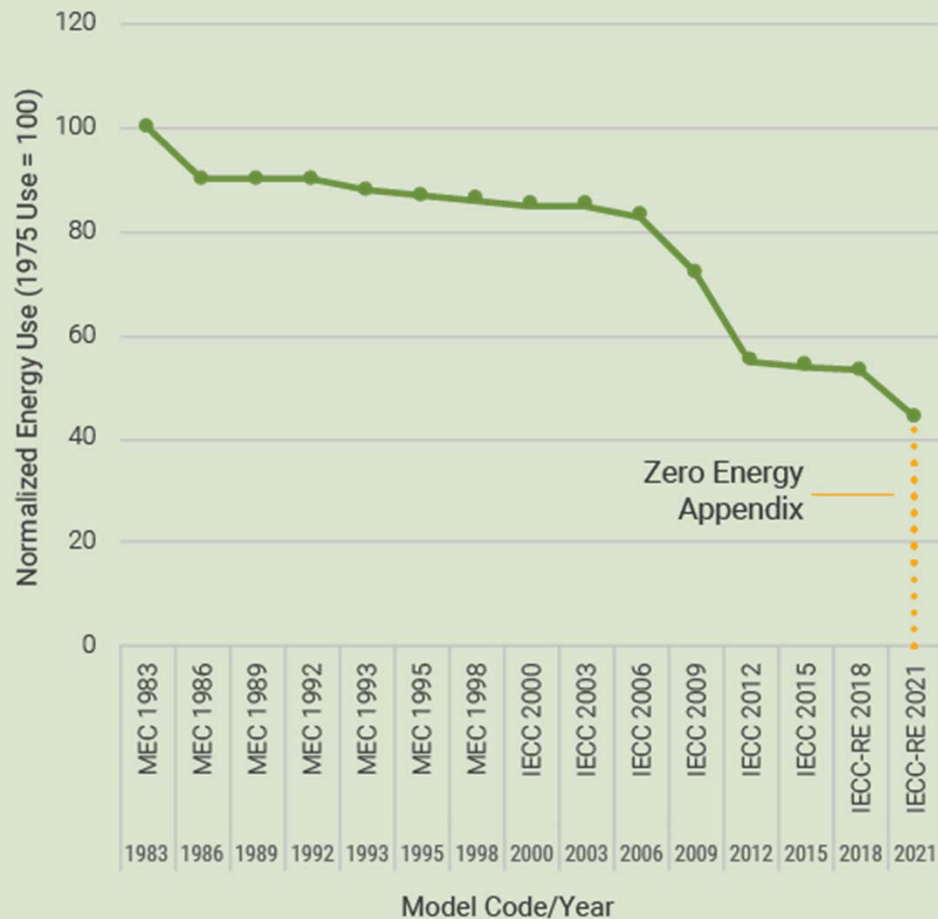


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Energy Efficiency Improvements

Improvement in Energy Use for Residential Model Energy Codes (1983–2021)

Courtesy of Pacific Northwest National Laboratory



- Increased Efficiency
 - Roughly a 40% increase in efficiency from 2006 IECC

- Improved Usability

- Compliance paths named and defined in C401.2 and R402.2
- Tropical Climate Region now a Compliance Option

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.



- Improved Usability

- “Mandatory” and “Prescriptive” labels removed in favor of mandatory tables

TABLE R405.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE	
SECTION ^a	TITLE
	General
R401.2.5	Additional energy efficiency
R401.3	Certificate
	Building Thermal Envelope
R402.1.1	Vapor retarder
R402.2.3	Eave baffle
R402.2.4.1	Access hatches and doors
R402.2.10.1	Crawl space wall insulation installations
R402.4.1.1	Installation
R402.4.1.2	Testing
R402.5	Maximum fenestration <i>U</i> -factor and SHGC
	Mechanical
R403.1	Controls
R403.3, including R403.3.1, except 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	Snow melt 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
404.2	Interior lighting controls

a. Reference to a code section includes all the relative subsections except as indicated in the table.

TABLE C407.2 REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE	
SECTION ^a	TITLE
	Envelope
C402.5	Air leakage—thermal envelope
	Mechanical
C403.1.1	Calculation of heating and cooling loads
C403.1.2	Data centers
C403.2	System design
C403.3	Heating and cooling equipment efficiencies
C403.4, except C403.4.3, C403.4.4 and C403.4.5	Heating and cooling system controls
C403.5.5	Economizer fault detection and diagnostics
C403.7, except C403.7.4.1	Ventilation and exhaust systems
C403.8, except C403.8.6	Fan and fan controls
C403.9	Large-diameter ceiling fans
C403.11, except C403.11.3	Refrigeration equipment performance
C403.12	Construction of HVAC system elements
C403.13	Mechanical systems located outside of the building thermal envelope
C404	Service water heating
C405, except C405.3	Electrical power and lighting systems
C408	Maintenance information and system commissioning

a. Reference to a code section includes all the relative subsections except as indicated in the table.



Chapter 1 Scope and Administration

- Proposals by BCAC were introduced to more align Chapter 1 with the other I-Codes
 - Commercial
 - Within C102 Alternative Materials, C106 Notice of Approval, C109 Stop Work Order
 - Residential
 - Within R102 Alternative Materials, R106 Notice of Approval, R109 Stop Work Order, and R110 Means of Appeals



Chapter 1 Scope and Administration

- Construction documents may be submitted in a digital format where allowed by the code official
- Information on Construction Documents
 - Added Compliance Path selected (if following ASHRAE 90.1 compliance option proceed to following its criteria and not the remaining IECC provisions)
 - Added identifying air barrier and air sealing details and locations



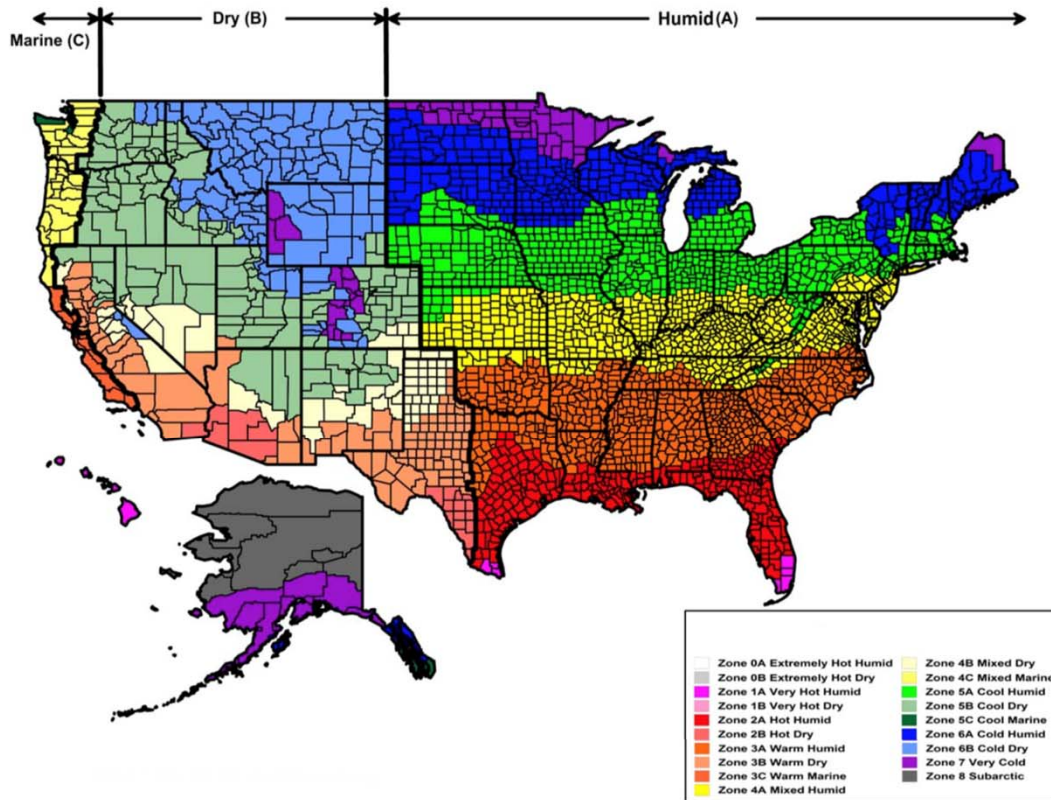
Chapter 2 Definitions

- Added definitions for
 - Biogas, Biomass, Renewable Energy Resources
 - Fan Efficiencies



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General Requirements



- Climate Zones Updated
 - New Climate Zone 0 added
 - 10% of U.S. Counties assigned new Climate Zones
 - Align with 2018 IgCC and ASHRAE 90.1

Commercial Provisions



- Pertains to buildings not covered by the Residential Provisions of the IECC
- Exempted buildings include low energy buildings, some equipment buildings, and non-mechanically heated and cooled greenhouses

Thermal Envelope-Certificate

Energy Efficiency Certificate			
Code edition		<input type="text"/>	
Compliance path		<input type="text"/>	
Insulation Rating		R -Value	R -Value
Ceiling/Roof		R-	R-
Walls	Frame	R-	Mass
	Basement	R-	Crawl space
Floors	Over unconditioned space	R-	Slab edge
Ducts	Attic	R-	Other
Air Leakage Test Results			
Envelope testing	<input type="text"/>	ACH <input type="text"/> Pa.	Duct testing <input type="text"/> cfm/100 ft ²
Fenestration Rating		NFRC U-Factor	NFRC SHGC
Window	U-	<input type="text"/>	<input type="text"/>
Opaque door	U-	<input type="text"/>	<input type="text"/>
Skylight	U-	<input type="text"/>	<input type="text"/>
Weighted average	U-	<input type="text"/>	<input type="text"/>
Designer/builder <input type="text"/>		Date <input type="text"/>	
This Certificate is to be posted in accordance with Section C401.3 of the International Energy Conservation Code.			

Sample thermal envelope certificate.

- Requirement for completed thermal envelope certificate
- Such certificate shall be posted on a wall in the space where the space conditioning equipment is located, a utility room or other approved lo-cation. If located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. A copy of the certificate shall also be included in the construction files for the project.

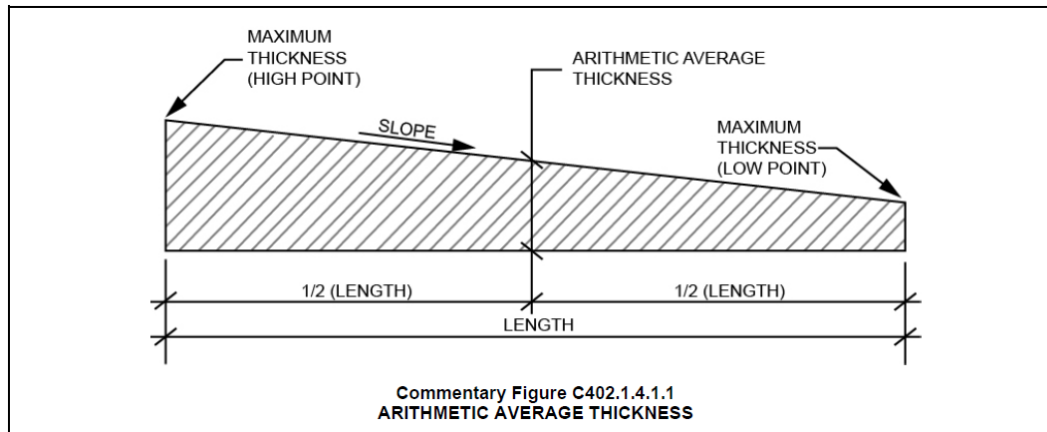
Thermal Envelope - R & U Value Tables

TABLE C402.1.3
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE METHOD^a

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
Roofs																
Insulation entirely above roof deck	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-35ci	R-35ci	R-35ci	R-35ci
Metal buildings ^b	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-25 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-25 + R-11 + R-11 LS	R-25 + R-11 + R-11 LS
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-49	R-49	R-49	R-49	R-49	R-49	R-60	R-60	R-60	R-60
Walls, above grade																
Mass ^c	R-5.7ci ^e	R-5.7ci ^e	R-5.7ci ^e	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci
Metal building	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-14ci	R-13 + R-14ci	R-13 + R-14ci	R-13 + R-14ci	R-13 + R-14ci	R-13 + R-17ci	R-13 + R-19.5ci	R-13 + R-19.5ci	R-13 + R-19.5ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-10ci	R-13 + R-10ci	R-13 + R-12.5ci	R-13 + R-12.5ci	R-13 + R-12.5ci	R-13 + R-15.6ci	R-13 + R-18.8ci	R-13 + R-18.8ci
Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-18.8ci	R-13 + R-18.8ci
Walls, below grade																
Below-grade wall ^d	NR	NR	NR	NR	NR	NR	R-7.5ci	R-10ci	R-10ci	R-10ci	R-15ci	R-15ci	R-15ci	R-15ci	R-15ci	R-15ci
Floors																
Mass ^e	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-14.6ci	R-16.7ci	R-14.6ci	R-16.7ci	R-16.7ci	R-16.7ci	R-20.9ci	R-20.9ci	R-23ci	R-23ci
Joist/framing	R-13	R-13	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-38	R-38	R-38	R-38	R-38	R-38
Slab-on-grade floors																
Unheated slabs	NR	NR	NR	NR	NR	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 24" below	R-25 for 48" below
Heated slabs ^f	R-7.5 for 12" below+ R-5 full slab	R-7.5 for 12" below+ R-5 full slab	R-7.5 for 12" below+ R-5 full slab	R-7.5 for 12" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-10 for 24" below+ R-5 full slab	R-15 for 24" below+ R-5 full slab	R-15 for 24" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-15 for 36" below+ R-5 full slab	R-20 for 36" below+ R-5 full slab	R-20 for 36" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab	R-20 for 48" below+ R-5 full slab

- Incremental increases in efficiency for Attic Insulation in CZ 4-8, Metal Buildings, Below Grade Walls, Joists in CZ1
- Non-swinging opaque doors moved from R to U Value table

Thermal Envelope - Roof Assembly Insulation



- Use of an R-value equivalent, area-weighted average U-factor option in lieu of an “R-value Only” compliance option
- The minimum thickness of above-deck roof insulation at its lowest point, gutter edge, roof drain or scupper, shall be no less than 1 inch

Thermal Envelope – Vertical Fenestration

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	
Vertical fenestration																
U-factor																
Fixed fenestration	0.50		0.50 <u>0.45</u>		0.46 <u>0.42</u>		0.38 <u>0.36</u>		0.38 <u>0.36</u>		0.36 <u>0.34</u>		0.29		0.29 <u>0.26</u>	
Operable fenestration	0.65 <u>0.62</u>		0.65 <u>0.60</u>		0.60 <u>0.54</u>		0.45		0.45		0.43 <u>0.42</u>		0.37 <u>0.36</u>		0.37 <u>0.32</u>	
Entrance doors	1.10 <u>0.83</u>		0.83 <u>0.77</u>		0.77 <u>0.68</u>		0.77 <u>0.63</u>		0.77 <u>0.63</u>		0.77 <u>0.63</u>		0.77 <u>0.63</u>		0.77 <u>0.63</u>	
SHGC																
Orientation ^a	SEW Fixed	N Operable	SEW Fixed	N Operable	SEW Fixed	N Operable	SEW Fixed	N Operable	SEW Fixed	N Operable	SEW Fixed	N Operable	SEW Fixed	N Operable	SEW Fixed	N Operable
PF < 0.2	0.25 <u>0.23</u>	0.33 <u>0.21</u>	0.25	0.33 <u>0.23</u>	0.25	0.33 <u>0.23</u>	0.36	0.48 <u>0.33</u>	0.38	0.51 <u>0.33</u>	0.40 <u>0.38</u>	0.53 <u>0.34</u>	0.45 <u>0.40</u>	NR <u>0.36</u>	0.45 <u>0.40</u>	N <u>0.36</u>
0.2 ≤ PF < 0.5	0.30 <u>0.28</u>	0.37 <u>0.25</u>	0.30	0.37 <u>0.28</u>	0.30	0.37 <u>0.28</u>	0.43	0.53 <u>0.40</u>	0.46	0.56 <u>0.40</u>	0.48 <u>0.46</u>	0.58 <u>0.41</u>	NR <u>0.48</u>	NR <u>0.43</u>	NR <u>0.48</u>	NR <u>0.43</u>
PF ≥ 0.5	0.40 <u>0.37</u>	0.40 <u>0.34</u>	0.40	0.40 <u>0.37</u>	0.40	0.40 <u>0.37</u>	0.58	0.58 <u>0.53</u>	0.61	0.61 <u>0.53</u>	0.64 <u>0.61</u>	0.64 <u>0.54</u>	NR <u>0.64</u>	NR <u>0.58</u>	NR <u>0.64</u>	NR <u>0.58</u>
Skylights																
U-factor	0.75 <u>0.70</u>		0.65		0.55		0.50		0.50		0.50		0.50 <u>0.44</u>		0.50 <u>0.41</u>	
SHGC	0.35 <u>0.30</u>		0.35 <u>0.30</u>		0.35 <u>0.30</u>		0.40		0.40		0.40		NR		NR	

Thermal Envelope – Air Leakage



- Dwelling unit air leakage testing required for Group R and Group I occupancies
- Required air leakage testing for occupancies other than Group R and I occupancies
- Performance or Materials verification requirement for buildings exempt from testing

Mechanical



- Updated equipment efficiency requirements
- Refinement of energy recovery ventilation requirements
- Updated fan efficiency metric

Mechanical – Operable Openings Interlocking

- Applies to occupancies that utilize operable openings to the outdoors that are larger than 40ft.
- Interlocked to HVAC system to raise cooling setpoint to 90 degrees and heating setpoint to 55 degrees.
- Setpoint effective 10 minutes of opening of operable opening



Mechanical – Data Centers

TABLE C403.1.2(2)
MAXIMUM ANNUALIZED MECHANICAL LOAD COMPONENT (ANNUALIZED MLC)

CLIMATE ZONE	HVAC MAXIMUM ANNUALIZED MLC AT 100% AND AT 50% ITE LOAD
0A	0.19
0B	0.20
1A	0.18
2A	0.19
3A	0.18

- Comply with Sections 6 and 8 of ASHRAE 90.4 but must follow mechanical load component tables provided in IECC C403.1.2

Mechanical – Low-capacity Ventilation Fans

2021 CODE: C403.8.5 Low-capacity ventilation fans. Mechanical ventilation system fans with motors less than 1/12 hp (0.062 kW) in capacity shall meet the efficacy requirements of Table C403.8.5 at one or more rating points.

Exceptions:

1. Where ventilation fans are a component of a listed heating or cooling appliance.
2. Dryer exhaust duct power ventilators, domestic range hoods and domestic range booster fans that operate intermittently.

TABLE C403.8.5 Low-Capacity Ventilation Fan Efficacy^a

<u>FAN LOCATION</u>	<u>AIRFLOW RATE MINIMUM (CFM)</u>	<u>MINIMUM EFFICACY (CFM/WATT)</u>	<u>AIR FLOW RATE MAXIMUM (CFM)</u>
<u>HRV or ERV</u>	<u>Any</u>	<u>1.2 cfm/watt</u>	<u>Any</u>
<u>In-line fan</u>	<u>Any</u>	<u>3.8 cfm/watt</u>	<u>Any</u>
<u>Bathroom, utility room</u>	<u>10</u>	<u>2.8 cfm/watt</u>	<u>< 90</u>
<u>Bathroom, utility room</u>	<u>90</u>	<u>3.5 cfm/watt</u>	<u>Any</u>

Mechanical – Large Diameter Ceiling Fans

- New definition added in C202. For fans that are greater than 7 feet in diameter
 - To be tested and labeled in accordance with AMCA 230
- Testing Provisions include energy efficiency metric

$$\frac{CFM}{Watt} = \frac{\sqrt{\frac{A F}{\rho}}}{Power\ Used}$$

A=Circular area of fan (dia) F=Thrust P=Density of Air



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Mechanical – Fault Detection and Diagnostics (FDD)

- HVAC system serving a gross conditioned floor area of >100,000sf shall include a FDD system. The system shall include
 - Permanently installed sensors to measure HVAC system performance
 - Sample performance every 15 minutes
 - Identify and report faults
 - Provide recommendations for repair
 - Be capable of transmitting recommendations to remotely located authorized personnel

Exception: R-1 and R-2 occupancies



Mechanical – Heat Pump supplementary heat

- Allows for more real world applications for when supplementary heat is allowable such as operating in defrost mode, malfunctions in the vapor compression cycle or thermostat

Mechanical – Automatic Start and Stop

- Introduces provisions for stop controls.
- Allow for varying setpoint by at least 2 degrees before scheduled unoccupied periods
- Provided for each HVAC system with Direct Digital Control of individual zones



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Mechanical – Energy Recovery Systems

- Requirements broken into two categories
 - Nontransient dwelling units
 - Spaces other than nontransient dwelling units
- Exemptions
 - In warm climate zones exemption from heating energy recovery reqs
 - In cooler climate zones exemption from cooling energy recovery reqs



Electrical Power and Lighting Systems



Photo courtesy of James O'Neil/The Image Bank/Getty Images

- Increased lighting efficacy and decreased lighting power density requirements
- New provisions for plant growth lighting
- New provisions for automatic receptacle control

Electrical Power and Lighting Systems – Occupant Controls in Warehouse Storage Areas

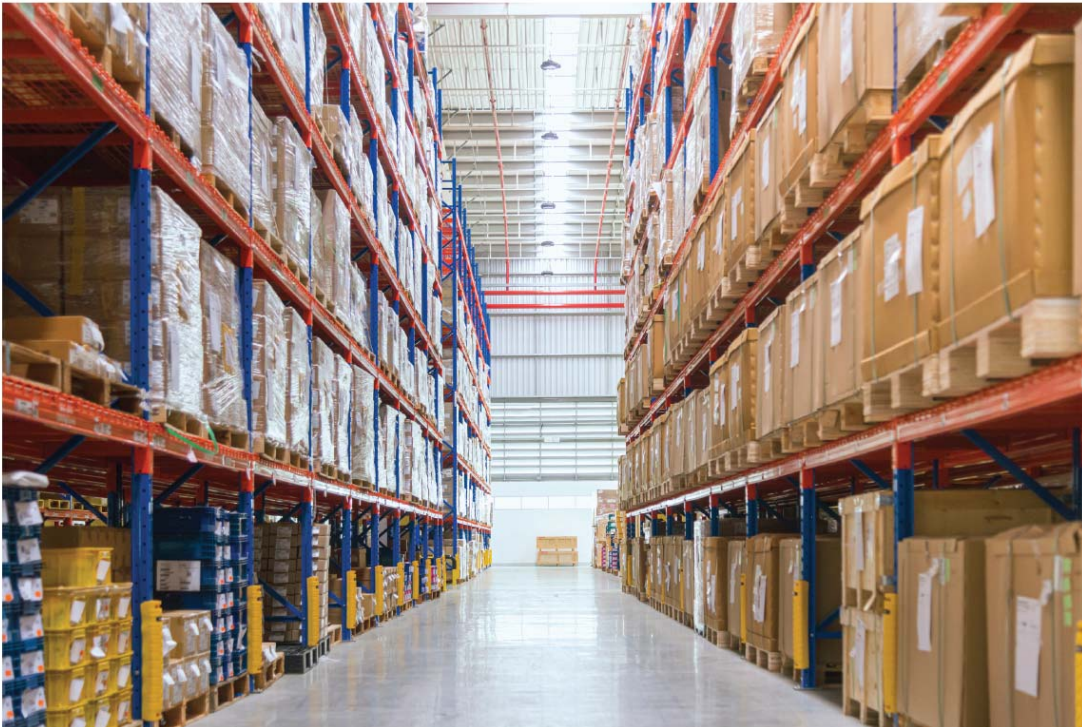


Photo courtesy of Kmatta/Moment/Getty Images

- specifies the time delay or “time out” for occupants leaving the warehouse area and turning off or reducing the lighting is 20 minutes. This aligns with the time delay for all other occupancy sensor spaces (C405.2.1.1) and open-plan office spaces (405.2.1.3), and reduces lighting power.
- clarifies that the warehouse lighting must automatically turn off according to methods already presented in the code (occupancy sensor or time-switch controls) but leaves the choice of method to the building design professional.

Electrical Power and Lighting Systems – Parking Garage Lighting Control



Photo courtesy of Dukai photographer/Moment/Getty Images

- Must be controlled by either an occupant sensor or time-switch control
- Additionally lighting power of luminaires shall be automatically reduced by not less than 30% when there is no activity within a lighting zone for 20 minutes
- Lighting zones not larger than 3600 sf
- Perimeter Daylight responsive controls

Electrical Power and Lighting Systems- Automatic Receptable Control



- New provision require at least 50 percent of covered receptacle and 25 percent of branch circuit feeder to be on automatically controlled receptacles
- Multiple Control Options
- All controlled receptacles shall be permanently marking per NFPA 70

Electrical Power and Lighting Systems – Energy Monitoring

TABLE C405.12.2 ENERGY USE CATEGORIES	
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.

- Applies to new buildings 25,000 ft² 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 ft²

Additional Efficiency Requirements



Revised structure of C406

- Points-based
- 10 points required (1 pt equivalent to 0.25% energy savings)
- Equity of efficiency options across climate zones

Expanded options

- 11 options total, 3 new



Additional Efficiency Requirements

TABLE C406.1(2)
ADDITIONAL ENERGY EFFICIENCY CREDITS FOR GROUP R AND I OCCUPANCIES

SECTION	CLIMATE ZONE															
	0A & 1A	0B & 1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7
C406.2.1: 5% heating efficiency improvement	NA	NA	NA	NA	1	NA	NA	1	NA	1	1	1	1	2	1	2
C406.2.2: 5% cooling efficiency improvement	3	3	2	2	1	1	1	1	1	NA	1	1	NA	1	1	NA
C406.2.3: 10% heating efficiency improvement	NA	NA	NA	NA	1	NA	NA	1	1	1	2	2	1	3	2	4
C406.2.4: 10% cooling efficiency improvement	5	5	4	3	2	3	1	2	2	1	1	1	1	1	1	1
C406.3: Reduced lighting power	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
C406.4: Enhanced digital lighting controls	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C406.5: On-site renewable energy	8	8	8	8	7	8	8	7	7	7	7	7	7	7	7	7
C406.6: Dedicated outdoor air system	3	4	3	3	4	2	NA	6	3	4	8	5	5	10	7	12
C406.7.2: Recovered or renewable water heating	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15
C406.7.3: Efficient fossil fuel water heater	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	11
C406.7.4: Heat pump water heater	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406.8: Enhanced envelope performance	3	6	3	5	4	4	1	4	3	3	4	5	3	5	4	6
C406.9: Reduced air infiltration	6	5	3	11	6	4	NA	7	3	3	9	5	1	13	6	3
C406.10: Energy monitoring	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
C406.11: Fault detection and diagnostics system	1	1	1	1	1	1	NA	1	1	NA	1	1	NA	1	1	1

- More efficient HVAC performance
- Reduced lighting power
- Enhanced lighting controls
- On-site supply of renewable energy
- Dedicated outdoor air systems
- High-efficiency service water heating
- Enhanced envelope performance
- Reduced air infiltration
- *Energy monitoring system*
- *Fault detection and diagnostics*
- *Efficient kitchen equipment*

Commercial Performance Path

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.

C407.2 Mandatory requirements. Compliance based on total building performance requires that a proposed design meet all of the following:

1. The requirements of the sections indicated within Table C407.2.
2. An annual energy cost that is less than or equal to 80 percent of the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source approved by the *code official*, such as the Department of Energy, Energy Information Administration's *State Energy Data System Prices and Expenditures* reports. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the proposed design associated with *on-site renewable energy* shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.

2018

C401
<85%

2021

C407
<80%

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of ANSI/ASHRAE/IESNA 90.1.
2. The requirements of Sections C402 through C405 and C408. In addition, commercial buildings shall comply with Section C406 and tenant spaces shall comply with Section C406.1.1.
3. The requirements of Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404, C405, C407 and C408. The building energy cost shall be equal to or less than 85 percent of the standard reference design building.

C407.2 Mandatory requirements. Compliance with this section requires compliance with Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404 and C405.

C407.3 Performance-based compliance. Compliance based on total building performance requires that a proposed building (*proposed design*) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the *standard reference design*. Energy prices shall be taken from a source approved by the *code official*, such as the Department of Energy, Energy Information Administration's *State Energy Price and Expenditure Report*. *Code officials* shall be permitted to require time-of-use pricing in energy cost calculations. The reduction in energy cost of the proposed design associated with *on-site renewable energy* shall be not more than 5 percent of the total energy cost. The amount of renewable energy purchased from off-site sources shall be the same in the *standard reference design* and the *proposed design*.

Commercial - Existing Buildings

- Clarification that projects complying with ASHRAE 90.1 to follow that path and not mix with IECC.
- Pulled in previously referenced Vertical Fenestration and Skylight provisions into the body of the Additions requirements
- Set a backstop for roof insulation for roof replacements under Alterations sections



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Commercial Appendices



Photo courtesy of Vithun Khamsong/Moment/Getty Images

- New Board of Appeals appendix
- New provision for system-ready area for electrical energy storage added to Solar-Ready Zone appendix

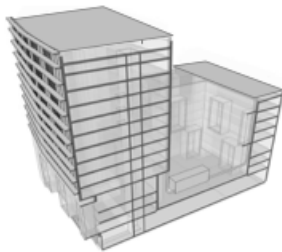
Commercial Appendices – Zero Energy Commercial Building Provisions

ZERO CODE

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

1

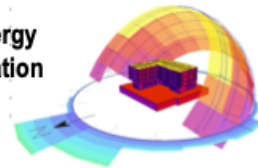
Design an energy efficient building in compliance with the 2021 IECC *or better*.



2

Establish the building's renewable energy requirement from:

an energy simulation



or

default renewable energy table

29

Building Type	Climate Zone											
	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	7a	7b
Commercial	20	20	20	20	20	20	20	20	20	20	20	20
Mid-rise/High-rise Residential	20	20	20	20	20	20	20	20	20	20	20	20
Public Assembly	20	20	20	20	20	20	20	20	20	20	20	20
Government	20	20	20	20	20	20	20	20	20	20	20	20
College	20	20	20	20	20	20	20	20	20	20	20	20
Healthcare	20	20	20	20	20	20	20	20	20	20	20	20
Performance Arts	20	20	20	20	20	20	20	20	20	20	20	20
Hotel	20	20	20	20	20	20	20	20	20	20	20	20
Office	20	20	20	20	20	20	20	20	20	20	20	20
Warehouse	20	20	20	20	20	20	20	20	20	20	20	20
Industrial	20	20	20	20	20	20	20	20	20	20	20	20
Manufacturing	20	20	20	20	20	20	20	20	20	20	20	20
Other	20	20	20	20	20	20	20	20	20	20	20	20

3

Meet the requirement by integrating onsite renewable energy when feasible.



4

If necessary, procure offsite renewable energy.



Source: Architecture 2030
Graphic adaptations: Sefaira; DOE; Green Ideas



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Residential Provisions [RE]

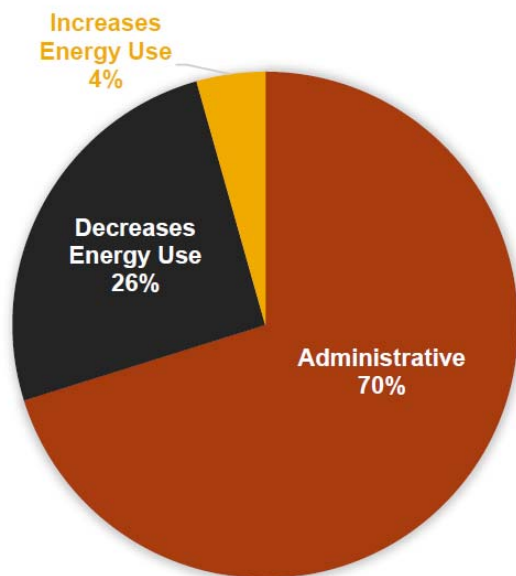


Figure 2. Categorization of Approved Code Changes

Source - <https://www.energycodes.gov/determinations>

According to Department of Energy Determination

A total of 114 approved code change proposals were identified and analyzed for the 2021 IECC. Analyses of those changes indicate the following:

- 35 changes with a direct impact on energy use in residential buildings—29 of these are expected to reduce energy use while 6 are expected to increase energy use
- 79 additional changes—changes in this category are administrative, impact non-energy portions of the code, or are otherwise not expected to have a direct impact on energy savings under the applied methodology

Chapter 1 Scope and Administration

- Construction documents may be submitted in a digital format where allowed by the code official
- Information on Construction Documents
 - Added Compliance Path selected



Chapter 2 Definitions

- Definition of *High Efficacy Light Source* drops lamps to 65 lumens per watt and luminaires to 45 lumens per watt



Photo courtesy of Peter Dazeley/The Image Bank/Getty Images

Chapter 2 Definitions

- Definition of *Renewable Energy Certificate (REC)* provided. Critical in ERI compliance path



Photo courtesy of cdwheatley/iStock / Getty Images Plus/
Getty Images

Chapter 3 General Requirements

TABLE R301.3(2) R301.3 Thermal Climate Zone Definitions

ZONE NUMBER	THERMAL CRITERIA	
	IP Units	SI Units
0	$10,800 < \text{CDD}50^{\circ}\text{F}$	$6000 < \text{CDD}10^{\circ}\text{C}$
1	$9,000 < \text{CDD}50^{\circ}\text{F} < 10,800$	$5000 < \text{CDD}10^{\circ}\text{C} < 6000$
2	$6,300 < \text{CDD}50^{\circ}\text{F} \leq 9,000$	$3500 < \text{CDD}10^{\circ}\text{C} \leq 5000$
3A and 3B 3	$4,500 < \text{CDD}50^{\circ}\text{F} \leq 6,300$ AND $\text{HDD}65^{\circ}\text{F} \leq 5,400$ 3,600	$\text{CDD}10^{\circ}\text{C} < 3500$ AND $\text{HDD}18^{\circ}\text{C} \leq 3000$ 2000
4A and 4B 4	$\text{CDD}50^{\circ}\text{F} \leq 4,500$ 6,300 AND $3,600 < \text{HDD}65^{\circ}\text{F} \leq 5,400$	$\text{CDD}10^{\circ}\text{C} < 2500$ 3500 AND $2000 < \text{HDD}18^{\circ}\text{C} \leq 3000$
3C-	$\text{HDD}65^{\circ}\text{F} \leq 3,600$	$\text{HDD}18^{\circ}\text{C} \leq 2000$
4C-	$3,600 < \text{HDD}65^{\circ}\text{F} \leq 5,400$	$2000 < \text{HDD}18^{\circ}\text{C} \leq 3000$
5	$\text{CDD}50^{\circ}\text{F} < 6,300$ AND $5,400 < \text{HDD}65^{\circ}\text{F} \leq 7,200$	$\text{CDD}10^{\circ}\text{C} < 3500$ AND $3000 < \text{HDD}18^{\circ}\text{C} \leq 4000$
6	$7,200 < \text{HDD}65^{\circ}\text{F} \leq 9,000$	$4000 < \text{HDD}18^{\circ}\text{C} \leq 5000$
7	$9,000 < \text{HDD}65^{\circ}\text{F} \leq 12,600$	$5000 < \text{HDD}18^{\circ}\text{C} \leq 7000$
8	$12,600 < \text{HDD}65^{\circ}\text{F}$	$7000 < \text{HDD}18^{\circ}\text{C}$

For SI: $^{\circ}\text{C} = [(^{\circ}\text{F}) - 32]/1.8$.

- Climate Zones Updated
 - New Climate Zone 0 added
 - 10% of U.S. Counties assigned new Climate Zones
 - Align with 2018 IgCC and ASHRAE 90.1



Chapter 4 Compliance Paths

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.

- Compliance Paths named rather than referenced by applicable section number
- Tropical Climate zone recognized as a compliance path



Chapter 4 Energy Efficiency Certificate

Energy Efficiency Certificate			
Code edition			
Compliance path			
Insulation Rating		R-Value	R-Value
Ceiling/Roof		R-	R-
Walls	Frame	R-	Mass
	Basement	R-	Crawl space
Floors	Over unconditioned space	R-	Slab edge
Ducts	Attic	R-	Other
Air Leakage Test Results			
Envelope testing	ACH	Pa.	Duct testing
			cfm/100 ft ²
Fenestration Rating		NFRC U-Factor	NFRC SHGC
Window		U-	
Opaque door		U-	
Skylight		U-	
Weighted average		U-	
Equipment Performance		Type	Efficiency
Heating system			AFUE
Cooling system			SEER
Water heater			EF
Indicate if the following have been installed (an efficiency shall not be listed)			
<input type="checkbox"/>	electric furnace	<input type="checkbox"/>	gas-fire unvented room heater
<input type="checkbox"/>		<input type="checkbox"/>	baseboard electric heater
Additional Energy Efficiency (check one)			
<input type="checkbox"/>	Proposed design had an annual energy cost \leq 95% of that of the reference design		
<input type="checkbox"/>	Energy Rating Index score is at least 5% less than ERI target		
<input type="checkbox"/>	Additional efficiency package option is installed (specify option)		
Photovoltaic Panel System		Energy Rating Index Score	
Array capacity		with PV	
Inverter efficiency		without PV	
Panel tilt			
Orientation			
Designer/builder		Date	
This Certificate is to be posted in accordance with Section R401.3 of the International Energy Conservation Code.			

- Expanded the Certificate to include
 - The Code Edition
 - The Compliance Path
 - PV system information
 - ERI score

Chapter 4 -Thermal Envelope

- U-factor primary prescriptive compliance path
 - Focus on entire envelope efficiency
 - Defines the performance of the entire assembly
- R-value remains as alternative approach



Photo courtesy of BanksPhotos/E+/Getty Images

Thermal Envelope- R Value

TABLE R402.1.2
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,*}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^e WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13+5 ^h	8/13	19	5/13 ^f	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13+5 ^h	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13+5 ^h	13/17	30 ^g	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	15/20	30 ^g	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20+5 ^h or 13+10 ^h	19/21	38 ^g	15/19	10, 4 ft	15/19

TABLE R402.1.3
INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT^a

CLIMATE ZONE	FENESTRATION U-FACTOR ^{b,1}	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b,*}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE ^g	MASS WALL R-VALUE ^h	FLOOR R-VALUE	BASEMENT ^{c,g} WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^{e,g} WALL R-VALUE
0	NR	0.75	0.25	30	13 or 0 & 10ci	3/4	13	0	0	0
1	NR	0.75	0.25	30	13 or 0 & 10ci	3/4	13	0	0	0
2	0.40	0.65	0.25	49	13 or 0 & 10ci	4/6	13	0	0	0
3	.30	0.55	0.25	49	20 or 13 & 10ci ^h or 0 & 15ci ^h	8/13	19	5ci or 13f	10ci, 2 ft	5ci or 13f
4 except Marine	.30	0.55	0.40	60	30 or 20 & 5ci ^h or 13 & 10ci ^h or 0 & 20ci ^h	8/13	19	10ci or 13	10ci, 4 ft	10ci or 13
5 and Marine 4	0.30 ⁱ	0.55	0.40	60	30 or 20 & 5ci ^h or 13 & 10ci ^h or 0 & 20ci ^h	13/17	30	15ci or 19 or 13 & 5ci	10ci, 4 ft	15ci or 19 or 13 & 5ci
6	0.30 ⁱ	0.55	NR	60	30 or 20 & 5ci ^h or 13 & 10ci ^h or 0 & 20ci ^h	15/20	30	15ci or 19 or 13 & 5ci	10ci, 4 ft	15ci or 19 or 13 & 5ci
7 and 8	0.30 ⁱ	0.55	NR	60	30 or 20 & 5ci ^h or 13 & 10ci ^h or 0 & 20ci ^h	19/21	38	15ci or 19 or 13 & 5ci	10ci, 4 ft	15ci or 19 or 13 & 5ci

- Add CZ 0
- Increases in fenestration U-factor SHGC
- Increases in R-Value in Ceiling and Walls
- Cavity & Ci option for basements and crawlspaces

Thermal Envelope – Basement Walls

New and modified exceptions:

- The floor overhead, including the underside stairway stringer leading to the basement, is insulated
- There are no uninsulated duct, domestic hot water, or hydronic heating surfaces exposed to the basement.
- There are no HVAC supply or return diffusers serving the basement.
- The walls surrounding the stairway and adjacent to conditioned space are insulated
- The door(s) leading to the basement from conditioned spaces are insulated and weather-stripped
- The building thermal envelope separates the basement from adjacent conditioned spaces



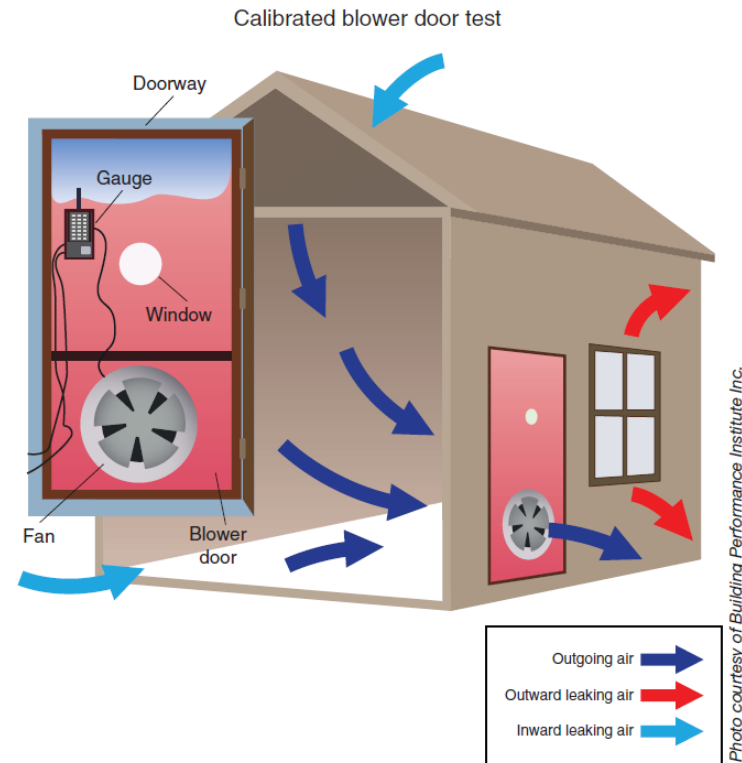
Photo courtesy of slobo/E+/Getty Images

Thermal Envelope – Air Leakage Testing

New definition for *Dwelling Unit Enclosure Area*

Modified Requirements:

- 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
- Alternative compliance method for attached single and multi-family dwelling units and detached dwelling units that are 1,500 sf or smaller. Limited to .3 cubic feet per minute at 50 Pa



Thermal Envelope – Maximum Fenestration U-Factor and SHGC

The area-weighted average maximum fenestration SHGC permitted using tradeoffs from Total Building Performance in Climate Zones 0 through 3 reduced to .40

Exception added for storm shelters complying with ICC 500



Photo courtesy of KatarzynaBialasiewicz/Stock/Getty Images Plus

Systems– Duct Location and Insulation

Ducts located outside conditioned space:

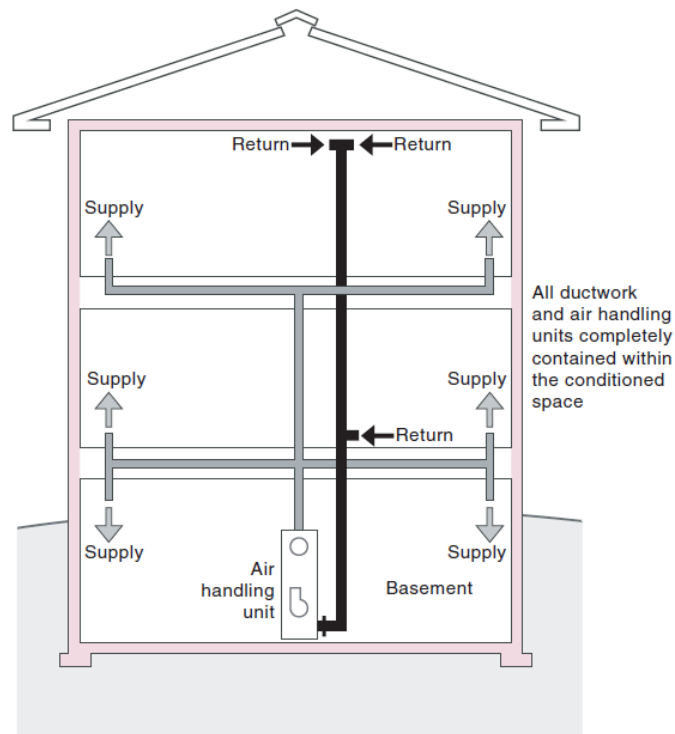
- Minimum R-8 for ducts over 3" diameter. Minimum R-6 for ducts under 3" diameter
- Buried ducts must be equivalent value, listed and labeled

Ducts located inside conditioned space:

- Additional requirements for ductwork in floor cavities located over unconditioned space
- New requirements for ductwork located within exterior walls of the building thermal envelope



Systems– Duct Testing



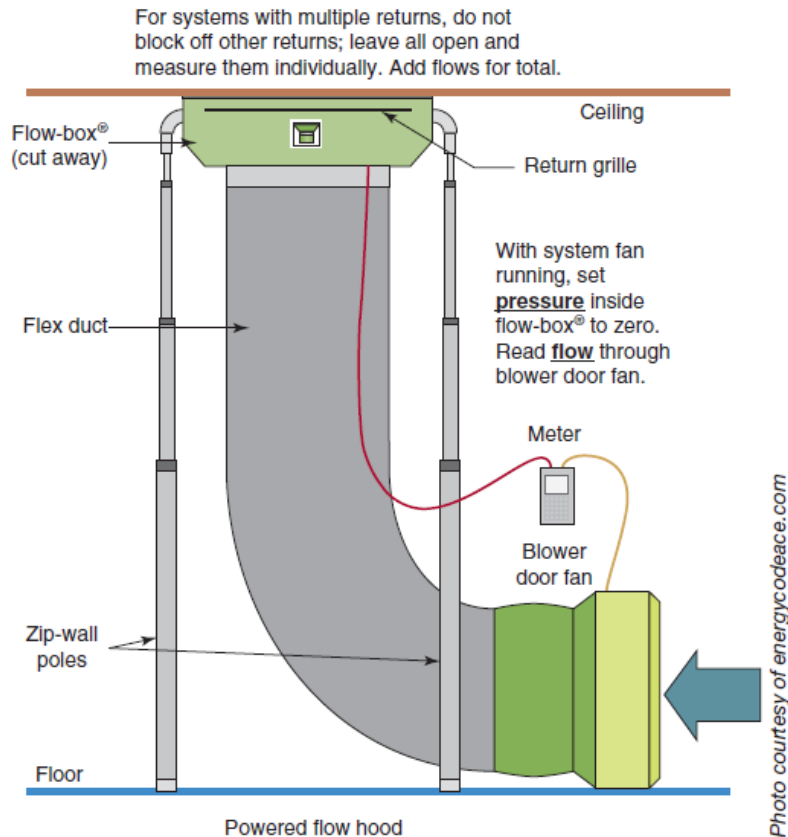
Note: Colored shading depicts the building's thermal barrier and pressure boundary. The thermal barrier and pressure boundary enclose the conditioned space.

Photo courtesy of Building America

Modifications:

- Testing in accordance with ANSI/RESNET/ICC 380 or ASTM E1554
- Removed exception for ducts and air handlers located entirely within the building thermal envelope.

Systems— 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.

Electrical Power and Lighting Systems– Exterior Lighting



Photo courtesy of rgraydos/E+/Getty Images

Connected exterior lighting shall comply with Commercial exterior lighting power requirements of Section C405.5

- Exceptions for one- and two-family dwellings and townhomes.



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Electrical Power and Lighting Systems – Interior Lighting Controls



Photo courtesy of SDI Productions/E+/Getty Images

Permanently installed lighting fixtures shall be controlled with either a dimmer, an occupant sensor control or other control that is installed or built into the fixture.

Exceptions for bathrooms, hallways, exterior lighting, or security/safety

Electrical Power and Lighting Systems – Exterior Lighting Controls



Photo courtesy of Shutterstock/E+/Getty

Permanently installed exterior lighting fixtures greater than 30 watts require the following

- Manual on/off switch
- Daylight Sensor
- Overrides must reset after 24 hours

Total Building Performance Compliance Report

- Simplification for report at time of permit (similar for C/O)
 1. Building street address, or other *building site* identification.
 2. The name of the individual performing the analysis and generating the compliance report.
 3. The name and version of the compliance software tool.
 4. Documentation of all inputs entered into the software used to produce the results for the reference design and/or the rated home.
 5. A certificate indicating that the proposed design complies with Section R405.3. The certificate shall document the building components' energy specifications that are included in the calculation including: component-level insulation *R*-values or *U*-factors; duct system and building envelope air leakage testing assumptions; and the type and rated efficiencies of proposed heating, cooling, mechanical ventilation and service water-heating equipment to be installed. If on-site renewable energy systems will be installed, the certificate shall report the type and production size of the proposed system.
 6. Where a site-specific report is not generated, the proposed design shall be based on the worst-case orientation and configuration of the rated home.



Energy Rating Index (ERI) Compliance Path

- Introduced provisions for buildings with and without on-site renewables. For buildings with on-site renewables a back stop of the 2018 IECC prescriptive thermal envelope was set.
- Credit for on-site renewable energy use limited to 5% of the total home energy use. This aligns with similar commercial provisions
- New definition for *Renewable Energy Certificate* (REC)
- Requirement for homeowner to own REC

R406.7.3 Renewable energy certificate (REC) documentation. Where on-site renewable energy is included in the calculation of an ERI, one of the following forms of documentation shall be provided to the code official:

1. Substantiation that the RECs associated with the on-site renewable energy are owned by, or retired on behalf of, the homeowner.
2. A contract that conveys to the homeowner the RECs associated with the on-site renewable energy, or conveys to the homeowner an equivalent quantity of RECs associated with other renewable energy.



Energy Rating Index (ERI) Compliance Path

2021

**TABLE R406.5
MAXIMUM ENERGY RATING INDEX**

CLIMATE ZONE	ENERGY RATING INDEX
0-1	52
2	52
3	51
4	54
5	55
6	54
7	53
8	53

2018

**TABLE R406.4
MAXIMUM ENERGY RATING INDEX**

CLIMATE ZONE	ENERGY RATING INDEX ^a
1	57
2	57
3	57
4	62
5	61
6	61
7	58
8	58

- Required scores return to 2015 IECC levels.



Energy Rating Index (ERI) Compliance Path

- Renewable Energy Certificate Documentation
 - Substantiation that the RECs are owned by, or retired on behalf of the, homeowner
 - Contract that convey to the homeowner the RECs associated with the renewable energy



Tropical Climate Region Compliance Path



Photo courtesy of Brand X Pictures/Stockbyte/Getty Images

- Recognized with its own compliance path
 - No technical changes from 2018 IECC



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Additional Efficiency Package Options



- Multiple Efficiency Package Options
 - Enhanced envelope performance
 - More efficient HVAC equipment
 - Reduced energy use in service water-heating
 - More efficient duct thermal distribution system
 - Improved air sealing and efficient ventilation system

Residential Appendices

- Board of Appeals
 - Follows requirements of the IBC, IFC, and IRC



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Residential Appendices – Solar Ready



Photo courtesy of Westend61/Getty Images

- Added Provisions
 - 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

Residential Appendices – Zero Energy Provisions

TABLE RC102.2 Maximum Energy Rating Index^a

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 SHGC in Table R402.1.2 or Table RR402.1.3 of the 2015 International Energy Conservation Code.

- New Appendix
 - ERI zero energy score
 - Follows ERI of RESNET/ICC 301 not IECC 406
- Incorporates renewables
 - CREF – community renewable energy facility
 - REPC – renewable energy purchase contract power production. Contract term duration of not less than 15 years



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Questions?



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